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# STUDIES AND RESEARCH CONCERNING BNFP

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT FY 1979 EVALUATION REPORT

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November 1979

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## ABSTRACT

The FY 1979 program for development and demonstration of nuclear materials measurement and control techniques at the Barnwell Nuclear Fuel Plant (BNFP) is described. Manual and computerized systems were used to accumulate accountability data during the FY 1979 Integrated Run in the BNFP Separations Facility. Evaluations of techniques and system performance are presented.

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# 1.0 INTRODUCTION

One phase of the safeguards research and development program at the Barnwell Nuclear Fuel Plant (BNFP) is to develop a comprehensive, state-of-the-art system for nuclear materials control and accounting. The program involves the development, demonstration, and refinement of measurement technology and the application of this technology using an automated, real-time computer system. The Nuclear Materials Control and Accounting System (NMCAS) being developed at the BNFP consists of three major elements: measurement, measurement control, and accounting. This system is defined by written plans and procedures.

Since nuclear materials control and accounting in a reprocessing facility is extremely complicated and involves large quantities of data, the use of a computerized system is a logical solution to the problem. The approach has been to develop the Computerized Nuclear Materials Control System (CNMCAS) in stages. To date, these stages have included conceptual design of a system, procurement and installation of basic hardware, and stepwise development, testing, and demonstration of selected subsystem programs and equipment. Additions and improvements have been made to hardware and software components based on the results of the evaluation tests.

Demonstration of the overall system (NMCAS) and the computerized system (CNMCAS) was conducted in conjunction with the FY 1978 and FY 1979 Integrated Runs at the BNFP. Data were accumulated manually for all aspects of NMCAS, and automatically for those parts of CNMCAS which are in place. Comparisons of data collected manually and by the computer were made, primarily to evaluate the reliability of the computer system. Extensive data evaluation was also done to determine the effectiveness and accuracy of NMCAS.

Three previously issued reports define the initial conceptual design of CNMCAS[1] and evaluate the manual[2] and computerized system[3] performance during the FY 1978 Integrated Uranium Runs.

This report describes modifications and additions to CNMCAS, and evaluates the performance of NMCAS and CNMCAS during the FY 1979 Integrated Uranium Runs. Two other FY 1979 reports describe the In-Process Inventory Development Program[4] and the Process Monitoring/Process Surveillance Development Program.[5]

## 2.0 SUMMARY

### 2.1 CNMCAS Development

CNMCAS modifications and additions were installed during the first half of FY 1979. These changes were made to support the next stages of CNMCAS development and to correct problems encountered in the FY 1978 demonstration program. Significant items included:

- Conversion of CNMCAS software from a time-sharing operating system (RTST/E) to a real-time operating system (RSX-11M) to improve program response time
- Improvement of coordination and reliability of automated data collection using the RTP system
- Development of modular accounting programs to generate accounting reports from the data base
- Development of programs for calculation of limit of error for input, product, and waste measurement points
- Development of programs for measurement control comparisons to provide real-time notification of measurement anomalies
- Development of a more comprehensive data base program with a flexible edit capability built in
- Improvement in the reliability of the CNMCAS-LDS link
- Development of programs to generate measurement control reports for determining control limits and estimating random error variances for bulk measurements
- Addition of "auto-zero" capability to the Ruska electromanometer level measuring systems.

### 2.2 Plant Modifications

Plant modifications identified during the FY 1978 Cold Uranium Run were completed during the first half of FY 1979. Further details on plant modifications and testing are covered in the FY 1979 Integrated Run evaluation report.(6)

### 2.3 FY 1979 Integrated Uranium Runs

The FY 1979 Integrated Uranium Run, which was performed during the second and third quarters of the fiscal year, provided the "test bed" for demonstrating and evaluating measurement techniques and CNMCAS equipment performance. An initial quantity of uranyl nitrate solution was transferred from the $UF_6$ Facility to the accountability tank

(18-D-101) in the Separations Facility. This solution was processed through the solvent extraction system of the facility, collected in the uranium product sample tank (24-D-204), and "recycled" by batch to the accountability tank to maintain a continuous supply of simulated feed solution. Three separate campaigns were conducted, each with a duration of two to four weeks, followed by a flushout and physical inventory. After the third campaign, essentially all of the uranyl nitrate solution in the Separations Facility was transferred back to the $UF_6$ Facility through the uranyl nitrate accountability tank (21-D-157).

Additional details on the operational aspects of the integrated uranium run are contained in the FY 1979 Integrated Run evaluation report.[6]

## 2.4 CNMCAS Performance

Uranium measurements, using installed and supplemental measurement equipment and standard analytical methods, were made on each batch of feed, product, and waste solution generated. The Computerized Nuclear Materials Control and Accounting System (CNMCAS) was tested in parallel with a Manual Nuclear Materials Control and Accounting System (MNMCAS).

Measurements were taken manually throughout all three campaigns. Automated measurements using CNMCAS were started toward the end of Campaign 1 (after a debugging period) and continued through the remainder of the cold run. The various accounting and measurement control programs were also used during this period.

The CNMCAS equipment produced excellent results and will serve as the foundation for future development work. The value of pursuing selected CNMCAS elements through all stages of development and implementation was demonstrated. Although several improvements were identified and these enhancements remain to be implemented, the overall performance of the measurement, accounting, and measurement control programs was satisfactory. Specific conclusions include:

- The conversion from a time-sharing system (RSTS/E) to a real-time operating system (RSX-11M) improved operating program response times.
- Sustained operations using CNMCAS for data collection, storage, evaluation, and reporting were demonstrated.
- Calculation of limits of error by interfacing error variance data with the accounting data accumulated and stored in the data base was demonstrated.
- Sustained operation of the RTP system was demonstrated.
- Transmission of sample requests and analytical results between CNMCAS and LDS was demonstrated.

## 2.5 NMCAS Performance

The Inventory Difference (ID) for the FY 1979 Integrated Uranium Run was +0.09 percent. The associated limit of error (LE) for the ID (LEID) was ±0.19 percent. This LEID is based on the use of the more precise and accurate potentiometric method for input analytical measurements. If input analytical measurements had been made using remote dilutions and mass spectrometry for uranium concentrations, the LEID would have been substantially increased. Extrapolation of the data collected during Campaign 3, using remote dilutions and mass spectrometry for uranium concentration, indicates that the LEID, under those conditions, would be approximately ±0.5 percent.

Federal regulations and the Materials Control and Accounting Plan (AG-L-109) require that the LEID for uranium and U-235 not exceed 0.7 percent of uranium input. Based on total uranium processed (about 300 MTU), the FY 1979 Integrated Uranium Run LEID and ID were well within the regulatory requirement. However, based on the 10 to 12 MTU of uranium used in the run, the ID exceeded the LEID. This indicated a measurement or inventory problem which is most likely associated with waste measurements.

Prior to the start of the FY 1979 Integrated Uranium Run and at the conclusion of each campaign, a physical inventory was performed. The inventory performed after the third campaign incorporated extensive flushing of the process equipment in the Separations Facility to remove residual uranium. The flush solutions were processed to the uranium product sample tank and transferred to the $UF_6$ Facility, leaving a small in-process inventory in the Separations Facility. Satisfactory inventory capability was demonstrated for uranium.

The input measurement system (accountability tank) continued to provide excellent results. Performance of the product measurement (uranium product sample tank) was generally good. The function swap of the horizontal product tank to new vertical product tank provided bulk measurements of improved accuracy. The average difference between product and feed tank measurements for the FY 1978 integrated run was less than 0.07 percent and the corresponding average difference for the FY 1979 integrated run was less than 0.05 percent. This demonstrated and confirmed that bulk measurement accuracies of $<0.05$ percent are obtainable in an operating environment using operating personnel. An apparent measurement bias of 0.1 percent between the product and input measurements was identified and corrected. This serves to illustrate the level of accuracy obtainable in bulk measurements.

An apparent sampling and/or mixing problem for the uranium product sample tank has been identified. Although the bias between the product and input uranium measurements was only 1.6 kilograms uranium or 0.09 percent, the bias is statistically significant. Other indications of this problem include a larger variation in replicate product samples than input samples and a significantly larger variance in process to lab

density measurements for the product than the input tank. Future work is needed in this area.

The performance of the waste measurement systems (HWW sample tank, 41-D-405, and GPW check tank, 43-D-409) was generally satisfactory. The redundant level and density instruments provided for the waste tanks improved measurement performance and the ability to detect measurement anomalies. One operating problem was the periodic plugging of the sampler on the GPW check tank.

The methods used to control measurement anomalies provided assurance that reliable measurements were obtained. The comparison of process density to laboratory density continued to be a very useful and sensitive method to detect measurement anomalies resulting from probe pluggage, inadequate mixing, or nonrepresentative samples. A comparison of uranium calculated from an empirically devised formula using acid and density to predict uranium was an excellent indicater of analytical anomalies. The value of these and similar measurement data comparisons as near real-time measurement control tools to detect measurement anomalies was demonstrated. The methods used to estimate random and systematic error variances were demonstrated.

Refinement and demonstration of the inventory procedure continued during the performance of the four inventories with generally satisfactory results. The sequence of inventory activities was improved. Organic carry-over in waste streams during high flow rate tests caused some problems.

Tests were continued to determine the effectiveness of moisturizing purge air to reduce probe pluggage. These results clearly demonstrated the effectiveness of humidified purge air for reducing probe pluggage and a method of humidifying the purge air.

The material balance accounting system performed satisfactorily. In addition to the Computerized Nuclear Materials Control and Accounting System, a manual data acquisition with report generation, and appropriate data analysis was used throughout the FY 1979 Integrated Uranium Run. Since a manual backup system will be needed, refinements to this system were appropriate.

In general, the performance of the analytical methods was satisfactory with method uncertainties roughly equivalent to those determined in FY 1978. One problem was the use of a volumetric method (U-VI) for determining concentrations on waste samples below the applicable method range. This results in an analytical bias for the waste samples.

Remote dilutions of the third campaign input samples followed by mass spectrometry analysis to determine uranium concentration were used to estimate the random and systematic variances expected for reprocessing input measurements. These data were in line with previous projections.

Vessel volume calibration activities were completed as planned and results were satisfactory. Additional calibration activities are planned for the plutonium storage tanks in Plutonium Product Cell. The accuracy of the revised calibration equations was demonstrated.

Mixing tests on the uranium product sample tank and the uranium off-specification product tanks were successful in demonstrating the mixing times required for the respective tanks.

Sampler accuracy tests were conducted for the product and input tanks. These tests indicated the need for additional and more intensive testing.

## 2.6 Recommendations for FY 1980

A number of areas for improvement of the Nuclear Materials Control and Accounting System and CNMCAS performance were identified as a result of the FY 1979 Uranium Runs. Also, as part of the on-going CNMCAS development program, there are a number of things that should be added during the next year. The following list presents the major areas and items recommended for implementation in FY 1980:

- Improving the recall and storage capability for analytical data from LDS.
- Improving the data analyses techniques and display methods for measurement comparison in real-time.
- Automating control limits for measurement comparisons.
- Accumulating analytical standard and replicate measurement data.
- Continuing operator/supervisor training to improve system performance and operator response to problems
- Addition of instruments to verify the duration of tank sparging and sample recirculation, connection of these instruments to CNMAS, and incorporation of the data into the measurement programs.
- Upgrade the RTP processor from a PDP 11/04 to a PDP 11/34 to improve speed and capabilities.
- Install a separate program development processor to be used to develop and debug new programs without tying up CNMCAS.
- Evaluate conversion of the Ruska output from digital to analog in order to speed up data acquisition from the Ruskas.
- Add faster decwriters, additional CRT terminals, and a colorgraphic display system to CNMCAS to enhance the system capabilities.

- Improve measurement program efficiency. Possible areas of improvement could include: (1) use of reentrant programs, (2) conversion to video dialogue, (3) video display of measurement trends and comparisons, and (4) improved video display of measurement program status for active measurement points.

- Accounting reports should be revised to show analytical methods used for determinations and to give status of final measurements.

- The physical inventory data acquisition and calculations should be automated. The use of measurement comparison should also be employed to validate measurements.

- Automate analytical QC data acquisition and error variance analysis.

- Modify sample requesting and logging sequences to permit timely and more straightforward incorporation of the data into the CNMCAS files. Assignment of the sample number at the time of request is one important recommended change.

- Conduct additional field tests and calibrations to complete the data base. Specific areas of testing and calibration include recalibration of uranium product and PPC product storage tanks after venting the sparger lines, repeats of selected mixing and sampling tests, and sampler accuracy tests and performance of tests to determine dip tube thermal expansion characteristics.

- Expand use of colorgraphic display of data, particularly with measurement programs and with the parameter monitoring and alarm program.

- Develop a functional waste package identification and control program for routine field use.

- Define and write standards for CNMCAS software programming maintenance, documentation, and security.

# 3.0 CNMCAS HARDWARE AND SOFTWARE DEVELOPMENT

## 3.1 CNMCAS Hardware Configuration

The FY 1979 hardware configuration for the Computerized Nuclear Materials Control and Accounting System (CNMCAS) development work consisted of a network of three computer systems. The network included the CNMCAS Central System (a PDP-11/35), the Laboratory Data System (a PDP-11/35), and the Remote Data Acquisition System (a PDP-11/04). Simplified hardware schematics for the network are shown in Figures 3-1 and 3-2. FY 1979 hardware objectives included the addition and upgrading of several input/output terminals and installation of Real-Time Peripheral* (RTP) remote data acquisition equipment for the Plutonium Nitrate Storage Area.

## 3.2 Network Component Functions

### 3.2.1 CNMCAS Central System

The CNMCAS Central System performs the functions of selective real-time data collection and storage, data base management, and report generation. Data sources for the central system are the Remote Data Acquisition System, the Laboratory Data System, and operator input. In addition, the central system functions as the software development system for the CNMCAS. The central system acts as the host system for the Remote Data Acquisition System (which has no program development capability).

### 3.2.2 Laboratory Data System

The Laboratory Data System is an independent system with a two-way communication link to the CNMCAS Central System over which requests for laboratory analyses and analytical results are passed.

### 3.2.3 Remote Data Acquisition System

Process instruments including vessel level and density transmitters, thermocouples, and radiation monitors are connected to the Remote Data Acquisition System, which functions as a preprocessor of real-time plant process data. A temporary data base (in the PDP-11/04's memory) is maintained for all active instruments. Retained data are updated on a frequency ranging from about 20 seconds to 6 minutes depending on the active scan mode of the particular instrument. The most recently obtained data are always available for immediate retrieval by the central system upon request.

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*Trademark of Computer Products, Incorporated.

## 3.3 FY 1979 Additions to CNMCAS Hardware

The FY 1979 CNMCAS hardware layout is essentially the same as that used in the FY 1978 program. Several enhancements were made to the system during FY 1979.

### 3.3.1 Remote Data Acquisition Equipment

During FY 1978, the Remote Data Acquisition System received and processed instrument signals from the separations area of the plant. The system was extended in FY 1979 to provide remote data acquisition in the Plutonium Nitrate Storage Area (PNSA) as well. The following components were installed for 1979:

- RTP wide-range analog controller for receipt of PNSA process instrumentation signals.
- Two RTP uniform temperature reference assemblies to provide temperature compensation for thermocouples located in the PNSA and additional thermocouples in the Separations area.
- Automated "zero" devices for the four Ruska DDR-6000 precision pressure gauge units. Four additional Ruska units were added for PNSL application.

### 3.3.2 Miscellaneous Hardware

Several input/output terminals were added to the CNMCAS Central System including two VT-100 CRT terminals, a DEC LA-180 printer, and a portable telephone dial-up I/O terminal. These additions enhanced the software development aspect of the CNMCAS system and also provided NMC office terminals for use in printing measurement out of limits, flags, and batch summaries.

An Intelligent System Corporation Intecolor Model 8051 Color CRT was added to the Remote Data Acquisition System along with a dual 8-inch DEC floppy disk drive for the purpose of storing and displaying process alarms.

A front panel programmer's console was added to the PDP 11/04 Remote Data Acquisition System computer to aid in troubleshooting.

Figures 3-1 and 3-2 show the CNMCAS hardware configuration.

## 3.4 CNMCAS Hardware Performance

Installation of hardware for the FY 1979 Uranium Input/Output Demonstration was completed in April and runs continued into August with cleanup operations continuing through October. Hardware performance throughout this period was excellent. All three components of the network system operated continuously on a 24-hour-a-day basis. Unscheduled

system downtime on the Central System was held to only about one percent of the total run period, while no unscheduled downtime was experienced on the Remote Data Acquisition System controlling computer. Table 3-1 summarizes the downtime on each component of the CNMCAS network.

Not all hardware failures resulted in system downtime since on-line repair was possible in some cases. The following are the hardware failures which occurred over the period of the run:

- Remote Data Acquisition System floppy disk failure
- DL11WA interface board in PDP-11/04
- Optical Isolator in serial interface modem (RTP)
- Five-volt power supply in serial interface modem (RTP)
- Two 16-bit digital input cards in Universal (Ruska) Controller (RTP)
- Serial formatter card in Universal (Ruska) Controller (RTP)
- RP 04 large capacity disk drive power failure
- LA 180 DEC Printer motor
- LA 36 DEC Writer
- VT 100 CRT Terminal
- RK 05 disk crash, power failure (LDS).

## 3.5 Recommended Hardware Improvements

Experience gained in the Demonstration Run has indicated several areas in which hardware improvements would enhance the overall CNMCAS System. Proposed improvements include the following:

- Provide a stand-alone software development computer (PDP-11/34 with 128K words of memory) to relieve the Central System of much of its development role which seriously hampers task throughput.

- Upgrade the Remote Data Acquisition System computer from a PDP-11/04 to a PDP-11/34 to provide larger memory capacity. The current 11/04 processor utilizes nearly the entire available memory and upgrade is necessary for any future expansions of the RTP program.

- Upgrade the Ruska differential pressure transducer data transmission mechanism to enable analog data transmission eliminating the cumbersome handshaking and translation of the analog signal to BCD with serial data transmission.

- Provide colorgraphic CRT output terminal(s) for communicating process information to operators.

- Upgrade existing LA 36 DEC Writers to faster terminals to speed up the operator/computer communication link.

## 3.6 Software Development

The software used in the CNMCAS Performance Evaluation Program is an enhancement of that used in the FY 1978 program. Based on the CNMCAS conceptual design and experience gained in the 1978 Demonstration

Program, a revised software specification was written. Programs for the various subsystems of CNMCAS were revised based on the software specifications.

For FY 1979, the RSX-11M Real-Time Operating System was adopted for the CNMCAS Central System, replacing the RSTS/E Time-Sharing Operating System. Software was rewritten in the BASIC PLUS 2 language and MACRO-11 assembly language.

Major software elements for CNMCAS which were revised included:

- Data Base System
- Generalized Measurement Program (written as a finite state automotion or state driven program)
- Specialized state tables and supporting data files for the four measurement programs associated with the following vessels:
  - Input Accountability Tank
  - Uranium Product Sample Tank
  - HWW Waste Tank
  - GPW Waste Tank.
- Accounting Program
- Measurement Control Program
- Error Variance for Measurement Control Program
- In-Process Inventory Program
- Physical Inventory Monitoring
- Remote Data Acquisition System Program
- LDS Communication Driver/File Update Program
- RTP Communication Driver Program
- Data Base Edit Program
- Auxiliary Program for Data Base Maintenance.

The 1979 Uranium Run was broken down into three campaigns. Campaign 1 served as an on-line shakedown test for the software system. By May 10, 1979, major software components had been installed. The Error Variance Program was installed and tested following completion of the run.

Program validity was tested by monitoring the data base as it was accumulated during Campaigns 2 and 3. Although slight modifications continued to be made to several programs, software reliability was good

and the data collected during Campaigns 2 and 3 were valid and without gaps.

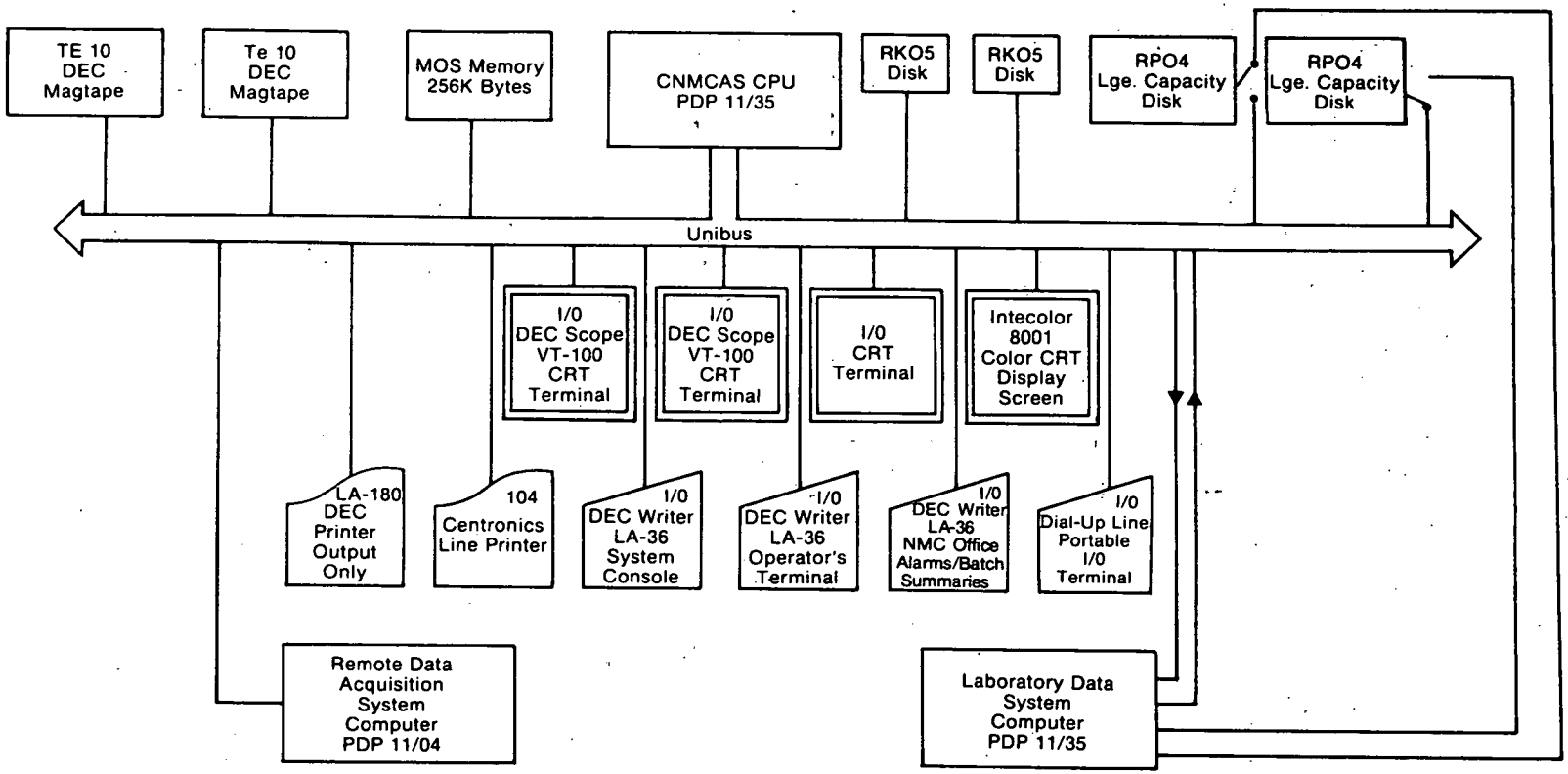
Detailed software descriptions and specifications may be found in Appendices A and B.

## TABLE 3-1

## CNMCAS SYSTEM DOWNTIME

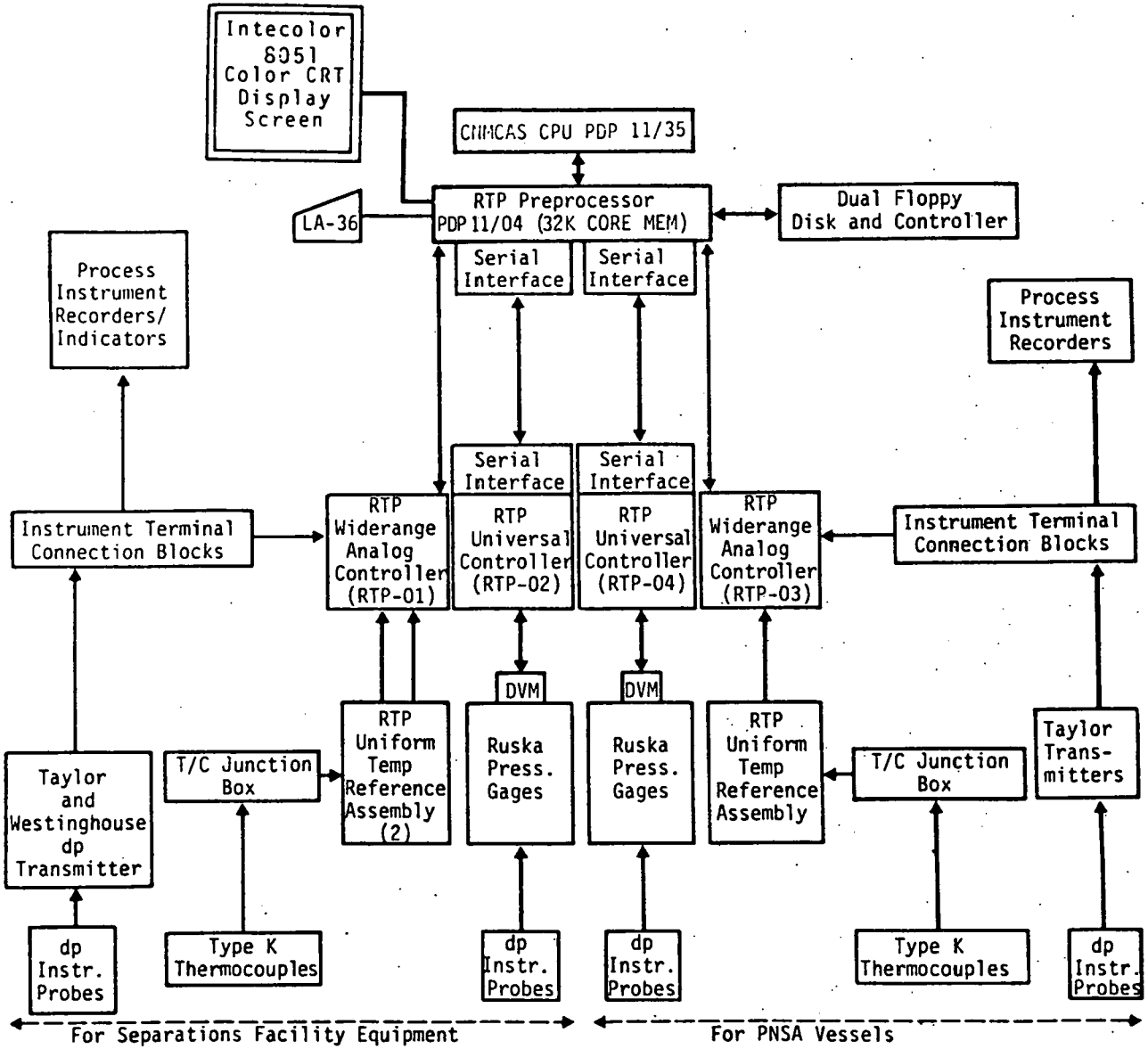
For the period: April through August, 1979 (3600 hours)

| SYSTEM | SCHEDULED | | | UNSCHEDULED | | |
|---|---|---|---|---|---|---|
| CNMCAS Central System | 20 | Disk backup at 1 hr./week | | 4 | RP 04 power supply failure | |
| | 12 | Reconfigure I/O terminals | | 4 | Main power supply failure | |
| | 6 | Preventive Maitnenance | | 30 | Chiller failures | |
| Total: | 38 | Hours | 1.06% | 38 | Hours | 1.06% |
| Laboratory Data System | 10 | C.S. Disk backup (RP04) | | 96 | Disk crash and power supply failure | |
| | 7 | Preventive Maittenance | | 4 | Main power failure | |
| | | | | 30 | Chiller failures | |
| Total: | 17 | Hours | 0.47% | 130 | Hours | 3.61% |
| Remote Data Acquisition System | 1 | Component Replacement | | 0 | | |
| Total: | 1 | Hour | 0.03% | 0 | Hours | 0% |




BASIC HARDWARE FOR CNMCAS SYSTEM

FIGURE 3-1




REMOTE DATA ACQUISITION (RTP) SYSTEM -- FY 1979

FIGURE 3-2

# 4.0 CNMCAS PERFORMANCE EVALUATIONS

## 4.1 Introduction

The CNMCAS performance evaluation program was conducted in conjunction with the FY 1979 Integrated Uranium Run during April through July, 1979. The objectives of the program were to demonstrate CNMCAS functions, to evaluate the reliability of the various CNMCAS components, and to establish a data base for subsequent evaluation of the NMCAS. Figure 4-1 is a simplified flowsheet for the FY 1979 Integrated Uranium Run.

Three major programs -- the measurement program, the measurement control program, and the accounting program -- are contained within CNMCAS. Supporting these programs are two major subsystems -- the Remote Data Acquisition System (RDAS) and the Laboratory Data System (LDS). The performance of the CNMCAS programs is described and evaluated in subsequent sections. Detailed discussion of the NMCAS performance during the uranium run is presented in Section 6.0. Exhibits discussed in Section 4.0 are included as Appendix N.

## 4.2 General Performance Summary

In general, all of the programs and systems performed very well, particularly considering the short time period allotted for implementation of the 1979 improvements and additions. Areas requiring additional improvement or enhancement have been identified for each program or system.

## 4.3 CNMCAS Measurement Program Performance

### 4.3.1 Introduction

The CNMCAS measurement programs coordinate input, product, and waste measurement activities. The programs acquire measurement data from the RTP and LDS systems; examine data for gross errors and potential measurement problems; calculate solution and uranium quantities for process control use; and move data to storage at the completion of measurement and transfer activities for each batch of input, product, and waste solution. Activities coordinated by the measurement programs include:

- Batch initiation
- Before-receipt measurements (input only)
- Before-sampling measurements
- Sample Request
- After-sampling measurements
- Analytical data handling
- Transfer
- After-transfer measurement
- Batch summary information.

See Section 6.0 for detailed discussion of the measurement program performance. This section covers CNMCAS performance of the measurement routines. Software specifications for the measurement programs are contained in Appendix A.

### 4.3.2 CNMCAS Measurement Program Dialogue

Measurement program coordination is accomplished by means of a hard copy dialogue between CNMCAS and the plant operators. An example of a typical measurement program-operator dialogue produced at the CNMCAS Input/Output (I/O) terminal in the Control Room of the Separations Facility is presented in Exhibit 4-1. The chronological step-by-step dialogue is for the time span 10-JUL-79, 01:01 AM, through 10-JUL-79, 07:28 AM. It includes batches as follows:

| | |
|---|---|
| 01:01 AM | Start of U Product Batch 175 |
| 01:25 AM | Complete Accountability Tank Batch 307 |
| 02:53 AM | Start Accountability Tank Batch 308 |
| 04:20 AM | U Product Batch 175 completed |
| *04:20 AM | Start of HWW Waste Batch 02023 - 238 |
| *04:21 AM | Start U Product Batch 176 |
| 07:28 AM | Complete Accountability Tank Batch 308 |

NOTE: U Product Batch 175 was transferred to the Accountability Tank (Batch 308).

The measurement program-operator dialogue was designed to have self-explanatory messages which request and instruct the operator simply and clearly. To activate the program, the operator enters M and the last two digits of the measurement point, e.g., M07 for product tank. This starts the program at the point where it previously stopped. No additional explanations of the individual messages are given since they should be self-explanatory to the reader. This particular activity was selected to also illustrate transfers between tanks, i.e., product tank to the accountability tank, which would be similar to a Material Balance Area (MBA) transfer. (Refer to Section 4.4.6 for detailed discussion of this activity.)

To supplement the dialogue of the measurement programs, the status program runs in the background mode once every minute. This program lists the program through the measurement sequence for each material balance measurement point on a color CRT monitor located near the operator's terminal in the control room. Exhibit 4-2 presents a sample of the output produced by the status program.

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*These two batches were not completed within this time frame.

### 4.3.3 Performance Evaluation

The measurement programs provide the primary data input into the data base. Measurement programs must be executed whenever a material balance transfer is made. This, coupled with the fact that data collection is real time, necessitates that these programs be extremely reliable.

By the start of Campaign 2, the measurement programs were exhibiting good reliability. All design features of the measurement programs performed according to specifications. Software refinements continued to be made during the run, such as adding additional functions and correcting errors as they were identified. Related data base errors and measurement errors resulting from operator error were corrected using the data base edit program. Measurement data produced by the programs exhibited very close agreement with data collected manually.

Nearly 500 batch measurement routines were completed with essentially no CNMCAS related problems. To facilitate cleanup operations at the conclusion of the run, a measurement program was adapted to monitor transfers through the GPC feed tank. This required the creation of auxiliary and state table files for the new program. A key element of the initial design was to make measurement programs modular. This demonstrates this capability.

### 4.3.4 Recommended Measurement Program Improvements

Experience gained during the evaluation program has indicated certain areas in which improvements could enhance the performance of the CNMCAS measurement programs.

The time frame in which the programs operate is closely tied to the separations process which they coordinate and monitor. At certain stages, the programs hold up the process, thus improvement in execution speed would enhance their utility as a process coordination mechanism.

The CNMCAS measurement programs require 22K words of memory each. This large memory requirement limits the number of programs which can run simultaneously with efficiency on the current processor. Investigation of the possibility of using common reentrant subroutines among several programs may be one means of reducing program size.

The physical nature of the level and density measurement devices require close observation by the operator of the measurement trends as they develop on each instrument. An enhancement to the CNMCAS measurement programs would be to have them retain files of measurement trend histories on each instrument for use as operator information to aid the operator in maintaining instrument reliability. Design and preliminary coding of a trend history retention and display function of the measurement programs began during Campaign 3. This addition will be completed during FY 1980 development work.

Other areas identified for CNMCAS improvements are the following:

- Streamline the dialogue to provide for routine operator interface via a fast video terminal with routine summaries printed elsewhere on hard copy terminals.

- Provide enhanced color graphic video display of measurement routine status.

## 4.4 CNMCAS Accounting Program Performance

### 4.4.1 Introduction

The nuclear materials accounting program is used to define accounting control units and to produce accounting, summary, and material balance reports. The accounting control units consist of individual measurement batches, lots consisting of several batches, and an inventory period consisting of several lots. Each batch measured is automatically incremented by the measurement programs to provide sequentially numbered batches. A measurement point file in the data base is utilized by the accounting program. This data base file services all the programs, i.e., accounting, measurement, and measurement control programs. The accounting program is subdivided as follows:

(1) Lot/Inventory Period Programs

(2) Input/Output Accounting:
- Accounting Report
- Summary Report
- Material Balance Reports

(3) Material Balance Area (MBA) Transfers.

The following performance discussions and exhibits are directed at the objectives and reports outlined therein. The software specifications for the CNMCAS accounting program are presented in Appendix A.

### 4.4.2 Lot/Inventory Period Program

Exhibit 4-3 shows the inventory periods for the FY 1979 integrated uranium run, the lots within these inventory periods, and the batches within the lots.

Inventory period 5, corresponding to Campaign 1, was used for on-line shakedown of CNMCAS development hardware/software. Therefore, inventory period 5 is not included in the evaluation of the accounting program.

Actual accounting reports are shown in Exhibits 4-4 through 4-13 which represent Campaigns 2 and 3 of the uranium runs. Campaign 2 activity consists of inventory periods 6, 7, 8, and 9 for which only measurement point summary reports and a material balance for the inventory periods are shown. Normally, only one inventory period is assigned to an accounting period which starts and finishes with a physical inventory, as was the case with each campaign. For demonstration purposes, however, additional inventory periods were created in Campaign 2. Campaign 3, on the other hand, has only one inventory period.

By referring to Exhibit 4-4, "Material Balance Report for Period 6-9", the reason for designating inventory periods can be seen. The material balance report is the final consolidated report for a Material Control Area (MCA) and is used to provide the book balance to which the physical inventory is compared. The quantities on this report for the input point 2-003 (lots 8 through 11, batches 206 through 271) correspond to the total received quantity for all the lots in those periods. This is detailed in the summary report (Exhibit 4-5) which shows individual lot quantities.

Exhibits 4-6 through 4-8 show the output quantities for points 2-007, 2-023, and 2-028 for the individual lots summarized on the above material balance report.

For inventory period 10 (Campaign 3), the detailed accounting reports (Exhibits 4-10 through 4-13) which list each batch are presented in place of the summary type reports. These illustrate the sequential numbering of batches and lots which is one of the control features to facilitate auditing and other verifications.

In order to obtain the material balance reports, only the entry of the desired inventory period and beginning inventory by the requestor at a CNMCAS input/output terminal is required. To obtain summary and accounting reports, the measurement point and lot numbers are required to be entered. Grouping of batches into lots and lots into inventory periods can readily be rearranged to provide additional combinations for analysis and evaluations.

### 4.4.3 Input/Output Accounting

#### 4.4.3.1 Accounting Report

Actual CNMCAS-generated accounting reports for inventory period 10 are shown in Exhibits 4-10 through 4-13. These reports reflect all final results and are considered to be the accepted results for quantities and designed format. Very little editing was required since the measurement program and the LDS/CNMCAS communications link provided the specific data for the raw and analytical data files.

For measurement points 2-003 and 2-007 (Exhibits 4-10 and 4-11), negative values are shown in the beginning batches. These are a result of the ending inventory being remeasured to start the new inventory period. Since slight differences are realized when a remeasurement is made, and since the quantities received and transferred are arrived at by difference, those differences are expected. The quantities involved are not significant.

For waste management points 2-023 and 2-028 (Exhibits 4-12 and 4-13), there are some negative uranium values shown in the quantity received. This is the result of the uranium concentration being lower than the previous batch to the extent that the calculated uranium content of the

new batch is lower than the previous heel. Consequently, when the difference is determined, it results in a negative quantity. Although these are occasionally expected because of the uncertainties associated with waste measurements and the wide fluctuations in concentrations, the batches involved should be examined for needed corrective measures.

The accounting report format and content was designed to provide a ready means of determining if gross errors or omissions appear on the report or other anamolies exist. The presence of negative values is one such type of indicator which should be immediately examined to establish the cause. Another check is to scan the sequential numbering of batches to assure no omissions. Spot checks of the quantities of uranium transferred should be performed by multiplying the uranium concentration times the kilograms of solution to assure those values are correct. Since the reports are readily available, frequent and systematic checks should be performed to assure data collection and programs are functioning properly.

One of the problems encountered during this demonstration was one resulting from limiting specific analytical methods to a measurement point, assuming other methods would not be used. When other non-specified methods were used, the programs had to be changed to accommodate them. In addition, this condition caused the preliminary/final (P/F) indicators to be shown incorrectly. In other cases, the P/F indicators did not get recorded correctly for nonroutine recordings, especially in cases when the LDS/CNMCAS communication link was out. Because of these conditions, it is considered that in place of P/F indicator being shown, a method code should be shown for the analytical method used. When a U/CALC (preliminary) value is used, the method code will identify it as such. The totals on the report will be sorted down by methods, thereby giving the user a complete breakdown by methods. This serves the same purpose as the P/F indicators while giving more detail and providing an additional audit component to readily detect errors.

### 4.4.4 Summary Report

Actual CNMCAS-generated summary reports for each measurement point for the second campaign (inventory periods 6-9) are shown in Exhibits 4-5 to 4-8. These reports provide only the lot totals without the individual batch listings. Each lot and batches within the lots, however, are shown to provide a means for readily verifying if the correct batches are used. Use of this report is limited primarily to those occasions where only lot totals are needed without the individual batch detail. They should only be issued for fully audited and accepted detailed accounting reports.

### 4.4.5 Material Balance Reports (MBR)

Actual CNMCAS-generated Material Balance Reports for the second and third campaigns are shown in Exhibits 4-4 and 4-9. These reports reflect the total activity for the input/output measurement points.

Some editing was required to purify the data base, but for the most part, the data files were created by the measurement programs and LDS/CNMCAS communication link.

The MBR is primarily designed to provide the beginning inventory, receipts, removals, and ending balance for a Material Balance Area (MBA) for an inventory period or for several inventory periods. In addition to this, it shows the lots and batches included in the report as well as the "received from" and "transferred to" measurement points. Indicators show if the quantities are preliminary or final and quantities recycled. Those quantities recycled (R) are not included in the calculation since these quantities were returned to the process and not transferred out. In addition, only the uranium quantities are used in the calculation. The liters and kilograms of solution are provided for reference.

Exhibit 4-14 is the material balance report for periods 6-10 and is the combined report of Exhibits 4-4 and 4-9. The difference in the ending balance on the 6-10 report (475.668) versus 10-10 report (396.227) or 79.4 is due to the inventory difference from the 6-9 report not being recorded, i.e., ending balance of 10608.4 versus physical inventory of 10529.0 or 79.4. This feature was not designed into the system but it could easily be programmed to provide the difference.

These three material balance reports are analagous to reports that would be generated for a multiple MBA structure with different inventory period durations, e.g., two months and six months. MBR 6-9 (Exhibit 4-4) could be an example of four inventory periods for one MBA while 10-10 MBR (Exhibit 4-9) could represent another MBA with a longer duration inventory period. MBR 6-10, therefore, would represent the plant MBR or the consolidation of the two MBA's. On the 6-10 MBR, therefore, the transfers from product output point 2-007 (176,212.0 + 2.015 = 176,214.015) to input accountability point 0-2003 (176,060.0) would not be used in the MBR calculation. This would be accomplished by programming the system in the same manner as the recycle was handled on the waste tanks during this demonstration.

The consolidated plant MBR (revised 6-10) would then be as follows:

| | |
|---|---|
| Beginning Inventory (11014 + 10529) | 21,543.000 |
| External Receipts | 0.0 |
| External Removals: | |
| 02-007 Product to 4-001 | 9,560.650 |
| 02-023 HWW Waste | 251.309 |
| 02-028 GPW Waste | 572.397 |
| Total Removals | 10,384.356 |
| Ending Balance | 11,158.644 |
| Physical Inventory (10528 + 462) | 10,991.000 |
| Inventory Difference | 167.644 |

Explanation of Inventory Difference

| | |
|---|---|
| Inventory Difference MBR 6-9 (10608.4 versus 10529.0) | 79.400 |
| Shipper/Receiver Difference (02-007 to 02-003) (176,214.015 versus 176,060.0) | 154.015 |
| Inventory Difference MBR 10-10 (396.277 versus 462.0) | -65.723 |
| Rounding | -0.048 |
| TOTAL INVENTORY DIFFERENCE | 167.644 |

In Exhibit 4-15, the MBR for period 6-10 was changed to show the combined beginning inventories of the two individual MBA reports used in the example. The ending inventory on this report is different from the ending balance above by 154.015 kilograms uranium, which is the shipper/receiver difference between the product and input transfers. This is being used in this example as transfers between MBA's.

Since these MBR's are available on demand at anytime, they provide the capability to routinely monitor the combined MBA activities to determine the cumulative total plant accumulation of inventory differences, shipper/receiver differences, and other problem areas. This feature is especially useful during multi-MBA plant physical inventories and reconciliation with the accounting records.

### 4.4.6 Material Balance Area (MBA) Transfers

Transfers between MBA's were demonstrated by comparing kilograms of solution transferred from the uranium product (output) tank, measurement point 2-007, to the quantity received in the feed accountability (input) tank, measurement point 2-003. The computer program determined the difference for each batch transferred, compared it to an established acceptable range, and reported if the difference was satisfactory, marginal, or out-of-limits. This was reported to the operator as part of the measurement program dialogue and to the NMC terminal.

An actual report which was transmitted to the NMC area is shown in Exhibit 4-16. The report shows that for transfer of batch 2007-175 to 2003-308, the difference of 10.8169 was marginal. The message in the measurement program dialogue is shown in Exhibit 4-1 under tank 02003, batch 308, 10-JUL-79, 06:19 AM. In actual practice, however, two comparisons would be made, i.e., one for before sampling (BS) and one after sampling (AS). This would provide a more timely comparison which, in this case, would have been reported at 04:39 AM versus 06:19 AM. (Refer to Exhibit 4-1 for message-tank 02003, Batch 308, 10-JUL-79, 04:39 AM.) The before-sampling measurement calculation, however, uses the less accurate process density versus the laboratory density used in the after-sampling calculation. In the example Batch 308, the difference was only 0.62 kilograms, i.e., 8330.26 (BS) versus 8329.64 (AS). With this level of agreement, the before-sampling comparison would be considerably more responsive for the purpose of the comparison.

A combination of the BS comparison and AS comparison for MBA transfers along with the BS and AS comparison within the batch itself would provide a more timely and more complete analysis. For an example of the BS to AS comparison within the batch, refer to Exhibit 4-1, message-tank 02003, Batch 308, 10-JUL-79, 06:21 AM.

An additional feature provided within the measurement program to satisfy MBA transfer activity is one which requires the supervisor's approval prior to the transfer being made. To assist the operator in determining the validity of the measurements taken, several comparisons are made. These consist of parallel instrument reading comparisons for level, temperature, and density. Comparisons to acceptance criteria are made by the computer programs and reported as satisfactory, marginal, or out-of-limits. For an illustration of the sequential messages provided, refer to messages tank 02003, batch 308, 10-JUL-79, 06:10 AM, through 06:28 AM in Exhibit 4-1. In this illustration, all of the comparisons were within limits and, therefore, the transfer was approved without any other action required. If any of the comparisons had been out-of-limits, then the supervisor would be required to document the findings and corrective action taken as part of the message dialogue. In many cases, the corrective action consists of blowing the probes, resetting the purges, and requesting the computer to remeasure the batch. Approval by the Supervisor is accomplished by entering a special assigned nonprinting password.

Another feature of the MBA transfer routine is to provide hard-copy documentation of the raw measurement data, analytical data, and calculated quantities. This is provided as a Batch Summary Record. An actual transfer report is shown for Product Batch 2007-175 in the measurement dialogue (Exhibit 4-1) as Message 10-JUL-79, 04:17 AM. The corresponding receiving Batch Summary Record is shown as Message 02003-308, Acct. Tk., 10-JUL-79, 07:24 AM. These identical reports are provided simultaneously to the NMC terminal for their centralized accounting records. These documents would, in effect, serve as the traditional source data transfer documents between MBA's.

For additional discussion on MBA transfers, refer to Section 4.4.5, Material Balance Reports.

### 4.4.7 Performance Evaluation

As with the measurement program, most of Campaign 1 was required to "debug" the accounting program. During Campaigns 2 and 3, performance was excellent. Design features which were included to provide flexibility and versatility in handling unanticipated problems proved their worth.

The reprogramming effort, which modularized the accounting system programs, was also effective. This change permitted small changes to be made without affecting the entire program.

### 4.4.8 Recommended Accounting System Improvements

Two additions to the accounting reports were identified. One is to change the P or F (preliminary or final) designation for the lab results to an analytical method name or code. This would permit ready assessment of the analytical status. The second addition would be an "update status" indicator. Initially, measurements are based on in-tank densities and uranium concentrations calculated from acid and density. As detailed analyses for these parameters are complete and entered into CNMCAS files, the reports are updated.

Automation of the physical inventory should also be implemented. Currently, these calculations are done manually with manual readings. Use of RTP data should improve the inventory accuracy. Rigorous use of measurement comparisons to establish measurement acceptability should be included in the program.

## 4.5 CNMCAS Measurement Control Program Performance

### 4.5.1 Introduction

The CNMCAS Measurement Control Program provides for various automated checks and comparisons of measurement data to: (1) control measurement anomalies prior to acceptance into the data base file, (2) for trend and error analysis of stored measurement data, (3) propagation of errors into limits of error for material balance calculation, and (4) for bias correction of measurement data.

Software development for bias correction of analytical results was not included in the 1979 CNMCAS program.

The software specification for the Measurement Control Program is contained in Appendix A.

### 4.5.2 Level Comparisons

Redundant instrumentation was provided for the four uranium input/output measurement points. Examples of summaries of the liquid level instrumentation comparisons are provided in Exhibits 4-17, 4-18, and 4-19 for the accountability tank, uranium product tank, and HWW sample tank, respectively. These data are used to establish control limits for instrument performance and to detect instrument trends and/or calibration requirements. The programs are structured to request a summary over any set of batches in the data base. Sufficient data is presented to indicate instrument shifts that occurred for the uranium product sample tank and GPW check tank (Exhibits 4-18 and 4-19). Note that a similar shift did not occur for the accountability tank level instruments. Detailed discussions of measurement and instrument performance are included in Section 6.0.

### 4.5.3 Density Comparisons

Process densities were obtained from at least two different instruments for each of the four uranium input/output measurement points. In the case of the input and product measurements, the pressure differential was determined directly by the Taylor instrumentation and indirectly as the difference between two Ruska instruments. For the two waste measurement points, both the Westinghouse and Taylor instruments provide a direct measure of the differential pressure across the high and medium pressure probes.

The density comparison reports provide instrument-to-instrument comparisons, process density-to-lab density for each instrument at 25°C, and at tank temperature. The comparisons are made for both before- and after-sampling data. The density comparisons continue as excellent indicators of measurement anomalies. In fact, this is a primary real time indication of sampling problems. Examples of density comparisons are provided as Exhibits 4-20 and 4-21 for the accountability tank and HWW sample tank.

### 4.5.4 Replicate Measurements

Replicate measurement data summary reports for solution quantities provide reliable estimates of the repeatability of the bulk measurement systems. These reports indicate any systematic effects between before- and after-sampling as well as provide a realistic estimate of the random error variances. In addition, for the accountability tank, the comparison between after-transfer and before-receipt solution quantities provides additional assurance that the tank has been properly isolated. Examples of these reports are provided in Exhibits 4-22 and 4-23 for the accountability tank and the uranium product sample tank, respectively. The very large quantity differences shown as "extreme values excluded" in Exhibit 4-21 represent missed measurement actions caused by operator oversight.

### 4.5.5 Product/Input Comparisons

Comparisons of product versus input quantities shown in Exhibit 4-24 provide a measure of the effectiveness of the other control methods and error estimates. This type of report could be expanded to include additional points where quantities are transferred and measured in two different tanks. This report provides the basis for the control limits to indicate that a measurement problem exists for one or both of the measurements.

The transferred-received values shown in Exhibt 4-22 represent process control data using uranium concentration estimated by an empirical formula using density and acid concentration. The corresponding accountability data using laboratory determined uranium concentrations are presented in Exhibit 4-25. The process control report is used to establish control limits.

### 4.5.6 Uranium Concentrations

Since the largest error sources for material balance determinations are analytical, it is important to be able to assess analytical performance and trends. For the FY 1979 integrated uranium run, uranium concentrations for input measurement were determined by two different methods. The uranium concentration report provides a comparison of the two methods, isotopic dilution/mass spec (U-ID) versus potentiometric (U-VP), on a batch-by-batch basis as well as summary statistics. An example of the comparison report is provided in Exhibit 4-26.

### 4.5.7 Limit of Error Calculations

A program that interfaces measurement control and accounting data to provide limit of error (LE) summary was implemented. The program output includes a limit of error summary which provides the quantity of nuclear material, the limit of error for that quantity, and the limit of error expressed as a percent of input for each material balance component and for the inventory difference (ID).

A summary of the estimated standard deviation(s) for the random and systematic error used in the LE calculation is output from the program. This output is useful in evaluating the error data. For error evaluation purposes, the total and individual random and systematic error variances for each measurement point are available.

Examples of both the summary of measurement point standard deviation and limit-of-error summary are provided as Exhibits 4-27 and 4-28. These summaries used Campaigns 2 and 3 data.

Details of the program and calculation routines are provided in Appendix A.

### 4.5.8 Performance Summary

In general, the CNMCAS measurement control program performed satisfactorily in that output summary reports were obtained which reflected the measurement values contained in the data base. The summary reports provide a demonstration of the methods and data needed to determine control limits and to estimate random error variances associated with bulk measurements.

The demonstration of an effective method to detect measurement anomalies incorporated the use of a control limits table. Measurement data comparison outside the 0.05 and 0.01 levels of significance generated message flags at the CNMCAS Control Room input/output terminal and at a NMC terminal. Due to the pressure of other test activities, process problems, measurement program problems, etc., supervisory approvals and documentation of corrective actions for flagged measurement anomalies were handled informally.

Summary reports were obtained for level comparisons, density comparisons, and replicate measurements for all input/output tanks, product to input comparisons, input uranium concentration comparisons for the accountability tank, and limit of error for inventory difference (LEID). Each of these types of reports are discussed in the following sections.

Extreme values were excluded from the summaries to provide for more meaningful summary data. Extreme value identifiers were based on the values in the control limit table.

### 4.5.9 Recommended Measurement Control Program Improvements

One of the areas for improvement is in the area of measurement comparison presentations. To be effective real-time warnings of measurement problems, the comparison must be presented in an easily readable method and should be indicative of the probable causes for the differences. Use of colorgraphic display of comparison data should be investigated.

Bias corrections and error variance estimates on analytical data are currently done manually. Automated calculation programs and automatic transfer of the QC data from LDS to CNMCAS should be implemented.

## 4.6 Remote Data Acquisition System

### 4.6.1 Introduction

Measurement instrumentation associated with the Computerized Nuclear Materials Control and Accounting System (CNMCAS) is interfaced to the Central System CPU through the remote data acquisition system (referenced to herein as the RTP system). The RTP system is composed of real-time peripheral/preprocessor equipment. The configuration of the RTP system, as demonstrated during the FY 1979 Uranium Input/Output Demonstration Program, included the following major components:

- Preprocessor - PDP 11/04, Digital Equipment Corporation.
- Two - Analog Controllers - RTP Wide Range Analog Controllers, Computer Products, Inc. One controller for separations area instrumentation and one controller for PNSA instruments.
- Two - Digital Controllers - RTP Universal Controllers, Computer Products, Inc. One digital controller for Ruska dp instruments in separations area and one for PNSA Ruska dp instruments.
- Three - Temperature Compensators - RTP Uniform Temperature Reference Assemblies, Computer Products, Inc., Two - UTR Assemblies compensating thermocouple in the separations area, and one UTR Assembly for PNSA thermocouples.

The RTP system scans selected process instrumentation; collects, manipulates, and stores instrument signals; and transmits instrument data to the CNMCAS Central System.

### 4.6.2 Software Development

The methodology of RTP signal preprocessing was developed for the FY 1978 demonstration program. The general scheme was retained for FY 1979 with three major enhancements as follows:

(1) Automatic zeroing of Ruska dp instruments. The Ruska instruments require an equalized reading to be subtracted from the actual reading to give a true reading each time the instrument is read. Processor control of this function was added in FY 1979.

(2) PNSA instrumentation was added to the system, including standard (Taylor) instruments, Type K thermocouples, and Ruska dp instruments.

(3) An additional scan mode, scan mode 4, not present in the 1978 program, was added to facilitate collection of data from the PNSA.

The remote data acquisition system computer utilizes an execute-only operating system. The software for the system is actually one program written in Assembly language and requiring at least 26 K words of core memory. This single program is composed of 8 subtasks, 25 subroutines, and 12 internal tables. Appendix C briefly describes each component of the RTP program.

The CNMCAS Central System serves as the host computer for the RTP computer. Programming, editing, assembling, and linking are thus performed on the Central System, and the resulting task image is downline loaded from the Central System to the RTP computer. Software preparation, installation, and testing of the RTP program, except for PNSA instrument interfacing, were completed in April for the start of the run. Final debugging and testing of PNSA functions were completed during August.

The FY 1979 software specifications for the Data Acquisition System (RTP) Program are included as Appendix B.

### 4.6.3 Instrumentation Connected to the RTP System

The RTP system currently receives and processes signals from four major types of measurement instrumentation:

(1) Taylor and Westinghouse differential pressure transmitters - the pressure signals are converted to current (4 to 20 milliamperes). The current is passed through a 62.5 ohm resistor which generates a voltage signal (0.25 to 1.25 volts) which serves as the input signal to the analog controller.

(2) Type K thermocouples - the thermocouple signals are routed to a temperature compensation unit, then input to the analog controller as voltage signals.

(3) Ruska DDR-6000 precision pressure gauges - differential pressure signals are routed from the Ruska DVM's as binary coded decimal signals to the digital controller. Signals are routed from the digital controller to the preprocessor through back-to-back serial interface units. The preprocessor must signal the Ruskas to "lock-up" or stabilize via the digital controller prior to accepting each Ruska signal. Whenever a data request is received from the CNMCAS Central System, the RTP processor signals the Ruska dp instrument to equalize pressures. It then takes a "zero" reading, which is subtracted from the instrument reading to give the true reading.

### 4.6.4 RTP Scan Modes

One of the tables integral to the RTP program, the Point Definition Table, defines the various parameters governing data collection for each measurement. One of the basic parameters associated with each instrument read is the scan mode governing the cycle time interval and data storage method for the particular instrument.

There are four possible scan modes:

#### 4.6.4.1 Scan Mode 1

Scan mode 1 is the basic scan mode for sampling all process instrument signals connected to the RTP system. The RTP system cycles through all points continuously (except for higher scan mode interruption) and stores only the latest instrument signal values.

#### 4.6.4.2 Scan Mode 2

Scan mode 2 is activated at a programmed frequency and continues for a programmed duration. Selected instruments requiring "averaged" signal values and short-term storage of these are included in scan mode 2. To support the Uranium Input/Output Demonstration Program, a scan frequency of four minutes and a scan duration of twenty seconds was used. All of the signal values from the instruments in scan mode 2 are collected over the twenty-second duration, and the averaged value stored in the core of the preprocessor. The last five "averaged" values are stored.

#### 4.6.4.3 Scan Mode 3

Scan mode 3 is similar in purpose and operation to scan mode 2 except the scan duration will be set at ten seconds and the last three "averaged" values stored. Scan frequency will also be set at four minutes. Scan mode 3 is activated two minutes after scan mode 2.

#### 4.6.4.4 Scan Mode 4

Scan mode 4 is similar to scan mode 3, the only difference being the scan duration which is 40 seconds and the scan frequency which is 6 minutes. As with scan mode 3, the last three "averaged" values are stored. Scan mode 4 is used primarily for PNSA instruments.

Figure 4-2 illustrates the scan mode timing scheme.

### 4.6.5 Other RTP System Requirements

#### 4.6.5.1 Conversion to Engineering Units

The preprocessor converts analog instrument signal values to engineering units applicable to the particular parameter being measured. The range of the instrument generating the signal is incorporated in the conversion process. Engineering units for the four instrument types are as follows:

- Taylor/Westinghouse differential pressure transmitters - inches of water.
- Taylor temperature transmitters - °C
- Type K thermocouples - °C
- Ruska gauges - centimeters of water (BCD input instead of analog).

The separation of the high pressure and medium pressure instrument probes is required to calculate density from density readout instrumentation. The relationship is as follows:

$$\text{Density} = \frac{\text{Density Instrument Reading (in inches } H_2O)}{\text{Probe Separation}}$$

This relationship is used by Central System program (such as Measurement Program) in calculating actual density units.

#### 4.6.5.2 Alarm Limits

The minimum and maximum expected reading for certain instruments is retained in the preprocessor Alarm Limit Table. At a programmed frequency, current instrument signal values are compared to the alarm points and out-of-limit values are printed by the process alarm monitoring function to a color CRT monitor. Under operator control, the current alarm table may, at any time, be printed out on hard copy and/or stored for later recall on the floppy disk.

### 4.6.6 RTP Data Tables

The listings of instruments connected to the RTP system and associated reference information are provided in Appendix O.

#### 4.6.6.1 RTP-Instrument Identification and Parameter Data

Table O-1 presents the following:

- Measurement point number for process vessel (or stream), vessel (or stream) name, and vessel equipment number.

- Instrument numbers for the associated vessel (or stream) instruments connected to the RTP system.

- Process instruments connected to the RTP system and their symbols are:

  (1) Liquid level recorders and indicators - LR, LI*
  (2) Density recorders and indicators - DR, DI*
  (3) Temperature recorders and indicators - TR, TI, TJR.
  (4) Weight recorders and indicators - WR, WI
  (5) Pressure recorders and indicators - PR, PI
  (6) In-line monitors on process streams:

      (a) Alpha count rate recorders and indicators - AR, AI
      (b) Neutron count rate recorders and indicators - AR, AI
      (c) Uranium concentration recorder - AR
      (d) Gamma count rate recorders and indicators - RR, RI
      (e) Flow rate (solution) recorders and indicators - FR, FI
      (f) Nitrite ($NO_2^-$) concentration recorder - AR
      (g) Conductivity (electrical) recorder - CR
      (h) Gadolinium concentration recorder (count rate from $\eta$ source monitored) - AR.

- Instrument type

- Instrument range

- Scan mode

- Probe separation (for density instruments)

- Low and high alarm points

- RTP connection data, i.e., the terminal board and channel number in the analog controller to which the leads from a particular instrument are connected.

- The analog controller is identified as RTP-01; the digital controller as RTP-02. The digital controller channel numbers from the Ruska instruments are noted in the "Comments" column.

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*Ruska instruments are identified with the suffix "R" after the instrument number. Westinghouse instruments are identified with the suffix "W" after the instrument number for the HWW Sample Tank and GPW Check Tank. Other alternate transmitters to be tied into the RTP system are identified as follows: LT-XXXS, S1 or S2 and DT-XXXS, S1 or S2.

#### 4.6.6.2 RTP Correlation Table

Table O-2 lists the process instruments connected to the RTP system by type in ascending numerical order. The table is used to correlate instruments with measurement point numbers and RTP-01 channel numbers.

### 4.6.7 Performance Summary

A glance at Table 3-1 will show that the computer hardware for the remote data acquisition system was extremely reliable over the period of the uranium input/output demonstration run.

The vast number of hardware peripheral connections to the system, however, required extensive troubleshooting by the AGNS special systems department especially in the PNSA peripherals which were added to the system for FY 1979. Since the PNSA instruments were not required by the various subsystems of the uranium input/output demonstration, much of the hardware and software troubleshooting for this area was conducted following the uranium input/output demonstration and prior to the process monitoring/process surveillance demonstration, which was also a part of the overall CNMCAS demonstration for FY 1979.

Throughout the demonstration run, measurement data for all batch transfers at material balance measurement points were obtained independently by two methods; automatically, via the CNMCAS measurement subsystem, and manually, by operators reading instrument gauges. Data obtained by both methods were retained in data files on the large capacity RP04 disk, the manual data having been input at central system input/output terminals. Tables 4-1 through 4-4 show comparisons between RTP-obtained data and manual data for the period covered by Campaign 2 and Campaign 3 inclusive.

Tables 4-1 and 4-2 present comparisons of liquid pressure level measurement by Ruska dp instruments for the input accountability tank and the uranium product sample tank as well as representative temperatures obtained by each method. As the tables show, agreement between RTP and manual level data is close. Temperatures show an offset between RTP and manual readings of somewhat more than 1°C. This may be explained by the fact that the RTP readings are direct instrument voltage readings; whereas, manual readings are taken from strip chart instruments which induce an extra level of calibration error.

Tables 4-3 and 4-4 compare RTP and manual data for liquid level in the HWW sample tank and the GPW check tank by Westinghouse and Taylor dp instruments. Again, comparisons between RTP and manual data are close in most cases. Recording errors probably account for the few large differences. As with the temperature readings of Table 4-1 and 4-2, the Taylor readings show a fairly consistent offset between RTP and manual data. The explanation is the same as for temperature reading offsets; manual Taylor readings are taken from strip chart recorders. Westinghouse and Ruska readings, all of which showed low average differences in

the comparisons, are manually taken from precision digital volt meters which do not induce the calibration error found in strip chart recorders.

It may be concluded from the extensive comparisons in Campaigns 2 and 3 that RTP readings are more precise than manual readings.

### 4.6.8 Future Improvements

At the current level of development of the RTP system, the RTP program occupies almost all of the available memory of the remote data acquisition computer. Upgrading of the PDP 11/04 computer to a PDP 11/34 would provide extended core memory capacity and will be necessary to support envisioned additions to the RTP program.

Two major bottlenecks in the system tend to slow down response. One is the serial interface between the preprocessor and the Ruska instruments. Conversions to analog output and parallel data transmission, rather than interfacing the Ruska's through the DVM and communicating serially between modem, would increase the response time in zeroing and reading the Ruskas by roughly an order of magnitude.

The other major bottleneck is the serial communication between the CNMCAS central system and the RTP system. It would be necessary to relocate the system(s) to within about 25 feet of each other before a conversion to parallel communication would be possible. The cost/benefit relation involved in these logistics requires further study.

Interfacing of several additional types of instruments for enhanced process information capability is planned. These instrument types include:

- Conductivity meters
- Radiation monitors
- Pressure detectors
- Flow meters
- Level detectors
- Valve position indicators.

## 4.7 Laboratory Data System Performance

### 4.7.1 Introduction

During plant operation, the Analytical Services Laboratory performs several hundred determinations on more than two hundred samples per day. Keeping track of these samples, reporting results, assuring that quality control samples have been analyzed, comparing laboratory results with expected process control limits, and compiling results and preparing reports are the tasks that are handled by the LDS System.

### 4.7.2 System Description

The system consists of a PDP 11/35 CPU with 128 K-words of memory, multiple disk drives, dual magnetic tape transports, and various input/output terminals (DEC writers and CRT terminals). These terminals are located at strategic points in the laboratories, the process control rooms, and the Administration Building.

### 4.7.3 LDS Operation

The operation begins when Production Department personnel request a sample via the terminal located in the control room. This request initiates the sampling operation in the AVOS. When Analytical Services Department personnel have completed the sampling operation, the sample is logged into the Laboratory Data System via a terminal in the AVOS. The sample is then analyzed for the requested constituents. If the analysis is performed using one of the interfaced densimeters or fluorophotometers, the data and results are transmitted directly to the computer. If the analysis is performed off-line, the data are entered manually via one of the system terminals.

After all analyses for a sample have been completed, the shift supervisor reviews the data and results for the sample and approves it. This is a "privileged" function and requires a nonprinting password to access the program. At this time, a final report is printed on multicopy paper by the line printer for distribution as required. Considerable information is contained in the final reports, e.g., the requesting department, the sampling date and time, and the log-in date and time. Also any COMMENT that was entered during the log-in is printed. The result for each constituent, the appropriate units, and the standard deviation for the determination are printed. Also, the method used for the determination, the crew and analyst, and the date and time the data were entered are printed on the final report.

Data for the laboratory methods quality control program are also handled by the system. For each analytical method, a series of quality control standards is prepared, and aliquots are flame sealed in glass ampuls. Each ampul is assigned a unique number. The reference values, along with the appropriate upper and lower limits, are logged into the system via the terminal located in the quality control chemist's office.

A quality control sample is required to be analyzed for each method at least once each shift that method is used. If satisfactory results are not obtained, the system locks out that method and will not accept sample data until satisfactory results are obtained for a quality control standard.

### 4.7.4 Analytical Instrument Interfacing

Initially, only two laboratory instruments were interfaced directly to the system, a mass spectrometer and a multichannel analyzer. These instruments have their own dedicated minicomputers for control, data

acquisition, and data reduction -- the interface merely serves as a data link to the laboratory system for long-term storage of data and results.

To interface other laboratory instruments to the computer, a laboratory instrument interface unit (LIIU) was designed to simplify this normally complex process. This unit also serves as an input/output terminal to enter analyst and sample identification, to prompt analyst entry, and to print data and results. This was accomplished by using a serial data link between the LIIU and the laboratory computer, and by using a standardized set of cards to link the LIIU to the analytical instrument. The set of cards includes:

- Analog-to-digital converters
- TTL one-shot modules
- TTL BCD modules
- TTL pulse-counter modules
- UART controller modules.

There are currently three Anton-Paar densimeters and two fluorophotometers interfaced to the system using the LIIU's. Future plans include interfacing electronic balances, titrating systems, spectrophotometers, a microphotometer, and a gas chromatograph.

### 4.7.5 LDS-Central System Network Communication Link

The LDS-Central System communication link operates over two separate unidirectional data transmission lines connecting the two systems. Communication is from a sending task at one node to a receiving task at the other node.

The sample request sequence begins when a Measurement Program initiates a request at the appropriate time in the measurement sequence. The sample request module places the request in a queue buffer, which is processed on a first-in-first-out basis by the sending task. (The sending task is always in execution and idles whenever the request queue is empty.) The request sending task formats the sample request information and passes it over the link to the Sample Authorization task on the LDS System. The Sample Authorization task, in turn, sends the request to the laboratory technician's terminal.

Upon receipt of a sample request, the laboratory technician acknowledges the request via the LDS Message Acknowledgment task and then pulls the sample. The technician assigns a sample log number when he pulls the sample and runs the LOGIN program on the LDS System, which records the sample log number for follow-up, and produces an analysis form detailing the analyses to be performed.

Analytical data are transmitted to the LDS system via the DATA task either automatically when the analysis is performed on-line via the LIIU or manually from one of the I/O terminals.

This task performs two functions. First, the data are transmitted along a terminal line. A DM-11 splitter sends the data to a teletype terminal in the Separations Control Room and simultaneously to a CNMCAS Central System terminal input port. The DATA task then stores the analytical data in a disk file on the LDS System disk.

A lab data receiving task (LDSLN2) is always in execution on the CNMCAS Central System. Its function is to constantly monitor the terminal input port over which the lab data is sent. As data are received from LDS, the LDSLN2 task determines which vessel and which batch, if any, the data is associated with. It then stores the data in the appropriate Analytical Summary Data File on the Central System. Analytical data for all vessels are retained while Measurement Programs initiate requests only for material balance measurement points. Non-Material-Balance analytical requests are initiated by Control Room Operators directly onto the LDS System, bypassing the network communication link.

After a Measurement Program has initiated a sample request, the Measurement Program cannot proceed until the appropriate data have been entered for the batch currently being measured.

### 4.7.6 LDS System Performance

Generally, the system performed satisfactorily as designed. The shortage of disk storage space for analytical data caused problems from time to time. Several system shutdowns were caused by failure of the chiller unit for the building air conditioning and not by computer hardware failures.

### 4.7.7 Recommended LDS Improvements

The addition of more data storage appears to be necessary, either in LDS or in CNMCAS. Also, transfer of QC program data from LDS to CNMCAS is necessary to allow the limit of error programs to be automated. The communications link must be upgraded to permit transfer of data other than the current $HNO_3$, density, and uranium results. This step is required if graphic display of process conditions is to be fully developed.

TABLE 4-1

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM INPUT ACCOUNTABILITY TANK

| BATCH NUMBER | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 206 | 402.986 | 403.030 | -0.044 | 402.950 | 402.970 | -0.020 | 114.280 | 114.230 | 0.050 | 31.928 | 33.200 | -1.272 |
| 207 | 434.168 | 434.210 | -0.042 | 434.188 | 434.230 | -0.042 | 107.930 | 107.870 | 0.060 | 32.044 | 34.000 | -1.956 |
| 208 | 453.562 | 453.550 | 0.012 | 453.558 | 453.560 | -0.002 | 126.328 | 126.340 | -0.012 | 32.596 | 34.000 | -1.404 |
| 209 | 411.458 | 411.460 | -0.002 | 411.426 | 411.430 | -0.004 | 122.912 | 122.900 | 0.012 | 32.740 | 36.000 | -3.260 |
| 210 | 424.526 | 424.270 | 0.256 | 424.300 | 424.290 | 0.010 | 133.505 | 133.520 | -0.015 | 33.017 | 34.000 | -0.983 |
| 211 | 368.042 | 368.020 | 0.022 | 368.086 | 368.050 | 0.036 | 65.770 | 65.790 | -0.020 | 33.309 | 34.800 | -1.491 |
| 212 | 367.900 | 367.910 | -0.010 | 367.922 | 367.900 | 0.022 | 51.998 | 52.040 | -0.042 | 33.570 | 35.000 | -1.430 |
| 213 | 334.790 | 334.860 | -0.070 | 334.847 | 334.860 | -0.013 | 50.582 | 50.620 | -0.038 | 33.257 | 34.000 | -0.743 |
| 214 | 309.532 | 309.580 | -0.048 | 309.548 | 309.560 | -0.012 | 48.722 | 48.750 | -0.028 | 33.198 | 34.500 | -1.302 |
| 215 | 286.357 | 286.400 | -0.043 | 286.355 | 286.390 | -0.035 | 50.724 | 50.760 | -0.036 | 33.227 | 34.500 | -1.273 |
| 216 | 300.922 | 300.920 | 0.002 | 300.985 | 300.940 | 0.045 | 80.766 | 80.810 | -0.044 | 33.336 | 35.000 | -1.664 |
| 217 | 321.132 | 321.120 | 0.012 | 321.128 | 321.170 | -0.042 | 42.380 | 42.470 | -0.090 | 33.289 | 34.500 | -1.211 |
| 218 | 347.980 | 348.030 | -0.050 | 347.970 | 348.060 | -0.090 | 40.908 | 40.950 | -0.042 | 33.109 | 34.400 | -1.291 |
| 219 | 344.460 | 344.400 | 0.060 | 344.460 | 344.480 | -0.020 | 51.933 | 51.940 | -0.007 | 32.812 | 34.000 | -1.188 |
| 220 | 299.768 | 299.700 | 0.068 | 299.704 | 299.720 | -0.016 | 47.170 | 47.250 | -0.080 | 32.771 | 34.000 | -1.229 |
| 221 | 291.925 | 291.980 | -0.055 | 289.314 | 289.300 | 0.014 | 44.962 | 44.990 | -0.028 | 33.160 | 34.500 | -1.340 |
| 222 | 384.312 | 384.270 | 0.042 | 384.310 | 384.300 | 0.010 | 68.952 | 68.930 | 0.022 | 33.004 | 34.500 | -1.496 |
| 223 | 338.108 | 338.110 | -0.002 | 338.065 | 338.060 | 0.005 | 51.266 | 51.300 | -0.034 | 32.928 | 34.000 | -1.072 |
| 224 | 308.226 | 308.290 | -0.064 | 308.248 | 308.290 | -0.042 | 45.538 | 45.560 | -0.022 | 33.191 | 34.500 | -1.309 |
| 225 | 350.122 | 350.140 | -0.018 | 350.070 | 350.110 | -0.040 | 42.582 | 42.540 | 0.042 | 33.141 | 34.500 | -1.359 |
| 226 | 306.526 | 306.080 | 0.446 | 306.086 | 306.080 | 0.006 | 48.156 | 48.210 | -0.054 | 33.136 | 34.000 | -0.864 |
| 227 | 304.098 | 304.150 | -0.052 | 304.096 | 304.150 | -0.054 | 45.525 | 45.600 | -0.075 | 33.097 | 34.000 | -0.903 |
| 228 | 354.580 | 354.680 | -0.100 | 354.600 | 354.670 | -0.070 | 48.580 | 48.680 | -0.100 | 33.502 | 35.000 | -1.498 |
| 229 | 329.170 | 329.230 | -0.060 | 329.170 | 329.260 | -0.090 | 46.717 | 46.790 | -0.073 | 33.006 | 34.000 | -0.994 |
| 230 | 288.757 | 288.860 | -0.103 | 288.776 | 288.860 | -0.084 | 40.433 | 40.560 | -0.127 | 33.108 | 34.000 | -0.892 |
| 231 | 334.795 | 334.810 | -0.015 | 334.780 | 334.900 | -0.120 | 43.350 | 43.440 | -0.090 | 33.277 | 34.500 | -1.223 |
| 232 | 294.395 | 294.540 | -0.145 | 294.352 | 294.390 | -0.038 | 47.380 | 47.540 | -0.160 | 32.966 | 34.000 | -1.034 |
| 233 | 374.978 | 375.050 | -0.072 | 374.994 | 375.040 | -0.046 | 42.870 | 42.910 | -0.040 | 33.719 | 35.000 | -1.281 |
| 234 | 315.952 | 316.030 | -0.078 | 315.950 | 316.030 | -0.080 | 45.470 | 45.370 | 0.100 | 34.421 | 36.000 | -1.579 |
| 235 | 295.088 | 295.100 | -0.012 | 294.980 | 295.110 | -0.130 | 42.480 | 42.540 | -0.060 | 34.337 | 35.500 | -1.163 |
| 236 | 327.507 | 327.580 | -0.073 | 327.505 | 327.570 | -0.065 | 46.280 | 46.350 | -0.070 | 33.804 | 35.000 | -1.196 |
| 237 | 327.297 | 327.330 | -0.033 | 327.298 | 327.360 | -0.062 | 47.473 | 47.460 | 0.013 | 35.523 | 36.800 | -1.277 |
| 238 | 331.078 | 331.130 | -0.052 | 331.070 | 331.120 | -0.050 | 45.308 | 45.300 | 0.008 | 34.934 | 36.000 | -1.066 |
| 239 | 306.075 | 306.090 | -0.015 | 306.096 | 306.110 | -0.014 | 45.506 | 45.490 | 0.016 | 34.561 | 36.000 | -1.439 |
| 240 | 321.892 | 321.920 | -0.028 | 321.780 | 321.920 | -0.140 | 43.324 | 43.310 | 0.014 | 35.057 | 36.500 | -1.443 |
| 241 | 341.436 | 341.420 | 0.016 | 341.398 | 341.410 | -0.012 | 48.500 | 48.550 | -0.050 | 34.387 | 36.000 | -1.613 |
| 242 | 334.604 | 334.620 | -0.016 | 334.578 | 334.590 | -0.012 | 46.515 | 46.570 | -0.055 | 34.238 | 35.700 | -1.462 |
| 243 | 359.080 | 359.140 | -0.060 | 359.070 | 359.140 | -0.070 | 48.798 | 48.790 | 0.008 | 33.951 | 35.000 | -1.049 |
| 244 | 308.190 | 308.180 | 0.010 | 308.090 | 308.160 | -0.070 | 47.448 | 47.440 | 0.008 | 33.914 | 35.000 | -1.086 |
| 245 | 345.273 | 345.280 | -0.007 | 345.212 | 345.230 | -0.018 | 50.310 | 50.300 | 0.010 | 33.946 | 35.200 | -1.254 |
| 246 | 357.272 | 356.800 | 0.472 | 356.734 | 356.770 | -0.036 | 56.217 | 56.210 | 0.007 | 33.964 | 35.500 | -1.536 |
| 247 | 339.702 | 339.720 | -0.018 | 339.673 | 339.680 | -0.007 | 49.310 | 49.370 | -0.060 | 33.953 | 35.000 | -1.047 |
| 248 | 339.783 | 339.760 | 0.023 | 339.720 | 339.790 | -0.070 | 49.818 | 49.810 | 0.008 | 34.122 | 35.500 | -1.378 |
| 249 | 355.613 | 355.610 | 0.003 | 355.604 | 355.620 | -0.016 | 45.310 | 45.320 | -0.010 | 34.086 | 35.000 | -0.914 |
| 250 | 317.100 | 317.150 | -0.050 | 317.110 | 317.130 | -0.020 | 46.120 | 46.150 | -0.030 | 34.269 | 35.500 | -1.231 |
| 251 | 347.120 | 347.200 | -0.080 | 347.110 | 347.190 | -0.080 | 50.198 | 50.220 | -0.022 | 35.241 | 36.500 | -1.259 |
| 252 | 357.224 | 357.250 | -0.026 | 357.225 | 357.200 | 0.025 | 51.742 | 51.720 | 0.022 | 34.626 | 36.000 | -1.374 |
| 253 | 365.503 | 365.490 | 0.013 | 365.510 | 365.500 | 0.010 | 49.568 | 49.610 | -0.042 | 34.967 | 36.200 | -1.233 |
| 254 | 329.402 | 329.450 | -0.048 | 329.433 | 329.420 | 0.013 | 47.580 | 47.600 | -0.020 | 34.487 | 36.000 | -1.513 |
| 255 | 331.066 | 331.100 | -0.034 | 331.042 | 331.010 | 0.032 | 42.663 | 42.660 | 0.003 | 34.967 | 36.000 | -1.033 |

TABLE 4-1 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM INPUT ACCOUNTABILITY TANK

| BATCH NUMBER | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 256 | 333.508 | 333.490 | 0.018 | 333.510 | 333.500 | 0.010 | 50.328 | 50.350 | -0.022 | 34.822 | 36.000 | -1.178 |
| 257 | 326.120 | 326.180 | -0.060 | 326.150 | 326.160 | -0.010 | 42.330 | 42.390 | -0.060 | 34.702 | 36.000 | -1.298 |
| 258 | 345.110 | 345.150 | -0.040 | 345.110 | 345.140 | -0.030 | 46.088 | 46.070 | 0.018 | 34.952 | 36.000 | -1.048 |
| 259 | 345.692 | 345.620 | 0.072 | 345.652 | 345.640 | 0.012 | 43.013 | 43.040 | -0.027 | 34.714 | 36.000 | -1.286 |
| 260 | 337.117 | 337.130 | -0.013 | 337.100 | 337.100 | -0.000 | 47.015 | 46.100 | 0.915 | 34.383 | 35.500 | -1.117 |
| 261 | 331.225 | 331.220 | 0.005 | 331.220 | 331.210 | 0.010 | 42.544 | 42.540 | 0.004 | 34.284 | 35.600 | -1.316 |
| 262 | 302.643 | 302.640 | 0.003 | 302.638 | 302.630 | 0.008 | 41.462 | 41.450 | 0.012 | 33.940 | 35.200 | -1.260 |
| 263 | 362.898 | 362.900 | -0.002 | 362.900 | 362.880 | 0.020 | 43.340 | 43.380 | -0.040 | 34.323 | 35.800 | -1.477 |
| 264 | 339.784 | 339.820 | -0.036 | 339.780 | 339.820 | -0.040 | 48.932 | 48.950 | -0.018 | 34.224 | 35.500 | -1.276 |
| 265 | 358.280 | 358.290 | -0.010 | 358.268 | 358.290 | -0.022 | 43.140 | 43.210 | -0.070 | 34.621 | 36.000 | -1.379 |
| 266 | 346.530 | 346.600 | -0.070 | 346.520 | 346.560 | -0.040 | 49.276 | 49.280 | -0.004 | 37.891 | 39.000 | -1.109 |
| 267 | 341.656 | 341.650 | 0.006 | 341.516 | 341.520 | -0.004 | 49.652 | 49.660 | -0.008 | 39.218 | 40.500 | -1.282 |
| 268 | 362.517 | 362.510 | 0.007 | 362.477 | 362.470 | 0.007 | 87.120 | 87.200 | -0.080 | 40.423 | 41.500 | -1.077 |
| 269 | 433.100 | 433.200 | -0.100 | 433.100 | 433.220 | -0.120 | 45.570 | 45.570 | 0.000 | 41.339 | 42.500 | -1.161 |
| 270 | 438.905 | 438.990 | -0.085 | 439.098 | 439.100 | -0.002 | 297.300 | 297.380 | -0.080 | 41.566 | 43.000 | -1.434 |
| 271 | 329.272 | 329.240 | 0.032 | 329.110 | 328.840 | 0.270 | 329.096 | 328.840 | 0.256 | 34.939 | 32.000 | 2.939 |
| 272 | 328.930 | 328.960 | -0.030 | 328.930 | 328.950 | -0.020 | 201.065 | 201.060 | 0.005 | 31.323 | 33.000 | -1.677 |
| 273 | 201.056 | 201.060 | -0.004 | 201.032 | 201.060 | -0.028 | 42.205 | 42.230 | -0.025 | 31.693 | 33.000 | -1.307 |
| 274 | 338.492 | 338.480 | 0.012 | 338.432 | 338.460 | -0.028 | 47.560 | 47.560 | -0.000 | 35.586 | 36.500 | -0.914 |
| 275 | 408.517 | 408.490 | 0.027 | 408.508 | 408.500 | 0.008 | 59.332 | 59.360 | -0.028 | 34.380 | 36.000 | -1.620 |
| 276 | 395.130 | 395.130 | -0.000 | 395.124 | 395.120 | 0.004 | 49.424 | 49.430 | -0.006 | 33.505 | 35.000 | -1.495 |
| 277 | 335.950 | 336.020 | -0.070 | 335.940 | 335.970 | -0.030 | 40.128 | 40.060 | 0.068 | 32.846 | 34.000 | -1.154 |
| 278 | 348.313 | 348.290 | 0.023 | 348.275 | 348.250 | 0.025 | 42.142 | 42.180 | -0.038 | 32.422 | 33.900 | -1.478 |
| 279 | 322.560 | 322.510 | 0.050 | 322.540 | 322.500 | 0.040 | 42.930 | 42.880 | 0.050 | 32.350 | 34.000 | -1.650 |
| 280 | 366.898 | 366.890 | 0.008 | 366.787 | 366.820 | -0.033 | 48.770 | 48.860 | -0.090 | 33.216 | 35.000 | -1.784 |
| 281 | 275.590 | 275.580 | 0.010 | 275.602 | 275.580 | 0.022 | 39.366 | 39.430 | -0.064 | 34.107 | 35.500 | -1.393 |
| 282 | 325.570 | 325.640 | -0.070 | 325.603 | 325.620 | -0.017 | 49.938 | 49.920 | 0.018 | 34.498 | 36.000 | -1.502 |
| 283 | 432.174 | 432.150 | 0.024 | 432.120 | 432.170 | -0.050 | 50.312 | 50.340 | -0.028 | 34.493 | 36.000 | -1.507 |
| 284 | 369.964 | 369.930 | 0.034 | 369.960 | 369.920 | 0.040 | 42.592 | 42.600 | -0.008 | 33.619 | 35.000 | -1.381 |
| 285 | 286.698 | 286.700 | -0.002 | 286.720 | 286.690 | 0.030 | 48.688 | 48.720 | -0.032 | 33.298 | 35.000 | -1.702 |
| 286 | 347.518 | 347.540 | -0.022 | 347.538 | 347.550 | -0.012 | 49.704 | 49.720 | -0.016 | 33.191 | 35.000 | -1.809 |
| 287 | 366.020 | 366.070 | -0.050 | 366.085 | 366.050 | 0.035 | 40.998 | 41.080 | -0.082 | 33.424 | 34.800 | -1.376 |
| 288 | 319.266 | 319.300 | -0.034 | 319.274 | 319.270 | 0.004 | 46.795 | 46.870 | -0.075 | 33.872 | 35.500 | -1.628 |
| 289 | 397.398 | 397.420 | -0.022 | 397.392 | 397.410 | -0.018 | 51.390 | 51.420 | -0.030 | 34.022 | 35.400 | -1.378 |
| 290 | 361.970 | 362.000 | -0.030 | 362.000 | 361.990 | 0.010 | 47.336 | 47.370 | -0.034 | 34.261 | 35.500 | -1.239 |
| 291 | 384.838 | 384.880 | -0.042 | 384.885 | 384.900 | -0.015 | 47.172 | 47.210 | -0.038 | 34.059 | 35.200 | -1.141 |
| 292 | 435.584 | 435.570 | 0.014 | 435.598 | 435.540 | 0.058 | 51.138 | 51.130 | 0.008 | 34.024 | 35.400 | -1.376 |
| 293 | 390.253 | 390.200 | 0.053 | 390.327 | 390.320 | 0.007 | 49.764 | 49.770 | -0.006 | 37.109 | 38.000 | -0.891 |
| 294 | 353.026 | 353.050 | -0.024 | 352.935 | 352.940 | -0.005 | 41.973 | 41.970 | 0.003 | 37.035 | 37.500 | -0.465 |
| 295 | 350.570 | 350.580 | -0.010 | 350.542 | 350.550 | -0.008 | 49.460 | 49.530 | -0.070 | 35.887 | 37.000 | -1.113 |
| 296 | 360.143 | 360.170 | -0.027 | 360.124 | 360.170 | -0.046 | 38.682 | 38.730 | -0.048 | 34.410 | 35.500 | -1.090 |
| 297 | 355.162 | 355.180 | -0.018 | 355.150 | 355.190 | -0.040 | 40.953 | 41.040 | -0.087 | 33.864 | 35.000 | -1.136 |
| 298 | 363.165 | 363.190 | -0.025 | 363.174 | 363.170 | 0.004 | 39.750 | 39.790 | -0.040 | 33.859 | 35.000 | -1.141 |
| 299 | 332.567 | 332.630 | -0.063 | 332.558 | 332.610 | -0.052 | 41.246 | 41.320 | -0.074 | 33.866 | 35.000 | -1.134 |
| 300 | 384.974 | 385.030 | -0.056 | 384.985 | 385.060 | -0.075 | 50.980 | 51.070 | -0.090 | 33.721 | 35.000 | -1.279 |
| 301 | 362.780 | 362.780 | -0.000 | 362.770 | 362.780 | -0.010 | 42.225 | 42.300 | -0.075 | 33.956 | 35.300 | -1.344 |
| 302 | 347.080 | 347.100 | -0.020 | 347.098 | 347.100 | -0.002 | 42.215 | 42.320 | -0.105 | 33.548 | 35.000 | -1.452 |
| 303 | 353.002 | 353.110 | -0.108 | 352.980 | 353.050 | -0.070 | 42.228 | 42.240 | -0.012 | 33.436 | 36.000 | -2.564 |
| 304 | 332.742 | 332.700 | 0.042 | 332.758 | 332.770 | -0.012 | 49.980 | 50.040 | -0.060 | 33.297 | 34.500 | -1.203 |
| 305 | 347.780 | 347.850 | -0.070 | 347.780 | 347.840 | -0.060 | 42.574 | 42.640 | -0.066 | 33.313 | 34.700 | -1.387 |

TABLE 4-1 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM INPUT ACCOUNTABILITY TANK

| | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BATCH NUMBER | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 306 | 330.772 | 330.750 | 0.022 | 330.780 | 330.840 | -0.060 | 49.070 | 49.130 | -0.060 | 33.250 | 35.000 | -1.750 |
| 307 | 349.910 | 349.930 | -0.020 | 349.914 | 349.950 | -0.036 | 42.173 | 42.120 | 0.053 | 33.358 | 34.800 | -1.442 |
| 308 | 348.763 | 348.830 | -0.067 | 348.780 | 348.860 | -0.080 | 46.352 | 46.410 | -0.058 | 33.385 | 34.800 | -1.415 |
| 309 | 359.498 | 359.550 | -0.052 | 359.447 | 359.520 | -0.073 | 60.818 | 60.920 | -0.102 | 34.707 | 36.000 | -1.293 |
| 310 | 368.995 | 369.020 | -0.025 | 368.810 | 366.690 | 2.120 | 50.462 | 50.560 | -0.098 | 58.020 | 59.000 | -0.980 |
| 311 | 136.890 | 136.950 | -0.060 | 136.743 | 136.950 | -0.207 | 1.780 | 2.100 | -0.320 | 60.874 | 61.000 | -0.126 |
| 312 | 93.720 | 93.760 | -0.040 | 93.612 | 93.620 | -0.008 | 28.672 | 28.690 | -0.018 | 39.280 | 42.000 | -2.720 |
| 313 | 338.403 | 338.410 | -0.007 | 338.090 | 338.130 | -0.040 | 27.270 | 27.280 | -0.010 | 47.124 | 48.000 | -0.876 |
| 314 | 226.200 | 226.210 | -0.010 | 226.080 | 226.110 | -0.030 | 28.230 | 28.210 | 0.020 | 50.543 | 51.800 | -1.257 |
| 315 | 136.520 | 136.950 | -0.430 | 136.426 | 136.400 | 0.026 | 23.940 | 23.970 | -0.030 | 48.212 | 49.800 | -1.588 |
| NUMBER OF READINGS: | | | 110 | | | 110 | | | 110 | | | 110 |
| AVERAGE DIFFERENCE: | | | -0.015 | | | -0.002 | | | -0.021 | | | -1.282 |
| STANDARD DEVIATION: | | | 0.090 | | | 0.210 | | | 0.107 | | | 0.550 |

TABLE 4-2

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM URANIUM PRODUCT SAMPLE TANK

| BATCH NUMBER | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 72 | 225.366 | 225.370 | -0.004 | 225.414 | 225.390 | 0.024 | 64.715 | 64.740 | -0.025 | 36.199 | 37.500 | -1.301 |
| 73 | 244.040 | 244.100 | -0.060 | 243.790 | 243.750 | 0.040 | 70.933 | 70.900 | 0.033 | 31.393 | 48.300 | -16.907 |
| 74 | 253.187 | 253.170 | 0.017 | 253.200 | 253.200 | -0.000 | 66.468 | 66.480 | -0.012 | 32.073 | 33.000 | -0.927 |
| 75 | 219.078 | 219.120 | -0.042 | 219.185 | 219.210 | -0.025 | 65.370 | 65.380 | -0.010 | 32.139 | 33.500 | -1.361 |
| 76 | 227.768 | 227.730 | 0.038 | 227.893 | 227.890 | 0.003 | 65.130 | 65.130 | -0.000 | 32.732 | 34.000 | -1.268 |
| 77 | 193.340 | 193.300 | 0.040 | 192.223 | 192.990 | -0.767 | 65.330 | 65.330 | -0.000 | 32.993 | 34.000 | -1.007 |
| 78 | 228.704 | 228.740 | -0.036 | 228.763 | 228.800 | -0.037 | 65.466 | 65.450 | 0.016 | 32.983 | 34.000 | -1.017 |
| 79 | 218.142 | 218.150 | -0.008 | 218.192 | 218.220 | -0.028 | 65.427 | 65.420 | 0.007 | 32.904 | 34.000 | -1.096 |
| 80 | 205.250 | 205.240 | 0.010 | 205.308 | 205.300 | 0.008 | 65.468 | 65.470 | -0.002 | 33.020 | 34.000 | -0.980 |
| 81 | 193.583 | 193.510 | 0.073 | 193.680 | 193.660 | 0.020 | 65.472 | 65.500 | -0.028 | 33.044 | 34.500 | -1.456 |
| 82 | 200.255 | 200.390 | -0.135 | 200.525 | 200.540 | -0.015 | 65.390 | 65.390 | -0.000 | 33.727 | 35.000 | -1.273 |
| 83 | 195.338 | 195.330 | 0.008 | 195.280 | 195.310 | -0.030 | 65.472 | 65.410 | 0.062 | 32.510 | 34.000 | -1.490 |
| 84 | 230.528 | 230.530 | -0.002 | 230.287 | 231.110 | -0.823 | 65.438 | 65.440 | -0.002 | 33.580 | 34.500 | -0.920 |
| 85 | 229.192 | 229.260 | -0.068 | 229.300 | 229.270 | 0.030 | 65.464 | 65.470 | -0.006 | 32.762 | 34.000 | -1.238 |
| 86 | 198.668 | 198.590 | 0.078 | 199.100 | 199.090 | 0.010 | 67.930 | 67.900 | 0.030 | 32.968 | 34.000 | -1.032 |
| 87 | 200.628 | 200.310 | 0.318 | 197.678 | 197.660 | 0.018 | 65.482 | 65.490 | -0.008 | 33.351 | 34.500 | -1.149 |
| 88 | 248.650 | 248.660 | -0.010 | 248.740 | 248.750 | -0.010 | 65.472 | 65.470 | 0.002 | 33.279 | 34.000 | -0.721 |
| 89 | 210.795 | 210.800 | -0.005 | 210.902 | 210.980 | -0.078 | 65.488 | 65.500 | -0.012 | 33.480 | 34.500 | -1.020 |
| 90 | 204.170 | 204.110 | 0.060 | 204.176 | 204.280 | -0.104 | 65.540 | 65.520 | 0.020 | 32.807 | 34.000 | -1.193 |
| 91 | 229.607 | 229.620 | -0.013 | 229.622 | 229.720 | -0.098 | 65.356 | 65.350 | 0.006 | 33.251 | 34.000 | -0.749 |
| 92 | 207.554 | 207.590 | -0.036 | 207.606 | 207.590 | 0.016 | 65.392 | 65.390 | 0.002 | 33.060 | 34.500 | -1.440 |
| 93 | 203.538 | 203.700 | -0.162 | 203.687 | 203.670 | 0.017 | 65.468 | 65.460 | 0.008 | 33.437 | 34.800 | -1.363 |
| 94 | 232.330 | 232.380 | -0.050 | 232.412 | 232.400 | 0.012 | 65.533 | 65.530 | 0.003 | 33.409 | 35.000 | -1.591 |
| 95 | 216.936 | 217.240 | -0.304 | 216.960 | 217.430 | -0.470 | 65.520 | 65.500 | 0.020 | 33.303 | 34.000 | -0.697 |
| 96 | 196.110 | 196.210 | -0.100 | 196.250 | 196.250 | -0.000 | 65.555 | 65.550 | 0.005 | 33.010 | 34.000 | -0.990 |
| 97 | 222.785 | 224.110 | -1.325 | 224.136 | 224.140 | -0.004 | 66.570 | 66.570 | 0.000 | 32.796 | 34.500 | -1.704 |
| 98 | 201.076 | 201.090 | -0.014 | 201.066 | 201.030 | 0.036 | 65.536 | 65.280 | 0.256 | 33.116 | 34.000 | -0.884 |
| 99 | 241.972 | 241.960 | 0.012 | 242.144 | 242.000 | 0.144 | 65.458 | 65.450 | 0.008 | 33.731 | 34.000 | -0.269 |
| 100 | 213.052 | 213.130 | -0.078 | 213.132 | 213.120 | 0.012 | 65.575 | 65.570 | 0.005 | 34.850 | 36.000 | -1.150 |
| 101 | 200.326 | 200.390 | -0.064 | 200.378 | 200.370 | 0.008 | 65.595 | 65.570 | 0.025 | 34.845 | 36.000 | -1.155 |
| 102 | 219.432 | 219.420 | 0.012 | 219.432 | 219.410 | 0.022 | 65.558 | 65.580 | -0.022 | 33.717 | 35.000 | -1.283 |
| 103 | 219.212 | 219.410 | -0.198 | 217.200 | 217.200 | 0.000 | 65.412 | 65.420 | -0.008 | 38.060 | 37.500 | 0.560 |
| 104 | 218.544 | 218.520 | 0.024 | 218.540 | 218.490 | 0.050 | 65.445 | 65.430 | 0.015 | 34.352 | 36.000 | -1.648 |
| 105 | 206.176 | 206.170 | 0.006 | 206.218 | 206.200 | 0.018 | 65.418 | 65.440 | -0.022 | 34.536 | 37.000 | -2.464 |
| 106 | 214.665 | 214.850 | -0.185 | 214.660 | 214.660 | -0.000 | 65.523 | 65.520 | 0.003 | 35.115 | 36.800 | -1.685 |
| 107 | 226.390 | 226.450 | -0.060 | 226.452 | 226.430 | 0.022 | 65.545 | 65.540 | 0.005 | 33.786 | 35.000 | -1.214 |
| 108 | 219.720 | 219.660 | 0.060 | 219.778 | 219.690 | 0.088 | 65.220 | 65.240 | -0.020 | 33.038 | 35.200 | -2.162 |
| 109 | 234.200 | 234.210 | -0.010 | 234.208 | 234.190 | 0.018 | 65.452 | 65.460 | -0.008 | 33.890 | 35.300 | -1.410 |
| 110 | 205.457 | 205.450 | 0.007 | 205.428 | 205.430 | -0.002 | 65.448 | 65.440 | 0.008 | 33.846 | 35.000 | -1.154 |
| 111 | 226.418 | 226.250 | 0.168 | 226.212 | 226.250 | -0.038 | 65.458 | 65.450 | 0.008 | 34.083 | 36.000 | -1.917 |
| 112 | 231.094 | 230.980 | 0.114 | 230.958 | 230.980 | -0.022 | 65.413 | 65.410 | 0.003 | 34.041 | 35.000 | -0.959 |
| 113 | 218.846 | 218.820 | 0.026 | 218.645 | 218.640 | 0.005 | 65.412 | 65.410 | 0.002 | 34.176 | 35.000 | -0.824 |
| 114 | 222.236 | 222.260 | -0.024 | 222.228 | 222.250 | -0.022 | 65.398 | 65.390 | 0.008 | 34.402 | 35.000 | -0.598 |
| 115 | 230.202 | 230.160 | 0.042 | 230.200 | 230.150 | 0.050 | 65.178 | 65.240 | -0.062 | 34.482 | 35.500 | -1.018 |
| 116 | 210.799 | 212.280 | -1.481 | 210.824 | 212.270 | -1.446 | 64.638 | 65.500 | -0.862 | 34.284 | 35.500 | -1.216 |
| 117 | 228.110 | 228.070 | 0.040 | 228.040 | 228.090 | -0.050 | 65.583 | 65.600 | -0.017 | 36.466 | 36.000 | 0.466 |
| 118 | 231.280 | 231.340 | -0.060 | 231.310 | 231.310 | -0.000 | 65.580 | 65.570 | 0.010 | 34.901 | 36.000 | -1.099 |
| 119 | 235.440 | 235.440 | -0.000 | 235.512 | 235.500 | 0.012 | 65.818 | 65.800 | 0.018 | 35.117 | 36.000 | -0.883 |
| 120 | 217.404 | 217.390 | 0.014 | 217.400 | 217.390 | 0.010 | 66.252 | 66.260 | -0.008 | 34.553 | 35.500 | -0.947 |
| 121 | 218.990 | 218.980 | 0.010 | 218.964 | 218.970 | -0.006 | 65.960 | 65.990 | -0.030 | 34.766 | 36.000 | -1.234 |

TABLE 4-2 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM URANIUM PRODUCT SAMPLE TANK

| BATCH NUMBER | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 122 | 223.217 | 223.120 | 0.097 | 223.078 | 223.080 | -0.002 | 66.060 | 66.060 | -0.000 | 34.047 | 36.000 | -1.953 |
| 123 | 214.912 | 214.940 | -0.028 | 214.914 | 214.940 | -0.026 | 65.957 | 65.960 | -0.003 | 34.068 | 36.000 | -1.932 |
| 124 | 229.405 | 229.400 | 0.005 | 229.406 | 229.400 | 0.006 | 65.918 | 65.910 | 0.008 | 35.049 | 36.000 | -0.951 |
| 125 | 227.488 | 227.560 | -0.072 | 227.358 | 227.350 | 0.008 | 65.614 | 65.610 | 0.004 | 34.744 | 35.000 | -0.256 |
| 126 | 224.105 | 224.250 | -0.145 | 224.240 | 224.220 | 0.020 | 65.488 | 65.490 | -0.002 | 34.467 | 35.500 | -1.033 |
| 127 | 220.378 | 219.660 | 0.718 | 219.390 | 219.390 | -0.000 | 65.456 | 65.440 | 0.016 | 33.790 | 35.500 | -1.710 |
| 128 | 205.978 | 205.960 | 0.018 | 205.956 | 205.980 | -0.024 | 65.496 | 65.500 | -0.004 | 33.935 | 35.000 | -1.065 |
| 129 | 238.964 | 239.020 | -0.056 | 239.023 | 238.990 | 0.033 | 65.418 | 65.410 | 0.008 | 34.661 | 36.000 | -1.339 |
| 130 | 225.572 | 225.640 | -0.068 | 225.574 | 225.570 | 0.004 | 65.487 | 65.490 | -0.003 | 34.413 | 35.200 | -0.787 |
| 131 | 232.582 | 232.560 | 0.022 | 232.536 | 232.520 | 0.016 | 65.504 | 65.500 | 0.004 | 34.846 | 36.000 | -1.154 |
| 132 | 229.312 | 229.310 | 0.002 | 229.302 | 229.290 | 0.012 | 65.500 | 65.490 | 0.010 | 39.919 | 41.000 | -1.081 |
| 133 | 223.115 | 223.140 | -0.025 | 223.135 | 223.190 | -0.055 | 65.433 | 65.430 | 0.003 | 41.640 | 42.500 | -0.860 |
| 134 | 234.428 | 234.780 | -0.352 | 234.424 | 234.440 | -0.016 | 65.504 | 65.510 | -0.006 | 42.951 | 44.000 | -1.049 |
| 135 | 221.732 | 221.780 | -0.048 | 221.677 | 221.590 | 0.087 | 221.618 | 221.590 | 0.028 | 42.794 | 44.000 | -1.206 |
| 136 | 375.260 | 375.250 | 0.010 | 375.242 | 375.240 | 0.002 | 188.653 | 188.660 | -0.007 | 43.219 | 44.000 | -0.781 |
| 137 | 313.454 | 313.460 | -0.006 | 313.432 | 313.450 | -0.018 | 101.530 | 101.520 | 0.010 | 42.054 | 44.000 | -1.946 |
| 138 | 145.612 | 145.630 | -0.018 | 145.568 | 145.560 | 0.008 | 145.480 | 145.560 | -0.080 | 40.917 | 42.500 | -1.583 |
| 139 | 159.323 | 159.310 | 0.013 | 159.318 | 159.300 | 0.018 | 159.272 | 159.300 | -0.028 | 38.368 | 39.500 | -1.132 |
| 140 | 158.956 | 158.950 | 0.006 | 158.964 | 158.980 | -0.016 | 159.220 | 158.980 | 0.240 | 37.159 | 38.000 | -0.841 |
| 141 | 258.692 | 258.690 | 0.002 | 258.728 | 258.700 | 0.028 | 97.713 | 97.710 | 0.003 | 36.715 | 38.000 | -1.285 |
| 142 | 276.360 | 276.280 | 0.080 | 276.393 | 276.380 | 0.013 | 83.753 | 83.750 | 0.003 | 34.147 | 35.000 | -0.853 |
| 143 | 244.574 | 244.620 | -0.046 | 244.612 | 244.600 | 0.012 | 63.228 | 63.230 | -0.002 | 33.195 | 34.000 | -0.805 |
| 144 | 218.038 | 218.000 | 0.038 | 218.008 | 218.000 | 0.008 | 63.226 | 63.230 | -0.004 | 31.909 | 33.000 | -1.091 |
| 145 | 229.554 | 229.510 | 0.044 | 229.580 | 229.570 | 0.010 | 63.256 | 63.260 | -0.004 | 31.838 | 32.000 | -0.162 |
| 146 | 214.607 | 214.650 | -0.043 | 214.630 | 214.620 | 0.010 | 63.286 | 63.220 | 0.066 | 32.013 | 32.500 | -0.487 |
| 147 | 238.358 | 238.330 | 0.028 | 238.338 | 238.330 | 0.008 | 63.172 | 63.170 | 0.002 | 33.113 | 34.000 | -0.887 |
| 148 | 185.502 | 185.410 | 0.092 | 185.666 | 185.640 | 0.026 | 63.132 | 63.130 | 0.002 | 34.481 | 35.000 | -0.519 |
| 149 | 217.706 | 217.690 | 0.016 | 217.694 | 217.710 | -0.016 | 63.220 | 63.210 | 0.010 | 34.667 | 31.000 | 3.667 |
| 150 | 284.412 | 284.390 | 0.022 | 284.656 | 284.650 | 0.006 | 78.572 | 78.560 | 0.012 | 33.769 | 35.000 | -1.231 |
| 151 | 236.078 | 236.120 | -0.042 | 236.133 | 236.140 | -0.007 | 63.420 | 63.410 | 0.010 | 33.166 | 34.200 | -1.034 |
| 152 | 195.088 | 195.090 | -0.002 | 195.132 | 195.090 | 0.042 | 63.608 | 63.610 | -0.002 | 32.683 | 34.000 | -1.317 |
| 153 | 225.026 | 225.170 | -0.144 | 224.734 | 224.740 | -0.006 | 63.467 | 63.430 | 0.037 | 32.345 | 33.800 | -1.455 |
| 154 | 234.284 | 234.270 | 0.014 | 234.362 | 234.350 | 0.012 | 63.506 | 63.510 | -0.004 | 33.118 | 34.500 | -1.382 |
| 155 | 213.650 | 213.550 | 0.100 | 213.625 | 213.640 | -0.015 | 63.435 | 63.440 | -0.005 | 33.467 | 34.800 | -1.333 |
| 156 | 252.604 | 252.600 | 0.004 | 252.730 | 252.730 | -0.000 | 63.438 | 63.440 | -0.002 | 33.376 | 34.500 | -1.124 |
| 157 | 230.913 | 231.280 | -0.367 | 231.267 | 231.260 | 0.007 | 63.332 | 63.350 | -0.018 | 33.362 | 35.000 | -1.638 |
| 158 | 245.554 | 245.470 | 0.084 | 245.590 | 245.530 | 0.060 | 63.328 | 63.310 | 0.018 | 33.434 | 34.500 | -1.066 |
| 159 | 284.668 | 284.700 | -0.032 | 284.748 | 284.730 | 0.018 | 75.350 | 75.350 | -0.000 | 33.152 | 34.500 | -1.348 |
| 160 | 246.226 | 246.330 | -0.104 | 246.330 | 246.320 | 0.010 | 63.525 | 63.490 | 0.035 | 33.030 | 34.500 | -1.470 |
| 161 | 226.735 | 226.720 | 0.015 | 226.836 | 226.810 | 0.026 | 63.410 | 63.390 | 0.020 | 37.878 | 39.000 | -1.122 |
| 162 | 229.926 | 229.970 | -0.044 | 230.024 | 230.000 | 0.024 | 63.382 | 63.370 | 0.012 | 35.645 | 37.000 | -1.355 |
| 163 | 231.208 | 231.170 | 0.038 | 231.225 | 231.230 | -0.005 | 63.342 | 63.350 | -0.008 | 33.615 | 36.300 | -2.685 |
| 164 | 233.652 | 233.360 | 0.292 | 232.400 | 233.360 | -0.960 | 61.516 | 61.540 | -0.024 | 33.346 | 34.000 | -0.654 |
| 165 | 237.352 | 237.240 | 0.112 | 237.372 | 237.330 | 0.042 | 63.406 | 63.400 | 0.006 | 33.350 | 34.500 | -1.150 |
| 166 | 221.374 | 221.330 | 0.044 | 221.473 | 221.470 | 0.003 | 63.444 | 63.430 | 0.014 | 33.179 | 34.500 | -1.321 |
| 167 | 248.908 | 248.930 | -0.022 | 248.975 | 248.930 | 0.045 | 63.380 | 63.370 | 0.010 | 32.878 | 34.000 | -1.122 |
| 168 | 231.803 | 231.740 | 0.063 | 231.833 | 231.820 | 0.013 | 63.402 | 63.390 | 0.012 | 33.424 | 35.000 | -1.576 |
| 169 | 227.728 | 227.710 | 0.018 | 227.742 | 227.730 | 0.012 | 63.390 | 63.380 | 0.010 | 32.698 | 34.000 | -1.302 |
| 170 | 230.820 | 230.840 | -0.020 | 230.952 | 230.990 | -0.038 | 63.440 | 63.440 | 0.000 | 33.354 | 34.500 | -1.146 |
| 171 | 220.108 | 220.030 | 0.078 | 220.106 | 220.070 | 0.036 | 63.400 | 63.400 | -0.000 | 32.817 | 34.000 | -1.183 |

TABLE 4-2 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM URANIUM PRODUCT SAMPLE TANK

| | BEFORE SAMPLING (CM H2O) | | | AFTER SAMPLING (CM H2O) | | | AFTER TRANSFER (CM H2O) | | | TEMPERATURE (A-S DEG C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BATCH NUMBER | RTP RUSKA (1) | MANUAL RUSKA (2) | DIFF (1) - (2) | RTP RUSKA (3) | MANUAL RUSKA (4) | DIFF (3) - (4) | RTP RUSKA (5) | MANUAL RUSKA (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 172 | 224.212 | 224.190 | 0.022 | 224.187 | 224.180 | 0.007 | 63.462 | 63.620 | -0.158 | 32.826 | 34.000 | -1.174 |
| 173 | 219.038 | 219.590 | -0.552 | 219.012 | 219.010 | 0.002 | 63.450 | 63.450 | -0.000 | 32.847 | 34.000 | -1.153 |
| 174 | 225.850 | 225.870 | -0.020 | 225.924 | 225.920 | 0.004 | 63.460 | 63.460 | -0.000 | 33.031 | 34.000 | -0.969 |
| 175 | 228.924 | 228.890 | 0.034 | 228.950 | 228.950 | -0.000 | 63.504 | 63.500 | 0.004 | 33.284 | 34.000 | -0.716 |
| 176 | 232.583 | 232.550 | 0.033 | 232.576 | 232.570 | 0.006 | 63.500 | 63.500 | -0.000 | 35.007 | 35.000 | 0.007 |
| 177 | 230.066 | 230.160 | -0.094 | 230.085 | 230.050 | 0.035 | 63.513 | 63.490 | 0.023 | 34.688 | 35.000 | -0.312 |
| 178 | 241.860 | 241.760 | 0.100 | 241.865 | 241.860 | 0.005 | 81.248 | 81.330 | -0.082 | 34.921 | 36.000 | -1.079 |
| 179 | 271.038 | 271.040 | -0.002 | 271.052 | 271.040 | 0.012 | 81.166 | 81.150 | 0.016 | 34.326 | 35.000 | -0.674 |
| 180 | 243.315 | 243.340 | -0.025 | 243.422 | 243.450 | -0.028 | 81.245 | 81.250 | -0.005 | 34.018 | 36.000 | -1.982 |
| 181 | 231.223 | 231.170 | 0.053 | 231.198 | 231.220 | -0.022 | 74.542 | 74.550 | -0.008 | 35.844 | 37.000 | -1.156 |
| 182 | 215.910 | 215.830 | 0.080 | 215.852 | 215.850 | 0.002 | 81.118 | 81.100 | 0.018 | 35.378 | 36.500 | -1.122 |
| 183 | 229.730 | 229.680 | 0.050 | 229.732 | 229.740 | -0.008 | 79.370 | 79.410 | -0.040 | 34.594 | 35.700 | -1.106 |
| 184 | 219.592 | 219.590 | 0.002 | 219.602 | 219.590 | 0.012 | 78.255 | 78.210 | 0.045 | 36.582 | 38.000 | -1.418 |
| 185 | 162.284 | 162.290 | -0.006 | 162.290 | 162.290 | -0.000 | 30.505 | 30.510 | -0.005 | 30.330 | 31.800 | -1.470 |
| 186 | 61.456 | 61.440 | 0.016 | 61.482 | 61.480 | 0.002 | 28.720 | 28.720 | -0.000 | 28.796 | 30.000 | -1.204 |
| NUMBER OF READINGS: | | | 115 | | | 115 | | | 115 | | | 115 |
| AVERAGE DIFFERENCE: | | | -0.029 | | | -0.034 | | | -0.003 | | | -1.232 |
| STANDARD DEVIATION: | | | 0.222 | | | 0.198 | | | 0.091 | | | 1.612 |

TABLE 4-3

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM HWW SAMPLE TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | A-S WESTINGHOUSE (CM H2O) MANUAL (2) | A-S WESTINGHOUSE (CM H2O) DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | A-T WESTINGHOUSE (CM H2O) MANUAL (4) | A-T WESTINGHOUSE (CM H2O) DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | A-S TAYLOR (CM H2O) MANUAL (6) | A-S TAYLOR (CM H2O) DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | A-T TAYLOR (CM H2O) MANUAL (8) | A-T TAYLOR (CM H2O) DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 159 | 363.114 | 373.438 | -10.324* | 55.116 | 55.029 | 0.088 | 364.047 | 360.121 | 3.925 | 57.623 | 56.998 | 0.625 |
| 160 | 358.338 | 358.308 | 0.031 | 48.546 | 49.122 | -0.576 | 359.105 | 355.458 | 3.647 | 51.297 | 50.780 | 0.518 |
| 161 | 353.325 | 353.385 | -0.060 | 42.540 | 42.541 | -0.001 | 354.171 | 351.831 | 2.341 | 44.560 | 44.562 | -0.002 |
| 162 | 358.749 | 358.774 | -0.025 | 58.860 | 58.863 | -0.003 | 359.682 | 354.940 | 4.743 | 57.000 | 56.998 | 0.002 |
| 163 | 389.513 | 389.656 | -0.143 | 53.361 | 53.422 | -0.061 | 390.731 | 387.584 | 3.147 | 55.915 | 55.961 | -0.047 |
| 164 | 387.165 | 387.117 | 0.048 | 46.174 | 46.168 | 0.006 | 388.098 | 386.029 | 2.069 | 48.965 | 46.634 | 2.331 |
| 165 | 345.063 | 344.991 | 0.072 | 59.394 | 50.262 | 9.132* | 345.830 | 341.986 | 3.844 | 61.710 | 51.816 | 9.894* |
| 166 | 348.431 | 348.514 | -0.083 | 26.463 | 26.530 | -0.067 | 349.119 | 347.167 | 1.952 | 29.697 | 26.944 | 2.752 |
| 167 | 325.518 | 325.664 | -0.145 | 46.941 | 47.153 | -0.212 | 326.364 | 321.259 | 5.105 | 49.858 | 47.671 | 2.188 |
| 168 | 345.553 | 345.613 | -0.059 | 44.711 | 44.821 | -0.110 | 346.281 | 341.986 | 4.295 | 47.510 | 45.598 | 1.912 |
| 169 | 380.484 | 380.537 | -0.052 | 51.353 | 51.453 | -0.101 | 381.820 | 378.257 | 3.564 | 54.310 | 51.816 | 2.494 |
| 170 | 347.728 | 347.841 | -0.113 | 53.076 | 43.940 | 9.136* | 348.906 | 344.576 | 4.329 | 55.796 | 44.044 | 11.753* |
| 171 | 389.719 | 389.760 | -0.041 | 23.569 | 23.732 | -0.162 | 391.253 | 388.620 | 2.633 | 27.333 | 25.908 | 1.425 |
| 172 | 403.397 | 403.388 | 0.010 | 31.626 | 31.711 | -0.085 | 404.773 | 398.983 | 5.790 | 35.065 | 34.199 | 0.867 |
| 173 | 393.601 | 393.646 | -0.045 | 47.059 | 47.153 | -0.093 | 395.182 | 391.211 | 3.972 | 50.301 | 47.671 | 2.630 |
| 174 | 349.277 | 349.343 | -0.066 | 44.324 | 44.303 | 0.021 | 350.693 | 347.167 | 3.525 | 47.724 | 45.598 | 2.126 |
| 175 | 399.634 | 399.709 | -0.075 | 45.091 | 45.184 | -0.093 | 401.452 | 398.983 | 2.469 | 48.530 | 46.634 | 1.896 |
| 176 | 403.966 | 435.254 | -31.288* | 35.943 | 36.012 | -0.069 | 405.137 | 399.501 | 5.635 | 39.224 | 39.380 | -0.156 |
| 177 | 412.387 | 412.300 | 0.087 | 48.736 | 48.966 | -0.230 | 413.597 | 409.346 | 4.250 | 51.732 | 50.780 | 0.953 |
| 178 | 419.139 | 419.347 | -0.208 | 46.712 | 46.842 | -0.130 | 420.436 | 415.564 | 4.871 | 49.748 | 46.634 | 3.113 |
| 179 | 394.336 | 394.320 | 0.017 | 47.423 | 47.515 | -0.092 | 395.467 | 391.729 | 3.738 | 50.459 | 48.189 | 2.270 |
| 180 | 398.788 | 398.776 | 0.012 | 32.693 | 32.644 | 0.049 | 399.997 | 396.392 | 3.605 | 35.975 | 35.235 | 0.740 |
| 181 | 383.647 | 383.801 | -0.154 | 41.572 | 41.712 | -0.140 | 384.738 | 380.848 | 3.890 | 44.648 | 44.044 | 0.604 |
| 182 | 418.854 | 418.984 | -0.130 | 35.500 | 35.753 | -0.253 | 420.191 | 416.601 | 3.590 | 38.860 | 36.789 | 2.071 |
| 183 | 423.551 | 423.699 | -0.149 | 44.893 | 45.080 | -0.187 | 424.927 | 422.300 | 2.626 | 47.929 | 46.634 | 1.295 |
| 184 | 377.812 | 377.894 | -0.082 | 46.941 | 47.049 | -0.108 | 378.911 | 375.666 | 3.245 | 49.937 | 47.671 | 2.267 |
| 185 | 417.067 | 417.067 | 0.000 | 42.075 | 42.075 | 0.000 | 414.630 | 414.528 | 0.102 | 44.044 | 44.044 | 0.000 |
| 186 | 416.672 | 416.860 | -0.187 | 39.778 | 39.743 | 0.035 | 417.969 | 414.528 | 3.441 | 42.853 | 41.453 | 1.400 |
| 187 | 397.088 | 397.273 | -0.185 | 51.163 | 51.246 | -0.083 | 398.179 | 393.802 | 4.377 | 54.033 | 51.816 | 2.217 |
| 188 | 371.827 | 372.039 | -0.212 | 0.025 | -1.036 | 1.062 | 372.957 | 368.930 | 4.027 | 3.289 | 1.554 | 1.735 |
| 189 | 330.586 | 330.690 | -0.103 | 52.942 | 53.060 | -0.118 | 331.764 | 326.959 | 4.805 | 56.097 | 54.407 | 1.690 |
| 190 | 301.040 | 301.258 | -0.218 | 51.606 | 51.712 | -0.107 | 302.052 | 300.533 | 1.519 | 54.721 | 51.816 | 2.905 |
| 191 | 420.317 | 420.228 | 0.089 | 54.958 | 54.925 | 0.033 | 421.898 | 418.155 | 3.743 | 57.828 | 56.998 | 0.831 |
| 192 | 422.381 | 422.352 | 0.029 | 46.862 | 46.842 | 0.020 | 423.836 | 420.746 | 3.090 | 49.771 | 46.634 | 3.137 |
| 193 | 395.261 | 395.356 | -0.095 | 78.812 | 78.916 | -0.104 | 396.519 | 393.802 | 2.717 | 81.239 | 78.760 | 2.479 |
| 194 | 368.308 | 368.360 | -0.052 | 47.194 | 47.204 | -0.011 | 369.360 | 366.339 | 3.021 | 50.230 | 47.671 | 2.559 |
| 195 | 370.973 | 371.054 | -0.082 | 44.608 | 44.717 | -0.109 | 372.064 | 367.894 | 4.170 | 47.763 | 46.634 | 1.129 |
| 196 | 414.490 | 414.994 | -0.504 | 2.783 | 2.746 | 0.037 | 416.229 | 411.937 | 4.292 | 7.068 | 4.663 | 2.405 |
| 197 | 366.474 | 366.391 | 0.083 | 21.909 | 21.970 | -0.061 | 367.328 | 362.712 | 4.616 | 23.166 | 49.743 | -26.577* |
| 198 | 339.956 | 340.327 | -0.372 | 49.234 | 49.329 | -0.095 | 338.018 | 332.659 | 5.360 | 49.677 | 46.634 | 3.042 |
| 199 | 453.556 | 453.597 | -0.041 | 53.740 | 53.630 | 0.111 | 452.497 | 445.618 | 6.879 | 53.899 | 50.780 | 3.119 |
| 200 | 424.848 | 424.943 | -0.095 | 55.725 | 53.578 | 2.147 | 423.472 | 417.637 | 5.835 | 56.128 | 50.780 | 5.349 |
| 201 | 384.169 | 384.008 | 0.160 | 46.403 | 46.583 | -0.179 | 382.674 | 378.257 | 4.418 | 47.052 | 44.044 | 3.008 |
| 202 | 213.879 | 213.896 | -0.018 | 214.013 | 213.896 | 0.117 | 212.463 | 207.264 | 5.199 | 212.471 | 207.264 | 5.207 |
| 203 | 213.926 | 213.896 | 0.030 | 46.522 | 46.531 | -0.009 | 212.432 | 207.264 | 5.168 | 47.289 | 44.044 | 3.245 |
| 204 | 142.269 | 142.235 | 0.035 | 41.865 | 41.919 | -0.054 | 141.297 | 138.867 | 2.430 | 42.719 | 40.416 | 2.302 |
| 205 | 381.299 | 381.366 | -0.067 | 52.365 | 52.334 | 0.031 | 380.405 | 374.630 | 5.775 | 53.013 | 51.298 | 1.715 |
| 206 | 392.067 | 392.040 | 0.027 | 39.359 | 39.328 | 0.030 | 391.174 | 383.438 | 7.735 | 40.410 | 36.271 | 4.139 |
| 207 | 426.065 | 426.446 | -0.380 | 48.222 | 48.137 | 0.085 | 425.828 | 419.710 | 6.118 | 48.949 | 46.634 | 2.315 |
| 208 | 394.408 | 394.372 | 0.036 | 53.282 | 55.029 | -1.747 | 393.443 | 388.620 | 4.823 | 53.851 | 51.816 | 2.035 |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

TABLE 4-3 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM HWW SAMPLE TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | A-S WESTINGHOUSE (CM H2O) MANUAL (2) | A-S WESTINGHOUSE (CM H2O) DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | A-T WESTINGHOUSE (CM H2O) MANUAL (4) | A-T WESTINGHOUSE (CM H2O) DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | A-S TAYLOR (CM H2O) MANUAL (6) | A-S TAYLOR (CM H2O) DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | A-T TAYLOR (CM H2O) MANUAL (8) | A-T TAYLOR (CM H2O) DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 209 | 381.251 | 381.158 | 0.093 | 39.880 | 39.795 | 0.086 | 380.160 | 374.111 | 6.049 | 40.734 | 37.826 | 2.909 |
| 210 | 367.407 | 367.324 | 0.083 | 71.957 | 71.921 | 0.036 | 366.229 | 360.121 | 6.108 | 72.084 | 67.361 | 4.723 |
| 211 | 414.980 | 414.839 | 0.141 | 42.632 | 42.696 | -0.065 | 414.205 | 408.310 | 5.895 | 43.367 | 40.935 | 2.432 |
| 212 | 400.891 | 400.849 | 0.042 | 50.167 | 50.106 | 0.061 | 399.839 | 393.802 | 6.038 | 50.689 | 47.671 | 3.018 |
| 213 | 438.455 | 438.415 | 0.039 | 52.080 | 52.023 | 0.057 | 437.727 | 431.109 | 6.618 | 52.649 | 46.634 | 6.015 |
| 214 | 395.586 | 395.615 | -0.030 | 41.707 | 41.764 | -0.057 | 394.574 | 388.102 | 6.472 | 42.553 | 40.416 | 2.136 |
| 215 | 398.867 | 398.828 | 0.039 | 51.788 | 51.816 | -0.028 | 397.934 | 391.729 | 6.205 | 52.349 | 47.671 | 4.678 |
| 216 | 390.083 | 389.864 | 0.219 | 43.604 | 43.629 | -0.025 | 388.256 | 383.438 | 4.818 | 44.253 | 40.935 | 3.318 |
| 217 | 398.464 | 398.206 | 0.258 | 50.934 | 50.935 | -0.001 | 397.246 | 390.693 | 6.553 | 51.376 | 48.189 | 3.188 |
| 218 | 418.744 | 418.621 | 0.122 | 35.919 | 34.924 | 0.995 | 417.692 | 410.901 | 6.791 | 36.805 | 38.862 | -2.057 |
| 219 | 422.910 | 422.870 | 0.040 | 55.425 | 55.288 | 0.137 | 422.064 | 414.528 | 7.536 | 55.709 | 51.816 | 3.893 |
| 220 | 414.609 | 414.476 | 0.132 | 36.686 | 36.634 | 0.052 | 412.909 | 404.165 | 8.744 | 37.295 | 33.162 | 4.133 |
| 221 | 415.905 | 415.772 | 0.134 | 15.473 | 15.648 | -0.175 | 414.814 | 407.274 | 7.540 | 16.928 | 15.027 | 1.901 |
| 222 | 393.965 | 394.112 | -0.148 | 62.596 | 62.438 | 0.157 | 392.992 | 384.475 | 8.518 | 62.880 | 56.998 | 5.883 |
| 223 | 83.406 | 83.476 | -0.070 | 27.214 | 27.255 | -0.041 | 83.524 | 77.724 | 5.800 | 28.511 | 23.317 | 5.194 |
| 224 | 398.052 | 398.154 | -0.102 | 32.187 | 32.281 | -0.094 | 397.167 | 389.656 | 7.511 | 33.365 | 30.571 | 2.794 |
| 225 | 398.456 | 398.569 | -0.113 | 52.444 | 52.490 | -0.046 | 397.404 | 389.656 | 7.748 | 53.013 | 48.189 | 4.824 |
| 226 | 327.503 | 332.607 | -5.104 | 54.215 | 54.200 | 0.015 | 326.001 | 320.223 | 5.778 | 54.784 | 51.816 | 2.968 |
| 227 | 398.780 | 398.620 | 0.159 | 49.273 | 49.173 | 0.100 | 397.689 | 390.693 | 6.996 | 49.961 | 46.634 | 3.327 |
| 228 | 427.164 | 427.171 | -0.007 | 49.518 | 49.588 | -0.070 | 426.231 | 419.710 | 6.522 | 50.246 | 46.634 | 3.611 |
| 229 | 345.340 | 345.198 | 0.142 | 50.167 | 50.210 | -0.043 | 343.964 | 336.804 | 7.160 | 50.894 | 46.634 | 4.260 |
| 230 | 413.881 | 413.854 | 0.027 | 50.127 | 50.158 | -0.031 | 412.790 | 404.165 | 8.625 | 50.649 | 46.634 | 4.015 |
| 231 | 420.040 | 419.969 | 0.072 | 49.028 | 49.018 | 0.010 | 419.028 | 411.937 | 7.091 | 49.637 | 46.634 | 3.003 |
| 232 | 420.523 | 420.487 | 0.036 | 50.040 | 50.054 | -0.014 | 419.550 | 411.937 | 7.613 | 50.609 | 46.634 | 3.975 |
| 233 | 342.873 | 342.866 | 0.007 | 50.783 | 50.780 | 0.004 | 341.497 | 335.768 | 5.730 | 51.511 | 46.634 | 4.876 |
| 234 | 411.288 | 411.315 | -0.027 | 94.103 | 94.098 | 0.005 | 410.481 | 401.574 | 8.907 | 93.731 | 88.087 | 5.644 |
| 235 | 401.255 | 401.211 | 0.043 | 51.701 | 51.609 | 0.092 | 400.163 | 393.802 | 6.362 | 52.191 | 49.225 | 2.966 |
| 236 | 373.076 | 373.127 | -0.051 | 51.827 | 51.712 | 0.115 | 371.819 | 365.303 | 6.516 | 52.309 | 46.634 | 5.675 |
| 237 | 421.977 | 421.989 | -0.012 | 50.325 | 50.365 | -0.040 | 421.171 | 414.528 | 6.643 | 50.934 | 46.634 | 4.299 |
| 238 | 364.213 | 364.215 | -0.002 | 47.550 | 47.515 | 0.034 | 363.082 | 357.012 | 6.070 | 48.435 | 46.116 | 2.319 |
| 239 | 396.392 | 396.444 | -0.052 | 50.175 | 50.210 | -0.035 | 395.586 | 388.620 | 6.966 | 50.949 | 47.153 | 3.797 |
| 240 | 412.790 | 412.818 | -0.028 | 49.447 | 49.173 | 0.274 | 411.493 | 404.165 | 7.329 | 49.937 | 45.598 | 4.339 |
| 241 | 377.369 | 377.065 | 0.304 | 44.474 | 44.510 | -0.036 | 376.317 | 367.894 | 8.424 | 45.399 | 41.453 | 3.946 |
| 242 | 381.868 | 381.832 | 0.036 | 44.917 | 43.577 | 1.340 | 380.895 | 374.111 | 6.784 | 45.723 | 40.416 | 5.307 |
| 243 | 359.232 | 359.448 | -0.216 | 43.984 | 44.044 | -0.060 | 358.220 | 351.312 | 6.907 | 45.035 | 40.935 | 4.101 |
| 244 | 422.057 | 421.523 | 0.533 | 53.298 | 53.267 | 0.031 | 421.487 | 414.528 | 6.959 | 53.986 | 49.225 | 4.760 |
| 245 | 367.209 | 367.168 | 0.041 | 51.432 | 51.401 | 0.030 | 365.952 | 360.121 | 5.831 | 52.120 | 47.671 | 4.449 |
| 246 | 425.417 | 425.513 | -0.096 | 43.502 | 43.474 | 0.028 | 424.523 | 416.601 | 7.923 | 44.434 | 40.416 | 4.018 |
| 247 | 392.265 | 392.403 | -0.138 | 38.441 | 38.447 | -0.006 | 390.731 | 383.438 | 7.293 | 39.532 | 36.271 | 3.261 |
| 248 | 399.673 | 399.450 | 0.224 | 49.210 | 49.225 | -0.015 | 398.740 | 391.211 | 7.530 | 50.096 | 46.634 | 3.461 |
| 249 | 375.226 | 375.355 | -0.129 | 45.644 | 45.650 | -0.006 | 374.167 | 367.894 | 6.273 | 46.656 | 42.489 | 4.167 |
| 250 | 341.426 | 341.571 | -0.145 | 49.858 | 49.899 | -0.040 | 340.296 | 334.213 | 6.082 | 50.870 | 47.671 | 3.200 |
| 251 | 350.329 | 350.380 | -0.051 | 40.299 | 39.898 | 0.401 | 349.238 | 342.504 | 6.734 | 41.557 | 38.862 | 2.695 |
| 252 | 223.675 | 223.638 | 0.037 | 57.749 | 49.432 | 8.317 | 222.457 | 217.109 | 5.348 | 58.476 | 46.634 | 11.842* |
| 253 | 225.090 | 225.141 | -0.051 | 53.092 | 53.060 | 0.033 | 223.951 | 217.627 | 6.324 | 54.104 | 51.816 | 2.288 |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

TABLE 4-3 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM HWW SAMPLE TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | A-S WESTINGHOUSE (CM H2O) MANUAL (2) | A-S WESTINGHOUSE (CM H2O) DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | A-T WESTINGHOUSE (CM H2O) MANUAL (4) | A-T WESTINGHOUSE (CM H2O) DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | A-S TAYLOR (CM H2O) MANUAL (6) | A-S TAYLOR (CM H2O) DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | A-T TAYLOR (CM H2O) MANUAL (8) | A-T TAYLOR (CM H2O) DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NUMBER OF READINGS: | | | 93 | | | 93 | | | 95 | | | 94 |
| AVERAGE DIFFERENCE: | | | -0.076 | | | 0.106 | | | 5.349 | | | 2.729 |
| STANDARD DEVIATION: | | | 0.546 | | | 0.938 | | | 1.853 | | | 1.621 |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

TABLE 4-4

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM GPW CHECK TANK

| | A-S WESTINGHOUSE (CM H2O) | | | A-T WESTINGHOUSE (CM H2O) | | | A-S TAYLOR (CM H2O) | | | A-T TAYLOR (CM H2O) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BATCH NUMBER | RTP (1) | MANUAL (2) | DIFF (1) - (2) | RTP (3) | MANUAL (4) | DIFF (3) - (4) | RTP (5) | MANUAL (6) | DIFF (5) - (6) | RTP (7) | MANUAL (8) | DIFF (7) - (8) |
| 564 | 140.510 | 140.028 | 0.482 | 23.533 | 23.308 | 0.225 | 139.507 | 135.827 | 3.681 | 22.784 | 22.638 | 0.146 |
| 565 | 88.608 | 88.269 | 0.339 | 16.138 | 16.136 | 0.002 | 87.263 | 126.771 | -39.509* | 15.218 | 14.488 | 0.730 |
| 566 | 148.787 | 148.486 | 0.301 | 23.887 | 23.761 | 0.126 | 147.797 | 145.606 | 2.191 | 23.591 | 23.000 | 0.591 |
| 567 | 85.320 | 85.227 | 0.093 | 17.854 | 17.911 | -0.057 | 85.461 | 83.307 | 2.154 | 18.236 | 18.110 | 0.125 |
| 568 | 142.910 | 142.908 | 0.002 | 26.010 | 26.006 | 0.004 | 139.450 | 139.449 | 0.001 | 25.350 | 25.354 | -0.004 |
| 569 | 141.063 | 140.934 | 0.130 | 16.854 | 17.168 | -0.315 | 139.988 | 137.638 | 2.351 | 16.768 | 16.299 | 0.469 |
| 570 | 143.652 | 143.433 | 0.220 | 18.904 | 18.816 | 0.088 | 142.533 | 140.354 | 2.179 | 18.440 | 18.110 | 0.330 |
| 571 | 153.189 | 152.832 | 0.357 | 17.520 | 17.024 | 0.496 | 152.155 | 148.504 | 3.652 | 17.081 | 16.299 | 0.781 |
| 572 | 145.421 | 145.244 | 0.177 | 15.807 | 15.828 | -0.022 | 144.827 | 141.260 | 3.567 | 15.721 | 14.488 | 1.233 |
| 573 | 151.091 | 150.840 | 0.252 | 31.166 | 31.041 | 0.125 | 149.649 | 146.693 | 2.956 | 30.372 | 29.520 | 0.853 |
| 574 | 141.359 | 141.133 | 0.226 | 24.462 | 26.894 | -2.432 | 139.861 | 137.638 | 2.223 | 23.400 | 25.354 | -1.954 |
| 575 | 144.570 | 144.284 | 0.286 | 22.848 | 24.612 | -1.764 | 143.114 | 140.897 | 2.216 | 22.212 | 22.638 | -0.426 |
| 576 | 148.505 | 148.685 | -0.180 | 9.785 | 9.689 | 0.096 | 147.571 | 144.882 | 2.689 | 9.404 | 9.055 | 0.349 |
| 577 | 143.793 | 143.904 | -0.111 | 22.743 | 22.801 | -0.058 | 141.699 | 139.449 | 2.250 | 21.356 | 20.827 | 0.529 |
| 578 | 146.637 | 146.493 | 0.143 | 17.194 | 17.277 | -0.083 | 145.095 | 142.708 | 2.386 | 16.301 | 15.575 | 0.726 |
| 579 | 146.242 | 146.167 | 0.075 | 20.786 | 20.736 | 0.050 | 144.769 | 143.071 | 1.698 | 20.305 | 19.740 | 0.565 |
| 580 | 149.992 | 150.097 | -0.106 | 23.779 | 23.670 | 0.109 | 148.632 | 146.693 | 1.939 | 22.732 | 21.732 | 0.999 |
| 581 | 150.428 | 149.753 | 0.675 | 20.604 | 23.471 | -2.867 | 148.646 | 145.787 | 2.859 | 18.904 | 21.732 | -2.828 |
| 582 | 146.242 | 145.678 | 0.564 | 23.760 | 23.362 | 0.397 | 144.586 | 142.165 | 2.421 | 22.699 | 22.276 | 0.423 |
| 583 | 155.480 | 155.096 | 0.384 | 22.010 | 21.968 | 0.043 | 154.618 | 151.763 | 2.854 | 21.911 | 21.189 | 0.722 |
| 584 | 155.002 | 154.770 | 0.232 | 21.198 | 20.917 | 0.281 | 153.584 | 150.315 | 3.269 | 20.504 | 20.283 | 0.221 |
| 585 | 153.755 | 153.900 | -0.145 | 25.133 | 23.761 | 1.372 | 152.338 | 149.409 | 2.929 | 24.594 | 22.638 | 1.956 |
| 586 | 145.971 | 145.769 | 0.202 | 21.239 | 21.171 | 0.069 | 144.841 | 142.889 | 1.951 | 20.604 | 19.921 | 0.683 |
| 587 | 153.175 | 152.741 | 0.434 | 20.264 | 20.338 | -0.074 | 151.843 | 148.504 | 3.339 | 19.330 | 16.299 | 3.031 |
| 588 | 136.097 | 135.808 | 0.289 | 15.425 | 15.321 | 0.104 | 134.696 | 132.204 | 2.492 | 14.745 | 14.488 | 0.257 |
| 589 | 100.770 | 100.801 | -0.031 | 20.930 | 20.791 | 0.139 | 99.256 | 97.433 | 1.823 | 20.037 | 19.016 | 1.022 |
| 590 | 142.732 | 143.632 | -0.900 | 23.038 | 23.018 | 0.020 | 141.035 | 139.449 | 1.587 | 22.162 | 20.827 | 1.336 |
| 591 | 153.952 | 153.647 | 0.305 | 19.358 | 19.251 | 0.106 | 152.324 | 150.134 | 2.190 | 18.636 | 18.110 | 0.526 |
| 592 | 149.947 | 150.894 | -0.947 | 150.202 | 149.789 | 0.412 | 148.872 | 146.693 | 2.180 | 149.171 | 145.787 | 3.384 |
| 593 | 150.246 | 150.007 | 0.239 | 3.581 | 3.477 | 0.104 | 149.425 | 146.693 | 2.733 | 3.313 | 2.898 | 0.416 |
| 594 | 146.396 | 146.041 | 0.356 | 21.778 | 21.768 | 0.010 | 144.161 | 142.165 | 1.996 | 20.151 | 19.921 | 0.229 |
| 595 | 149.679 | 149.319 | 0.361 | 17.647 | 18.472 | -0.825 | 148.223 | 145.244 | 2.979 | 17.152 | 17.205 | -0.052 |
| 596 | 151.067 | 150.858 | 0.209 | 7.953 | 7.950 | 0.003 | 149.652 | 146.693 | 2.959 | 7.290 | 7.244 | 0.046 |
| 597 | 147.571 | 147.308 | 0.263 | 24.865 | 24.666 | 0.199 | 146.170 | 143.433 | 2.737 | 24.100 | 23.543 | 0.556 |
| 598 | 147.018 | 146.964 | 0.054 | 8.774 | 8.711 | 0.063 | 145.888 | 143.071 | 2.817 | 8.180 | 7.606 | 0.573 |
| 599 | 157.818 | 157.450 | 0.367 | 25.713 | 25.626 | 0.087 | 156.458 | 153.575 | 2.883 | 25.119 | 24.449 | 0.670 |
| 600 | 150.699 | 150.423 | 0.276 | 18.509 | 18.002 | 0.508 | 149.525 | 146.693 | 2.832 | 17.887 | 17.748 | 0.139 |
| 601 | 140.298 | 140.101 | 0.197 | 50.730 | 50.564 | 0.167 | 139.109 | 137.456 | 1.653 | 50.236 | 48.898 | 1.338 |
| 602 | 158.677 | 158.247 | 0.430 | 10.874 | 10.939 | -0.065 | 157.375 | 153.937 | 3.439 | 10.252 | 9.780 | 0.473 |
| 603 | 149.254 | 149.500 | -0.246 | 22.770 | 22.493 | 0.278 | 148.110 | 145.787 | 2.323 | 22.049 | 21.732 | 0.317 |
| 604 | 157.646 | 157.396 | 0.251 | 19.429 | 20.211 | -0.782 | 156.345 | 153.937 | 2.408 | 18.681 | 18.654 | 0.027 |
| 605 | 150.923 | 150.550 | 0.373 | 2.460 | 2.463 | -0.003 | 149.862 | 148.504 | 1.358 | 2.354 | 2.354 | 0.000 |
| 606 | 95.754 | 95.531 | 0.223 | 18.636 | 18.635 | 0.001 | 94.652 | 92.724 | 1.928 | 18.155 | 17.748 | 0.407 |
| 607 | 157.235 | 156.925 | 0.310 | 23.154 | 27.256 | -4.101 | 155.947 | 152.126 | 3.821 | 22.066 | 24.449 | -2.383 |
| 608 | 147.726 | 147.471 | 0.254 | 22.519 | 22.602 | -0.083 | 145.943 | 143.071 | 2.873 | 21.217 | 20.827 | 0.391 |
| 609 | 150.497 | 150.188 | 0.309 | 14.370 | 14.108 | 0.262 | 149.323 | 146.693 | 2.630 | 13.803 | 13.039 | 0.764 |
| 610 | 150.315 | 150.188 | 0.127 | 15.458 | 16.082 | -0.623 | 148.842 | 146.512 | 2.331 | 14.723 | 14.488 | 0.235 |
| 611 | 152.224 | 151.836 | 0.389 | 18.943 | 18.654 | 0.290 | 150.837 | 147.417 | 3.420 | 17.910 | 17.024 | 0.886 |
| 612 | 149.663 | 149.409 | 0.254 | 22.831 | 22.819 | 0.012 | 148.008 | 144.882 | 3.126 | 22.179 | 21.551 | 0.628 |
| 613 | 68.668 | 68.620 | 0.048 | 28.007 | 22.565 | 5.442* | 67.736 | 66.646 | 1.091 | 26.833 | 21.732 | 5.100* |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

TABLE 4-4 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM GPW CHECK TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | A-S WESTINGHOUSE (CM H2O) MANUAL (2) | A-S WESTINGHOUSE (CM H2O) DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | A-T WESTINGHOUSE (CM H2O) MANUAL (4) | A-T WESTINGHOUSE (CM H2O) DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | A-S TAYLOR (CM H2O) MANUAL (6) | A-S TAYLOR (CM H2O) DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | A-T TAYLOR (CM H2O) MANUAL (8) | A-T TAYLOR (CM H2O) DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 614 | 148.403 | 148.214 | 0.189 | 14.585 | 14.615 | -0.030 | 146.747 | 144.701 | 2.047 | 13.554 | 13.039 | 0.515 |
| 615 | 145.363 | 145.171 | 0.192 | 20.372 | 20.501 | -0.129 | 143.663 | 141.260 | 2.404 | 19.510 | 19.197 | 0.313 |
| 616 | 146.297 | 146.113 | 0.184 | 21.505 | 21.587 | -0.083 | 144.498 | 142.708 | 1.790 | 20.441 | 19.921 | 0.520 |
| 617 | 147.654 | 147.526 | 0.128 | 20.712 | 20.465 | 0.247 | 145.758 | 143.433 | 2.325 | 19.239 | 18.654 | 0.585 |
| 618 | 141.599 | 141.404 | 0.195 | 21.248 | 20.972 | 0.276 | 140.043 | 137.638 | 2.406 | 20.399 | 19.921 | 0.478 |
| 619 | 168.462 | 168.081 | 0.381 | 38.649 | 38.792 | -0.143 | 165.704 | 161.181 | 4.524 | 35.946 | 35.315 | 0.631 |
| 620 | 40.077 | 39.824 | 0.253 | 1.658 | 1.684 | -0.026 | 37.897 | 36.220 | 1.677 | 0.000 | 0.000 | 0.000 |
| 621 | 149.041 | 148.775 | 0.266 | 25.238 | 25.481 | -0.243 | 146.720 | 143.976 | 2.744 | 23.160 | 22.638 | 0.522 |
| 622 | 150.655 | 150.496 | 0.159 | 26.838 | 25.590 | 1.248 | 149.210 | 146.693 | 2.517 | 26.371 | 23.905 | 2.466 |
| 623 | 149.649 | 149.409 | 0.240 | 19.816 | 19.740 | 0.076 | 147.952 | 144.882 | 3.071 | 18.728 | 18.110 | 0.617 |
| 624 | 135.080 | 135.066 | 0.014 | 20.994 | 20.736 | 0.257 | 133.762 | 131.661 | 2.101 | 20.046 | 19.016 | 1.030 |
| 625 | 152.294 | 152.017 | 0.277 | 15.052 | 15.158 | -0.106 | 150.865 | 148.504 | 2.361 | 14.389 | 13.945 | 0.444 |
| 626 | 162.888 | 162.720 | 0.168 | 25.163 | 25.083 | 0.081 | 161.645 | 157.559 | 4.086 | 24.542 | 23.181 | 1.361 |
| 627 | 158.743 | 158.410 | 0.333 | 24.064 | 23.779 | 0.285 | 156.991 | 153.937 | 3.055 | 22.906 | 21.732 | 1.173 |
| 628 | 151.813 | 151.438 | 0.375 | 24.177 | 24.231 | -0.055 | 150.243 | 147.055 | 3.188 | 23.047 | 21.732 | 1.314 |
| 629 | 149.975 | 149.735 | 0.240 | 21.234 | 21.261 | -0.027 | 148.151 | 144.882 | 3.270 | 20.004 | 18.291 | 1.713 |
| 630 | 152.465 | 152.162 | 0.303 | 25.136 | 24.612 | 0.524 | 150.569 | 146.693 | 3.877 | 23.594 | 22.094 | 1.499 |
| 631 | 143.183 | 142.944 | 0.239 | 21.872 | 21.406 | 0.466 | 141.386 | 138.543 | 2.843 | 20.499 | 19.921 | 0.578 |
| 632 | 146.311 | 146.077 | 0.234 | 14.035 | 13.999 | 0.036 | 144.556 | 141.260 | 3.297 | 12.734 | 11.409 | 1.324 |
| 633 | 165.591 | 165.038 | 0.553 | 22.395 | 22.276 | 0.119 | 163.864 | 160.456 | 3.408 | 21.248 | 19.921 | 1.326 |
| 634 | 165.732 | 165.491 | 0.241 | 24.696 | 24.539 | 0.157 | 164.063 | 161.000 | 3.063 | 23.453 | 21.732 | 1.721 |
| 635 | 151.136 | 150.949 | 0.187 | 24.022 | 24.485 | -0.463 | 149.820 | 146.693 | 3.128 | 23.201 | 22.094 | 1.107 |
| 636 | 165.525 | 165.237 | 0.287 | 21.104 | 21.461 | -0.357 | 164.292 | 161.181 | 3.111 | 20.297 | 19.559 | 0.738 |
| 637 | 170.612 | 170.471 | 0.141 | 25.650 | 25.553 | 0.096 | 169.170 | 165.708 | 3.461 | 24.743 | 23.543 | 1.200 |
| 638 | 154.148 | 154.172 | -0.024 | 20.905 | 20.754 | 0.151 | 152.987 | 149.590 | 3.397 | 20.806 | 19.559 | 1.247 |
| 639 | 64.362 | 63.875 | 0.488 | 22.831 | 22.819 | 0.012 | 62.494 | 60.126 | 2.368 | 21.612 | 19.921 | 1.691 |
| 640 | 156.696 | 156.345 | 0.350 | 22.873 | 22.909 | -0.037 | 154.601 | 151.401 | 3.200 | 21.671 | 20.646 | 1.025 |
| 641 | 163.966 | 163.752 | 0.214 | 17.614 | 17.458 | 0.156 | 162.101 | 158.826 | 3.274 | 16.426 | 14.850 | 1.575 |
| 642 | 161.714 | 161.489 | 0.225 | 18.517 | 18.291 | 0.226 | 159.962 | 156.291 | 3.671 | 17.343 | 16.118 | 1.225 |
| 643 | 151.487 | 151.184 | 0.303 | 18.377 | 17.386 | 0.991 | 149.690 | 146.693 | 2.998 | 17.233 | 16.661 | 0.571 |
| 644 | 148.955 | 148.105 | 0.850 | 19.056 | 18.726 | 0.330 | 147.004 | 143.071 | 3.934 | 17.807 | 16.299 | 1.508 |
| 645 | 143.453 | 143.161 | 0.292 | 19.150 | 20.139 | -0.988 | 141.572 | 138.543 | 3.029 | 18.003 | 18.110 | -0.107 |
| 646 | 139.803 | 139.539 | 0.264 | 44.673 | 44.714 | -0.041 | 138.062 | 135.464 | 2.598 | 43.286 | 41.835 | 1.451 |
| 647 | 55.765 | 55.798 | -0.032 | 18.968 | 18.762 | 0.206 | 54.635 | 53.063 | 1.572 | 18.330 | 17.205 | 1.125 |
| 648 | 104.188 | 103.989 | 0.200 | 20.971 | 20.736 | 0.235 | 102.983 | 101.055 | 1.929 | 20.449 | 19.016 | 1.433 |
| 649 | 103.241 | 103.138 | 0.103 | 19.034 | 18.907 | 0.127 | 102.066 | 99.606 | 2.460 | 18.440 | 17.386 | 1.054 |
| 650 | 139.449 | 139.141 | 0.309 | 15.865 | 15.448 | 0.417 | 137.739 | 134.921 | 2.818 | 14.831 | 13.945 | 0.886 |
| 651 | 153.103 | 152.796 | 0.307 | 20.438 | 20.356 | 0.082 | 151.760 | 148.504 | 3.257 | 20.253 | 18.835 | 1.418 |
| 652 | 163.358 | 163.155 | 0.203 | 13.717 | 13.673 | 0.044 | 161.960 | 158.645 | 3.315 | 13.195 | 12.496 | 0.699 |
| 653 | 161.523 | 160.601 | 0.922 | 23.693 | 23.471 | 0.223 | 159.500 | 156.653 | 2.847 | 22.746 | 22.094 | 0.651 |
| 654 | 150.373 | 150.242 | 0.131 | 50.333 | 49.676 | 0.656 | 149.848 | 144.882 | 4.966 | 47.276 | 47.449 | -0.173 |
| 655 | 150.088 | 149.880 | 0.208 | 18.310 | 17.476 | 0.834 | 149.127 | 146.693 | 2.434 | 17.009 | 16.842 | 0.166 |
| 656 | 138.800 | 138.905 | -0.105 | 28.189 | 28.270 | -0.081 | 134.738 | 134.921 | -0.183 | 26.943 | 26.260 | 0.683 |
| 657 | 141.431 | 141.024 | 0.407 | 4.786 | 4.763 | 0.023 | 139.590 | 136.732 | 2.858 | 0.738 | 0.000 | 0.738 |
| 658 | 152.197 | 151.763 | 0.433 | 26.335 | 26.459 | -0.124 | 150.586 | 147.236 | 3.350 | 25.075 | 24.811 | 0.264 |
| 659 | 110.782 | 110.472 | 0.310 | 24.285 | 24.268 | 0.017 | 111.602 | 109.567 | 2.036 | 26.053 | 25.173 | 0.880 |
| 660 | 62.544 | 62.516 | 0.028 | 19.684 | 19.867 | -0.183 | 64.611 | 63.386 | 1.225 | 21.651 | 20.283 | 1.368 |
| 661 | 131.991 | 131.770 | 0.221 | 18.636 | 18.146 | 0.490 | 133.508 | 130.212 | 3.296 | 20.759 | 19.921 | 0.837 |
| 662 | 155.679 | 155.277 | 0.402 | 19.302 | 18.961 | 0.341 | 154.120 | 150.858 | 3.262 | 18.086 | 16.480 | 1.606 |
| 663 | 185.211 | 182.134 | 3.077 | 78.804 | 78.526 | 0.278 | 183.456 | 177.299 | 6.158* | 76.524 | 74.614 | 1.910 |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM GPW CHECK TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | MANUAL (2) | DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | MANUAL (4) | DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | MANUAL (6) | DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | MANUAL (8) | DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 664 | 157.704 | 157.504 | 0.200 | 13.371 | 13.365 | 0.005 | 155.723 | 152.307 | 3.416 | 11.229 | 11.228 | 0.001 |
| 665 | 158.879 | 152.126 | 6.753* | 19.783 | 20.465 | -0.681 | 157.066 | 147.055 | 10.011* | 18.482 | 18.291 | 0.190 |
| 666 | 152.437 | 152.126 | 0.312 | 20.731 | 20.465 | 0.266 | 150.682 | 147.055 | 3.628 | 19.570 | 18.291 | 1.279 |
| 667 | 139.775 | 139.376 | 0.399 | 26.943 | 20.066 | 6.877* | 138.247 | 134.921 | 3.326 | 25.020 | 17.929 | 7.091* |
| 668 | 141.204 | 140.952 | 0.252 | 21.568 | 21.388 | 0.180 | 139.590 | 135.827 | 3.764 | 20.576 | 19.740 | 0.836 |
| 669 | 157.491 | 157.215 | 0.277 | 21.596 | 21.461 | 0.135 | 155.977 | 152.488 | 3.489 | 20.449 | 19.559 | 0.890 |
| 670 | 171.355 | 171.214 | 0.142 | 22.359 | 21.370 | 0.989 | 170.648 | 165.889 | 4.759 | 21.311 | 20.283 | 1.028 |
| 671 | 141.853 | 141.060 | 0.793 | 25.586 | 25.209 | 0.377 | 140.016 | 136.189 | 3.827 | 23.732 | 22.638 | 1.094 |
| 672 | 154.432 | 154.516 | -0.084 | 19.230 | 19.016 | 0.215 | 149.352 | 149.409 | -0.057 | 17.688 | 17.205 | 0.484 |
| 673 | 179.325 | 179.653 | -0.328 | 4.573 | 4.528 | 0.046 | 178.391 | 175.669 | 2.722 | 4.220 | 3.984 | 0.235 |
| 674 | 61.593 | 61.122 | 0.471 | 5.554 | 1.213 | 4.341 | 64.451 | 61.575 | 2.876 | 9.459 | 4.528 | 4.931 |
| 675 | 104.730 | 104.496 | 0.234 | 0.025 | -0.996 | 1.021 | 107.178 | 104.677 | 2.501 | 2.592 | 1.449 | 1.143 |
| 676 | 60.546 | 83.579 | -23.033* | 7.743 | 5.596 | 2.147 | 63.547 | 85.118 | -21.571* | 11.139 | 8.150 | 2.990 |
| 677 | 117.069 | 106.868 | 10.200* | 14.886 | 13.782 | 1.105 | 119.431 | 115.905 | 3.526 | 18.070 | 16.118 | 1.952 |
| 678 | 154.803 | 154.498 | 0.305 | 18.028 | 17.386 | 0.643 | 157.094 | 153.756 | 3.338 | 20.759 | 19.559 | 1.200 |
| 679 | 165.047 | 163.897 | 1.149 | 7.572 | 7.244 | 0.328 | 167.296 | 162.811 | 4.485 | 10.769 | 9.780 | 0.989 |
| 680 | 133.862 | 132.494 | 1.367 | 14.804 | 15.720 | -0.916 | 136.125 | 132.204 | 3.920 | 18.681 | 17.205 | 1.476 |
| 681 | 142.901 | 142.473 | 0.428 | 17.081 | 16.861 | 0.220 | 144.686 | 141.984 | 2.702 | 19.642 | 18.110 | 1.532 |
| 682 | 141.077 | 141.531 | -0.454 | 23.779 | 23.362 | 0.417 | 144.584 | 142.165 | 2.419 | 27.385 | 26.260 | 1.125 |
| 683 | 156.627 | 156.200 | 0.426 | 7.375 | 7.805 | -0.430 | 159.600 | 156.653 | 2.947 | 11.916 | 11.409 | 0.506 |
| 684 | 143.158 | 142.817 | 0.341 | 14.378 | 14.361 | 0.016 | 146.297 | 143.252 | 3.045 | 18.296 | 17.386 | 0.911 |
| 685 | 153.965 | 153.230 | 0.735 | 0.597 | 0.362 | 0.235 | 157.293 | 153.031 | 4.261 | 4.700 | 3.622 | 1.078 |
| 686 | 144.106 | 143.741 | 0.365 | 20.178 | 19.903 | 0.275 | 147.203 | 143.795 | 3.408 | 23.887 | 22.638 | 1.249 |
| 687 | 152.269 | 152.126 | 0.143 | 19.543 | 19.106 | 0.436 | 155.325 | 152.126 | 3.199 | 23.110 | 21.732 | 1.378 |
| 688 | 147.018 | 146.928 | 0.090 | 12.596 | 12.605 | -0.009 | 150.033 | 146.512 | 3.522 | 16.345 | 15.031 | 1.314 |
| 689 | 123.972 | 122.099 | 1.873 | 11.761 | 11.645 | 0.116 | 127.014 | 122.244 | 4.770 | 15.384 | 14.669 | 0.715 |
| 690 | 122.413 | 122.135 | 0.278 | 0.025 | -3.405 | 3.430 | 125.469 | 122.244 | 3.225 | 0.823 | 0.000 | 0.823 |
| 691 | 146.551 | 147.145 | -0.594 | 3.385 | 3.350 | 0.035 | 149.707 | 146.693 | 3.014 | 7.417 | 6.157 | 1.259 |
| 692 | 146.634 | 146.349 | 0.286 | 19.429 | 19.233 | 0.196 | 149.663 | 146.693 | 2.970 | 23.124 | 21.732 | 1.392 |
| 693 | 130.919 | 131.009 | -0.091 | 18.302 | 18.183 | 0.119 | 133.989 | 130.393 | 3.595 | 22.138 | 20.283 | 1.854 |
| 694 | 165.992 | 165.726 | 0.265 | 18.484 | 18.436 | 0.048 | 168.750 | 164.803 | 3.947 | 22.306 | 21.551 | 0.755 |
| 695 | 114.338 | 114.058 | 0.280 | 18.175 | 18.201 | -0.026 | 117.295 | 114.456 | 2.839 | 22.066 | 20.827 | 1.239 |
| 696 | 124.411 | 124.200 | 0.211 | 9.857 | 9.472 | 0.385 | 127.636 | 124.598 | 3.038 | 13.875 | 12.677 | 1.198 |
| 697 | 137.667 | 137.438 | 0.229 | 18.202 | 18.183 | 0.020 | 140.043 | 138.543 | 1.500 | 21.870 | 21.370 | 0.499 |
| 698 | 186.645 | 220.618 | -33.973* | 144.343 | 143.994 | 0.349 | 186.645 | 181.102 | 5.543* | 146.764 | 144.882 | 1.882 |
| 699 | 149.947 | 149.409 | 0.538 | 10.932 | 10.540 | 0.392 | 152.733 | 148.504 | 4.229 | 14.171 | 13.402 | 0.769 |
| 700 | 160.175 | 188.908 | -28.732* | 160.175 | 190.139 | -29.964* | 162.794 | 179.291 | -16.497* | 162.794 | 158.464 | 4.330 |
| 701 | 163.176 | 163.028 | 0.148 | 17.595 | 18.128 | -0.534 | 165.652 | 162.086 | 3.566 | 20.678 | 19.921 | 0.757 |
| 702 | 136.719 | 136.334 | 0.385 | 8.978 | 9.417 | -0.439 | 139.010 | 135.827 | 3.183 | 12.701 | 12.677 | 0.023 |
| 703 | 151.476 | 151.383 | 0.092 | 24.555 | 24.648 | -0.093 | 153.935 | 150.496 | 3.439 | 27.767 | 27.165 | 0.601 |
| 704 | 158.238 | 158.066 | 0.172 | 11.766 | 11.627 | 0.140 | 160.968 | 157.559 | 3.409 | 14.936 | 14.488 | 0.448 |
| 705 | 138.092 | 138.108 | -0.016 | 8.851 | 8.620 | 0.231 | 140.497 | 137.638 | 2.859 | 12.189 | 11.409 | 0.780 |
| 706 | 123.803 | 123.385 | 0.418 | 18.570 | 18.346 | 0.224 | 126.348 | 123.330 | 3.018 | 21.798 | 20.646 | 1.152 |
| 707 | 137.835 | 137.493 | 0.343 | 8.370 | 8.240 | 0.130 | 139.958 | 137.275 | 2.682 | 11.568 | 11.228 | 0.339 |
| 708 | 139.435 | 138.996 | 0.440 | 10.888 | 10.757 | 0.130 | 141.516 | 138.000 | 3.517 | 13.803 | 13.039 | 0.764 |
| 709 | 148.206 | 146.584 | 1.622 | 16.462 | 16.245 | 0.217 | 150.116 | 146.330 | 3.785 | 19.545 | 18.110 | 1.435 |
| 710 | 146.496 | 146.493 | 0.003 | 20.974 | 14.995 | 5.979* | 148.488 | 145.787 | 2.701 | 23.282 | 17.205 | 6.077* |
| 711 | 156.370 | 156.219 | 0.151 | 14.270 | 13.981 | 0.289 | 158.224 | 153.937 | 4.287 | 17.042 | 16.299 | 0.743 |
| 712 | 158.834 | 158.663 | 0.171 | 12.728 | 12.550 | 0.178 | 160.857 | 157.378 | 3.480 | 15.400 | 14.850 | 0.550 |
| 713 | 156.513 | 156.291 | 0.222 | 16.462 | 16.426 | 0.036 | 158.323 | 154.842 | 3.481 | 19.164 | 18.110 | 1.054 |

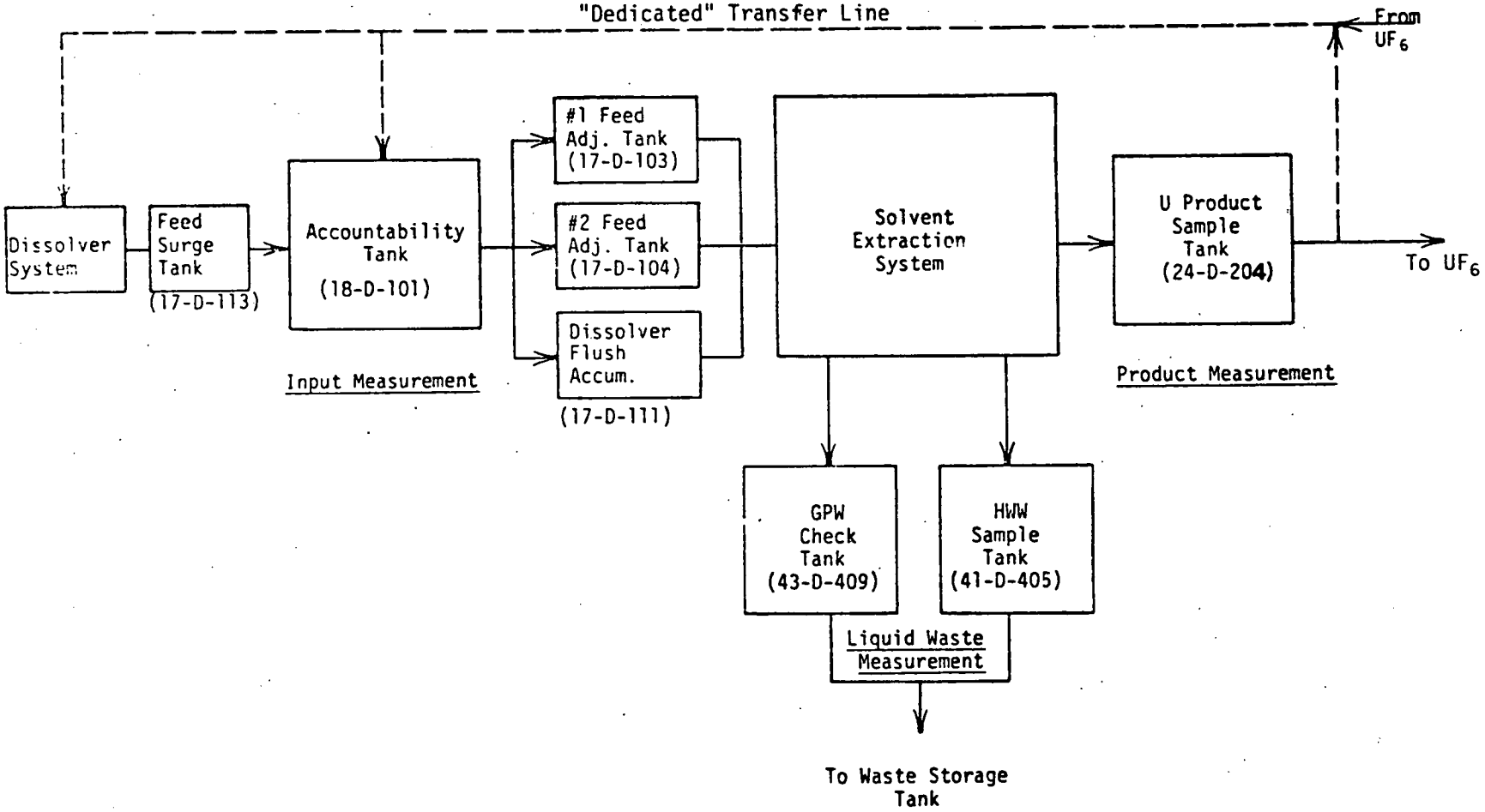
* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY

TABLE 4-4 (CONTINUED)

COMPARISON OF INSTRUMENT READINGS BETWEEN REMOTE DATA ACQUISITION SYSTEM AND MANUAL DATA SYSTEM GPW CHECK TANK

| BATCH NUMBER | A-S WESTINGHOUSE (CM H2O) RTP (1) | A-S WESTINGHOUSE (CM H2O) MANUAL (2) | A-S WESTINGHOUSE (CM H2O) DIFF (1) - (2) | A-T WESTINGHOUSE (CM H2O) RTP (3) | A-T WESTINGHOUSE (CM H2O) MANUAL (4) | A-T WESTINGHOUSE (CM H2O) DIFF (3) - (4) | A-S TAYLOR (CM H2O) RTP (5) | A-S TAYLOR (CM H2O) MANUAL (6) | A-S TAYLOR (CM H2O) DIFF (5) - (6) | A-T TAYLOR (CM H2O) RTP (7) | A-T TAYLOR (CM H2O) MANUAL (8) | A-T TAYLOR (CM H2O) DIFF (7) - (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 714 | 153.172 | 153.031 | 0.141 | 15.177 | 15.068 | 0.109 | 154.941 | 151.220 | 3.721 | 17.863 | 16.299 | 1.563 |
| 715 | 149.494 | 149.192 | 0.302 | 12.529 | 12.605 | -0.075 | 151.434 | 148.323 | 3.112 | 15.190 | 14.488 | 0.702 |
| 716 | 159.498 | 159.062 | 0.436 | 15.544 | 15.140 | 0.404 | 161.363 | 157.559 | 3.804 | 17.976 | 17.567 | 0.409 |
| 717 | 146.396 | 146.186 | 0.211 | 15.840 | 15.955 | -0.115 | 148.262 | 144.882 | 3.380 | 18.515 | 17.929 | 0.586 |
| 718 | 143.312 | 143.089 | 0.224 | 18.388 | 18.563 | -0.175 | 145.109 | 142.165 | 2.944 | 20.974 | 19.921 | 1.053 |
| 719 | 133.467 | 133.056 | 0.411 | 16.674 | 16.571 | 0.103 | 135.417 | 133.110 | 2.307 | 19.349 | 18.110 | 1.239 |
| 720 | 139.181 | 138.960 | 0.222 | 12.361 | 12.315 | 0.046 | 141.033 | 137.638 | 3.395 | 15.047 | 14.126 | 0.921 |
| 721 | 102.179 | 102.757 | -0.578 | 10.606 | 14.253 | -3.647 | 103.578 | 97.795 | 5.783* | 19.971 | 16.299 | 3.672 |
| 722 | 147.612 | 147.544 | 0.069 | 15.851 | 16.571 | -0.720 | 148.955 | 146.330 | 2.625 | 17.589 | 16.299 | 1.290 |
| 723 | 131.032 | 130.955 | 0.077 | 15.190 | 15.068 | 0.123 | 132.928 | 130.031 | 2.896 | 18.003 | 16.661 | 1.342 |
| 724 | 143.453 | 143.306 | 0.147 | 18.683 | 18.382 | 0.301 | 145.418 | 141.622 | 3.796 | 21.118 | 19.921 | 1.197 |
| 725 | 147.825 | 147.689 | 0.136 | 16.605 | 16.517 | 0.089 | 149.649 | 146.693 | 2.956 | 19.264 | 18.110 | 1.153 |
| 726 | 131.015 | 130.973 | 0.042 | 12.057 | 11.917 | 0.140 | 132.955 | 128.220 | 4.735 | 14.646 | 14.488 | 0.158 |
| 727 | 151.813 | 151.582 | 0.230 | 16.859 | 16.661 | 0.198 | 153.639 | 150.315 | 3.325 | 19.432 | 18.472 | 0.960 |
| 728 | 156.030 | -45.276 | 201.305* | 136.211 | 135.863 | 0.348 | 186.667 | 181.102 | 5.565* | 137.979 | 134.921 | 3.058 |
| 729 | 136.774 | 136.334 | 0.441 | 10.501 | 10.576 | -0.075 | 138.642 | 135.645 | 2.997 | 13.104 | 12.858 | 0.246 |
| 730 | 109.795 | 109.567 | 0.229 | 13.477 | 13.456 | 0.021 | 111.708 | 109.205 | 2.503 | 16.207 | 15.213 | 0.995 |
| 731 | 126.108 | 125.866 | 0.242 | 14.071 | 13.999 | 0.072 | 128.017 | 125.141 | 2.876 | 16.746 | 15.394 | 1.353 |
| 732 | 144.896 | 144.519 | 0.377 | 13.845 | 13.728 | 0.117 | 146.805 | 143.071 | 3.735 | 16.520 | 14.850 | 1.669 |
| 733 | 143.340 | 142.998 | 0.342 | 14.638 | 14.434 | 0.204 | 145.291 | 141.984 | 3.307 | 17.227 | 16.299 | 0.928 |
| 734 | 145.236 | 144.954 | 0.282 | 12.314 | 12.061 | 0.252 | 147.162 | 142.165 | 4.997 | 14.873 | 14.126 | 0.747 |
| 735 | 148.958 | 148.413 | 0.545 | 8.760 | 8.983 | -0.223 | 150.812 | 148.504 | 2.309 | 11.717 | 11.228 | 0.488 |
| 736 | 155.325 | 155.114 | 0.211 | 13.789 | 13.709 | 0.080 | 157.431 | 153.937 | 3.494 | 16.760 | 16.299 | 0.461 |
| 737 | 131.441 | 131.227 | 0.214 | 15.572 | 26.405 | -10.833* | 133.480 | 130.393 | 3.087 | 18.388 | 17.205 | 1.183 |
| 738 | 149.254 | 149.373 | -0.119 | 12.623 | 12.496 | 0.127 | 151.390 | 148.141 | 3.248 | 15.566 | 14.488 | 1.078 |
| 739 | 93.328 | 93.268 | 0.061 | 11.979 | 12.061 | -0.082 | 95.564 | 93.811 | 1.753 | 14.906 | 14.488 | 0.418 |
| 740 | 72.818 | 72.676 | 0.142 | 16.194 | 16.227 | -0.033 | 75.195 | 73.709 | 1.486 | 19.178 | 18.110 | 1.068 |
| NUMBER OF READINGS: | | | 171 | | | 172 | | | 169 | | | 176 |
| AVERAGE DIFFERENCE: | | | 0.261 | | | 0.077 | | | 2.913 | | | 0.889 |
| STANDARD DEVIATION: | | | 0.381 | | | 0.774 | | | 0.848 | | | 0.871 |

* INDICATES EXTREME VALUE EXCLUDED FROM STATISTICAL SUMMARY




SIMPLIFIED PROCESS FLOWSHEET FOR URANIUM ACCOUNTABILITY - FY 1979 INTEGRATED URANIUM RUN

FIGURE 4-1

PSF = Priority Scan Frequency

SI = Scan Interval

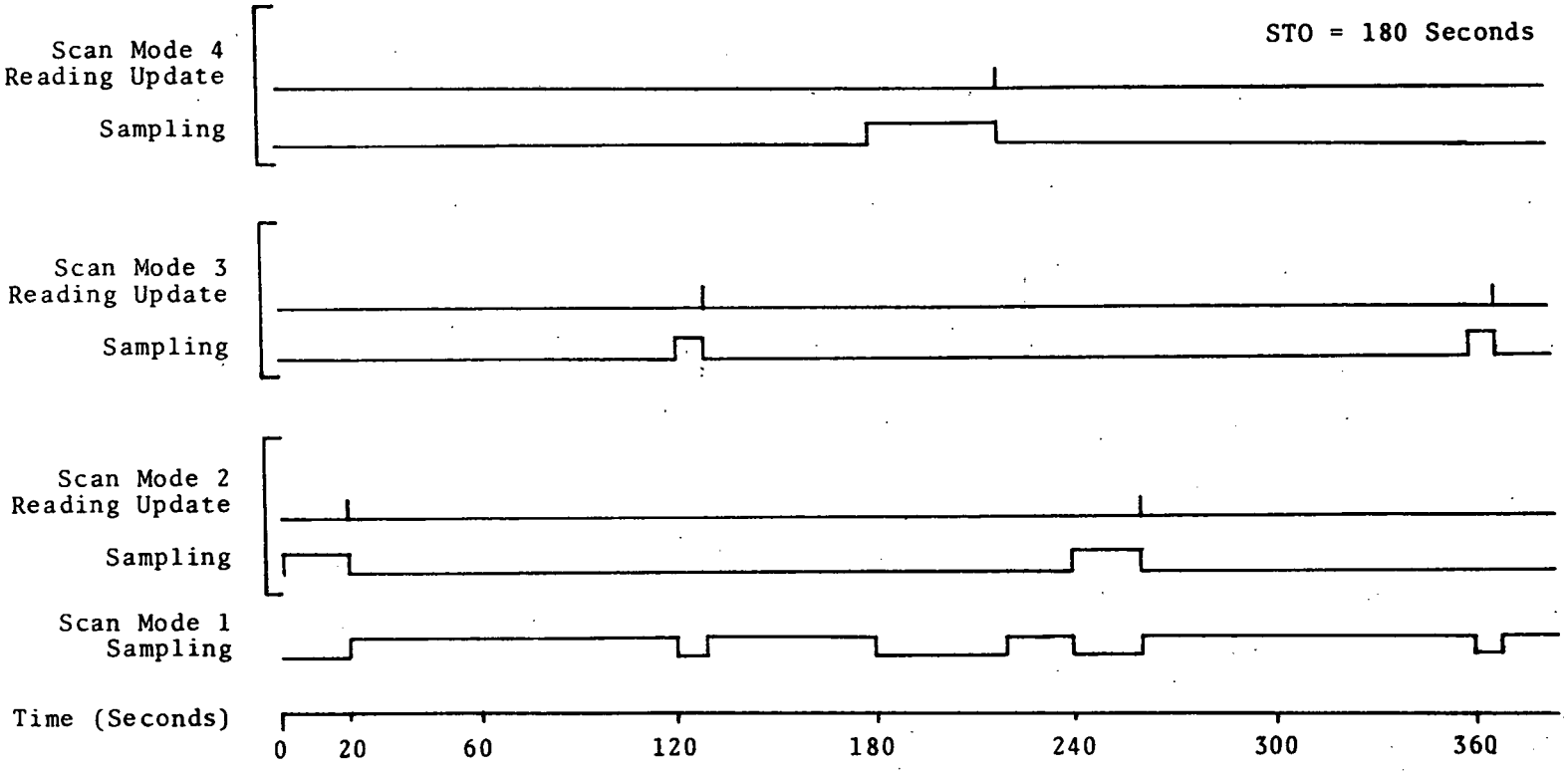
STO = Scan Time Offset

PSF = 360 Seconds

Scan Mode 2: SI = 20 Seconds
STO = 0 Seconds

Scan Mode 3: SI = 10 Seconds
STO = 120 Seconds

Scan Mode 4: SI = 40 Seconds
STO = 180 Seconds




SCAN MODE TIMING DIAGRAM

FIGURE 4-2

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## 5.0 CNMCAS "BACKUP" SYSTEM

With CNMCAS development, a parallel "backup system" has also evolved. This "backup system" relies on manual collection of measurement data with computer-based "batch processing" of measurement data for data analysis and report generation.

The "backup system" is a set of procedures for measuring accountability batch transfers and recording data on "hard copy" measurement forms. It uses a series of software programs which run on the CNMCAS hardware to process and store measurement data and print summary reports. It does not directly interface measurement equipment to the computer. Data are entered to the backup system by NMC personnel on a daily basis rather than on the "real-time" basis as CNMCAS does.

### 5.1 Purpose of Backup System

The backup system serves several purposes. The first is to provide a measurement system to collect measurement data in the event the on-line CNMCAS goes down. It allows continuous operations to be maintained in the event of CNMCAS hardware failure for whatever reason. This continuity is essential to plant operations. The facility cannot be "turned off" in the event of a computer hardware failure.

Another function is to serve as the development tool for CNMCAS. Data collection and data base handling have been structured to be very flexible in the backup system. This has allowed development of varied data handling and data analysis methods and procedures. The more effective tools, as demonstrated in the backup system, are then incorporated in CNMCAS development.

The backup system has also provided a data base against which CNMCAS performance and reliability can be compared. A wealth of data is recorded both in the backup system and in CNMCAS. Comparison of data from the two systems is the indication of successful CNMCAS implementation. Results actually show CNMCAS equipment provides a more precise reading of measurement devices than the backup system.

### 5.2 Auxiliary Programs to Process Manual Data

The backup system software resides in the CNMCAS central system processor hardware, but is apart from CNMCAS software. It consists of programs to allow NMC personnel to input data and generate accounting and measurement control reports. It also includes programs to provide current measurement control parameters to Operations personnel to use during the data collection activities.

The data handling is based on a very simplified data base file structure. A data handling program is available for each of the major material balance measurement points. These programs allow NMC personnel to

enter data and build the data base files, list batchwise measurement data or summary data, and edit the data base.

A larger pool of programs is available to NMC personnel for data evaluation. These programs are all special function programs which access the data base files, extract specific measurement data, and summarize data for analysis. They are all rather simple, special function programs. The data base file structure is purposely simple. There is little system security built in other than that NMC personnel are essentially the only users. This allows rapid development of these kinds of programs. It allows NMC personnel to develop a data analysis method and rapidly apply it to a complete data base for evaluation of the techniques or investigation of specific measurement performance. The methods and techniques which prove effective in this analysis are then submitted to the systems personnel for incorporation into CNMCAS software.

This has been a very effective scheme during CNMCAS development. The overall measurement program is a very complex operation and CNMCAS software is very involved to accomplish these complex activities. It is quite inflexible to changes and these alterations must be left to skilled systems personnel. On the other hand, NMC personnel are daily involved in measurement functions and have the understanding of measurement intricacies that are difficult to convey to system personnel. The use of the simplified backup system allows program development and data analysis directly by NMC personnel. Many of these developments prove ineffective or serve only for a limited application and are not worth the systems personnel time or pertubations on CNMCAS software to incorporate. With this backup system tool, NMC personnel have been able to evaluate the techniques and carry only the valuable tools to CNMCAS implementation with the system personnel.

## 5.3 Use of Redundant Measurements (Density and Level Comparisons)

Probably the most important development that has come out of NMCAS development has been the concepts of redundant measurements and their application to measurements and measurement routines. Measurement system performance has been advanced to the point where very small measurement errors are the dominant factor. With previously accepted measurement technology, the small errors were undetectable or were generally masked by overall measurement uncertainties.

The concept of redundant measurements has been developed and implemented both in the backup system and in CNMCAS to detect these errors. Once a batch of solution is moved, there is no way to remeasure; therefore, any error must be detected before it is moved. Redundant measurements are used to evaluate data at the time of measurement and are very sensitive to small measurement errors. The application and results obtainable using these methods are described further in Section 6.0.

## 5.4 "Backup" Accounting System

This section is primarily concerned with the "backup" manual accounting system performance during the FY 1979 Integrated Uranium Run. Conversion of data from source generation points into the final material balance report quantities is discussed. The section is organized per the flow of accounting data which is discussed and figuratively presented in Section 5.4.1.

### 5.4.1 Data Flow Description

The data flow (see Figure 5-1) consisted of the source documents (Batch Measurement Records) which originated in the Control Room and were completed by Separations Production operators. The operators recorded the instrument readings on the records, obtained interim analytical results from the Laboratory Data System (LDS) via terminals located in the Control Room, and performed certain bulk measurement calculations to obtain preliminary solution and uranium quantities for process control. After supervisory approval, the documents were forwarded to Nuclear Materials Control.

Nuclear Materials Control personnel used a computer terminal located in the Administration Building to obtain analytical results from the Laboratory Data System. Nuclear Materials Control personnel also developed auxiliary computer programs for calculating volumes and quantities measured. The programs produced printed reports of essential accounting and measurement control data. In addition, other auxiliary programs provided the cumulative input/output quantities (MCA Ledger) for material balance purposes.

### 5.4.2 Batch Measurement Record

The Batch Measurement Record consisted of an operating checklist, batch identity assignment, instrument reading recordings (liquid level, density, temperature), applicable sample log number, and analytical results. This document represented the raw data for calculating the bulk quantity. It was used by Separations Production personnel for process control purposes and by Nuclear Materials Control. Each measurement point had its own form, and control of documents was accomplished by sequentially numbering each batch. The batch identity consisted of the measurement point identity followed by the sequentially numbered batches [e.g., 2-003-01, 2-003-02, refers to measurement point 2-003, the accountability tank (18-D-101), batches 1 and 2]. An example of a batch measurement check sheet/record is included as Figures 5-2 and 5-3.

These forms were transmitted to the Nuclear Materials Control department and audited for content and verification that all batches were received.

### 5.4.3 Sample and Batch Identity Control

Sample results must be correlated to batch identification numbers to ensure proper accounting of batch transfers for material balance measurements. The manual (NMCAS) system uses batch identifications as described in Section 5.4.2 and correlates this to the analytical sample log number.

For FY 1979 integrated uranium runs where NMCAS operated in parallel to CNMCAS, CNMCAS incremented and assigned batch numbers and these were entered on NMCAS measurement forms. The assigned batch identifications were cross-checked and entered to an operational control room log book. As part of the measurement routine, CNMCAS requested the sample and LDS assigned the analytical log number. This log number was entered on the NMCAS form by the operator and became identified with the batch identification.

In actual plant operation, NMCAS would be implemented when CMNCAS is inoperative. In this case, the operational log book would be the source of the batch identification numbers and analytical requests would be made directly to LDS by the operator. The log number would still be assigned and entered on the NMCAS form.

Assurance that sample results are representative of the batch contents is critical to the measurement program. This requires the assurance that no sampling problems occurred, as well as the fact that the log number is assigned to the proper batch identification. This assurance is provided by comparison of analytically determined parameters to batch measured parameters.

### 5.4.4 Analytical Results

The Laboratory Data System operated by Analytical Services provided the analytical results of samples. Analytical results were obtained on request via terminals located throughout the facility and by transmittal of hard copy printouts. Analytical results were retained on disc for 24 hours after final approval was recorded. This permitted prompting the system for results (status) from all the terminals while the data were on disc. After the 24-hour period, the data were removed from disc storage and transferred to and stored on magnetic tape. Analytical Services transmitted computer printouts of final analytical results to Nuclear Materials Control.

Future programming and system development will provide for final analytical result printout at the Nuclear Materials Control terminal. In addition, the reporting format will be structured to simplify data presentation.

### 5.4.5 Complete Batch Report

Auxiliary computer programs were written and stored in CNMCAS* to assist Nuclear Materials Control in calculating batch measurement, accounting, and measurement control data. These programs generated hard copy batch reports for each measurement point.

Batch report generation was accomplished by entering the data from the Batch Measurement Record and final analytical report into the computer via the NMC terminal. The volume, kilograms of solution, and kilograms of uranium were calculated and the batch report generated. These calculated quantities were stored and available on demand for cumulative quantities by campaign(s) and the run in total.

### 5.4.6 Ledgers and Material Balance Reports

Material Control Area (MCA) ledger accounts, i.e., the input/output measurement points, were maintained completely by the auxiliary computer programs and were available on demand. These accounts were the following:

Separations Facility

2-003 Accountability Tank
2-009 Uranium Product Sample Tank
2-023 HWW Sample Tank
2-028 GPW Check Tank.

$UF_6$ Facility

4-001 Uranyl Nitrate Accountability Tank.

During the FY 1979 integrated uranium run, the analytical laboratory was not handled as a separate MCA. Consequently, the accounting system for this area was not demonstrated.

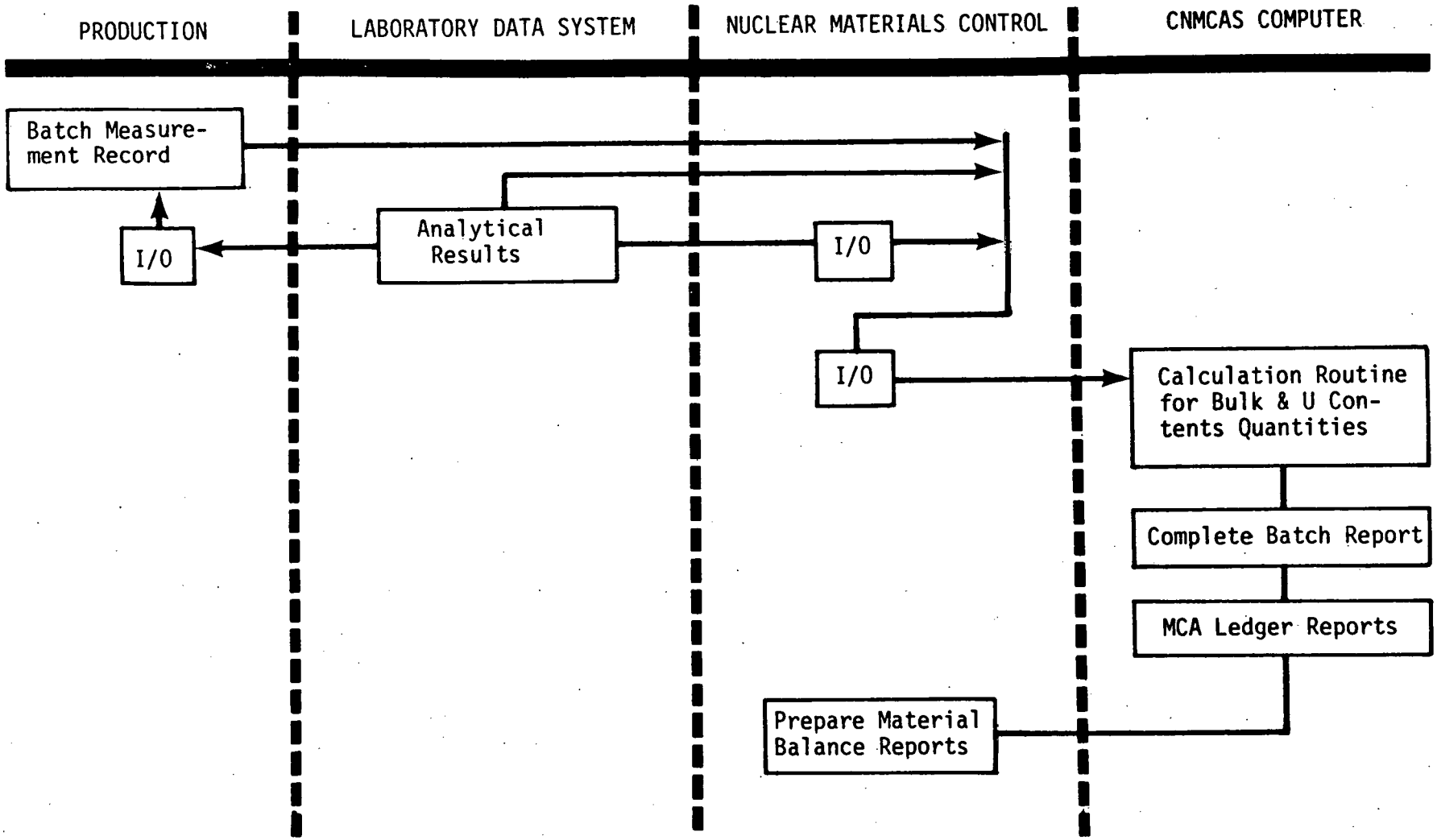
## 5.5 Performance Summary

With a few minor omissions (due to human error), the manual system performed satisfactorily throughout the 1979 uranium run. The system was particularly needed during Campaign 1, when CNMCAS software problems prevented automated data acquisition and handling.

Comparison of manual data to CNMCAS data indicates very good agreement. This assures a viable, ready-to-use backup to CNMCAS, as well as indicating the effectiveness of CNMCAS itself.

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*Computerized Nuclear Materials Control and Accounting System.




FY 1979 INTEGRATED URANIUM RUN DATA FLOW CHART

FIGURE 5-1

INPUT ACCOUNTABILITY MEASUREMENT CHECKSHEET

Batch No. _____ Date _____

| | TIME | OP. INIT. |
|---|---|---|
| 1. Record "Before Receipt" Measurement Data | | |
| a. Sparge Off, Purges Set | | |
| b. Record Data | | |
| c. Take CNMCAS Data | | |
| 2. Receive Transfer | | |
| a. Set Transfer Valving | | |
| b. Transfer Started | | |
| c. Transfer Integrity Check Complete | | |
| d. Transfer Complete | | |
| e. After Transfer Valving Complete | | |
| 3. Record "Before Sampling" Measurement Data | | |
| a. Sparge a Minimum of 15 Minutes Before Readings | | |
| b. Sparge Off, Purge Set | | |
| c. Record Data | | |
| d. Take CNMCAS Data | | |
| e. Receipt Volume Comparison | | |
| 4. Sample the Accountability Tank | | |
| a. Sparge off | | |
| b. Request Sample | | |
| c. Sampling Complete | | |
| 5. Record "After Sampling" Measurement Data | | |
| a. Sparge Off, Purges Set | | |
| b. Record Data | | |
| c. Take CNMCAS Data | | |
| 6. Compare Before and After Sampling Measurements | | |
| a. Compare Measurement Data | | |
| 7. Transfer Tank Contents | | |
| a. Set Transfer Valving | | |
| b. Transfer Started | | |
| c. Transfer Integrity Check | | |
| d. Transfer Complete | | |
| 8. Record "After Transfer" Measurement Data | | |
| a. Sparge Off, Purges Set | | |
| b. Record Data | | |
| c. Take CNMCAS Data | | |
| 9. Complete Accountability Logbook Entries | | |

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INPUT ACCOUNTABILITY MEASUREMENT CHECKSHEET

FIGURE 5-2

INPUT ACCOUNTABILITY MEASUREMENT RECORD
Vessel No. 18-D-101 Measurement Point 2-03

Input Accountability
Batch I.D. _____ Date _____

Transfer To:
#1 FAT ____
#2 FAT ____
Diss. Fl'sh Accm. ____
Sump Coll. Tank ____

Date/Time/Op. Init.

| | BEFORE RECEIPT | BEFORE SAMPLING | AFTER SAMPLING | AFTER TRANSFER |
|---|---|---|---|---|
| | / / | / / | / / | / / |
| Inst. Air Purge Rate | | | | |
| LEVEL | | | | |
| LR-125 | | | | |
| Ruska "Zero" | | | | |
| LR-125-R | | | | |
| DENSITY | | | | |
| DR-166 | | | | |
| Ruska "Zero" | | | | |
| DR-166-R | | | | |
| TEMPERATURE | | | | |
| TRJ-108-10 | | | | |
| SAMPLE RESULTS | | | | |
| Log No. | * | NA | | NA |
| Density | * | NA | | NA |
| U Conc | * | NA | | NA |
| VOLUME | | | | |

Volume Received _____ Volume Transferred _____

Kg U Transferred _____

NMC USE ONLY

Kg Solution ____
U Trans ____

Transfer Complete

_____
Shift Supervisor Date

* Use log number and density from previous batch sample.

NMC FORM 203/REV. 9/78

INPUT ACCOUNTABILITY MEASUREMENT RECORD

FIGURE 5-3

# 6.0 NMCAS EVALUATION

## 6.1 Introduction

A third integrated uranium run was conducted at the BNFP during FY 1979 to demonstrate implementation of CNMCAS. An equally important objective was to demonstrate key elements of the installed Nuclear Material Control and Accounting System (NMCAS). Previous uranium runs pointed to the need for some equipment modifications, some additional calibration activities and special tests before additional testing could be accomplished. Nuclear Material Control evaluations were included in the objectives of the FY 1979 contract between Allied-General Nuclear Services (AGNS) and the Department of Energy (DOE) for studies and research concerning safeguards. This included demonstration over a longer (three-month) period that previous runs where plant steady-state and routine operations could be reached.

This section evaluates the FY 1979 cold run results with respect to Nuclear Material Control measurement capabilities. The findings discussed in this section are based on manually collected data but are applicable to a generic reprocessing plant measurement system whether based on computer generated measurements or manually recorded data.

There are three basic questions to be asked: (1) How sensitive is the measurement system, (2) how sensitive can it be, and (3) with the sensitivity now available, what are the problems encountered? The third question is the most interesting because advances in measurement technology and the R&D mode of operation at the BNFP have revealed problems never before realized in reprocessing plant operations.

It must be noted that findings are based on processing of "cold" natural uranium. Thus, the impact of analytical measurement uncertainties with "hot" uranium and plutonium solutions cannot be assessed. However, great care was taken to ensure "bulk" measurement of solution quantities were made using equipment and techniques that can and will be applied in "hot" operating facilities. Results include the effects of an operating organization in an operating facility performing nuclear material control functions and, in this sense, represent actual capabilities.

Thus, this section concentrates on the assessment of solution quantity measurement capabilities. A number of analytical measurement techniques are under development and evaluation at a number of government laboratories. Incorporation of these investigations and results with the finding of bulk measurement capabilities at BNFP can provide the assessment of overall measurement capabilities for a generic operating large scale reprocessing facility.

## 6.2 Evaluation Basis and Philosophy

During FY 1979 activities, as with previous years, the basis for assessment of measurement capabilities is uranium input/output demonstration. Material balance data is generated for the Separations Facility using

only uranium solutions. A complete physical inventory of the Separations Facility is performed at the start of a "campaign". Input quantities are measured as they are received in the input accountability tank. Product solutions are measured as they are transferred from the uranium product sample tank. Waste solutions going to the waste storage tanks are measured as they are transferred from the GPW check tank or the HWW sample tank. At the conclusion of each campaign, a complete system physical inventory is conducted to allow calculation of a material balance over the campaign.

Three such campaigns were conducted during the FY 1979 run. Each consisted of beginning inventory, input, product and waste measurements, and ending inventory. Data from these campaigns and the material balance summaries for uranium solutions provide the basis for assessment of measurement performance.

A number of factors can affect material balance performance. A major objective of nuclear material control studies at the BNFP is to assess the contributions of as many of these factors as possible. Thus, processing schemes and piping arrangements are set up to simulate routine operations, yet allow isolation of various factors contributing to material balance performance.

During integrated uranium runs, a limited amount of natural uranium ($\approx$12 MTU) was moved into the facility. As processing proceeded, product solution batches were measured as they were transferred out of the product tank. Instead of being transferred to $UF_6$, however, the product batches were transferred back to the input accountability tank where they were remeasured.

The advantage of this arrangement is two-fold. First, it allows direct comparison of the two major primary measurement points in the material balance system. This allows direct assessment of measurements in these tanks and enables investigation into the causes and effects of minute problems affecting these measurements.

Secondly, with this rerouting of product, the total inventory in the Separations Facility remains the same despite product and input transfers. It is adjusted only for quantities of waste transferred through the waste measurement tanks to waste storage. Thus, we can remove the effect of input and output measurements from material balance summaries and directly assess the effects of inventory and waste measurements on material balance summaries.

This scheme also provides a third benefit in that the "true" in-plant inventory is known at any time from the known quantity received in the facility at the start and from the waste transfers. With this information, in-process inventory and holdup measurement schemes can be assessed. (The assessment of in-process inventories is treated separately in AGNS-35900-2.2-23.)

All this points to the fact that activities in accordance to the AGNS-DOE contract have been tailored to accomplish a wide range of goals. An assessment of current state-of-the-art measurement capabilities as applied in a generic facility can be made. Careful design of processing activities has also provided a unique opportunity to isolate and assess specific aspects of measurement components. This section uses this unique attribute to assess material balance measurement capabilities.

## 6.3 Material Balance Summaries

During the FY 1979 Integrated Uranium Runs, three separate campaigns were conducted. Each was separated by shutdown and flushout physical inventories. The run was preceded by a shutdown period that included the period from conclusion of FY 1978 activities.

### 6.3.1 Shutdown Period - FY 1978 to Start of FY 1979 Runs

A discussion of measurement performance must also include measurement activities preceding the FY 1979 run. FY 1978 was concluded with a final plant cleanout that left a total in-plant inventory of 20.6 kilograms. This provides a base starting point. During the period from the end of FY 1978 runs to the start of the FY 1979 run, several activites concerning movement of uranium took place. A special contract for Brookhaven National Laboratory required movement of uranium to the Separations Facility. This BNL contract and some maintenance items resulted in waste discharges. Some material was received from the laboratory and from the engineering laboratory (N. T. receipts). Additional uranium was brought into the Separations Facility in preparation for the FY 1979 run prior to the FY 1979 beginning inventory. Table 6-1 shows the material balance summary for the period starting with the end of the FY 1978 run to the beginning inventory in the FY 1979 run.

The calculated ID is -160.5 kilograms uranium. This means there is an over accounting of uranium for the period by 160.5 kilograms. This is a significant quantity. It turns out that this is due to a problem with the ending inventory quantity. The inventory was conducted between completion of BNL activities and start of the FY 1979 run. Due to schedule restraints and other parallel activities, reverification of some of the tank measurements was not completed. It is possible that a large single measurement error may have caused the problem. More will be said about this in the discussion of Campaign 1 summary. The important thing to note in the summary is that the beginning inventory was carefully taken after extensive plant flushout at the end of FY 1978 activities and represents a base starting point.

### 6.3.2 Campaign 1

Campaign 1 is the first segment of the FY 1979 run integrating the entire separations process. The run started on April 10 with the first feed to solvent extraction cycles. The inventory at the conclusion of the first campaign was completed on May 17, 1979.

During the first campaign, 125 MTU was processed through the Separations Facility. This was accomplished using an inventory of only ≈12 MTU by measuring product solutions in the uranium product sample tank and transferring the product solution back to the input accountability tank for remeasurement and input to the solvent extraction cycle. That is, the same 12 MTU was continually cycled back through the system and a total system throughput of 125.4 MTU was realized during the campaign.

Beginning inventory was the ending inventory from the pre-run period. During the first campaign, batches 131 through 205 were received as input. Of these, batches 131 and 169 were received from $UF_6$. The rest were received from the uranium product sample tank. Product batches 2 through 71 were transferred. All of these were routed back to input. In the GPW check tank, batches 475 to 563 were measured. Batches 106 through 158 were transferred from the HWW sample tank.

Activities during the first campaign were devoted to bringing the plant up and holding steady-state operations. The major objective was to check out modifications identified as required during FY 1978 runs (see AGNS-1040-2.2-50 and AGNS-1040-3.6-55).

Table 6-2 shows the material balance summary for Campaign 1. To a degree, the summary is representative of performance that can be expected from an operating design basis reprocessing facility. In an operating facility, feed solutions would be received from the dissolver system. Here, most feed is received from the product tank. In both cases, however, solutions are received and measured in the input tank. Product solutions during the integrated runs are measured in the uranium product sample tank. In the initial BNFP design, product solutions were to have been measured at the receiving end of the transfer at $UF_6$. However, the measurements at $UF_6$ are essentially the same as uranium product sample tank measurements, so they are representative of performance that can be expected. Waste solutions are transferred as would be expected in an operating facility.

Of course, as discussed in Section 6.1, input and waste measurements do not show effects of hot solutions on analytical determinations or the capabilities of analytical methods for plutonium quantity determinations. However, bulk measurement is a difficult part of overall measurement performance in a reprocessing facility. A lot of information on bulk measurement capabilities is available from these data and focus can be directed at problem areas using the measurement results in this unique application of the BNFP.

The first step is to observe the ID computed without the input and product measurements, which is 189.3 kilograms. This represents measurements on the quantity of material in the facility during the run (approximately 12 MTU), adjusted only for waste transfers. There is no effect from measuring 125 MTU of feed solution.

The ID calculated, based on the 125 MTU of throughput (including input and product measurements), is 131.7 kilograms. Thus, the difference of

53.6 kilograms uranium is directly attributable to random error/ mistakes in input and product measurements. It is the effect of product and input measurements on the material balance calcination.

This highlights the value of the BNFP in this R&D mode. An operating facility would show the 131.7 kilograms ID and give no indication of the problem area. In the R&D mode, the effects of input and product measurement are isolated and are 53.6 kilograms uranium. Attributable to waste and inventory measurement problems are 189.3 kilograms.

The input and product measurements are discussed in detail in Sections 6.4 and 6.5. As for the 189.3 kilograms ID indicated without input and product measurement effects, a closer evaluation is required.

As indicated by the ID for the pre-run period discussed in Section 6.3.1 above, the ending inventory (Campaign 1 beginning inventory) is suspect by the 160.5 kilograms ID for the pre-run period. This is confirmed by the +189.3 kilograms ID calculated at the end of Campaign 1. The cumulative ID through the end of the Campaign 1 (Beginning ID + Campaign 1 ID) is only 28.8 kilograms. Inventory problems are the major contribution to the large ID for Campaign 1. The Campaign 1 inventory measurements are discussed in detail in Section 6.8.

In general, results from the first run are excellent and must be looked at in the context of an operating facility. This must be tempered with the idea that natural uranium was used and effects of fission product activity on analytical sample preparation and analysis are not included. However, results do show some real measurement problems to be dealt with if a plant were to operate.

As indicated above, the contribution of input and product measurements to the ID is 53.6 kilograms. This is a real and a well-established number. It is important to note that this is only 0.04% of throughput. As will be discussed in Sections 6.4 and 6.5, this problem can be dealt with. Use of the BNFP in the R&D mode has allowed corrective actions to be developed for a problem at the 0.04% level. Similarily, small problems in waste and inventory have been identified and investigated as will be discussed below. It is important to keep these problems in the context of throughput to realize the level of the problem being dealt with.

### 6.3.3 Campaign 2

Campaign 2 was the second segment of the FY 1979 run. The facility was started up after the completion of the Campaign 1 ending inventory (which becomes the Campaign 2 beginning inventory). The inventory at the conclusion of Campaign 2 was completed on June 23, 1979.

Approximately 110 MTU throughput was realized during Campaign 2. Again, this was accomplished using the base 12 MTU by rerouting product solutions.

During Campaign 2, batches 206 through 271 were received as input. All of these batches were received from product with no additional receipts to the facility from $UF_6$. Batches 72 to 138 were transferred from the product tank and all were transferred to input. GPW check tank batches 564 to 657 and HWW sample tank batches 159 to 204 were transferred to waste. Also during this period, 275 gallons of process solutions containing 69.0 kilograms uranium were removed and transferred to the engineering laboratory for testing purposes. This transfer is also shown in the summary.

The first half of Campaign 2 was devoted to continuing steady-state process activities. During the second half, the plant was run according to a "coprocessing flowsheet." This alternate flowsheet scheme in an operating plant would divert uranium to the plutonium cycle to give a 25 to 75 plutonium to uranium ratio in the plutonium product. Integrated uranium runs simulate plutonium cycle operating conditions by sending quantities of uranium equal to normal plutonium amounts to the plutonium cycle. During the "alternate flowsheet" test, additional uranium is sent down the plutonium cycles to simulate the total plutonium and uranium quantities the plutonium cycles would see. This places an additional processing load on plutonium cycle equipment which may have impacted waste and inventory measurements.

Table 6-3 shows the material balance summary for Campaign 2. Again, the ID considering routine type operations with input and output measurements, as well as the ID removing input/output measurement problems, are shown. The ID computed with input and output measurements is -10.2 kilograms uranium. Without the input/output measurements, the ID is 107.8; thus, the effect of measuring input and product is 118.0 kilograms uranium. This is 0.17% of throughput. The specifics of input and product measurements are discussed in Sections 6.4 and 6.5.

The material balance, excluding input and product measurements, shows an ID of 107.8 kilograms. This is significant with respect to the 10.5 MTU in inventory and indicates a problem. The problem is likely in waste measurements as discussed in Section 6.6. The high throughput in the plutonium cycles during coprocessing tests along with a tight operating schedule to meet throughput objectives resulted in developing solvent problems. Deteriorating solvent quality and high flow rates resulted in problems with GPW check tank waste measurements. This is likely the major contributor to the ID problem. Inventory measurements were probably not a problem as discussed in Section 6.8.

Again, it is significant to note that the ID is only about 0.1% of throughput. A problem of this magnitude in an operating plant would be undetectable. Yet, with the BNFP in the R&D mode, this 0.1% problem is detected and isolated.

### 6.3.4 Campaign 3

Campaign 3 was the final segment of the FY 1979 Integrated Uranium Run. The facility was restarted at the completion of the Campaign 2 ending

inventory (the beginning inventory for Campaign 3). The final inventory was completed on July 26, 1979. This campaign was followed by a plant cleanout effort, which included thorough and repeated chemical flushes of vessels and equipment. This provided a final check on inventory procedures and a cross check on inventory quantities.

The final campaign was cut short compared to initial plans. Only 66 MTU throughput was realized. At the conclusion of this campaign, uranium solutions were returned to $UF_6$ to allow decontamination and chemical flushes of the entire Separations Facility.

Input batches 272 through 315 were received as input during this campaign. Batches 272 through 310 were received from the uranium product sample tank. Batches 311 through 315 were flushes of transfer lines and headend equipment not used during the FY 1979 run. An additional 104 kilograms of uranium were received from the Nuclear Technology Engineering Laboratory. This included material originally transferred to the laboratory for testing during Campaign 2. Product batches 139 through 186 were transferred during the third campaign. Of these, batches 139 through 177 were transferred back to input and batches 178 through 186 were sent to the UF Facility for storage. GPW check tank batches 658 to 740 and HWW sample tank batches 205 through 253 were transferred to waste. Also, at the conclusion of Campaign 3, any samples in the laboratory area were consolidated and 5.2 kilograms uranium were measured as laboratory inventory.

The first half of the third campaign was devoted to continuation of the coprocessing flowsheet demonstration. The second half of the campaign consisted of a maximum throughput rate test. The BNFP is designed as a 5 MTU/day facility. During this rate test, a continuous rate of 6 MTU/day with upwards of 7 MTU/day for isolated times was maintained. This allowed assessment of excessive rates on process parameters and NMC objectives.

Table 6-4 shows the material balance summary for Campaign 3. As with previous summaries, both calculations of ID are shown. With input and product measurements an ID of 36.3 kilograms uranium is shown. Without input/output, the ID is 132.0 kilograms uranium. Thus, the effects of input and product measurements are 75.7 kilograms uranium or 0.1% of throughput. Again, these measurements are discussed in detail in Sections 6.4 and 6.5.

The ID of 132.0, which excludes input/output measurement effects, is indicative of the continuing waste measurement problem. By the third campaign, solvent quality had become a problem. Disengaging times were very slow. The solvent quality coupled to the high throughput rates of both the coprocessing and maximum rate tests resulted in the increasing GPW problem. Detailed discussion of waste measurements is provided in Section 6.6.

The final inventory was completed and again demonstrated the capabilities of shutdown and flushout inventories. The details of inventory performance are included in Section 6.8.

After completion of the final inventory, the entire system was flushed with acid and caustic solutions for decontamination. This flush provided the cross check of inventory performance. These flushes and measured transfers to waste have verified the inventory quantities.

### 6.3.5 Cumulative Summary

In an operating reprocessing facility, a shutdown and flushout inventory would normally be conducted on a six-month frequency. This inventory would involve flushout of the system and movement of product and waste solutions out of the facility to minimize inventory quantities and thus the uncertainties associated with inventory determinations. During integrated uranium runs at the BNFP, there is usually 10 to 12 MTU in the system at any one time. One of the shortcomings of the runs is that inventories such as those at the end of Campaigns 1 and 2 must be conducted with this 10 to 12 MTU in the system rather than flushing the system to 10 to 50 kilograms total inventory. As discussed in Section 6.8, this necessity to store 10 to 12 MTU has a strong impact on inventory results and material balance summaries. It tends to mask some of the measurement effects.

Thus, it is important to look at the full summary for activities from the end of FY 1978 to the end of FY 1979. Table 6-5 shows this summary.

Over the full summary, 307.5 MTU were measured as input. The ID of 21.5 kilograms using input and product measurements is only 0.007% of throughput. Without input and product measurements, the ID is 268.6. Thus, the effects of input and output measurements over 307.5 MTU throughput is 247.1 kilograms or 0.08%. As discussed in Sections 6.4 and 6.5, these effects can be detected and corrected using techniques developed during the runs.

The ID without input and output effects is 268.6. This represents 0.08% of throughput. As stated before, this is likely a problem with waste measurements. The details are discussed in Section 6.6.

## 6.4 Input Measurements

This section describes in detail the input measurements. Appendix L includes batch summaries as measured in the input accountability tank. Detailed batch measurement data and comparisons are also included.

### 6.4.1 Input Measurements Description

During FY 1979, input measurements were made in the input accountability tank. As with previous integrated runs, in-tank liquid level and density measurements were made using a pneumatic dip tube bubbler system

with Ruska DDR-6000 electromanometer readout. Backup (redundant) measurement of liquid level and density were provided using Taylor differential pressure transmitters. Temperature measurements are made using type K thermocouples. An instrument schematic is included as Figure 6-1.

During the FY 1979 integrated run, data were recorded manually for the entire run. The CNMCAS functioned in parallel for the second and third campaigns. Agreement between both systems in the parallel mode was excellent with essentially no difference. For completeness, manually collected data are discussed in this section but results are applicable to computer directed data collection as well.

Previous integrated uranium runs have demonstrated excellent performance in the input accountability tank. The only problem encountered was during the FY 1977 run when measurement procedures specified sparging during sampling. (A 3-kilogram of solution loss to evaporation during sampling was detected.) This was corrected by changing the procedures, and performance has been excellent ever since.

This performance continued during the FY 1979 run. Data show bulk measurements can routinely be made to less than 0.1%. Note that this is bulk measurement and does not include analytical uncertainties related to "hot" operation. The BNFP uses natural uranium for the runs and the effects of hot solutions on analytical determinations cannot be fully assessed. Bulk measurements are made using equipment and procedures applicable to an operating facility and, thereby, represent capabilities of an operating facility.

The FY 1979 run continued to show the effects of measurement errors on measurement performance. It emphasized the need for techniques to detect and control these errors on a real-time basis to realize the 0.1% potential.

Another development during the FY 1979 run was the "UCALC" method for predicting uranium concentration from acid and density measurements. It was applied to measurement data for up-to-the-minute accounting reports until analytical determinations of uranium concentrations were available. The method proved effective for concentration prediction and will serve as a valuable tool for near real-time inventory program development. Details are discussed in Section 6.4.5.

### 6.4.2 Input Measurement Sequences

Measurement sequences in the input accountability tank during the FY 1979 run were the same as FY 1978. (The details are described in the FY 1978 report, AGNS-1040-2.2-50.)

Measurements of the heel quantity are made prior to receipt. After receipt, the batch is thoroughly mixed and an initial set of measurements are recorded. The batch is then sampled. After sampling, a second set of measurements is recorded and measurement comparisons are

made. Comparisons of appropriate instrument readings and instrument-to-laboratory densities are made. These parameters must agree within preset limits to allow continuation of the measurement sequence. The batch is then transferred and after transfer, data are recorded.

This sequence has proved effective for generation of accurate measurement data. It relies on two separate measurement sets separated in time by the sampling sequence to spot tank or process problems. It uses redundant measurements and comparisons to spot instrument and probe problems. All these are effective problem detectors. This comparison approach, which is part of the measurement sequence, allows for corrective action to be taken before the batch is transferred. This is the key to measurement performance to accuracies of less than 0.1%. Measurement equipment is capable of performance better than this. Detection and correction of errors are the main problems in meeting this performance level.

### 6.4.3 Input Uranium Calculations

Accounting procedures use before-receipt and after-sample measurement data to calculate the quantity of uranium received for input to the facility. Ruska instrument liquid level determinations are used. The laboratory analysis for density (density at 25°C) is adjusted to the measured tank temperature, using an empirically developed relationship. This relationship considers the effects of temperature, acid concentration, and uranium concentration in the density change. The true liquid level is calculated from the Ruska liquid level and adjusted density. The "true" level is converted to volume using tank calibration equations. Solution weight is then calculated from volume and adjusted density.

For the FY 1979 Integrated Uranium Run, concentrations were determined using the potentiometric titration method on weighed sample aliquots. This method is a "bench-top method", which, at present, is not suitable for input analyses in an operating facility. Mass spectrometric methods were also made but sample preparation, for the most part, was done "bench top." Again, this is not applicable to routine operations. Some input samples was subjected to in-cell preparation and mass spectrometric analysis as a special test. This is discussed in Appendix E.

A key to near real-time accountability is the rapid determination of solution concentrations. The analytical procedures for input samples are, at present, too slow to support a real-time accounting system. For this reason, further refinement of calculational methods for concentrations (i.e., UCALC) and development of reliable, accurate in-line analyses methods should be continued (see Section 6.4.5).

### 6.4.4 Measurement Data Comparisons

Evaluation of batch transfer data from the BNFP cold runs indicates that measurement data comparisons are a very important part of the measurement sequence. It has been demonstrated that measurement capabilities exist to measure solution quantities to better than 0.1%. However, at

this level, very small problems can cause significant errors and can seriously impact measurement performance.

There are four major problem areas with measurements. They are: (1) plugged or partially plugged probes, (2) bad or misread instruments, (3) inadequate mixing which leads to nonrepresentative sampling, and (4) sample analysis problems. The first three are critical from a real-time measurement standpoint. If these problems occur and remain undetected, the batch will be transferred with bad measurement data. Thus, data comparisons are structured to spot the problems prior to batch transfer and allow corrective action.

Effective use of comparisons in the past had been hampered by a lack of operating experience to characterize instrument performance parameters. Instrument transmitter studies, conducted in FY 1979, provided a substantial base of data on which transmitter performance was characterized. Still missing is a fully-trained and experienced operating organization to effectively implement the techniques and some timely statistical techniques to aid in pinpointing problems.

The measurement comparisons made for the accountability tank are as follows:

(1) Density Measurement Comparisons
(2) Liquid Level Measurement Comparisons
(3) Solution Quantity - Before Sample Versus After Sample
(4) Uranium Concentration Comparisons
(5) Quantity Transferred Versus Quantity Received.

By far, the most sensitive indicator is the density measurement comparison. It is sensitive to probe pluggage and mixing/sampling problems. Liquid level measurement comparisons are sensitive to instrument/reading problems, but less sensitive to probe restrictions. Solution quantity before sample to after sample is used to detect changes in the tank during measurements. These first three comparisons are real-time comparisons and are used to identify any problems so that timely corrective action may be taken.

Uranium concentration comparisons involve checking the laboratory reported uranium concentration against the uranium concentration calculated using the solution density and acid concentration. This comparison is primarily an indicator of analytical problems.

The last comparison, quantity transferred versus quantity received, is the performance indicator for the input and uranium product measurements. (This comparison would not be available during normal operations.) Product solutions are measured and then transferred back to the input tank where they are remeasured as input. The transfer is a pump transfer through a temporary transfer route specifically designed to eliminate line holdup. These special transfer arrangements are designed to allow direct comparison of the two most important material balance measurements, input and product. After the fact, the comparison shows

specific batches with measurement problems. The sensitivity of each of the other comparisons to show the measurement problems can then be evaluated. When the product to input comparison shows a problem, one can check the other comparisons, such as density, to see if the problem was indeed indicated.

Evaluation of batch transfer data from the FY 1979 program indicates that the comparisons are sensitive indicators. For almost every transfer that the quantity transferred versus quantity received did not compare favorably, one or more of the measurement comparisons, either on the sending or receiving end, indicated a measurement problem.

Stringent comparison limits and mandatory corrective actions were not applied by operations during 1979 due to a lack of experience and the evolving nature of the program. As a result, measurement errors occurred and are reflected in the data. Future tests with applied limits and mandatory corrective actions should show the projected improvement in overall system performance.

The individual listing for all measurement comparisons for input batches are included in Appendix L. Figures 6-2, 6-3, and 6-4 graphically present the comparison (or difference) of product to input kilograms of solution (quantity transferred versus quantity received) in parallel with appropriate input and product density measurement comparisons (laboratory density to measured in-tank density). These graphs provide examples of how comparisons can pinpoint problems and are indicative of input measurement performance during FY 1979 runs.

The results from Campaign 1 are shown in Figure 6-2. The first observation is that comparisons are widely fluctuating for the first part of the campaign and begin to settle down towards the end. This is indicative of how application of comparison techniques can affect measurement performance. As with previous years, operations personnel assigned to NMC measurements were not experienced. They had to learn the measurement techniques and procedures and how to interpret the comparisons. The wide fluctuations at the beginning of the campaign represent performance without real-time measurement evaluations, such as comparison data, since the personnel simply did not know how to use the data. As the campaign progressed, the fluctuations decreased. This is directly attributable to more effective data evaluation and corrective actions as the operators gained experience.

Campaign 2, as shown in Figure 6-3, is a better example of measurement capabilities. The performance indicator, the comparison of product to input measurements, shows some problem batches at the beginning of the campaign, but smooths out considerably toward the end. The early "spikes" are mostly attributable to product measurements which will be discussed in Section 6.5. Input accountability tank measurements were excellent. The only readily apparent problems, based on input density comparisons, are Batches 232 through 234 and 270.

Batches 232 and 233 show differences of +11 and -14 kilograms of solution, respectively. This could be attributable to line holdup. If the

operator stops a transfer without proper drainback, a quantity of solution can be trapped in the transfer line. This would be measured as product transferred but would not be in the quantity received in the accountability. The next transfer, however, would show a similar overaccounting. This is likely the case for Batches 232 and 233 with perhaps a small measurement problem for Batch 233. Batch 234, however, shows a 10 kilogram of solution difference in the input to product comparison without an offsetting difference. The input measurement density comparison also shows this batch as a problem where the product density comparison does not. Thus, careful application of comparison techniques should have flagged this batch for remeasurement or other corrective action while it was still in the input tank.

This is important to note. There is a case where the indicator has shown an "error" of 10 kilograms of solution (also 10.6 kilograms uranium as shown in the summary in Appendix L). This is a 0.1% error in the quantity of solution transferred. Thus, the comparison technique is sensitive to this 0.1% problem. Also, note that the difference in kilograms uranium was 10.6. All things being equal, a difference of 10 kilograms of solution with nominal 300 grams/liter uranium should show a difference of 3 kilograms uranium. Here it is 10.6 kilograms uranium. This is indicative of a sampling problem and the density measurement comparison is sensitive to this at this level.

Batch No. 270 of input shows a large density measurement difference. Here is another example of problems. Here the difference was 17 kilograms solution as indicated by the product to input difference. This is another 0.1% error readily detectable by the comparison technique.

The excellent performance of the input accountability measurements continued for the third campaign, as shown in the density comparisons in Figure 6-4. The large variations in Batches 274 and 275 are probably associated with line holdups.

The density measurement comparison has been the emphasis. As stated above, this is the most sensitive for timely detection of batch measurement problems. This is not the only useful comparison though. The uranium concentration comparisons have proven both useful and necessary in evaluation of analytical results.

### 6.4.5 Uranium Concentration Comparisons

One of the most important concepts to evolve during integrated uranium runs at the BNFP was the use of calculated uranium concentrations for feed solution measurements.

The routine method for determination of feed solutions in a reprocessing facility is isotope dilution/mass spectrometry. Unfortunately, this method is time consuming and cannot provide results in a timely manner to allow near real-time inventory determinations. Potentiometric titrations, as used at the BNFP during integrated uranium runs, have the same problem. Thus, it was desirable to find a method that can "approach"

the accuracy requirements of input measurements yet provide timely results for near real-time inventory. It was this need for results and the advances in density measurement technology that led to re-examination of the methods for calculation of uranium concentration from acid and density results.

A statistically designed experiment was conducted to accumulate results and develop refined calculational methods for the limited concentration ranges expected in normal feed solutions. This calculation was then applied to product and feed solutions during the integrated uranium run for any calculations made prior to availability of normal analytical results. This provided considerable data on comparisons of calculated versus mass spectrometric and potentiometric titration (V.P.) results. These uranium concentration comparison summaries are included in Appendix L and represented graphically in Figure 6-5.

The first section of the graph shows the performance of the "U Calc" method compared to the concentrations determined on bench top using the potentiometric titration method. It is evident that the calculated quantities are generally within ±0.5% of the potentiometric method and no bias is detectable. The potentiometric method is generally considered to be a 0.1% to 0.25% method. The "spikes" in the results were generally attributed to bad acid results or a sampling problem where one bottle was analyzed for density, another for uranium concentration, and the bottles were not representative. (It should be noted here that densities for these calculations were analyzed using an Anton-Parr vibrating tube densitometer, which is accurate to ±0.0008 density units.)

The second part of the graph shows comparison of the uranium calculation prediction to mass spectrometry determinations. It should be mentioned that mass spectrometry results are from "bench-top" dilutions and sample preparations and represent optimization of the method. Here the variation of the difference appears to be about the same ±0.5%. However, a bias of approximately 0.25% is observed.

The third section of the graph is a comparison of results from mass spectrometric and potentiometric determinations of uranium concentration. It shows a bias of ±0.25%. Considering that controlled "bench-top" analysis by potentiometric titration is a very precise method, it is assumed the bias is in mass spectrometric determinations. Quality Control analyses confirm this.

The interesting thing to note is that the "U Calc" method shows the same bias to mass specification as the potentiometric to mass specification comparison. This leads to the concept of using this method to cross check mass specification results in an operating facility.

During actual operation, the potentiometric method is not yet applicable to feed solution analyses. However, density and acid analysis methods are applicable. Thus, calculated uranium concentrations with this level of accuracy can be realized in an actual operating plant. These can be

used for concentrations in calculations of near real-time, in-process inventory determinations. They can also be applied as cross-checks of mass spectrometric results and can flag the need to reanalyze a particular sample.

### 6.4.6 Input Measurement Evaluation

No apparent problems were detected with input measurements. The only difficulties were "mistakes" such as mixing, probe pluggage, etc., and these mistakes were few. Comparison procedures developed to control these "mistakes" were demonstrated to be effective. Mistakes and problems were numerous at the start of the run. As the run progressed and experience was gained, the number of problems decreased, showing the effectiveness of implementation of measurement comparison procedures. Probe pluggage and steps to eliminate this problem are discussed in Appendix K.

### 6.4.7 Receipts from $UF_6$ Plant

At the start of this year's integrated uranium run, as with previous years, the initial change of uranium solution was received in the accountability tank from the $UF_6$ Facility. The material was pump-transferred to the Separations Facility through the line originally installed as the product-to-$UF_6$-line.

The material was measured in the $UF_6$ accountability tank and transferred up the line to the Separations Facility. In the Separations Facility, the material was routed through the special temporary transfer system to the input accountability tank where it was measured as a receipt. The transfer line is better than a half mile long. An evaluation of this transfer and measurements is an indication of long-line pump transfer and measurement capabilities.

The summary of transfer comparisons is shown in Table 6-6. Note that the summary includes the BNL receipt. This receipt was several months prior to the start of the FY 1979 run. This transfer shows the largest variation (224.4 kilograms solution). This is due to the lack of an adequate drainback and flush. Batches 32A, 32B, and 33, however, show fairly good comparisons (probably within the measurement uncertainty). Batch 34, again, shows a high difference, indicating insufficient drainback. Note, however, that the flush from Separations back to UF picks up essentially all of the missing uranium, bringing the overall comparison difference down to a reasonable level. This points to the fact that transfers like this, through a long transfer line, do not provide meaningful comparison data unless proper drainback and line flush techniques are implemented.

#### 6.4.7.1 Additional Input Measurements

As shown in Table 6-5, the cumulative summary for FY 1979 activities includes several input quantities other than those measured in the input accountability tank. These were nonroutine transfers which must be included in the material balance summary.

As shown in Table 6-5 and discussed briefly in Section 6.3-1, 2920.9 kilograms uranium were received in the Separations Facility in support of a contract for BNL. This material was measured in the off-specification uranium tank, but still must be included as input to the facility.

Two transfers were received from the Nuclear Technology Laboratory, one of 18.6 kilograms uranium and the other of 104.0 kilograms uranium. The Nuclear Technology Laboratory is a pilot-plant engineering laboratory for process development work. Both of these transfers were uranium solutions used in the pilot-plant experiments.

The HCLA waste receipt was a cumulative summary of transfers of waste from the laboratory area to the separations area. During integrated runs, the laboratory is considered part of the Separations Facility. The laboratory waste transfer consists only of samples and solutions drawn from separations process streams. However, during the shutdown period, samples and waste solutions in the HCLA did not come from process streams. These transfers from the HCLA or wastes are in addition to separations process inventory.

## 6.5 Product Measurements

This section describes in detail the product measurements. Appendix L includes batch summaries as measured in the uranium product sample tank. Specific batch measurement data are also included.

### 6.5.1 Product Measurement Description

Product measurements were made in the uranium product sample tank. Like the input accountability tank, the product tank is fitted with Ruska manometers for precision liquid level and density measurements. Backup (redundant) measurement of these parameters is also made by Taylor instruments. The arrangement is similar to that shown in Figure 6-1.

Previous integrated uranium runs showed measurement and sampling problems with the uranium product sample tank. A part of this problem was attributed to the fact that the tank was a horizontal cylinder. With this arrangement, calibration is a problem and density determination is a key factor. A recommendation from the FY 1978 run was to change the functions of the uranium product sample tank and the off-specification uranium tank. The off-specification uranium tank was a vertical cylinder of larger capacity. The vertical cylinder allows measurements to be made in the straight-walled section where density measurement problems have a limited effect as transfer measurements. Also, it was suspected the vertical cylinder configuration could make mixing with the sparge system more efficient. Thus, the change was made as part of the preparations for the FY 1979 run. Product measurements for the FY 1979 were made in the vertical cylindrical off-specification uranium tank which was functionally switched and renamed the uranium product sample tank. The old product tank became the off-specification uranium tank.

Product measurement data were recorded manually for the entire run. The CNMCAS functioned in parallel for the last two campaigns. Agreement was excellent. For completeness, manual data are used in this discussion. However, as with input, the results are applicable to computer measurements.

The tank function change corrected some of the problems. However, some problems persisted and new problems were created. In general, measurement performance capabilities are excellent. Like the input tank, measurements can be made to better than 0.1%. However, measurement errors (mistakes) are equally as dominant, and the need for methods of detecting and correcting errors was emphasized by FY 1979 runs.

An example of the sensitivity of the system was provided by one problem detected during the FY 1979 run. Comparison of product-to-input measurements showed a "significant" bias of 6 kilograms of solution. This is 6 kilograms in a batch transfer of 7000 to 8000 kilograms and it was statistically significant. It proved to be a problem with the sparger line filling with solution. The point is that the measurements are sensitive to this 0.07% to 0.09% problem.

Another point to mention is that measurements in the uranium product sample tank are made using instrumentation available for measurement of product in an operating reprocessing facility. The analytical method is potentiometric titration, a very precise uranium analysis method which is also suitable for measurements in an operating facility. Likewise the same instrumentation and "bench top," accurate, and precise analytical methods could be used for plutonium product measurements in an operating facility. Thus, results here are totally applicable to an operating facility, unlike input measurements which encounter fission product-related problems.

### 6.5.2 Measurement Sequences

Measurement sequences for the uranium product sample tank are essentially the same as those for input measurements and are the same as those applied during FY 1978 activities described in AGNS-1040-2.2-50.

Briefly, measurements are made before sampling and after sampling with appropriate comparison data. When comparisons are satisfactory, the batch is moved and after-transfer data are recorded. A very necessary step in product transfers is drainback after transfer is complete. Time must be allowed for transfer piping to drain back to the tank, or product solution can be trapped giving false input to product comparison data. Results for FY 1979 clearly show these effects, although to a small degree.

However, among the the most important functions in the measurement sequence is the comparison step. Redundant measurements (such as Ruska, Lab, and Taylor determined density comparisons) allow detection of problems while timely corrective action is possible. The effectiveness of these detectors is clearly evident from product measurement results.

### 6.5.3 Uranium Calculations

Accounting procedures use after-sample and after-transfer measurement data to calculate the quantity of material transferred from the product tank. As with input, the laboratory analysis for density (Anton-Parr densitometer) is adjusted from the analysis temperature (25°C) to tank temperature using the empirically developed correction equation. Ruska determined liquid level and the adjusted density are used to calculate "true" liquid level. Calibration equations convert level to volume and weight of solution is calculated.

The potentiometric titration method is used for determination of uranium concentration. This method is applicable to routine measurements. Also, as with input, the uranium calculation method described in Section 6.4.5 was applied as uranium concentration prior to availability of analytical results.

### 6.5.4 Measurement Data Comparisons

As described in Section 6.4.4, the FY 1979 run has underscored the importance of measurement comparisons. Not only are they essential to meet measurement capabilities, they are sensitive as indicators of performance. Such was also the case for product measurements and product measurement comparison.

The same comparisons are available for product measurements as for input measurements. Like input, the comparison which shows density measured by the Ruska instrument, to the Taylor instrument density, and to the laboratory analysis is the most sensitive. The comparison of quantities measured in the product tank to quantities measured in the input tank is the performance indicator. The density comparison is the tool that will be available for routine operations and will serve as the problem indicator. The performance indicator of product to input comparison would not be available in an operating facility. Figures 6-2, 6-3, and 6-4 presented with the discussion on input measurements, also show the product measurement density comparisons.

Figure 6-2 shows the comparisons for the first campaign. Considerably more variation is evident in the product density comparisons than in the corresponding input density comparisons. An improvement is noted toward the end of the campaign as more experience was gained. However, the variation is considerably larger than demonstrated for input.

Figure 6-3 shows this trend continuing through Campaign 2. The overall performance has improved considerably over the beginning of Campaign No. 1, but the large variations in relation to the corresponding results from input measurements indicate product measurement problems. Figure 6-4 shows this same performance continuing.

With all this comparison data in place, we can look at the overall product/input performance picture and observe problems and the sensitivities of comparison data to the problems. This is very important!

It is not important because we can go back and point to the problems. It is important because the techniques are sensitive to the problems. The techniques can be applied in real time. They are specifically developed to use only data that are available at the time of the measurement. They are available to make a judgment as to measurement acceptability while there is time to take corrective action. For this overall look, consider Campaign 2 as the test bed.

Figure 6-6 shows the same comparison data as presented in Figure 6-3, but with an additional comparison superimposed. The product to input comparison summary included in Appendix L shows both kilograms solution and kilograms uranium difference between product and input measurements. The additional comparison of kilograms uranium is superimposed in Figure 6-6. This figure shows the "true performance." The degree of sensitivity of other available measurement comparisons to indicate problems is the question.

A key element in Figure 6-6 is how the differences of solution quantity and kilogram uranium track. If a problem exists whereby the solution quantity measured in either tank is in error, the kilograms of uranium should be in error by an amount proportional to concentration. Thus, the scales are chosen so 25 kilograms of solution corresponds to 5 kilograms uranium (a 200 milligram/gram ratio which corresponds to routine solution concentration). With this, significant spikes in the graph indicating measurement problems as well as major divergencies of the two lines are indicators of "true" problems. How the other comparisons react to these problems is the indicator of sensitivity.

A simple example is Product Batch 77 (corresponding to Input Batch 211). The routinely available density comparison is "off-scale." With careful attention to measurement evaluations, this should have been remeasured and/or resampled. As it turns out, the performance indicator (Product to Input) shows there really was a measurement problem. The fact that kilograms solution and kilograms uranium "track" indicates it was a measurement problem with the product batch, probably not an analysis problem. Batch 97 of product (corresponding to Batch 231 of input) shows the same difficulty.

Batch 124 of product (corresponding to Input Batch 258) shows a considerable density comparison problem. A careful look at the performance indicator shows a marked shift in the track between kilograms uranium and kilogram solution. This is indicative of a sampling problem. Interpolating from the graph would indicate the effect is only 3 to 4 kilograms uranium ($\approx$0.2% of total uranium transferred) based upon kilograms solution difference. But the difference is -10 kilograms uranium, indicating a sampling problem in the product tank.

A very careful and thorough examination of all the available comparison techniques could probably pinpoint the exact problems with each batch. But, as stated above, pinpointing the problems after the fact is not the important consideration. The techniques, if carefully applied, can point to the need for corrective action. The integrated uranium run

points this out. These errors did occur as part of the routine operation. They should have been corrected. As seen by these limited examples and as it becomes evident if the reader pursues the concepts to try to explain several of the other indicated problems, actual real-time use of these indicators will require skilled and trained measurement personnel. Since the personnel were not available, they had to be trained during the integrated runs. As performance indicates, increased experience resulted in fewer specific problems. In actual operation, the techniques would be refined and understood by personnel and could essentially eliminate errors.

### 6.5.5 Product Measurement Evaluation

As stated in Section 6.5.1, one of the recommendations of FY 1978 was to functionally change the uranium product sample tank and the off-specification uranium tank. The purpose was to allow product measurements in a straight-walled vertical tank. This limits the effects of density errors on transfer measurements. The performance indicator (product to input comparisons) demonstrates the effectiveness of this.

Several of the product tank density comparisons go way off scale (such as Batches 76, 78, and 124). The performance indicator shows these are likely sampling problems and analyzed densities are for these batches probably not representative of tank contents. Yet comparisons of solution quantities transferred for these batches show fairly good agreement. This shows the erroneous density measurements have limited effect on the transfer quantity measurement. This demonstrates the value (or necessity) of using straight-walled vertical tanks for accountability measurements. It can minimize the importance of density in transfer measurements (unlike horizontal cylinders).

The problem remains, however, that "nonrepresentative" samples are sampling problems and result in problems with comparison of kilograms uranium transferred. They must be dealt with for concentration measurements to be accurate.

A difficulty was encountered in the product measurements. This problem surfaced as we began to look at summaries of product to input measurement comparisons. A very basic (and not necessarily statistically rigorous) technique was used on this comparison summary. The average difference and standard deviation of the difference was calculated for all batches in the summary. Then each individual comparison was evaluated against the average and standard deviation. If the difference exceeded three standard deviations, it was dropped from the summary and a new average and standard deviation was calculated. The comparison of each remaining difference was then repeated to the new statistics. This procedure was iteratively applied until no new "outliers" were dropped.

This iterative application was made to both kilogram solution differences and kilogram uranium differences in the summary. However, if an input to product comparison was dropped for exceeding limits on kilograms solution, it was automatically eliminated from the kilograms uranium calculation. Table 6-7 shows the initial results from

application of this storative technique. It wound up with an average difference of 8.64 kilograms solution and 3.05 kilograms uranium. This is "significant" compared to the calculated standard deviations. It should be noted that the average transfer batch is 7000 to 8000 kilograms solution, so this is $\approx$0.1%.

A careful investigation of the product tank design, calibration, and measurement system was performed. It was discovered that the tank air sparge line had not been vented. This resulted in a calibration problem. The sparger line was used as the add line during calibration. Thus, water was added and the line opened after each incremental addition. This allows solution to fill the sparge line to the tank level at each incremental addition. The calibration relationship was developed to this data.

During routine operations, the tank is sparged prior to measurements. This blows solution out of the sparge line and does not let it back in with the line not vented. This results in a different indication than calibration data predict. The calibration relationships were adjusted for this and the product batches recalculated using the adjusted calibration relationships. It resulted in a total difference of 387 kilograms uranium and 1600 kilograms solution over the 185 batches of product. Table 6-8 shows the effects of this adjustment on measurement results.

With the "corrected" data, the Input to Product comparison summary iterative calculation was again applied. Results are shown in Table 6-9. This time the average difference was -0.52 kilogram solution and 1.01 kilograms uranium. Standard deviations were 6.54 kilograms solution and 5.04 kilograms uranium. This has essentially eliminated the problem.

A second difficulty is now apparent. The 0.52 kilogram solution average difference is not statistically significant; however, the 1.01 kilograms uranium is "significant" in relation to 5.04 kilograms uranium standard deviation.

A "significant" bias of approximately 1 kilogram of uranium per batch of product means that the measurement system can, ideally, be sensitive to approximately 0.04% (1 kilogram in 2000 kilograms).

In attempting to explain the reason for this problem, the following observations were made:

(1) Even with the wide variation in product tank density comparisons, the solution weight comparisons between input and product tanks were very good (hence the -0.52 kilogram solution average difference). This is to be expected, since the tank densities do not affect mass measurements very much.

(2) The product tank density comparisons (laboratory to Ruska measured in-tank density) indicate about a 0.3% positive bias, i.e., the laboratory densities are higher.

(3) Sampler accuracy tests, performed in FY 1979 in the uranium product tank, while not conclusive, indicated a possible concentration effect. If this is the case, it would explain the higher laboratory densities and the positive bias on each product tank.

It appears the "significant" bias in uranium quantities transferred is due to a sampling bias. This sampling problem may also be part of the variations seen in comparison to results in the input tank. Further testing is planned in FY 1980 to investigate this bias and to determine and correct the cause of the variations and/or bias. It is expected that the system performance can be further improved once these problems are corrected.

### 6.5.6 Transfers to $UF_6$ Plant

As the FY 1979 run was concluded, product solutions were transferred from the product tank back to the $UF_6$ Facility for storage. The material was pump transferred through the installed separations to $UF_6$ transfer line. This is the same line used to bring material up at the start of the run.

The material was measured as product in the uranium product sample tank. It was then transferred to the UN accountability tank at $UF_6$ where it was remeasured as a receipt. The transfer line is approximately a half mile long and results are indicative of long-line pump transfer and measurement capabilities.

The summary of the transfers is shown in Table 6-10. As discussed in Section 6.4.7, these transfer comparisons show the problems associated in the long-line transfers. As an example, the material transferred in Separations Batch 186 was essentially flush solution. Between Batch 186 and the actual flush, 14 kilograms uranium that were held up in the transfer line were flushed. This amount of holdup would cause problems with individual batch comparisons. The cumulative totals, however, compare quite well, i.e., the total percent difference being 0.26%. Routine transfers could be even better than this value. The line to $UF_6$ was used at the start of the integrated run to transfer feed to Separations and probably had some residual uranium in it which would have added to the receipts at $UF_6$. In normal operation, this is a one-way line. Any holdup would show up as a shortage in one batch and an overaccounting in the next; however, the total of the two would tend to come out even.

## 6.6 GPW Waste Tank Measurements

This section describes in detail measurements of waste solutions made in the GPW check tank. Appendix L includes individual batch summaries and individual batch measurement data.

### 6.6.1 GPW Waste Tank Measurement Description

All liquid waste generated in the Separations Facility during the FY 1979 Integrated Uranium Run was discarded to the ILLW storage tank

(D-425). The GPW check tank handles waste concentrates generated primarily from solvent treatment. These liquid wastes are measured batchwise and transferred to waste storage from the GPW check tank.

The GPW check tank is equipped with Taylor differential pressure transmitters with strip-chart readout for liquid level and density determination. Westinghouse pressure differential transmitters are installed with precision digital voltmeter readout for redundant measurement of liquid level and density. A Type K thermocouple provides temperature measurement. All instruments are interfaced to the computer for direct computer readout.

As with the other measurements discussed, data were recorded manually for the entire run. Computer data were recorded for the last two campaigns. Agreement between manual and computer data was excellent. For completeness, manual data are discussed but conclusions are applicable to both systems.

GPW waste measurements have been a continuing problem with plugged dip tubes, solids in the samples, two-phase samples, and plugged sampler lines being frequent occurrences. It appears most of the problems have been due to solvent and solvent degradation products reaching the GP system. Numerous modifications have been made in the plant which have been fairly successful in eliminating most of the problems.

Measurement problems still persisted during the FY 1979 runs although to a much lesser degree than experienced in previous years. It is suspected that there is still some physical entrainment of solvent in the GP system. Another possibility is that there are significant quantities of TBP, DBP, and MBP dissolved in the waste which could be causing measurement problems.

It is felt that the measurement problems would not be representative of normal operation, since the solvent quality could not be allowed to deteriorate as far in hot operation (fission product accumulation in the solvent would not be tolerable). Experience has shown, however, that the GPW measurement is a problem and can result in unmeasured losses. Further work is being done on this system.

### 6.6.2 Measurement Sequence

The measurement sequences for GPW waste measurements are essentially the same as for product and input. Before-sampling and after-sampling measurements are recorded. The comparisons of these measurements to laboratory determinations still play an important role. The only difference is in the sampling routine itself. For product and input, a sample is drawn and analyzed for acid and density. If replicate density determinations agree within pre-established limits and lab tank densities compare within limits, the measurement sequence can proceed. For waste measurements, the uranium analysis must also be completed to proceed, since this analysis is required for decision on routing the batch to waste or recycle. (Calculated uranium values cannot be used

for the GPW system because of the normally low uranium concentration and the variable salt content in this waste.)

### 6.6.3 Uranium Calculation

Quantities transferred to waste are calculated using after-sampling and after-transfer measurement data. For calculation of volumes, in-tank density measurements are used. While laboratory densities are more precise, there is the potential for density measurement problems due to solids and in-tank densities are more representative.

Uranium concentrations are determined in the laboratory. The analytical method is determined by the concentration. Method selection is based upon operator visual indications. Very low concentrations are analyzed by a fluorometric method. Middle levels (up to 40 grams/liter) are determined by a volumetric titration. Higher levels (above 40 grams/liter) are by a weight based potentiometric titration method.

### 6.6.4 Measurement Data Comparisons

Measurement data comparisons for GPW check tank measurements are used in essentially the same way as discussed for product and input measurements. Several minor but important differences exist. Uranium concentrations for low levels cannot be predicted from acid and density. Thus, this comparison to analytical determinations cannot be made. Also, waste tanks are equipped with Taylor and Westinghouse transmitters, not the precision Ruska gauges. These two process-type transmitters must be compared to each other and to laboratory analyses. This provides some data on the performance of this type of instrument.

Another important fact is that waste transfers are made to waste storage. A receiving measurement is not available for comparison such as for product and input. Thus, performance must be measured against indicators other than transfer versus received measurements.

The density measurement comparisons are the most sensitive for GPW measurements as for previous measurements. The comparison also reveals some interesting performance characteristics for these process-type instruments.

Appendix L includes the summary of comparisons of density measurements for the GPW check tank. A graphic representation of these comparisons is rather cumbersome so some additional tools were developed.

An iterative calculation of average and standard deviations for each of the comparisons was applied. This iterative calculation was the same as applied to the differences between product and input measurements (see Section 6.5.5). For each comparison, the average difference and standard deviation were calculated. Limits of three standard deviations around the mean were calculated for each comparison. The individual comparisons were reviewed and any comparison which exceeded the limits was excluded in a recalculation of the limits. The process was iteratively applied until no additional comparisons were eliminated.

Table 6-11 shows the results of this application. Column (1) is the Taylor density as shown in the comparison summary in Appendix L, Column (2) is the Westinghouse determined density, and Column (3) is the laboratory determined density. The same column numbers apply in Table 6-11. The first iteration shows the Taylor to laboratory density comparison (1-3/3) averages 0.83% ±2.18% over the entire integrated uranium run. Similarly, the Westinghouse to laboratory density (2-3/3) averages 0.48% ±3.4%. Subsequent iterations point to "outlier" batches. In all, 25 batches end up as "outliers" in this analysis and the final averages show the Taylor instrument at 0.52% ±0.59% and Westinghouse at -0.03% ±2.36%.

On the surface, this indicates 1% of the total batches exhibited measurement errors. The Taylor instrument was biased 0.52% and exhibited a precision of ±0.89% at the 1S level. The Westinghouse exhibited average bias of -0.03% with ±2.36% performance at the 1S level. This suggests a sampling or other measurement problems 1% of the time, and the Westinghouse instruments did not perform with the precision of the Taylor.

The first suggestion corresponds to the expected sampling problem. As the problems with solvent developed, sampler pluggage and sampling difficulties increased. Indications are that sampling problems occurred in 1% of the batches.

The second suggestion is that Westinghouse performance was poor. Table 6-12 shows each density determination for each batch. Comparison data is replaced by an indication of whether the individual comparison was above or below the final calculational average difference. This shows an interesting trend. For essentially all batches through 606, the Westinghouse to laboratory comparison is above the average. From 607 on, it is mostly below the average. Through the whole run, the Taylor comparison tends to vary around the average. This shows the Westinghouse instrument drifts with time and drifted throughout the run toward a consistently lower reading. These drifts resulted in the large 2.36% variation. Subsequent evaluations indicate the short-term precision of the Westinghouse instrument is equal to the Taylor, but it exhibits the drift problem.

The two very significant findings are evident from comparison data. This shows the value of comparisons not only in problem batch indications but in systematic problem detection.

### 6.6.5 GPW Check Tank Measurement Evaluation

GPW check tank measurements exhibited problems. The problems centered around solvent and the ramifications of solvent in waste systems. By the fact that the BNFP was operated in the R&D mode, we can pinpoint the problem and magnitude.

As discussed in Section 6.3.5, the cumulative summary eliminating the effects of input and product measurements shows an ID of 268.8 kilograms. This is a significant quantity in relation to the amount of

uranium in the facility and represents a real problem. It must also be viewed in the context of the total throughput of 308 MTU. Thus, the problem is 0.09% of throughput.

As discussed above and in subsequent sections, the GPW waste measurements are likely the major contributor.

The 25 batches with measurement problems contained a total of 88 kilograms uranium as measured. It is not likely these could be off by more than 10%, so they are not considered to be major contributors to the problem. This leaves a systematic problem as the source of the difficulty.

One possible explanation is that the uranium losses were associated with solvent losses. Run evaluations showed a solvent loss equal to about 178 liters/day, or about 11,000 liters.

The total measured solution transferred through the GPW system to waste during the integrated run was 130,000 liters. If all the organic losses were via the GPW system, they would constitute only approximately 8% of the volume. The average uranium concentration through the GPW system in the run was 6.5 grams/liter. If all the missing uranium was in the lost organic, the average organic uranium concentration would have been about 24 grams/liter. This is a reasonable concentration of solvent in equilibrium with 6 grams/liter aqueous waste and makes the concept reasonable.

If the solvent were reaching the GPW system as a dissolved/emulsion system, by the time it reached the GPW check tank, it would likely have separated as an organic skim on each batch with some residual emulsion towards the top of the tank. This would not be detected by routine sampling and measurement comparisons since the sparger is off during sampling. This is likely the case and it is concluded that it constitutes a majority of the ID problem. The solution to the problem is difficult, but the important fact is that a measurement problem with a magnitude of less than 0.09% of throughput was detectable.

## 6.7 HWW Sample Tank

This section describes measurements of waste solutions in the HWW sample tank. Appendix L includes batch summaries and individual batch measurement data.

### 6.7.1 HWW Sample Tank Measurement Description

The HWW sample tank is the final accountability point for high-level waste solutions (HAW) prior to transfer to waste storage. The high-level waste system (HAW) handles the high activity waste solutions from the codecontamination cycle, the first cycle of fission product removal. Solutions are collected batchwise in the HWW sample tank and transferred to waste. During the FY 1979 Integrated Uranium Run, these solutions

were transferred to the ILW storage tank along with GPW check tank transfers.

The HWW sample tank is instrumented like the GPW check tank. Liquid level and density measurements are made using the dip tube bubbler system. Differential pressures are sensed by Taylor and Westinghouse transmitters. Strip-chart readout is provided for Taylor instruments and previous voltmeters provide readout for Westinghouse instruments. A Type K thermocouple senses in-tank temperatures. All instruments are also interfaced to the CNMCAS system for computer readout.

HWW sample tank data was recorded manually for all of the FY 1979 run. Computer generated measurement data is available for the last two campaigns. As with the other measurement, data from both the manual and computer systems agreed. Manual data is discussed in this section for completeness.

The HWW sample tank only receives aqueous waste from the co-decontamination cycle. With only one cycle of cleanup feeding the HAW and this cycle being at the form of the process, the HWW does not see the myriad of solutions containing solids, solvents, and solvent degradation products like the GPW system. Thus, measurements during the integrated runs were much better than GPW measurements. The operating problems characteristic of integrated run activities which created problems in GPW measurements were not present in the HWW.

### 6.7.2 Measurement Sequences

The measurement sequences used for HWW sample tank measurements are the same as applied for GPW check tank measurements. Before-sample, after-sample, and after-transfer measurements are recorded. Measurement comparisons are applied. Like the GPW check tank transfers, uranium concentration determinations must be made prior to transfer.

### 6.7.3 Uranium Calculations

HWW sample tank transfer quantities are calculated from after-sample and after-transfer measurement data. Volume calculation is made using appropriate liquid level measurement. Like the GPW check tank, in-tank density measurements are used, since samples may not be representative of solids content, and factors to correct density from laboratory temperature to tank temperature have not been developed.

### 6.7.4 Measurement Comparisons

Density measurement comparisons are considered the most important for HWW sample tank measurement like those measurements discussed above. Also, like the GPW check tank measurements, HWW sample tank batches are transferred directly to waste storage. Batchwise comparisons like input and product are not available. Thus, measurement evaluation must rely on material balance measurement data and available individual measurement comparisons.

Density measurement comparisons provide the indication of measurement performance. The summary of the individual measurement comparisons is included in Appendix L. The data were submitted to the same kind of analysis as GPW density measurement comparisons. The average and standard deviation was calculated for each type of comparison and the results were used to indicate "outliers." These were eliminated and new limits calculated. The process was iteratively applied until no new outliers appeared. Table 6-14 is the summary of this iterative calculation.

With this analysis, 10 of the 148 batches show a problem with one or more of the comparisons. An indication of the type of problem is also available from the comparisons. Of the 10 indicated problem batches, only one shows problems with both Westinghouse and Taylor determinations. A problem in sampling or probe difficulty is indicated when both instruments show problems. Thus, this one batch is the only one indicating possible sampling problems from this analysis. The other 9 batches with problems show one of the instruments as an outlier. This is indicative of an instrument reading problem only.

Thus, from the data, it is concluded sampling problems or probe plugging was not a particular problem with HWW sample tank measurement. This was expected, since the HAW did not see the problems as experienced in GPW check tank measurement. The HWW saw solutions from the co-decontamination cycle representative of the solutions expected during routine operations. It demonstrated that accurate measurements of waste solutions can be made in a plant operating routinely.

The second area of interest in the comparison summary is measurement performance. After the iterative applications, the final performance summary shows the Taylor instrument averaged 2.8% different than laboratory analysis with a standard deviation of 0.55%. The Westinghouse instrument averaged 7.29% difference with a standard deviation of 2.17%. The average difference is not a problem, since calibration can correct for the affect. However, the standard deviation of the Westinghouse was a factor of four greater than the Taylor.

Laboratory testing of these instruments indicates the accuracy should be comparable. Table 6-15 shows each comparison related to the average with a "+" indicating above the average and "-" indicating below. The results of this calibration show generally "+" readings for the first part of the run drifting to mostly "-" readings. Several recalibrations were made between Batches 200 to 220, as evident from the specific results in Appendix L. But the "+/-" summary is indicative of the drift problem and this is reflected in the final calculated accuracies. This confirms the results seen for the GPW check tank. The Westinghouse instruments exhibit more drift than Westinghouse transmitter.

This is not necessarily a problem and may prove to be a valuable safeguards tool. Further investigation indicates specific instruments exhibit characteristic drifts. When these instruments are characterized, the instruments can be installed and monitored for drift rate.

Thus, measurement of specific batch measurements must show characteristic instrument comparisons related to time. This provides an element of tamper-safe to measurement data and the indicated instrument sensitivity may be significantly enhanced.

This is true even of Taylor instruments. The "+/-" summary indicates the instrument performs with discrete shifts yet does not exhibit the drift of the Westinghouse. Further investigation may correlate these shifts to environmental effects and monitoring temperature and humidity may allow prediction of characteristic shifts.

These comparison summaries are important in characterizing instrument performance as demonstrated with HWW measurement data. Also, HWW measurements show only a few problems which were expected due to operating considerations. A considerably larger number of problems were indicated by GPW check-tank measurement comparisons, again as expected from operating considerations. This demonstrates the sensitivity of the comparisons to measurement problems. Careful application of the techniques in a real-time situation by trained personnel can reveal problems and allow corrective action before measurement problems impact material balance performance.

### 6.7.5 HWW Sample Tank Measurement Evaluations

The HWW sample tank measurements did not show problems. Measurement data comparisons show measurement equipment and sampling functioned well. Unfortunately, material balance summary is the only method to evaluate overall HWW sample tank measurement performance. As discussed in Section 6.6, GPW check tank measurements are blamed for material balance difficulties and, based on the other performance indicators, HWW sample tank measurements are assumed to be excellent.

## 6.8 Physical Inventory

A physical inventory involving process equipment draindown and flushout was performed after each of the three campaigns during the FY 1979 Integrated Uranium Run. An inventory was also conducted prior to the start of the run. The period between the conclusion of the FY 1978 Integrated Uranium Run and the start of the FY 1979 run was devoted to process modifications and some additional contract work involving uranium solutions. Therefore, this period is also considered in inventory discussions.

As reported in AGNS-1040-2.2-50, the most significant conclusion from the FY 1978 Integrated Uranium Run was that facility operations during an inventory period have a major effect on inventory performance. Process upsets tend to send uranium to equipment that is difficult to inventory. Thus, operating problems have a significant and direct influence on inventory problems.

Activities during the FY 1979 Integrated Uranium Run in the area of inventory were to develop procedures that handle these problems and that

are insensitive to operational difficulties. Results indicate inventory procedures are effective and flushout inventories properly conducted isolate uranium in measurable places to within a few kilograms uranium.

### 6.8.1 Introduction

Inventory procedures for the FY 1979 Integrated Uranium Run were issued as a part of the Integrated Uranium Run Plan, AGNS-1040-6.1-66. Each inventory consisted of processing the feed solution in the HA feed tank (21-D-201) until the tank had been emptied, and then subsequent shutdown, draining, and flushing of solvent extraction cycles in sequence to process the remaining in-process uranium through to product. This was followed by shutdown of the solvent and acid recovery systems and the waste handling systems. The product material (the ≈12 MTU used during the FY 1979 Integrated Uranium Run) was stored in uranium product and headend vessels. The procedures were adapted to approximate the inventory sequence during normal operations. To this extent, the inventory quantities in the process vessels should be typical of normal operations, except for the quantities in the uranium product and headend tanks.

The condition of large inventory quantities in headend and product vessels is important. With the exception of the uranium product sample tank (24-D-204) and the accountability tank (18-D-101), the other tanks are normal process tanks equipped with process control-type measurement instrumentation. These tanks are not equipped for precise measurements on large quantities of uranium solutions. This situation is no problem during routine operations. The inventory quantity normally found in these vessels is only a few kilograms uranium. An uncertainty of ±5 to 10% on these measurements is acceptable for normal inventories. However, for between-campaign inventories during a uranium test run, the tank may contain 2000 kilograms uranium. An uncertainty of ±5% represents ±100 kilograms uranium and has a significant impact on inventory results. Thus, the inventories after Campaigns 1 and 2 must be viewed with this in mind.

The final inventory incorporated a very extensive flushout and draindown after the bulk of the uranium had been returned to the $UF_6$ Facility, and it demonstrates potential inventory capabilities. A rather extended period of time was required to complete this inventory (approximately ten days). However, additional experience would considerably reduce this time requirement, and routine inventories should be able to approach this level of plant cleanout.

The ending inventory for the FY 1978 Integrated Uranium Run also incorporated a very extensive flushout. During the period from the end of FY 1978 to the beginning of the FY 1979 Integrated Uranium Run, activities included process modifications such as the product tank functional change. Some additional contractual activities involving uranium solution handling were also conducted. An inventory was taken prior to the start of the FY 1979 integrated run and this allows

consideration of the material balance between FY 1978 and FY 1979 activities.

### 6.8.2 FY 1978 Integrated Uranium Run - Ending Inventory

The final inventory after the conclusion of FY 1978 Integrated Uranium Run activities involved extensive flushout of process equipment. All product uranium was removed from the Separations Facility and transferred to the $UF_6$ plant for storage. Vent headers, decanters, separators, process lines, columns, and vessels received extensive flushes. Solutions were pocketed and measured. The final inventory quantity was 20.6 kilograms uranium. The detailed listing of vessels and inventory quantities is included in Table 6-16.

### 6.8.3 Prestartup Inventory

The prestartup inventory was conducted just prior to the start of the FY 1979 activities. During the period from the end of FY 1978 activities, 2920.9 kilograms uranium were received for conduct of the BNL contract activities. These activities ran up to the start of the FY 1979 Integrated Uranium Run. Also just prior to the inventory, three additional batches of uranium were received in the Separations Facility in preparation for the run. These quantities were measured as part of the inventory. See Table 6-17 for the detailed listing of inventory quantities for the prestartup inventory.

This inventory had problems. It was conducted at the start of operations and the plant was not fully flushed with quantities pocketed prior to inventory. The major quantities in the FAT dissolver flush accumulator and HA feed tank were measured but measurement data was not verified by Ruska measurements. Thus, the indicated ID of -160.5 was probably influenced by these measurements. This quantity represents 4% of the total in the FAT, HA feed and dissolver flush accumulator tanks. These tank measurements can easily be in error by this much.

This again points to the importance of the large volume tanks during inventory. A routine inventory during normal operations should find these tanks with a small quantity of flush solutions at a few grams/liter concentration. The impact of ±5% of this small quantity on total inventory and material balance quantities would be minimal. The impact of a full tank with concentrated feed is maximum.

### 6.8.4 Campaign 1 - Ending Inventory

A full system flushout inventory was conducted at the end of the first campaign. The summary of inventory quantities in the Campaign 1 ending inventory is presented in Table 6-18. Like the inventories during the FY 1978 run, the uranium solutions used for the testing activities were pocketed in product and headend tank. This leaves the same problem of measuring concentrated feed solutions in these "process" vessels. With the problems that have resulted in the past (particularly in the

prestartup inventory), special procedures were developed to accurately measure these tanks.

The fact that the inventory difference (ID) was only 28.8 kilograms uranium versus the ID of -160.5 kilograms uranium for the prestartup inventory indicates that the missing uranium was accounted for in this inventory. The ID is only about 0.04% of the campaign throughput, which indicates excellent overall measurement performance.

The most significant occurrence during the first campaign which impacted inventory measurements was handling of some solvent during startup for the first campaign. This solvent sat on top of some aqueous solution in the sump collection tank while the aqueous was being boiled off. This "cooked" the solvent for a long period of time. Severe degradation occurred and the solvent complexed a considerable amount of uranium. It was eventually pocketed in the solvent burner feed. There was some question as to the accuracy of the analytical measurement of the degraded solvent. It is possible that this uncertainty had an effect on the ID for this and subsequent inventories.

### 6.8.5 Campaign 2 - Ending Inventory

The same procedures were used for Campaign 2 ending inventory as provided for the ending inventory for Campaign 1. The problem solvent remained in the solvent burner feed tank for this inventory. Campaign 2 was devoted to coprocessing flowsheet tests, a flowsheet whereby the plutonium cycle received uranium to effect a 75% to 25% uranium/plutonium ratio in plutonium product. This puts an additional burden on plutonium cycles but does not affect inventory procedures. The Campaign 2 inventory quantities are shown in Table 6-19.

The only indication of problems with the Campaign 2 ending inventory was in the GP waste system. Some of the final inventory samples showed considerable organic, and it is likely some GP waste system tanks and the sump collection tank contained an undetected two-phase system. This may have contributed to the 107.8 kilograms ID quantity. However, the majority of the problem was likely in GP waste measurements, as discussed in Section 6.6. The high burden on plutonium cycles resulted in high flow rates and a possible carryover of solvent to waste systems.

All these factors point to continued excellent inventory performance. The ID is sensitive to a problem of 107 kilograms uranium in 110 MTU throughput and it is likely a problem with waste measurements. The only difficulties encountered were two-phase systems in the GP waste system. This again underscores the importance of operating conditions on inventory performance and the need for consideration of this performance during inventory.

### 6.8.6 Campaign 3 - Ending Inventory

The Campaign 3 ending inventory included the routine inventory with transfer of product solutions to $UF_6$ rather than pocketing in product

and headend vessels. An additional 30 kilograms uranium (based on sample and analyses) was added to the problem solvent in the solvent burner feed tank during this campaign. The campaign was devoted to continued coprocessing flowsheet demonstration and a maximum throughput rate test. This continued the burdens on the cleanup cycles and the associated solvent carryover problems. As a final check on the inventory, a thorough plant cleanout was performed, followed by acid and caustic flushes to pick up any additional uranium missed by inventory. The results of the inventory are shown in Table 6-20.

Due to time limits under the DOE contract, the post inventory flushes were combined with a solvent cleanup campaign to treat the bad solvent in the solvent burner feed tank. For this reason, the absolute quantities associated with each of these efforts are somewhat difficult to distinguish. As of October 1, 1979, approximately 20 kilograms uranium had been measured through the GPW check tank associated with flush solutions. The inventory shows all but about 4 kilograms of the total was associated with the bad solvent. Thus, the maximum error in the flushout inventory is less than 16 kilograms uranium. This means that the routinely applied inventory procedure is capable of reducing plant inventory to the range of 20 to 30 kilograms uranium, and, with some additional precautions, this is measurable. This would make the inventory of 20 to 30 kilograms uranium during a six-month inventory (at 1500 MT/yr) only 0.002% of throughput with plant systems and procedures capable of measurements to this level.

Thus, inventory quantities appear to be representative and the indicated ID of 128.1 kilograms is likely associated with the same waste problems discussed in Section 6.8.5 and 6.7. The entire third campaign subjected processing equipment to high throughput rates during coprocessing and rate tests. If this ID is totally associated with waste problems, it is ≈0.2% of throughput. About half of the second campaign was devoted to coprocessing tests. Thus, if the ID for the second campaign was the result of high processing rates during these tests, it represents 0.2% of throughput here as well. This is definitely an area of future investigation. However, it is important to note that the measurement system is sensitive to this level of problem with the BNFP in the R&D mode.

## 6.9 Measurement Control Summaries

The measurement control program is designed to meet the following objectives:

- The detection and correction of measurement anomalities at the time of measurement
- The collection and evaluation of data to estimate random and systematic error
- The detection and correction of measurement biases

- The propagation of measurement uncertainties into Limits of Error (LE).

This section details the approaches taken to accomplish these objectives, provides the results of the approaches, evaluates the effectiveness of the approaches, and recommends improvements or enhancements to the approaches.

### 6.9.1 Controlling Measurement Anomalies

In order to ensure that measurement performance approaches measurement capabilities, a series of checks and comparisons have been established to provide for timely detection of measurement problems. These comparisons are provided to detect recording errors, equipment malfunction, and/or measurement system anomalies. The current concept is based on the traditional Shewhart control chart with warning limits set at two standard deviation (s) and out-of-control limit set at 3 s or two consecutive points about the warning limits.

While the control limits concept was effective for flagging most measurement problems, the responsiveness of control limits to a sudden or abrupt shift in instrument output needs to be improved. Additional software and evaluation tools for the operator and/or his supervisor are needed to ensure that the system is responsive to trends and shifts.

The approaches used during the FY 1979 integrated uranium run to ensure reliable bulk measurements, sampling, and analytical measurements are discussed in the following sections.

#### 6.9.1.1 Bulk Measurements

Bulk liquid measurements consist of pressure differential measurements for liquid level and density, a temperature measurement from a Type K thermocouple, and density measurements on samples by laboratory personnel. The tank instrumentation for the product and input measuring tanks is shown in Figure 6-1.

Two instruments in parallel, a precision differential pressure gauge (Ruska DDR 6000) and the installed differential pressure transducer - strip chart readout (Taylor instrument loop), were provided for the differential pressure used in determining liquid level. (Hereafter, in Section 6.9, these instruments are referred to as Ruska and Taylor, respectively.) For density measurements, the difference between Ruska level and Ruska density readings (representing the differential pressure between the low pressure probe and the reference probe) is used to calculate process density. The Taylor density transducer is installed across the high pressure and density probe in the normal manner and provides a direct measurement of density.

The tank instrumentation for the two waste measurement tanks is shown in Figure 6-7. For these tanks, two instruments in parallel, the Taylor

instrument and a Westinghouse transducer with readout on a digital voltmeter, were provided for both level and density measurements.

Agreement between the Ruska or Westinghouse differential pressure and the corresponding Taylor differential pressure provides assurance that the instruments are functioning properly and that there are no large recording errors. These data comparisons provide instrument trend information which is used to indicate the need for instrument calibration and to establish calibration frequencies. Data from the FY 1979 integrated uranium run have been used to determine and update acceptable limits for these instrument comparisons to allow timely review of measurement data.

Pressure differential and temperature measurements are taken both before and after sampling for each accountability measurement. Agreement within specified limits provides assurance that the total pressure measurement system, including the pneumatic dip tubes (probes), is functioning normally. This check between the two independent measurements is used to detect gross measurement or recording errors, tank isolation during measurement, or probe plugging problems which the instrument comparisons would not detect.

A comparison of process density measurements from Ruska or Taylor instruments to laboratory density determination provides additional assurance that the pneumatic dip tubes are not starting to plug and as an indirect check of the laboratory analysis. Trends are generally more useful than absolute differences for these comparisons.

6.9.1.2 Sampling

There are two comparisons made to ensure that representative samples are obtained. These checks are between sample density comparisons and laboratory-to-process density comparisons. Density agreement within limits between samples provides assurance that the sample circulation time was long enough to provide consistent samples. In addition to providing assurance that dip tubes are not plugging and a gross check on laboratory density as described in Section 6.9.1.1, agreement of process density and laboratory density measurements is a reasonable indication that the tank contents have been adequately mixed.

6.9.1.3 Analytical Measurements

The Analytical Method Quality Control (QC) Program is used to ensure that reliable analytical measurements are obtained and to establish systematic error variances for analytical measurements. A QC sample, concentration unknown by the analyst, is analyzed each shift that an analytical method is used. If the results of the QC sample are within established limits, the analyst and method are qualified for that shift.

For the input and product uranium concentration measurement, a comparison of uranium concentration calculated from acid and density

measurements to the analyzed uranium concentration was found to be effective in detecting measurement anomalities.

### 6.9.2 Estimating Random Error Variances

The precision of the measurement systems and methods used during the FY 1979 integrated uranium run is estimated by replicate measurements. The calculation methods and measurements replicated are described in the following sections.

#### 6.9.2.1 Bulk Measurement Precision

Data taken for bulk measurements include both before-sampling and after-sampling differential pressure and temperature measurements. From these data, the mass of solution before-sampling was compared to the mass of solution after-sampling. The variance of the differences provides an estimate of the precision of the bulk measurement system. The random error variance estimate is calculated by the following formula:

$$s^2 = \frac{n\sum_{i=1}^{n} (d_i)^2 - \left(\sum_{i=1}^{n} d_i\right)^2}{2n(n-1)}$$

Where: $d_i$ = difference between mass of solution before- and after-sampling of batch i

$n$ = number of measurements.

For the accountability tank (18-D-101), data taken for bulk measurements included both after-transfer and before-receipt differential pressure and temperature measurements. The random error variances for solution heel measurements in the accountability tank were calculated as above, except d is the difference between mass of solution measurement after-transfer and before-receipt.

For the accountability tank, the two variances are combined into a single variance representing the variance associated with a net transfer.

$$s_n^2 = s_f^2 = s_h^2$$

Where: $s_h^2$ = random error variance associated with a net transfer bulk measurement

$s_h^2$ = random error variance associated with a full tank bulk measurement

$s_h^2$ = random error variance associated with a heel measurement.

The coefficient of variation ($\hat{\gamma}$) for the accountability tank is calculated from the above variance by the following formula:

$$\hat{\gamma}_{br} = \frac{s_n}{\left[\sum_{i=1}^{n} x_i\right] / n}$$

Where: $x$ = weight of solution in batch i
$n$ = number of batches
$\hat{\gamma}_{br}$ = coefficient of variation for bulk measurement random error.

For the uranium product sample tank (24-D-204), HWW sample tank (41-D-405), and GPW check tank (43-D-409), the standard deviation of a net bulk measurement was estimated by twice the variance of a single full tank measurement. The corresponding coefficient of variation is calculated by the following formula:

$$\hat{\gamma}_{br} = \frac{\sqrt{2}\, s}{\left[\sum_{i=1}^{n} x_i\right] / n}$$

Where: $x$ = weight of solution in batch i
$n$ = number of batches
$\hat{\gamma}_{br}$ = coefficient of variation for bulk measurement random error.

This equation applies to the coefficient of variation associated with a net quantity transferred.

Listings of mass comparisons for after-transfer to before-receipt, before-sampling to after-sampling for the accountability tank, and for before-sampling to after-sampling for the uranium product sample tank, GWP check tank, and HWW sample tank are provided in Tables 6-21, 6-22, 6-23, and 6-24. The estimated standard deviation for random error for a net solution measurement for each of the four input/output points is provided in Table 6-25.

6.9.2.2 Sampling and Analytical Measurement Precision

The replicate measurement program to establish the random error estimates consisted of analytical QC personnel selecting, coding, and submitting a second sample at a later time for analyses. The replicate sample was coded to ensure that the analyst would not be able to compare or be influenced by the original result. Approximately 20% of the input, product, and waste output measurements were submitted for replicate measurements.

The random variance for sampling and for analytical measurements is combined as a single variance and calculated by the following formula:

$$s^2 = \frac{\sum_{(i=1)}^{n} (d_i - \bar{d})^2}{2(n-1)}$$

Where: $d_i$ = difference between original and replicate for measurement i,

$\bar{d}$ = average difference between original and replicate measurements

n = number of replicate measurements

The analytical methods of concern for uranium concentration are isotopic dilution mass spectrometry (U-ID), potentiometry (U-VP-1), fluorimetry (U-F-1), volumetry (U-VI-1), and density method (DM-DM-1). Tables 6-26 through 6-29 provide a tabulation of the original and replicate results for these methods.

Note that the variance of random error for sampling and analysis ($s_{ar}$) for the uranium product sample tank was significant difference than the corresponding variance for the accountability for Campaigns 2 and 3. The "F" test was used to compare these variances.

To simulate the analytical and sampling variance for input measurement expected for reprocessing operations, the samples for Campaign 3 were diluted remotely. The data from this test and an evaluation of these data are presented in Appendix G.

### 6.9.3 Estimating Systematic Error Variances

Systematic error variances are estimated by calibrations, standard measurements, and statistically designed tests. The methods used for estimating these variances for sampling, bulk, and analytical measurements are described in the following subsections.

#### 6.9.3.1 Bulk Measurement Accuracies

The accuracies of bulk measurements of process liquids are established based on the initial vessel calibration data and the calibration of differential pressure measurement systems. These data are summarized in Table 6-25 by measurement point and the corresponding standard deviation. The estimated systematic error variances for bulk measurement for the four input/output measurement points are significantly smaller than the corresponding analytical variances.

#### 6.9.3.2 Sampling Accuracies

Since sampling standards do not exist, systematic error introduced by the long sampling lines using vacuum-assisted air lift sampling systems

is determined experimentally. The accountability tank and the uranium product sample tank have long sample circulation lines at relatively high elevations and are used for the tests to quantify any bias and the magnitude of the systematic error variance introduced by the sampling systems.

The tests include determining the degree of homogeneity obtained by the mixing system by sampling the mixed solution at randomly selected depths.

After ensuring that the solution is mixed, multiple pairs of samples are taken and the results compared. Each pair consists of a dip sample taken directly from the vessel and a sample obtained from the remote needle sampling system.

Tests completed in FY 1978 using uranyl nitrate at ambient temperatures with density as the indicator of bias showed no significant bias in the vacuum-assisted air lift sampling system for the accountability tank. Equivalent data were not obtained for the uranium product sample tank. Tests planned for FY 1979 included performing the tests at nominal operating temperature of about 50°C. The results of these tests are presented in Appendix F. These data indicated the need for additional tests of the sampling system as well as providing the basic for the coefficient of variance ($\hat{\gamma}_{SS}$) used as the estimate of sampling systematic errors for the uranium product sample tank.

The coefficients of variation given in Table 6-25 for the HWW sample tank and GPW check tank are estimates which consider the fact that solids were present for some of the waste batches. While these estimates would normally be conservative, the possibility of organic in waste batches makes any estimate meaningless.

6.9.3.3 Analytical Accuracies

The systematic errors associated with analytical measurements are estimated by measurements of standards. The standards are quality control (QC) samples analyzed each shift that an analytical method is used. These data are summarized by Analytical Services' QC personnel and a monthly report issued to Nuclear Materials Control.

The results of QC samples analyzed during a particular time period are used as the basis for both bias corrections and estimates of systematic error variances. The estimated standard deviations for analytical systematic errors used in calculating limits of error are provided in Table 6-30. The apparent bias for each analytical method is also provided in this table.

The uranium concentration of input batches was determined by both potentiometric (U-VP-1) and isotope dilution mass spectrometric (U-ID) analytical methods. These data are tabulated for Campaign 2 and Campaign 3 in Tables 6-31 and 6-32. Note that the U-ID data for Campaign 3

consists of QC samples remotely diluted and should be representative of reprocessing input measurements.

Since the U-VP-1 method was used for both input and product measurement, any systematic error effects cancel. Therefore, bias correction of the input and product analyses would not affect these material balance determinations. Table 6-35 shows a material balance and associated limits of error using U-VP-1 for both input and product. Corresponding results using U-ID for input and U-VP-1 for product measurements are provided in Table 6-39. Note these data do not include results of bias correction of analytical results based on the remote dilution data obtained during Campaign 3.

Analytical Services' QC personnel have implemented a mass and balance quality control program. The program provides the methods used to ensure that all mass measurements are traceable to the National Bureau of Standards and that balances are tested to ensure operation within 3 s control limits.

### 6.9.4 Propagation of Error Variances

The error variance estimates generated by the methods described in the above sections were propagated into a single variance for each measurement point by the following equation:

$$s^2 = \sum_{i=1}^{n} \left\{ x_i^2 \left[ \left( \frac{s_{br}}{W_i} \right)^2 + \left( \frac{s_{ar_j}}{U_i} \right)^2 + \left( \frac{s_{ar_k}}{U_i} \right)^2 \right] \right\} + \left[ \sum_{j=1}^{n} x_i \right]^2 \left[ \left( \frac{s_{bs}}{\bar{W}} \right)^2 + \hat{\gamma}_{ss}^2 \right] + \left[ \sum_{j=1}^{n} x_j \right]^2 \left[ \frac{s_{as}}{\bar{U}_j} \right]^2 + \left[ \sum_{k=1}^{p} x_k \right]^2 \left[ \frac{s_{as}}{\bar{U}_k} \right]^2$$

Where: $x_i$, $x_j$, $x_k$ = kilograms uranium in batch i, j, and k

$s_{br}$ = estimated standard deviation of random error associated with a net kilogram solution measurement

$W_i$ = kilogram solution in batch i

$s_{ar_j}$, $s_{ar_k}$ = estimated standard deviation of random error associated with analytical and sampling for methods j and k

$U_i$ = uranium concentration for batch i

$s_{bs}$ = estimated standard deviation of systematic error associated with a net kilogram solution measurement

$\bar{W}$ = average kilogram solution for n batches

$s_{as}$ = estimated standard deviation of systematic error associated with analytical measurement

$\hat{\gamma}_{ss}$ = estimated coefficient of variation for systematic error associated with sampling.

$\bar{U}_j$, $\bar{U}_k$ = average uranium concentration for batch using methods j and k

6.9.4.1 Input Measurement Uncertainty

The initial input measurements were made in both the $UF_6$ Facility and the accountability tank in the Separations Facility. The difference between the two measurement points was not statistically significant at the 95% confidence level. Since there is no significant difference in the two quantities, the quantities measured in the Separations Facility accountability tank are used for material balances.

The input measurement uncertainty is dominated by the analytical error variances. The single batch uncertainty using the U-ID method and variances obtained from the remote dilution study is about 1.8% with random error variance from sampling and analysis being the dominate error.

The single batch measurement uncertainty for the accountability tank using U-VP-1 method is about 1% with analytical and sampling error variances contributing the most to measurement uncertainty. For the 64 batches measured for Campaign 2, the uncertainty is reduced to about 0.1%.

6.9.4.2 Product Measurement Uncertainty

Uranyl nitrate product was measured both in the uranium product sample tank and in the accountability tank or in the $UF_6$ Facility for the final batches. A comparison between product and receiving tank measurements showed that there was no statistically significant difference between the measurements.

The measurement uncertainty for a single batch measurement was about 0.83% with random error variance associated with sampling and analysis being the dominate error. However, systematic error variances dominate the total uncertainty as the number of batches increase.

6.9.4.3 $UF_6$ Measurement Uncertainty

The measurements made in the $UF_6$ Facility were equivalent to those made in the accountability tank and uranium product tank in Separations Facility. To demonstrate the difficulty in comparing individual measurements when very long pipe lines are available, Tables 6-33 and 6-34 are provided. Note that for both the initial input values (Table 6-33) and the final product batches (Table 6-34), the overall agreement is

excellent. However, it is readily apparent that piping holdups dominate single batch comparisons.

The limit of error for final product measurements is 40 kilograms uranium for the uranium product sample tank and 49 kilograms uranium for the UN accountability tank. The difference of 24.9 kilograms uranium was considerable smaller than the combined limit of error of 63 kilograms uranium.

The limit of error for the initial input batches is 53 kilograms uranium for the UN accountability tank and 26 kilograms for the accountability tank. The 14 kilograms uranium difference is very small compared to the combined limit of error of 59 kilograms uranium. In these comparisons of a few batches, the random error variances dominate the calculated limit of error.

#### 6.9.4.4 Liquid Waste Measurement Uncertainties

The uncertainties of the liquid waste measurements in the GPW check tank and the HWW sample tank were relatively large. However, since the total quantities discarded were about 0.5% of the input quantity, the uncertainty was not the major contributor to the limit of error associated with the balance.

It should be noted that the limit of error for the overall balance excluding input and product recycle indicates a significant inventory difference. Because of the agreement with $UF_6$ for the initial quantity received, the final product batches, and the size of the beginning and ending inventories, the waste measurements are suspect. If organic solutions were present in the waste batches, the measurement would be biased. Furthermore, the bias would not be detected nor would the limit of error for the waste measurement or the balance reflect the bias.

##### 6.9.4.4.1 Uncertainty of HWW Waste Measurements

The measurement uncertainty for Campaigns 2 and 3 batches of waste measured in the HWW sample tank was ±9.6 kilograms uranium or 3.8 of the quantity measured. However, this represents less than 0.14% of the total input to the process.

##### 6.9.4.4.2 Uncertainty of GPW Waste Measurements

The measurement uncertainty for Campaigns 2 and 3 batches of waste measured in the GPW check tank was ±31.7 kilograms uranium or ±5.5% of the quantity measured. This represents less than 0.02% of the total input to the process.

#### 6.9.4.5 Inventory Measurement Uncertainties

The inventory measurement uncertainties for the beginning and ending inventories for the FY 1979 integrated uranium run are estimated at about 5% for the beginning and ending inventories. Because the

inventory quantities are a small percentage of the initial and total input quantities, the inventory uncertainty quantities do not contribute significantly to the overall material balance uncertainty. Measurement uncertainties for the intermediate inventories were estimated at about 1%.

### 6.9.4.6 Material Balance Measurement Uncertainties

The measurement uncertainty of a material balance is calculated by combining the material balance component uncertainties for input, product, waste, and inventory using the sum of squares technique. This has been done for overall material balances using U-VP-1 and U-ID for input, with and without considering uranium product recycle from the uranium product sample tank to the accountability tank.

#### 6.9.4.6.1 Material Balance Measurement Uncertainties with Recycle Campaigns 2 and 3

The measurement uncertainties for Campaign 2, Campaign 3, Campaigns 2 and 3 combined, and overall material balance, based on the uncertainty of the beginning inventory, input batches measured in the accountability tank using U-VP-1 for uranium concentration measurement, product batches measured in the uranium product sample tank, waste measurements in the GPW check tank and HWW sample tank, and the final Separations Facility process inventory are presented in Tables 6-35 through 6-38. Both the individual error estimates and the limits of error by material balance component and overall balance are provided.

The measurement uncertainties for Campaigns 2, 3, and 2 and 3 combined material balances were based on these uncertainties, except that of the input analysis. Uranium concentration determined by the U-ID method is presented in Tables 6-39 through 6-41. These increases in material balance uncertainties should be representative of reprocessing plant balances. The increase in the uncertainty of the input measurement from using the U-ID method highlights the fact that improvement in analytical input measurement are needed to reduce the material balance uncertainty.

#### 6.9.4.6.2 Material Balance Measurement Uncertainties Without Recycle

The measurement uncertainty for the overall material balance, excluding recycle from the uranium product sample tank to the accountability tank, is $\pm$82 kilograms uranium. This represents $\pm$0.70% of the initial 11.7 MTU input. The limit of error is a significantly larger percentage of the initial input, because of the relatively small number of measurements with random error estimates tending to dominate the total uncertainty.

Note that the inventory difference (ID) is significant. That is, the ID $\pm$ LEID does not include zero. While the reasons for the significant ID are not known, the waste measurements are considered the most probable cause. Specifically, it is probable that there was organic in the waste solutions.

### 6.9.5 Measurement Control System Evaluation

In general, the methods used to control measurement anomalies and to estimate random and systematic error variances provided assurances that reliable measurements of acceptable quality were obtained. The data collected provide the basis for calculation of quantitative control limits for those parameters important to ensuring reliable measurement.

#### 6.9.5.1 Methods to Control Measurement Anomalies

The methods used were described in Section 6.9.1. The process density to laboratory density comparison continues to be an excellent and useful tool in detecting probe and/or sampling/mixing problems. The before-sampling to after-sampling comparison also proved to be helpful in detecting probe problems.

As noted in Section 6.9.1, the control chart method with warning and out-of-control limits two and three times the standard deviation flagged most measurement anomalies. However, this sytem is slow to respond to instrument shifts. Therefore, graphic control charting and trend analyses are needed for interpretation of comparisons by the operator.

#### 6.9.5.2 Estimating Random and Systematic Error Variances

The methods described in Sections 6.9.2 and 6.9.3 appear to provide reasonable and reliable error estimates for input and product measurements. However, the methods may not adequately describe the uncertainties associated with liquid waste measurement when solids are present nor when organic solutions are present.

TABLE 6-1

MATERIAL BALANCE SUMMARY PRE-FY 1979 RUN ACTIVITIES

| | Kilograms |
|---|---|
| Beginning Inventory (FY 1978 E.I.) | 20.6 |
| Input | |
| Receipts for BNL Contract | 2920.9 |
| NT Waste Transfers* | 18.6 |
| Input Batch No. 128 | 1859.4 |
| Input Batch No. 129 | 2096.8 |
| Input Batch No. 130 | 2105.6 |
| HCLA Waste | 19.8 |
| | 9041.7 |
| Waste | |
| (GPW 399 - 474) | 29.1 |
| | 9012.6 |
| Ending Inventory (FY 1979 B.I.) | 9173.1 |
| Inventory Difference (ID) [(BI + I - W) - EI] = | -160.5 |

*Receipts of waste solutions from Engineering Laboratory.

TABLE 6-2

MATERIAL BALANCE SUMMARY CAMPAIGN 1

| | Kilograms |
|---|---|
| Beginning Inventory | 9173.1 |
| Input (batches 131-205)* | 125400.0 |
| Waste | |
| (GPW 475-563) | 304.8 |
| (HWW 106-158) | 417.6 |
| Product (batches 2-71) | 122701.0 |
| Ending Inventory | 11014.0 |
| ID (with input and product) | 131.7 |
| ID (w/o input and product) | 189.3 |
| Cumulative ID (FY 1978 to Campaign No. 1) | 28.8 |

*Includes batches received from $UF_6$: Batch 131 - 1963.8 kilograms, Batch 169 - 788.8 kilograms.

TABLE 6-3

MATERIAL BALANCE SUMMARY CAMPAIGN 2

| | Kilograms |
|---|---|
| Beginning Inventory | 11014.0 |
| Input (batches 206-271) | 110084.0 |
| Waste | |
| (GPW 564-657) | 209.8 |
| (HWW 159-204) | 94.1 |
| (Transfers to NT)* | 69.0 |
| Product (batches 72-138) | 110202.0 |
| Ending Inventory | 10533.3 |
| BPID (with input and output) | -10.2 |
| BPID (w/o input and output) | 107.8 |
| Cumulative BPID (FY 1978 to Campaign 2) | 136.6 |

*Transfer of solutions to Engineering Laboratory.

TABLE 6-4

MATERIAL BALANCE SUMMARY CAMPAIGN 3

| | Kilograms |
|---|---|
| Beginning Inventory | 10533.3 |
| Input (batches 272-315) | 65960.7 |
| (received from NT) | 104.0 |
| Waste | |
| (GPW 658-740) | 342.9 |
| (HWW 205-253) | 147.2 |
| Product (batches 139-186)* | 75589.2 |
| Ending Inventory (vessels) | 457.2 |
| (lab. samples) | 5.2 |
| ID (with input and output) | 56.3 |
| ID (w/o input and output)* | 132.0 |
| Cumulative ID (FY 1978 to Campaign 3) (without input and output) | 268.6 |

*Includes batches 178-186 transferred to $UF_6$ - 9552.8 kilograms uranium.

TABLE 6-5

MATERIAL BALANCE SUMMARY CUMULATIVE FY 1978 TO FY 1979

| | | |
|---|---|---|
| I | Beginning Inventory (FY 1978 ending inventory) | 20.6 |
| II | Input | |
| | Input (batches 128-315)* | 307,506.5 |
| | Receipts for BNL contract | 2,920.9 |
| | Receipts from NT Laboratory*** | 18.6 |
| | Receipts from NT Laboratory*** | 104.0 |
| | HCLA waste receipts | 19.8 |
| III | Waste | |
| | GPW (batches 399-740) | 886.6 |
| | HWW (batches 106-253) | 658.9 |
| | Transfers to NT Laboratory | 69.0 |
| IV | Product | |
| | (batches 2-186)** | 308,492.2 |
| V | Ending Inventory | |
| | (vessels) | 457.2 |
| | (Lab. samples) | 5.2 |
| | ID (with input and output) | 21.5 |
| | ID (w/o input and output) | 268.6 |

*Includes 8,814.4 kilograms received from $UF_6$ directly.
**Includes 9,552.8 kilograms sent back to $UF_6$.
***Transfers to and from the Engineering Laboratory.

TABLE 6-6

$UF_6$ TO SEPARATIONS TRANSFERS

| $UF_6$ Values | | | Separation Values | | | Difference ($UF_6$ - Sep.) | |
|---|---|---|---|---|---|---|---|
| Batch No. | Kgs Solution | Kgs U | Batch No. | Kgs Solution | Kgs U | Kgs Solution | Kgs U |
| 30 | 12,771.4 | 2,985.7 | BNL Receipt | 12,547.0 | 2,920.9 | 224.4 | 64.8 |
| 31 | 8,908.8 | 1,863.8 | 128 | 8,857.2 | 1,859.4 | 51.6 | 4.4 |
| 32A | 9,185.9 | 2,089.4 | 129 | 9,195.4 | 2,096.8 | (9.5) | (7.4) |
| 32B | 9,215.6 | 2,095.7 | 130 | 9,201.0 | 2,105.6 | 14.6 | (9.9) |
| 33 | 8,389.2 | 1,935.1 | 131 | 8,413.7 | 1,963.8 | (24.5) | (28.7) |
| 34 | 3,957.7 | 912.9 | 169 | 3,361.7 | 788.8 | 596.0 | 124.1 |
| Subtotal | 52,428.6 | 11,882.6 | | 51,576.0 | 11,735.3 | 852.6 | 147.3 |
| Flush | (699.8) | (161.3) | - | - | - | (699.8) | (161.3) |
| | 51,728.8 | 11,721.3 | | 51,576.0 | 11,735.3 | 152.8<br>0.30% | (14)<br>0.12% |
| Limit of error | | ±53<br>±0.45% | | | ±26<br>±0.22% | | ±59<br>±0.50% |

## TABLE 6-7

### PRODUCT TO INPUT COMPARISONS ITERATIVE OUTLIER TEST APPLICATION BEFORE CALIBRATION ADJUSTMENT

| INPUT BATCH | EXCLUDED FOR KG SOL | EXCLUDED FOR KG U | PRODUCT BATCH |
|---|---|---|---|
| NO. RESULTS | 172 | 172 | |
| AVE DIFF | 1.67 | 3.72 | |
| ST DEV | 132.52 | 29.69 | |
| 133 | OUT | OUT TOO | 2 |
| 157 | OUT | OUT TOO | 25 |
| 197 | | OUT | 64 |
| NO. RESULTS | 170 | 169 | |
| AVE DIFF | 8.36 | 3.57 | |
| ST DEV | 38.83 | 13.43 | |
| 137 | OUT | OUT TOO | 6 |
| 140 | | OUT | 9 |
| 150 | OUT | OUT TOO | 18 |
| 152 | OUT | OUT TOO | 20 |
| 153 | | OUT | 21 |
| 182 | | OUT | 49 |
| 205 | OUT | OUT TOO | 71 |
| 220 | OUT | OUT TOO | 86 |
| 227 | | OUT | 93 |
| NO. RESULTS | 165 | 160 | |
| AVE DIFF | 9.41 | 4 | |
| ST DEV | 25.09 | 8.66 | |
| 138 | OUT | OUT TOO | 7 |
| 140 | OUT | OUT TOO | 9 |
| 148 | OUT | OUT TOO | 17 |
| 154 | OUT | OUT TOO | 22 |
| 206 | OUT | OUT TOO | 72 |
| 275 | OUT | OUT TOO | 142 |
| 282 | | OUT | 149 |
| 300 | | OUT | 167 |
| NO. RESULTS | 159 | 153 | |
| AVE DIFF | 9.05 | 3.6 | |
| ST DEV | 16.83 | 6.98 | |
| 135 | OUT | OUT TOO | 4 |
| 159 | OUT | OUT TOO | 27 |
| 221 | OUT | OUT TOO | 87 |
| 231 | OUT | OUT TOO | 97 |
| 283 | | OUT | 150 |
| 297 | OUT | OUT TOO | 164 |
| 310 | OUT | OUT TOO | 177 |
| NO. RESULTS | 153 | 146 | |
| AVE DIFF | 8.19 | 3.28 | |
| ST DEV | 11.85 | 6.23 | |
| 134 | OUT | OUT TOO | 3 |
| 156 | OUT | OUT TOO | 24 |
| 167 | OUT | OUT TOO | 35 |
| 211 | OUT | OUT TOO | 77 |
| 218 | OUT | OUT TOO | 84 |
| 274 | OUT | OUT TOO | 141 |
| 301 | | OUT | 168 |
| NO. RESULTS | 147 | 139 | |
| AVE DIFF | 8.11 | 3.33 | |
| ST DEV | 9.15 | 5.72 | |
| 136 | OUT | OUT TOO | 5 |
| 153 | OUT | OUT TOO | 21 |
| 168 | OUT | OUT TOO | 36 |
| NO. RESULTS | 144 | 137 | |
| AVE DIFF | 8.34 | 3.23 | |
| ST DEV | 7.91 | 5.54 | |
| 166 | OUT | OUT TOO | 34 |
| 186 | OUT | OUT TOO | 53 |
| NO. RESULTS | 142 | 135 | |
| AVE DIFF | 8.35 | 3.17 | |
| ST DEV | 7.34 | 5.47 | |
| 172 | OUT | OUT TOO | 39 |
| 199 | OUT | OUT TOO | 66 |
| 244 | | OUT | 110 |
| NO. RESULTS | 140 | 132 | |
| AVE DIFF | 8.34 | 3.05 | |
| ST DEV | 6.84 | 5.28 | |
| 269 | OUT | OUT TOO | 136 |
| NO. RESULTS | 139 | 131 | |
| AVE DIFF | 8.5 | 3.09 | |
| ST DEV | 6.61 | 5.28 | |
| 293 | OUT | OUT TOO | 160 |
| NO. RESULTS | 138 | 130 | |
| AVE DIFF | 8.64 | 3.05 | |
| ST DEV | 6.4 | 5.28 | |
| NO. RESULTS | 138 | 130 | |
| AVE DIFF | 8.64 | 3.05 | |
| ST DEV | 6.4 | 5.28 | |

TABLE 6-8

EFFECTS OF PRODUCT CALIBRATION CORRECTION
(ADJUSTMENT FOR SPARGER VENT)

| | Before Correction for Sparger | After Correction for Sparger | Difference kgU | Difference % |
|---|---|---|---|---|
| Product Campaign 1 | 122,867 | 122,701 kgU | 166 | 0.14 |
| Product Campaign 2 | 110,337 | 110,202 kgU | 135 | 0.12 |
| Product Campaign 3 | 75,675.9 | 75,589.2 kgU | 86.7 | 0.11 |
| BPID (with I/O) | -365.3 | 21.5 | | |
| BPID (w/o I/O) | 257.6 | 268.8 | | |
| Average Difference | | | | |
| Input to Product | 8.65 kg Sol | -0.52 kg Sol | | |
| Comparison | 3.05 kg U | 1.01 kg U | | |
| Standard Deviation | | | | |
| Input to Product | 6.41 kg Sol | 6.54 kg Sol | | |
| Comparison | 5.26 kg U | 5.04 Kg U | | |

## TEST 6-9

### PRODUCT TO INPUT COMPARISONS ITERATIVE OUTLIER TEST APPLICATION AFTER CALIBRATION ADJUSTMENT

| INPUT BATCH | EXCLUDED FOR KG SOL | EXCLUDED FOR KG U | PRODUCT BATCH |
|---|---|---|---|
| NO. RESULTS | 172 | 172 | |
| AVE DIFF | -7.2 | 1.53 | |
| ST DEV | 131.86 | 29.54 | |
| 133 | OUT | OUT TOO | 2 |
| 157 | OUT | OUT TOO | 25 |
| 197 | | OUT | 64 |
| NO. RESULTS | 170 | 169 | |
| AVE DIFF | -.56 | 1.37 | |
| ST DEV | 38.71 | 13.39 | |
| 137 | OUT | OUT TOO | 6 |
| 140 | | OUT | 9 |
| 150 | OUT | OUT TOO | 18 |
| 152 | OUT | OUT TOO | 20 |
| 153 | | OUT | 21 |
| 182 | | OUT | 49 |
| 205 | OUT | OUT TOO | 71 |
| 220 | OUT | OUT TOO | 86 |
| 227 | | OUT | 93 |
| NO. RESULTS | 165 | 160 | |
| AVE DIFF | .5 | 1.82 | |
| ST DEV | 24.99 | 8.61 | |
| 138 | OUT | OUT TOO | 7 |
| 140 | OUT | OUT TOO | 9 |
| 148 | OUT | OUT TOO | 17 |
| 154 | OUT | OUT TOO | 22 |
| 206 | OUT | OUT TOO | 72 |
| 275 | OUT | OUT TOO | 142 |
| 282 | | OUT | 149 |
| 300 | | OUT | 167 |
| NO. RESULTS | 159 | 153 | |
| AVE DIFF | .15 | 1.43 | |
| ST DEV | 16.78 | 6.95 | |
| 135 | OUT | OUT TOO | 4 |
| 159 | OUT | OUT TOO | 27 |
| 221 | OUT | OUT TOO | 87 |
| 231 | OUT | OUT TOO | 97 |
| 283 | | OUT | 150 |
| 297 | OUT | OUT TOO | 164 |
| 310 | OUT | OUT TOO | 177 |
| NO. RESULTS | 153 | 146 | |
| AVE DIFF | -.7 | 1.11 | |
| ST DEV | 11.74 | 6.19 | |

| INPUT BATCH | EXCLUDED FOR KG SOL | EXCLUDED FOR KG U | PRODUCT BATCH |
|---|---|---|---|
| 134 | OUT | OUT TOO | 3 |
| 156 | OUT | OUT TOO | 24 |
| 167 | OUT | OUT TOO | 35 |
| 211 | OUT | OUT TOO | 77 |
| 218 | OUT | OUT TOO | 84 |
| 274 | OUT | OUT TOO | 141 |
| 301 | | OUT | 168 |
| NO. RESULTS | 147 | 139 | |
| AVE DIFF | -.78 | 1.15 | |
| ST DEV | 8.95 | 5.65 | |
| 136 | OUT | OUT TOO | 5 |
| 153 | OUT | OUT TOO | 21 |
| 168 | OUT | OUT TOO | 36 |
| NO. RESULTS | 144 | 137 | |
| AVE DIFF | -.53 | 1.06 | |
| ST DEV | 7.67 | 5.47 | |
| 166 | OUT | OUT TOO | 34 |
| 172 | OUT | OUT TOO | 39 |
| 186 | OUT | OUT TOO | 53 |
| 199 | OUT | OUT TOO | 66 |
| 244 | | OUT | 110 |
| NO. RESULTS | 140 | 132 | |
| AVE DIFF | -.52 | .88 | |
| ST DEV | 6.54 | 5.22 | |
| 170 | | OUT | 37 |
| NO. RESULTS | 140 | 131 | |
| AVE DIFF | -.52 | 1.01 | |
| ST DEV | 6.54 | 5.04 | |
| NO. RESULTS | 140 | 131 | |
| AVE DIFF | -.52 | 1.01 | |
| ST DEV | 6.54 | 5.04 | |

TABLE 6-10

SEPARATIONS TO $UF_6$ TRANSFERS

| Separations Batch No. | Separations Values | | $UF_6$ Values | | Difference (Sep - $UF_6$) | |
|---|---|---|---|---|---|---|
| | Kgs Solution | Kgs U | Kgs Solution | Kgs U | Kgs Solution | Kgs U |
| 178 + 179 | 16,181 | 3,807.4 | 16,028 | 3,790.0 | 153 | 17.4 |
| 180 + 181 | 14,717 | 3,436.1 | 14,398 | 3,361.2 | 319 | 74.9 |
| 182 + 183 | 13,160 | 1,904.8 | 13,438 | 2,005.3 | (278) | (100.5) |
| 184 + 185 | 12,597 | 391.5 | 12,538 | 402.2 | 59 | (10.7) |
| 186 | 1,481 | 13.0 | 1,505 | 24.7 | (24) | (11.7) |
| Subtotal | 58,136 | 9,552.8 | 57,907 | 9,583.4 | 229 | (30.6) |
| Line Flush | - | - | 4,322 | 2.2 | - | (2.2) |
| Total | - | 9,552.8 | - | 9,585.6 | - | (32.8)<br>(0.26%) |
| | LE | ±40.1<br>±0.42% | | ±48.9<br>±0.51% | | ±63<br>±0.66% |

# TABLE 6-11

## ITERATIVE OUTLIER TEST APPLICATION -- GPW CHECK TANK

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| NO. RESULTS | | | | 261 | 257 | 261 | 257 | 257 | |
| AVE. DIFF. | | | | .0095 | .0056 | .83 | .48 | .0039 | |
| ST. DEV. | | | | .0239 | .0379 | 2.18 | 3.4 | .032 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 475 IS EXCLUDED FOR | | | | OUT | OUT | OUT | OUT | | |
| BATCH NO. 479 IS EXCLUDED FOR | | | | | | | | OUT | |
| BATCH NO. 482 IS EXCLUDED FOR | | | | OUT | OUT | OUT | | | |
| BATCH NO. 484 IS EXCLUDED FOR | | | | | OUT | | | | |
| BATCH NO. 506 IS EXCLUDED FOR | | | | OUT | OUT | OUT | OUT | | |
| BATCH NO. 523 IS EXCLUDED FOR | | | | OUT | | OUT | OUT | | |
| BATCH NO. 540 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 542 IS EXCLUDED FOR | | | | | OUT | | OUT | OUT | |
| BATCH NO. 555 IS EXCLUDED FOR | | | | OUT | | OUT | OUT | | |
| BATCH NO. 565 IS EXCLUDED FOR | | | | OUT | | OUT | | OUT | |
| BATCH NO. 674 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| NO. RESULTS | | | | 253 | 252 | 253 | 252 | 254 | |
| AVE. DIFF. | | | | .008 | .0027 | .67 | .19 | .0057 | |
| ST. DEV. | | | | .0147 | .0315 | 1.27 | 2.74 | .0274 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 479 IS EXCLUDED FOR | | | | | OUT | | OUT | | |
| BATCH NO. 482 IS EXCLUDED FOR | | | | | | | OUT | | |
| BATCH NO. 484 IS EXCLUDED FOR | | | | | | | OUT | OUT | |
| BATCH NO. 485 IS EXCLUDED FOR | | | | OUT | OUT | OUT | OUT | | |
| BATCH NO. 497 IS EXCLUDED FOR | | | | OUT | OUT | OUT | OUT | | |
| BATCH NO. 517 IS EXCLUDED FOR | | | | OUT | OUT | OUT | | | |
| BATCH NO. 523 IS EXCLUDED FOR | | | | | OUT | | | | |
| BATCH NO. 543 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 555 IS EXCLUDED FOR | | | | | OUT | | | | |
| BATCH NO. 658 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 730 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| NO. RESULTS | | | | 249 | 246 | 247 | 247 | 253 | |
| AVE. DIFF. | | | | .0074 | .0001 | .63 | 0 | .0061 | |
| ST. DEV. | | | | .0126 | .0273 | 1.05 | 2.41 | .0267 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 517 IS EXCLUDED FOR | | | | | | | OUT | | |
| BATCH NO. 543 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 549 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 654 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 656 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 658 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 680 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 683 IS EXCLUDED FOR | | | | | | OUT | | | |
| NO. RESULTS | | | | 244 | 246 | 242 | 246 | 253 | |
| AVE. DIFF. | | | | .0069 | .0001 | .56 | -.03 | .0061 | |
| ST. DEV. | | | | .0114 | .0273 | .94 | 2.36 | .0267 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 487 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 654 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 682 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 683 IS EXCLUDED FOR | | | | OUT | | | | | |
| NO. RESULTS | | | | 242 | 246 | 240 | 246 | 253 | |
| AVE. DIFF. | | | | .0066 | .0001 | .53 | -.03 | .0061 | |
| ST. DEV. | | | | .0109 | .0273 | .91 | 2.36 | .0267 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 484 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 682 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 697 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| NO. RESULTS | | | | 239 | 246 | 239 | 246 | 253 | |
| AVE. DIFF. | | | | .0062 | .0001 | .52 | -.03 | .0061 | |
| ST. DEV. | | | | .0103 | .0273 | .89 | 2.36 | .0267 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 487 IS EXCLUDED FOR | | | | OUT | | | | | |
| NO. RESULTS | | | | 238 | 246 | 239 | 246 | 253 | |
| AVE. DIFF. | | | | .0061 | .0001 | .52 | -.03 | .0061 | |
| ST. DEV. | | | | .0101 | .0273 | .89 | 2.36 | .0267 | |

## TABLE 6-12

## GPW CHECK TANK -- DENSITY MEASUREMENT COMPARISONS

The following summary is to delect runs ... in the statistical sense. It uses the last average (with all outliers excluded). A "+" means it is above the average, and a "-" indicates below.

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 475 | 1.1144 | 1.1616 | 1.017 | + | + | + | + | - | 04/04 |
| 476 | 1.0778 | 1.1309 | 1.0738 | - | + | - | + | - | 04/07 |
| 477 | 1.0498 | 1.1004 | 1.0462 | - | + | - | + | - | 04/08 |
| 478 | 1.2014 | 1.2581 | 1.1989 | - | + | - | + | - | 04/10 |
| 479 | 1.1606 | 1.2634 | 1.1588 | - | + | - | + | - | 04/10 |
| 480 | NO SAMPLE | | | | | | | | |
| 481 | 1.1247 | 1.1448 | 1.1117 | + | + | + | + | - | 04/12 |
| 482 | 1.2981 | 1.3245 | 1.2022 | + | + | + | + | - | 04/12 |
| 483 | 1.1764 | 1.1966 | 1.1684 | + | + | + | + | - | 04/13 |
| 484 | 1.2981 | 1.3894 | 1.2581 | + | + | + | + | - | 04/14 |
| 485 | 1.219 | 1.2555 | 1.1537 | + | + | + | + | - | 04/14 |
| 486 | 1.2567 | 1.2774 | 1.2235 | + | + | + | + | - | 04/14 |
| 487 | 1.1582 | 1.1773 | 1.1191 | + | + | + | + | - | 04/15 |
| 488 | 1.1521 | 1.1757 | 1.1403 | + | + | + | + | - | 04/16 |
| 489 | 1.3115 | 1.3264 | 1.2761 | + | + | + | + | - | 04/16 |
| 490 | 1.1551 | 1.1697 | 1.124 | + | + | + | + | - | 04/17 |
| 491 | 1.1582 | 1.1742 | 1.1323 | + | + | + | + | - | 04/17 |
| 492 | 1.1265 | 1.1379 | 1.0991 | + | + | + | + | - | 04/17 |
| 493 | 1.146 | 1.172 | 1.1277 | + | + | + | + | - | 04/18 |
| 494 | 1.1454 | 1.1606 | 1.1411 | - | + | - | + | - | 04/19 |
| 495 | 1.1271 | 1.1488 | 1.1295 | - | + | - | + | - | 04/19 |
| 496 | 1.0851 | 1.1049 | 1.0858 | - | + | - | + | - | 04/20 |
| 497 | 1.2592 | 1.2948 | 1.183 | + | + | + | + | - | 04/21 |
| 498 | 1.1703 | 1.2067 | 1.138 | + | + | + | + | - | 04/22 |
| 499 | 1.2494 | 1.2698 | 1.2246 | + | + | + | + | - | 04/22 |
| 500 | 1.2373 | 1.2652 | 1.2209 | + | + | + | + | - | 04/22 |
| 501 | 1.0973 | 1.1318 | 1.0945 | - | + | - | + | - | 04/23 |
| 502 | NO SAMPLE | | | | | | | | |
| 503 | 1.2434 | 1.2775 | 1.2399 | - | + | - | + | - | 04/23 |
| 504 | 1.2312 | 1.2658 | 1.2245 | + | + | + | + | - | 04/24 |
| 505 | NO SAMPLE | | | | | | | | |
| 506 | 1.3529 | 1.3884 | 1.2014 | + | + | + | + | - | 04/25 |
| 507 | 1.286 | 1.3258 | 1.2687 | + | + | + | + | - | 04/25 |
| 508 | 1.3225 | 1.3588 | 1.3176 | - | + | - | + | - | 04/25 |
| 509 | 1.2707 | 1.3094 | 1.2759 | - | + | - | + | - | 04/26 |
| 510 | 1.2008 | 1.2406 | 1.2047 | - | + | - | + | - | 04/26 |
| 511 | 1.1855 | 1.2213 | 1.1907 | - | + | - | + | - | 04/27 |
| 512 | 1.1673 | 1.2061 | 1.1672 | - | + | - | + | - | 04/27 |
| 513 | 1.2008 | 1.2336 | 1.1981 | - | + | - | + | - | 04/27 |
| 514 | 1.219 | 1.2482 | 1.2166 | - | + | - | + | - | 04/28 |
| 515 | 1.286 | 1.3272 | 1.2932 | - | + | - | + | - | 04/29 |
| 516 | 1.2677 | 1.301 | 1.2654 | - | + | - | + | - | 04/29 |
| 517 | 1.2768 | 1.3061 | 1.2074 | + | + | + | + | - | 04/30 |
| 518 | 1.1642 | 1.1945 | 1.1633 | - | + | - | + | - | 04/30 |

TABLE 6-12 (CONTINUED)

GPW CHECK TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 519 | 1.219 | 1.2544 | 1.2188 | - | + | - | + | - | 05/01 |
| 520 | 1.216 | 1.2472 | 1.2147 | - | + | - | + | - | 05/02 |
| 521 | 1.2981 | 1.3263 | 1.293 | - | + | - | + | - | 05/02 |
| 522 | 1.2111 | 1.2411 | 1.2125 | - | + | - | + | - | 05/02 |
| 523 | .93 | .9469 | .8283 | + | + | + | + | - | 05/03 |
| 524 | 1.2434 | 1.2722 | 1.2124 | + | + | + | + | - | 05/03 |
| 525 | 1.286 | 1.3131 | 1.2582 | + | + | + | + | - | 05/04 |
| 526 | 1.2038 | 1.2323 | 1.1993 | - | + | - | + | - | 05/04 |
| 527 | 1.2598 | 1.2747 | 1.2409 | + | + | + | + | - | 05/06 |
| 528 | 1.2008 | 1.2151 | 1.1954 | - | + | - | + | - | 05/06 |
| 529 | 1.1886 | 1.2022 | 1.1841 | - | + | - | + | - | 05/06 |
| 530 | 1.2239 | 1.2376 | 1.2168 | + | + | + | + | - | 05/07 |
| 531 | 1.1916 | 1.2065 | 1.192 | - | + | - | + | - | 05/08 |
| 532 | 1.1764 | 1.1944 | 1.1799 | - | + | - | + | - | 05/08 |
| 533 | 1.1947 | 1.2014 | 1.1864 | + | + | + | + | - | 05/08 |
| 534 | 1.2373 | 1.2281 | 1.2221 | + | + | + | + | + | 05/09 |
| 535 | 1.1308 | 1.1332 | 1.1183 | + | + | + | + | - | 05/09 |
| 536 | 1.1338 | 1.1366 | 1.1223 | + | + | + | + | - | 05/09 |
| 537 | 1.0851 | 1.0897 | 1.0818 | - | + | - | + | - | 05/09 |
| 538 | 1.0967 | 1.0976 | 1.0843 | + | + | + | + | - | 05/10 |
| 539 | 1.0973 | 1.0987 | 1.0889 | + | + | + | + | - | 05/10 |
| 540 | 1.0194 | 1.0203 | 1.0889 | - | - | - | - | - | 05/10 |
| 541 | 1.2251 | 1.172 | 1.2154 | + | - | + | - | + | 05/10 |
| 542 | 1.0486 | 1.2318 | 1.0421 | + | + | + | + | - | 05/10 |
| 543 | 1.0091 | 1.0131 | 1.0421 | - | - | - | - | - | 05/10 |
| 544 | 1.1277 | 1.1296 | 1.1177 | + | + | + | + | - | 05/11 |
| 545 | 1.3194 | 1.321 | 1.3044 | + | + | + | + | - | 05/13 |
| 546 | 1.2993 | 1.3041 | 1.2895 | + | + | + | + | - | 05/13 |
| 547 | 1.003 | 0 | 1.0031 | - | - | - | + | - | 05/13 |
| 548 | 1.1247 | 1.1242 | 1.1119 | + | + | + | + | - | 05/14 |
| 549 | 1.359 | 1.3603 | 1.3081 | + | + | + | + | - | 05/14 |
| 550 | 1.219 | 1.2175 | 1.2021 | + | + | + | + | - | 05/15 |
| 551 | 1.2129 | 1.2168 | 1.2033 | + | + | + | + | - | 05/15 |
| 552 | 1.0334 | 0 | 1.0335 | - | - | - | + | - | 05/15 |
| 553 | 1.2434 | 1.242 | 1.2326 | + | + | + | + | - | 05/15 |
| 554 | 1.2494 | 1.2612 | 1.2369 | + | + | + | + | - | 05/15 |
| 555 | .9543 | .9649 | .8596 | + | + | + | + | - | 05/15 |
| 556 | 1.0121 | 1.0276 | 1.0285 | - | - | - | - | - | 05/15 |
| 557 | 1.2002 | 1.2158 | 1.1922 | + | + | + | + | - | 05/16 |
| 558 | 1.0425 | 1.0587 | 1.0412 | - | + | - | + | - | 05/16 |
| 559 | 1.1153 | 1.1303 | 1.1144 | - | + | - | + | - | 05/16 |
| 560 | 1.0365 | 1.0492 | 1.0386 | - | + | - | + | - | 05/16 |
| 561 | 1.076 | 1.0923 | 1.0812 | - | + | - | + | - | 05/17 |
| 562 | 1.0419 | 1.0564 | 1.0446 | - | + | - | + | - | 05/17 |
| 563 | .9987 | 1.0195 | 1.0072 | - | + | - | + | - | 05/18 |

TABLE 6-12 (CONTINUED)

GPW CHECK TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 564 | 1.1734 | 1.1924 | 1.1729 | - | + | - | + | - | 05/20 |
| 565 | 1.0973 | 1.2546 | 1.2363 | - | + | - | + | - | 05/21 |
| 566 | 1.2701 | 1.2884 | 1.2677 | - | + | - | + | - | 05/21 |
| 567 | 1.2616 | 1.2785 | 1.2579 | - | + | - | + | - | 05/22 |
| 568 | 1.2555 | 1.2749 | 1.2545 | - | + | - | + | - | 05/23 |
| 569 | 1.2342 | 1.2539 | 1.2353 | - | + | - | + | - | 05/25 |
| 570 | 1.2464 | 1.2572 | 1.2475 | - | + | - | + | - | 05/25 |
| 571 | 1.2494 | 1.2664 | 1.2518 | - | + | - | + | - | 05/25 |
| 572 | 1.2251 | 1.241 | 1.2245 | - | + | - | + | - | 05/25 |
| 573 | 1.2525 | 1.2655 | 1.2491 | - | + | - | + | - | 05/25 |
| 574 | 1.2555 | 1.2691 | 1.2501 | - | + | - | + | - | 05/25 |
| 575 | 1.2494 | 1.2619 | 1.2453 | - | + | - | + | - | 05/26 |
| 576 | 1.2494 | 1.267 | 1.257 | - | + | - | + | - | 05/26 |
| 577 | 1.2555 | 1.2696 | 1.2653 | - | + | - | + | - | 05/27 |
| 578 | 1.2586 | 1.2688 | 1.2633 | - | + | - | + | - | 05/27 |
| 579 | 1.2367 | 1.2479 | 1.2411 | - | + | - | + | - | 05/27 |
| 580 | 1.2555 | 1.2711 | 1.2636 | - | + | - | + | - | 05/27 |
| 581 | 1.2616 | 1.2709 | 1.2632 | - | + | - | + | - | 05/28 |
| 582 | 1.2525 | 1.261 | 1.2634 | - | - | - | - | - | 05/28 |
| 583 | 1.2586 | 1.2684 | 1.2645 | - | + | - | + | - | 05/28 |
| 584 | 1.2555 | 1.2689 | 1.2639 | - | + | - | + | - | 05/28 |
| 585 | 1.2616 | 1.2788 | 1.2664 | - | + | - | + | - | 05/28 |
| 586 | 1.2068 | 1.2214 | 1.2089 | - | + | - | + | - | 05/29 |
| 587 | 1.2555 | 1.2704 | 1.2541 | - | + | - | + | - | 05/29 |
| 588 | 1.2586 | 1.2779 | 1.2609 | - | + | - | + | - | 05/29 |
| 589 | 1.2446 | 1.2586 | 1.2486 | - | + | - | + | - | 05/29 |
| 590 | 1.2677 | 1.2822 | 1.2674 | - | + | - | + | - | 05/30 |
| 591 | 1.2799 | 1.2926 | 1.2774 | - | + | - | + | - | 05/30 |
| 592 | 1.3286 | 1.3385 | 1.3184 | + | + | + | + | - | 05/30 |
| 593 | 1.3286 | 1.3335 | 1.3184 | + | + | + | + | - | 05/30 |
| 594 | 1.2251 | 1.2337 | 1.2193 | - | + | - | + | - | 05/31 |
| 595 | 1.2975 | 1.3083 | 1.2888 | + | + | + | + | - | 05/31 |
| 596 | 1.2403 | 1.2525 | 1.238 | - | + | - | + | - | 05/31 |
| 597 | 1.286 | 1.2906 | 1.2752 | + | + | + | + | - | 06/01 |
| 598 | 1.2951 | 1.3073 | 1.2917 | - | + | - | + | - | 06/01 |
| 599 | 1.3012 | 1.312 | 1.2993 | - | + | - | + | - | 06/02 |
| 600 | 1.2494 | 1.2546 | 1.2445 | - | + | - | + | - | 06/02 |
| 601 | 1.3164 | 1.3231 | 1.3048 | + | + | + | + | - | 06/02 |
| 602 | 1.1855 | 1.1953 | 1.1909 | - | + | - | + | - | 06/02 |
| 603 | 1.3438 | 1.3784 | 1.3553 | - | + | - | + | - | 06/03 |
| 604 | 1.3377 | 1.3462 | 1.3261 | + | + | + | + | - | 06/03 |
| 605 | NO SAMPLE | | | | | | | | |
| 606 | 1.1247 | 1.1353 | 1.1207 | - | + | - | + | - | 06/04 |
| 607 | 1.3359 | 1.3066 | 1.3223 | + | - | + | - | + | 06/04 |
| 608 | 1.1898 | 1.1632 | 1.1829 | + | - | + | - | + | 06/04 |

TABLE 6-12 (CONTINUED)

GPW CHECK TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 609 | 1.2543 | 1.2422 | 1.2496 | - | - | - | - | + | 06/04 |
| 610 | 1.2513 | 1.2386 | 1.2457 | - | - | - | - | + | 06/04 |
| 611 | 1.2373 | 1.2268 | 1.2345 | - | - | - | - | + | 06/05 |
| 612 | 1.2415 | 1.2298 | 1.2409 | - | - | - | - | + | 06/05 |
| 613 | 1.1995 | 1.1761 | 1.1922 | + | - | + | - | + | 06/05 |
| 614 | 1.2689 | 1.2523 | 1.2712 | - | - | - | - | + | 06/05 |
| 615 | 1.2847 | 1.2711 | 1.2784 | + | - | - | - | + | 06/06 |
| 616 | 1.2707 | 1.2558 | 1.2646 | + | - | - | - | + | 06/06 |
| 617 | 1.2525 | 1.2398 | 1.2499 | - | - | - | - | + | 06/06 |
| 618 | 1.1703 | 1.1641 | 1.1707 | - | - | - | - | + | 06/06 |
| 619 | 1.2008 | 1.189 | 1.2015 | - | - | - | - | + | 06/07 |
| 620 | .8843 | 0 | .8605 | + | - | + | + | + | 06/07 |
| 621 | 1.2829 | 1.2656 | 1.2738 | + | - | + | - | + | 06/07 |
| 622 | 1.286 | 1.2699 | 1.2793 | + | - | - | - | + | 06/07 |
| 623 | 1.2787 | 1.2633 | 1.2741 | - | - | - | - | + | 06/08 |
| 624 | 1.2762 | 1.2615 | 1.2686 | + | - | + | - | + | 06/08 |
| 625 | 1.2993 | 1.2706 | 1.2798 | + | - | + | - | + | 06/08 |
| 626 | 1.2981 | 1.2703 | 1.2921 | - | - | - | - | + | 06/08 |
| 627 | 1.2981 | 1.2787 | 1.2912 | + | - | + | - | + | 06/08 |
| 628 | 1.2835 | 1.2724 | 1.2806 | - | - | - | - | + | 06/09 |
| 629 | 1.2434 | 1.2087 | 1.2359 | + | - | + | - | + | 06/09 |
| 630 | 1.2616 | 1.2448 | 1.2554 | + | - | - | - | + | 06/10 |
| 631 | 1.1922 | 1.1741 | 1.1827 | + | - | + | - | + | 06/11 |
| 632 | 1.2008 | 1.1811 | 1.1912 | + | - | + | - | + | 06/11 |
| 633 | 1.2677 | 1.2414 | 1.25 | + | - | + | - | + | 06/11 |
| 634 | 1.2555 | 1.2387 | 1.2468 | + | - | + | - | + | 06/11 |
| 635 | 1.2251 | 1.2057 | 1.2142 | + | - | + | - | + | 06/11 |
| 636 | 1.1503 | 1.1388 | 1.1478 | - | - | - | - | + | 06/12 |
| 637 | 1.286 | 1.276 | 1.2832 | - | - | - | - | + | 06/12 |
| 638 | 1.1716 | 1.1641 | 1.1734 | - | - | - | - | + | 06/12 |
| 639 | 1.1947 | 1.1732 | 1.1866 | + | - | + | - | + | 06/13 |
| 640 | 1.2981 | 1.2794 | 1.2849 | + | - | + | - | + | 06/13 |
| 641 | 1.1399 | 1.1226 | 1.1413 | - | - | - | - | + | 06/14 |
| 642 | 1.0973 | 1.0786 | 1.0962 | - | - | - | - | + | 06/14 |
| 643 | 1.1034 | 1.084 | 1.1047 | - | - | - | - | + | 06/14 |
| 644 | 1.0967 | 1.0755 | 1.0967 | - | - | - | - | + | 06/15 |
| 645 | 1.1186 | 1.099 | 1.1204 | - | - | - | - | + | 06/16 |
| 646 | 1.2172 | 1.1956 | 1.2163 | - | - | - | - | + | 06/16 |
| 647 | 1.1892 | 1.1695 | 1.1905 | - | - | - | - | + | 06/17 |
| 648 | 1.1886 | 1.1692 | 1.1921 | - | - | - | - | + | 06/17 |
| 649 | 1.1825 | 1.1615 | 1.1829 | - | - | - | - | + | 06/17 |
| 650 | 1.1855 | 1.1688 | 1.1894 | - | - | - | - | + | 06/18 |
| 651 | 1.1612 | 1.1422 | 1.1622 | - | - | - | - | + | 06/19 |
| 652 | 1.1825 | 1.1583 | 1.1776 | - | - | - | - | + | 06/20 |
| 653 | 1.2525 | 1.2286 | 1.2358 | + | - | + | - | + | 06/20 |

## TABLE 6-13

## GPW CHECK TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 699 | 1.0882 | 1.0362 | 1.0576 | + | - | + | - | + | 07/14 |
| 700 | 1.1886 | 1.1412 | 1.1637 | + | - | + | - | + | 07/15 |
| 701 | 1.1886 | 1.1369 | 1.1603 | + | - | + | - | + | 07/15 |
| 702 | 1.0547 | 1.0198 | 1.0463 | + | - | + | - | + | 07/16 |
| 703 | 1.1247 | 1.0731 | 1.1075 | + | - | + | - | + | 07/17 |
| 704 | 1.1338 | 1.0754 | 1.1194 | + | - | + | - | + | 07/17 |
| 705 | 1.0864 | 1.0318 | 1.0737 | + | - | + | - | + | 07/17 |
| 706 | 1.1886 | 1.1377 | 1.1724 | + | - | + | - | + | 07/18 |
| 707 | 1.0517 | 1.0111 | 1.051 | - | - | - | - | + | 07/19 |
| 708 | 1.0851 | 1.0408 | 1.0816 | - | - | - | - | + | 07/20 |
| 709 | 1.143 | 1.0895 | 1.1323 | + | - | + | - | + | 07/29 |
| 710 | 1.2269 | 1.1875 | 1.2191 | + | - | + | - | + | 07/20 |
| 711 | 1.1521 | 1.1103 | 1.1447 | + | - | + | - | + | 07/21 |
| 712 | 1.146 | 1.101 | 1.1376 | + | - | + | - | + | 07/22 |
| 713 | 1.1886 | 1.1492 | 1.1853 | - | - | - | - | + | 07/22 |
| 714 | 1.2434 | 1.2118 | 1.2438 | - | - | - | - | + | 07/22 |
| 715 | 1.2221 | 1.1845 | 1.2231 | - | - | - | - | + | 07/22 |
| 716 | 1.1703 | 1.1403 | 1.1744 | - | - | - | - | + | 07/22 |
| 717 | 1.1472 | 1.117 | 1.1559 | - | - | - | - | + | 07/22 |
| 718 | 1.1947 | 1.1612 | 1.1963 | - | - | - | - | + | 07/23 |
| 719 | 1.2129 | 1.1818 | 1.2184 | - | - | - | - | + | 07/23 |
| 720 | 1.1612 | 1.1262 | 1.1605 | - | - | - | - | + | 07/23 |
| 721 | 1.2032 | 1.1623 | 1.1973 | - | - | - | - | + | 07/23 |
| 722 | 1.1722 | 1.144 | 1.179 | - | - | - | - | + | 07/23 |
| 723 | 1.1874 | 1.1524 | 1.1855 | - | - | - | - | + | 07/23 |
| 724 | 1.1764 | 1.1434 | 1.1808 | - | - | - | - | + | 07/24 |
| 725 | 1.1509 | 1.1172 | 1.1564 | - | - | - | - | + | 07/24 |
| 726 | 1.146 | 1.1125 | 1.1516 | - | - | - | - | + | 07/24 |
| 727 | 1.2367 | 1.2036 | 1.2396 | - | - | - | - | + | 07/24 |
| 728 | 1.0547 | 0 | 1.0687 | - | - | - | + | + | 07/24 |
| 729 | 1.0541 | 1.0214 | 1.0687 | - | - | - | - | + | 07/24 |
| 730 | 1.0237 | .9982 | 1.0687 | - | - | - | - | + | 07/25 |
| 731 | 1.0097 | .9869 | 1.0206 | - | - | - | - | + | 07/25 |
| 732 | 1.0212 | .9979 | 1.0324 | - | - | - | - | + | 07/25 |
| 733 | 1.0194 | .999 | 1.0336 | - | - | - | - | + | 07/25 |
| 734 | 1.1107 | 1.0867 | 1.1208 | - | - | - | - | + | 07/25 |
| 735 | 1.0365 | .993 | 1.0374 | - | - | - | - | + | 07/25 |
| 736 | 1.0359 | .9978 | 1.0331 | - | - | - | - | + | 07/26 |
| 737 | 1.0486 | 1.01 | 1.0379 | + | - | + | - | + | 07/26 |
| 738 | 1.0474 | .9933 | 1.037 | + | - | + | - | + | 07/26 |
| 739 | 1.1764 | 1.1232 | 1.1558 | + | - | + | - | + | 07/26 |
| 740 | 1.0498 | .9993 | 1.0373 | + | - | + | - | + | 07/26 |

TABLE 6-14

HAW SAMPLE TANK DENSITY COMPARISONS
ITERATIVE OUTLIER TEST APPLICATION

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| NO. RESULTS | | | | 148 | 148 | 148 | 148 | 148 | |
| AVE. DIFF. | | | | .0331 | .0888 | 2.7 | 7.24 | -.0558 | |
| ST. DEV. | | | | .0122 | .0278 | .99 | 2.24 | .0298 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 112 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 153 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 161 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 162 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 163 IS EXCLUDED FOR | | | | | OUT | | OUT | | |
| NO. RESULTS | | | | 145 | 147 | 144 | 147 | 148 | |
| AVE. DIFF. | | | | .0332 | .0894 | 2.73 | 7.29 | -.0558 | |
| ST. DEV. | | | | .0095 | .0268 | .75 | 2.17 | .0298 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 153 IS EXCLUDED FOR | | | | OUT | | | | | |
| BATCH NO. 158 IS EXCLUDED FOR | | | | | | OUT | | | |
| BATCH NO. 159 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 160 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 163 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| NO. RESULTS | | | | 141 | 147 | 140 | 147 | 148 | |
| AVE. DIFF. | | | | .0341 | .0894 | 2.77 | 7.29 | -.0558 | |
| ST. DEV. | | | | .0077 | .0268 | .6 | 2.17 | .0298 | |

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| BATCH NO. 129 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| BATCH NO. 135 IS EXCLUDED FOR | | | | OUT | | OUT | | | |
| NO. RESULTS | | | | 139 | 147 | 138 | 147 | 148 | |
| AVE. DIFF. | | | | .0345 | .0894 | 2.8 | 7.29 | -.0558 | |
| ST. DEV. | | | | .0071 | .0268 | .55 | 2.17 | .0298 | |

## TABLE 6-15

## HWW SAMPLE TANK -- DENSITY MEASUREMENT COMPARISONS

The following summary is to delect runs ... in the statistical sense. It uses the last average (with all outliers excluded). A "+" means it is above the average, and a "-" indicates below.

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 106 | 1.0526 | 1.1334 | 1.0379 | - | + | - | + | - | 04/08 |
| 107 | 1.0526 | 1.1102 | 1.0108 | + | + | + | + | - | 04/09 |
| 108 | 1.1078 | 1.1914 | 1.0877 | - | + | - | + | - | 04/11 |
| 109 | 1.1078 | 1.191 | 1.0877 | - | + | - | + | - | 04/11 |
| 110 | 1.2368 | 1.3129 | 1.197 | + | + | + | + | - | 04/12 |
| 111 | 1.3052 | 1.3815 | 1.2589 | + | + | + | + | - | 04/12 |
| 112 | 1.3684 | 1.3745 | 1.2616 | + | + | + | + | + | 04/13 |
| 113 | 1.3263 | 1.4076 | 1.2793 | + | + | + | + | - | 04/14 |
| 114 | 1.3263 | 1.4088 | 1.3011 | - | + | - | + | - | 04/14 |
| 115 | 1.3263 | 1.3503 | 1.281 | + | - | + | - | + | 04/15 |
| 116 | 1.321 | 1.4026 | 1.2866 | - | + | - | + | - | 04/15 |
| 117 | 1.2631 | 1.3413 | 1.2292 | - | + | - | + | - | 04/17 |
| 118 | 1.2736 | 1.3574 | 1.2445 | - | + | - | + | - | 04/17 |
| 119 | 1.2999 | 1.3791 | 1.2624 | + | + | + | + | - | 04/18 |
| 120 | 1.3078 | 1.3921 | 1.2744 | - | + | - | + | - | 04/18 |
| 121 | 1.2894 | 1.3754 | 1.2609 | - | + | - | + | - | 04/19 |
| 122 | 1.2684 | 1.3522 | 1.223 | + | + | + | + | - | 04/19 |
| 123 | 1.2999 | 1.3853 | 1.2633 | + | + | + | + | - | 04/20 |
| 124 | 1.3052 | 1.3975 | 1.2783 | - | + | - | + | - | 04/20 |
| 125 | 1.2947 | 1.3726 | 1.2614 | - | + | - | + | - | 04/20 |
| 126 | 1.2842 | 1.3679 | 1.2554 | - | + | - | + | - | 04/21 |
| 127 | 1.3052 | 1.3869 | 1.2675 | + | + | + | + | - | 04/21 |
| 128 | 1.2973 | 1.3721 | 1.2663 | - | + | - | + | - | 04/21 |
| 129 | 1.2736 | 1.3784 | 1.2649 | - | + | - | + | - | 04/22 |
| 130 | 1.3026 | 1.3865 | 1.2645 | + | + | + | + | - | 04/22 |
| 131 | 1.2831 | 1.3516 | 1.2495 | - | + | - | + | - | 04/22 |
| 132 | 1.2842 | 1.3474 | 1.2544 | - | + | - | + | - | 04/23 |
| 133 | 1.2921 | 1.361 | 1.2596 | - | + | - | + | - | 04/23 |
| 134 | 1.2973 | 1.3547 | 1.264 | - | + | - | - | - | 04/24 |
| 135 | 1.2947 | 1.3603 | 1.2856 | - | - | - | - | - | 04/25 |
| 136 | 1.2842 | 1.3455 | 1.2518 | - | + | - | + | - | 04/26 |
| 137 | 1.2947 | 1.357 | 1.2562 | + | + | + | + | - | 04/27 |
| 138 | 1.3052 | 1.3676 | 1.2723 | - | + | - | + | - | 04/28 |
| 139 | 1.3026 | 1.3811 | 1.2728 | - | + | - | + | - | 04/29 |
| 140 | 1.3131 | 1.3906 | 1.276 | + | + | + | + | - | 04/30 |
| 141 | 1.2999 | 1.3844 | 1.2742 | - | + | - | + | - | 04/30 |
| 142 | 1.271 | 1.3445 | 1.2473 | - | + | - | + | - | 05/01 |
| 143 | 1.2789 | 1.3667 | 1.255 | - | + | - | + | - | 05/01 |
| 144 | 1.2684 | 1.3573 | 1.2418 | - | + | - | + | - | 05/01 |
| 145 | 1.2499 | 1.3369 | 1.2275 | - | + | - | + | - | 05/03 |
| 146 | 1.2657 | 1.3572 | 1.2354 | - | + | - | + | - | 05/04 |
| 147 | 1.2526 | 1.3475 | 1.2301 | - | + | - | + | - | 05/04 |
| 148 | 1.2684 | 1.3597 | 1.2446 | - | + | - | + | - | 05/05 |
| 149 | 1.2526 | 1.3434 | 1.2267 | - | + | - | + | - | 05/06 |

TABLE 6-15 (CONTINUED)

HWW SAMPLE TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 150 | 1.2578 | 1.3447 | 1.2332 | - | + | - | + | - | 05/07 |
| 151 | 1.2578 | 1.3438 | 1.232 | - | + | - | + | - | 05/07 |
| 152 | 1.2526 | 1.3412 | 1.2233 | - | + | - | + | - | 05/08 |
| 153 | 1.2184 | 1.3373 | 1.2217 | - | + | - | + | - | 05/09 |
| 154 | 1.2473 | 1.3394 | 1.2155 | - | + | - | + | - | 05/10 |
| 155 | 1.2499 | 1.3344 | 1.2211 | - | + | - | + | - | 05/11 |
| 156 | 1.1973 | 1.2908 | 1.176 | - | + | - | + | - | 05/13 |
| 157 | 1.0552 | 1.1447 | 1.0389 | - | + | - | + | - | 05/13 |
| 158 | 1.0526 | 1.1024 | .9998 | + | + | + | + | + | 05/13 |
| 159 | 1.1473 | 1.2281 | 1.1456 | - | - | - | - | - | 05/21 |
| 160 | 1.2184 | 1.3036 | 1.2212 | - | - | - | - | - | 05/21 |
| 161 | 1.2421 | 1.3272 | 1.2462 | - | - | - | - | - | 05/22 |
| 162 | 1.2342 | 1.3113 | 1.2462 | - | - | - | - | - | 05/22 |
| 163 | 1.241 | 1.2407 | 1.2413 | - | - | - | - | + | 05/22 |
| 164 | 1.2721 | 1.2731 | 1.2309 | + | - | + | - | + | 05/23 |
| 165 | 1.2789 | 1.2802 | 1.2389 | + | - | + | - | + | 05/23 |
| 166 | 1.2789 | 1.2853 | 1.2426 | + | - | + | - | + | 05/23 |
| 167 | 1.2921 | 1.2915 | 1.2503 | + | - | + | - | + | 05/24 |
| 168 | 1.2815 | 1.2802 | 1.2407 | + | - | + | - | + | 05/24 |
| 169 | 1.1657 | 1.1648 | 1.1352 | - | - | - | - | + | 05/30 |
| 170 | 1.1815 | 1.1817 | 1.1424 | + | - | + | - | + | 06/01 |
| 171 | 1.1921 | 1.1887 | 1.1548 | + | - | + | - | + | 06/02 |
| 172 | 1.2263 | 1.2217 | 1.1832 | + | - | + | - | + | 06/03 |
| 173 | 1.2394 | 1.2392 | 1.2001 | + | - | + | - | + | 06/04 |
| 174 | 1.2263 | 1.2287 | 1.1837 | + | - | + | - | + | 06/05 |
| 175 | 1.2578 | 1.2605 | 1.213 | + | - | + | - | + | 06/06 |
| 176 | 1.2684 | 1.3067 | 1.2274 | + | - | + | - | + | 06/06 |
| 177 | 1.271 | 1.3168 | 1.2287 | + | - | + | - | + | 06/07 |
| 178 | 1.2631 | 1.3092 | 1.2225 | + | - | + | - | + | 06/07 |
| 179 | 1.2315 | 1.2732 | 1.1923 | + | - | + | - | + | 06/08 |
| 180 | 1.1868 | 1.23 | 1.1467 | + | - | + | - | + | 06/08 |
| 181 | 1.2289 | 1.2755 | 1.1938 | + | - | + | - | + | 06/09 |
| 182 | 1.2631 | 1.3089 | 1.2269 | + | - | + | - | + | 60/97 |
| 183 | 1.271 | 1.3209 | 1.2394 | - | - | - | - | + | 06/09 |
| 184 | 1.2736 | 1.3167 | 1.2298 | + | - | + | - | + | 06/10 |
| 185 | 1.2657 | 1.3038 | 1.2294 | + | - | + | - | + | 06/10 |
| 186 | 1.2578 | 1.3025 | 1.2204 | + | - | + | - | + | 06/11 |
| 187 | 1.2631 | 1.3085 | 1.2242 | + | - | + | - | + | 06/11 |
| 188 | 1.2499 | 1.2966 | 1.2202 | - | - | - | - | + | 06/12 |
| 189 | 1.2684 | 1.3058 | 1.2331 | + | - | + | - | + | 06/12 |
| 190 | 1.2973 | 1.3443 | 1.2552 | + | - | + | - | + | 06/13 |
| 191 | 1.2921 | 1.3349 | 1.2553 | + | - | + | - | + | 06/13 |
| 192 | 1.2947 | 1.3407 | 1.2541 | + | - | + | - | + | 06/13 |
| 193 | 1.2763 | 1.3174 | 1.2588 | - | - | - | - | + | 06/14 |
| 194 | 1.2921 | 1.3494 | 1.2597 | - | + | - | - | - | 06/14 |

TABLE 6-15 (CONTINUED)

HWW SAMPLE TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 195 | 1.2789 | 1.3439 | 1.2533 | - | + | - | - | - | 06/15 |
| 196 | 1.2789 | 1.3389 | 1.2502 | - | - | - | - | - | 06/15 |
| 197 | 1.2815 | 1.3455 | 1.2519 | - | + | - | + | - | 06/15 |
| 198 | 1.2868 | 1.3456 | 1.2589 | - | - | - | - | - | 06/16 |
| 199 | 1.2984 | 1.3605 | 1.2691 | - | + | - | - | - | 06/16 |
| 200 | 1.3368 | 1.389 | 1.3042 | - | - | - | - | + | 06/16 |
| 201 | 1.2447 | 1.2373 | 1.2145 | - | - | - | - | + | 06/18 |
| 202 | 1.121 | 1.1235 | 1.0984 | - | - | - | - | + | 06/18 |
| 203 | 1.1236 | 1.1227 | 1.0961 | - | - | - | - | + | 06/18 |
| 204 | 1.0721 | 1.0657 | 1.0409 | - | - | + | - | + | 06/18 |
| 205 | 1.1578 | 1.1773 | 1.1262 | - | - | - | - | + | 06/25 |
| 206 | 1.2631 | 1.3261 | 1.2104 | + | + | + | + | - | 06/25 |
| 207 | 1.3315 | 1.3927 | 1.29 | + | + | + | + | - | 06/26 |
| 208 | 1.321 | 1.3839 | 1.2863 | + | + | - | + | - | 06/27 |
| 209 | 1.3263 | 1.3952 | 1.29 | + | + | + | + | - | 06/27 |
| 210 | 1.2736 | 1.3415 | 1.2446 | - | + | - | + | - | 06/28 |
| 211 | 1.2236 | 1.2868 | 1.191 | - | + | - | + | - | 06/28 |
| 212 | 1.2468 | 1.3032 | 1.2117 | + | + | + | + | - | 06/29 |
| 213 | 1.2289 | 1.2972 | 1.1975 | - | + | - | + | - | 06/29 |
| 214 | 1.2631 | 1.3258 | 1.2278 | + | + | + | + | - | 06/29 |
| 215 | 1.2499 | 1.3131 | 1.2113 | + | + | + | + | - | 06/30 |
| 216 | 1.2878 | 1.2837 | 1.2441 | + | - | + | - | + | 06/30 |
| 217 | 1.2894 | 1.2863 | 1.2501 | + | - | + | - | + | 07/01 |
| 218 | 1.3026 | 1.3035 | 1.2604 | + | - | + | - | + | 07/01 |
| 219 | 1.3184 | 1.3155 | 1.275 | + | - | + | - | + | 07/01 |
| 220 | 1.321 | 1.3907 | 1.2801 | + | + | + | + | - | 07/02 |
| 221 | 1.3368 | 1.4008 | 1.2924 | + | + | + | + | - | 07/02 |
| 222 | 1.321 | 1.3869 | 1.2802 | + | + | + | + | - | 07/03 |
| 223 | 1.3236 | 1.3882 | 1.2793 | + | + | + | + | - | 07/03 |
| 224 | 1.3147 | 1.3726 | 1.2739 | + | + | + | + | - | 07/03 |
| 225 | 1.3473 | 1.4102 | 1.3047 | + | + | + | + | - | 07/04 |
| 226 | 1.3147 | 1.3802 | 1.2747 | + | + | + | + | - | 07/04 |
| 227 | 1.2499 | 1.3078 | 1.2139 | + | + | + | + | - | 07/05 |
| 228 | 1.2463 | 1.3001 | 1.2027 | + | + | + | + | + | 07/05 |
| 229 | 1.271 | 1.3425 | 1.2376 | - | + | - | + | - | 07/06 |
| 230 | 1.2789 | 1.3403 | 1.2391 | + | + | + | + | - | 07/07 |
| 231 | 1.2763 | 1.3355 | 1.2363 | + | + | + | + | - | 07/07 |
| 232 | 1.2999 | 1.3611 | 1.2613 | + | + | + | + | - | 07/07 |
| 233 | 1.2894 | 1.3503 | 1.2497 | + | + | + | + | - | 07/08 |
| 234 | 1.2684 | 1.338 | 1.2385 | - | + | - | + | - | 07/08 |
| 235 | 1.271 | 1.3397 | 1.2395 | - | + | - | + | - | 07/08 |
| 236 | 1.2578 | 1.3244 | 1.2228 | + | + | + | + | - | 07/09 |
| 237 | 1.2763 | 1.3312 | 1.2382 | + | + | + | + | + | 07/09 |
| 238 | 1.2973 | 1.3596 | 1.2607 | + | + | + | + | - | 07/10 |
| 239 | 1.3052 | 1.3682 | 1.2674 | + | + | + | + | - | 07/11 |

TABLE 6-15 (CONTINUED)

HWW SAMPLE TANK -- DENSITY MEASUREMENT COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 240 | 1.2973 | 1.304 | 1.267 | - | - | - | - | + | 07/11 |
| 241 | 1.3447 | 1.3993 | 1.3092 | + | + | - | - | + | 07/12 |
| 242 | 1.2868 | 1.3514 | 1.2545 | - | + | - | + | - | 07/13 |
| 243 | 1.2842 | 1.3379 | 1.2443 | + | + | + | + | + | 07/14 |
| 244 | 1.2473 | 1.3093 | 1.2159 | - | + | - | + | - | 07/15 |
| 245 | 1.2131 | 1.2711 | 1.1787 | - | + | + | + | - | 07/16 |
| 246 | 1.2031 | 1.2621 | 1.172 | - | + | - | + | - | 07/16 |
| 247 | 1.1921 | 1.2555 | 1.1565 | + | + | + | + | - | 07/17 |
| 248 | 1.2026 | 1.197 | 1.1667 | + | - | + | - | + | 07/18 |
| 249 | 1.1631 | 1.1601 | 1.1352 | - | - | - | - | + | 07/18 |
| 250 | 1.1605 | 1.2228 | 1.1246 | + | + | + | + | - | 07/19 |
| 251 | 1.1973 | 1.2549 | 1.1611 | + | + | + | + | - | 07/20 |
| 252 | 1.1315 | 1.1876 | 1.1015 | - | - | - | + | - | 07/20 |
| 253 | 1.1157 | 1.1768 | 1.0877 | - | - | - | + | - | 07/20 |

TABLE 6-16

ENDING INVENTORY - FY 1978 RUN

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| Hull Rinse Surge Tank | 61-D-617 | 78.84 ppm | 0 | 0 |
| Dissolver Acid Surge Tank | 61-D-602 | 4.1 ppm | 230 | 1 |
| No. 1 Dissolver | 15-C-101 | 284.09 ppm | 0 | 0 |
| No. 1 Transfer Tank | 15-D-107 | 284.09 ppm | 11 | 0 |
| No. 2 Dissolver | 15-C-102 | 348.08 ppm | 0 | 0 |
| No. 2 Transfer Tank | 15-D-108 | 348.08 ppm | 33 | 11 |
| No. 3 Dissolver | 15-C-103 | 733.13 ppm | 0 | 0 |
| No. 3 Transfer Tank | 15-D-109 | 733.13 ppm | 0 | 0 |
| No. 4 Transfer Tank | 15-D-112 | 47.05 ppm | 0 | 0 |
| Feed Surge Tank | 17-D-113 | 842.9 ppm | 300 | 253 |
| Accountability Tank | 18-D-101 | 425.66 ppm | 15 | 6 |
| Dissolver Flush Accumulator | 17-D-111 | 184.50 ppm | 0 | 0 |
| No. 1 Feed Adjustment Tank | 17-D-103 | 64.68 ppm | 100 | 7 |
| No. 2 Feed Adjustment Tank | 17-D-104 | 132.28 ppm | 114 | 15 |
| HA Feed Tank | 21-D-201 | 90.67 ppm | 40 | 4 |
| HA Contactor | 21-C-225 | -------- | 0 | 0 |
| 1BU Recycle Tank | 21-D-210 | 39.86 ppm | 0 | 0 |
| 2E Column | 22-C-205 | 1.06 g/l | 0 | 0 |
| 2EU Concentrator | 24-E-260 | 0.4 g/l | 0 | 0 |
| 2UC Head Pot | 24-D-257 | 0.4 g/l | 38 | 131 |
| U Prod. Catch Tank | 24-D-202 | 1.6 g/l | 0 | 0 |
| U Prod. Sample Tank | 24-D-203 | 372.0 ppm | 0 | 0 |
| Off-Spec U Tank | 24-D-204 | 300.62 ppm | 28 | 8 |
| 1UD/2UD Surge Tank | 62-D-625 | <0.1 ppm | 785 | 0 |
| 2EU Decanter | 22-D-209 | <0.1 ppm | 77 | 0 |
| 1BX Anolyte Feed Tank | 21-D-213 | <0.1 ppm | 0 | 0 |
| 1BX Electrocell | 21-C-275 | 39.48 ppm | 0 | 0 |
| 1BX Column | 21-C-202 | 39.48 ppm | 0 | 0 |
| 1C Column | 21-C-203 | 15.15 ppm | 0 | 0 |
| 1CU Concentrator | 21-E-261 | 1.3 g/l | 0 | 0 |
| 1CU Decanter | 21-D-212 | 40.0 ppm | 0 | 0 |
| 2D Column | 22-C-204 | 7.0 ppm | 2 | 0 |
| 3P Concentrator | 34-E-360 | 17.49 ppm | 14 | 0 |
| Pu Catch Tank | 34-D-302 | 17.49 ppm | 15 | 0 |
| Pu Sample Tank | 34-D-303 | 17.49 ppm | 0 | 0 |
| No. 1 Pu Prod. Storage Tank | 35-D-304 | 290.15 ppm | 10 | 3 |
| No. 2 Pu Prod. Storage Tank | 35-D-305 | 0.4 ppm | 0 | 0 |
| No. 3 Pu Prod. Storage Tank | 35-D-306 | 20.11 ppm | 37 | 1 |
| 1BP Surge Tank | 32-D-307 | 67.64 ppm | 2 | 0 |
| 2A Column | 32-C-301 | 734.93 ppm | 544 | 412 |
| 3A Column | 33-C-303 | 173.46 ppm | 341 | 59 |
| 2B Column | 32-C-302 | 195.83 ppm | 275 | 54 |
| 3B Column | 33-C-306 | 368.31 ppm | 301 | 113 |
| 3PS Column | 33-C-309 | 694.46 ppm | 0 | 0 |

TABLE 6-16 (CONTINUED)

ENDING INVENTORY - FY 1978 RUN

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| No. 1 Solvent Feed Tank | 51-D-502 | 182.62 ppm | 14322 | 2615 |
| No. 2 Solvent Feed Tank | 52-D-503 | 316.25 ppm | 5066 | 1607 |
| Carbonate Diversion Tank | 51-D-501 | 92.57 ppm | 2 | 0 |
| HAW Surge Tank | 41-D-417 | 35.54 ppm | 0 | 0 |
| HAW Concentrator | 41-E-460 | 59.73 ppm | 0 | 0 |
| HWW Catch Tank | 41-D-404 | 59.73 ppm | 43 | 3 |
| HWW Sample Tank | 41-D-405 | 59.73 ppm | 233 | 15 |
| 1SF Tank | 42-D-433 | 520.08 ppm | 7 | 4 |
| 1S Column | 42-C-401 | 6.78 ppm | 556 | 4 |
| LAW Feed Tank | 42-D-406 | 18.67 ppm | 56 | 1 |
| LAW Concentrator | 42-E-461 | 841.11 ppm | 0 | 0 |
| LAWB Check Tank | 41-D-434 | 841.11 ppm | 63 | 53 |
| A.F. Overhead Vaporizer | 54-E-502 | <0.1 ppm | 17 | 0 |
| Blowdown Transfer Tank | 54-D-510 | <0.1 ppm | --- | 0 |
| Solvent Batch Strip Tank | 42-D-501 | 31.27 ppm | 0 | 0 |
| GP Feed Tank | 43-D-408 | 33.94 ppm | 0 | 0 |
| GP Concentrator | 43-E-445 | 85.36 ppm | 307 | 26 |
| GPW Check Tank | 43-D-409 | 33.94 ppm | 58 | 2 |
| No. 1 Iodine Scrubber | 45-K-425 | 19.47 ppm | 527 | 10 |
| No. 2 Iodine Scrubber | 45-K-426 | 119.74 ppm | 1005 | 120 |
| S.C. Feed Tank | 44-D-459 | 185.92 ppm | 388 | 72 |
| Service Concentrator | 44-E-462 | 3.37 ppm | 8 | 0 |
| S.C. Check Tank | 44-D-460 | 3.37 ppm | 127 | 0 |
| HS Column | 21-C-201 | 24.36 ppm | 0 | 0 |
| Pu Rework Tank | 32-D-301 | 54.52 ppm | 3 | 0 |
| Sump Collection Tank | 43-D-412 | 18.80 ppm | 0 | 0 |
| No. 1 Silica Gel Bed | 24-C-280 | -------- | 0 | 0 |
| No. 2 Silica Gel Bed | 24-C-281 | -------- | 0 | 0 |
| NO Absorber | 45-C-490 | <0.1 ppm | 0 | 0 |
| HAW Decanter | 21-D-211 | 23.95 ppm | 0 | 0 |
| 1-O Column | 51-C-501 | 46.55 ppm | 3 | 0 |
| 1-P Column | 51-C-502 | 48.3 ppm | 1 | 0 |
| 1-R Column | 51-C-503 | 8.09 ppm | 675 | 5 |
| 2-O Column | 52-C-504 | 0.9 g/l | 41 | 37 |
| 2-P Column | 52-C-505 | 10.91 ppm | 76 | 1 |
| Acid Fractionator | 54-C-550 | 0.6 ppm | 6 | 0 |
| DOG Vacuum Breaker | 45-D-432 | <0.1 ppm | 125 | 0 |
| Acid Fractionator Accumulator | 54-D-505 | <0.1 ppm | 1068 | 0 |
| Acid Fractionator Diverter | 54-D-506 | 0.37 ppm | 3393 | 1 |
| 100 Filter Pump Tank | 51-D-507 | 0.4 g/l | 32 | 13 |
| 200 Filter Pump Tank | 52-D-509 | 5.0 g/l | 0 | 0 |
| Solvent Burner Feed Tank | 42-D-402 | 4.0 g/l | 3718 | 14,872 |
| GP Distillate Receiver | 43-D-410 | <0.1 ppm | 300 | 0 |
| Sump Collection Decanter | 43-D-411 | 31.27 ppm | 2 | 0 |
| Recovered Acid Storage Tank | 62-D-605 | 5.93 ppm | 8840 | 52 |

TABLE 6-16 (CONTINUED)

ENDING INVENTORY - FY 1978 RUN

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| UF Acid Tank | 62-D-621 | 0.35 ppm | 811 | 0 |
| 1UC Surge Pot | 21-D-249 | 1.3 g/1 | 1 | 2 |
| Sumps ILC | | ------- | 0 | 0 |
| UPC | | ------- | 0 | 0 |
| HLC (ACC) | | 8.10 ppm | 4 | 0 |
| HLC (Non-ACC) | | ------- | 0 | 0 |
| HILC | | ------- | 0 | 0 |
| RPC (East) | | 115.42 ppm | 0 | 0 |
| RPC (West) | | ------- | 0 | 0 |
| PPC | | 5.49 ppm | 1 | 0 |
| Solvent Treatment Waste Decanter | 51-D-511 | 38.73 ppm | 11 | 0 |
| | | TOTAL | | 20593 grams |

TABLE 6-17

PRESTARTUP INVENTORY

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| Hull Rinse Surge Tank | 61-D-617 | ---------- | ---- | 0 |
| Dissolver Acid Surge Tank | 61-D-602 | ---------- | ---- | 0 |
| Feed Surge Tank | 17-D-113 | ---------- | ---- | 0 |
| Accountability Tank | 18-D-101 | 228.6 mg/g | 6613 | 2305900 |
| Dissolver Flush Accumulator | 17-D-111 | 261.8 g/l | 7731 | 2016000 |
| No. 1 Feed Adjustment Tank | 17-D-103 | 192.51 mg/g | 7323 | 2081000 |
| No. 2 Feed Adjustment Tank | 17-D-104 | 56.5 g/l | 32 | 1810 |
| HA Feed Tank | 21-D-201 | 9.7 g/l | 14199 | 137730 |
| HA Contactor | 21-C-225 | ---------- | ---- | 0 |
| 1BU Recycle Tank | 21-D-210 | ---------- | ---- | 0 |
| 2E Column | 22-C-205 | ---------- | ---- | 0 |
| 2EU Concentrator | 24-E-260 | ---------- | ---- | 0 |
| 2UC Head Pot | 24-D-257 | ---------- | ---- | 0 |
| U Prod. Catch Tank | 24-D-202 | ---------- | ---- | 0 |
| U Prod. Sample Tank | 24-D-204 | 230.49 g/l | 6823 | 1150600 |
| Off-Spec. U Tank | 24-D-203 | 220.60 g/l | 3587 | 1085130 |
| 1UD/2UD Surge Tank | 62-D-625 | ---------- | ---- | 0 |
| 2EU Decanter | 22-D-209 | ---------- | ---- | 0 |
| 1BX Anolyte Feed Tank | 21-D-213 | ---------- | ---- | 0 |
| 1BX Electrocell | 21-C-275 | ---------- | ---- | 0 |
| 1BX Column | 21-C-202 | ---------- | ---- | 0 |
| 1C Column | 21-C-203 | ---------- | ---- | 0 |
| 1CU Concentrator | 21-E-261 | ---------- | ---- | 0 |
| 1CU Decanter | 21-D-212 | ---------- | ---- | 0 |
| 2D Column | 22-C-204 | ---------- | ---- | 0 |
| 3P Concentrator | 34-E-360 | ---------- | ---- | 0 |
| Pu Catch Tank | 34-D-302 | ---------- | ---- | 0 |
| Pu Sample Tank | 34-D-303 | ---------- | ---- | 0 |
| No. 1 Pu Prod. Storage Tank | 35-D-304 | ---------- | ---- | 0 |
| No. 2 Pu Prod. Storage Tank | 35-D-305 | ---------- | ---- | 0 |
| No. 3 Pu Prod. Storage Tank | 35-D-306 | ---------- | ---- | 0 |
| 1BP Surge Tank | 32-D-307 | ---------- | ---- | 0 |
| 2A Column | 32-C-301 | ---------- | ---- | 0 |
| 3A Column | 33-C-303 | ---------- | ---- | 0 |
| 2B Column | 32-C-302 | ---------- | ---- | 0 |
| 3B Column | 33-C-306 | ---------- | ---- | 0 |
| 3PS Column | 33-C-309 | ---------- | ---- | 0 |
| No. 1 Solvent Feed Tank | 51-D-502 | 0.649 g/l | 17742 | 12310 |
| No. 2 Solvent Feed Tank | 52-D-503 | 1.5 g/l | 4330 | 6500 |
| Carbonate Diversion Tank | 51-D-501 | | | 0 |
| HAW Surge Tank | 41-D-417 | 0.111 g/l | 2529 | 280 |
| HAW Concentrator | 41-E-460 | | | 0 |
| HWW Catch Tank | 41-D-404 | | | 0 |
| HWW Sample Tank | 41-D-405 | 0.0841 g/l | 3219 | 270 |
| 1SF Tank | 42-D-433 | 1.4 g/l | 273 | 380 |

TABLE 6-17 (CONTINUED)

PRESTARTUP INVENTORY

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| 1S Column | 42-C-401 | ---------- | ----- | 0 |
| LAW Feed Tank | 42-D-406 | ---------- | ----- | 0 |
| LAW Concentrator | 42-E-461 | ---------- | ----- | 0 |
| LAWB Check Tank | 41-D-434 | ---------- | ----- | 0 |
| A.F. Overhead Vaporizer | 54-E-502 | ---------- | ----- | 0 |
| Blowdown Transfer Tank | 54-D-510 | ---------- | ----- | 0 |
| Solvent Batch Strip Tank | 42-D-501 | 1.9 g/l | 329 | 630 |
| GP Feed Tank | 43-D-408 | ---------- | ----- | 0 |
| GP Concentrator | 43-E-445 | ---------- | ----- | 0 |
| GPW Check Tank | 43-D-409 | 22.5 g/l | 794 | 17870 |
| No. 1 Iodine Scrubber | 45-K-425 | 0.0848 g/l | 416 | 40 |
| No. 2 Iodine Scrubber | 45-K-426 | 0.649 g/l | 644 | 40 |
| S.C. Feed Tank | 44-D-459 | ---------- | ----- | 0 |
| Service Concentrator | 44-E-462 | ---------- | ----- | 0 |
| S.C. Check Tank | 44-D-460 | ---------- | ----- | 0 |
| HS Column | 21-C-201 | ---------- | ----- | 0 |
| Pu Rework Tank | 32-D-301 | 0.0672 g/l | 1144 | 80 |
| Sump Collection Tank | 43-D-412 | 80.71 | 4281 | 345520 |
| NO Absorber | 45-C-490 | ---------- | ----- | 0 |
| HAW Decanter | 21-D-211 | ---------- | ----- | 0 |
| 1-O Column | 51-C-501 | ---------- | ----- | 0 |
| 1-P Column | 51-C-502 | ---------- | ----- | 0 |
| 1-R Column | 51-C-503 | ---------- | ----- | 0 |
| 2-O Column | 52-C-504 | ---------- | ----- | 0 |
| 2-P Column | 52-C-505 | ---------- | ----- | 0 |
| Acid Fractionator | 54-C-550 | ---------- | ----- | 0 |
| DOG Vacuum Breaker | 45-D-432 | ---------- | ----- | 0 |
| Acid Fractionator Accumulator | 54-D-505 | ---------- | ----- | 0 |
| Acid Fractionator Diverter | 54-D-506 | ---------- | ----- | 0 |
| 100 Filter Pump Tank | 51-D-507 | 0.0226 | 269 | 10 |
| 200 Filter Pump Tank | 52-D-509 | ---------- | ----- | 0 |
| Solvent Burner Feed Tank | 42-D-404 | 3.1 g/l | 3534 | 10960 |
| GP Distillate Receiver | 43-D-410 | ---------- | ----- | 0 |
| Sump Collection Decanter | 43-D-411 | ---------- | ----- | 0 |
| Recovered Acid Storage Tank | 62-D-605 | 0.00393 g/l | 8517 | 30 |
| $UF_6$ Acid Tank | 62-D-621 | ---------- | ----- | 0 |
| 1UC Surge Pot | 21-D-249 | ---------- | ----- | 0 |
| Sumps ILC | | ---------- | ----- | 0 |
| UPC | | ---------- | ----- | 0 |
| HLC | | ---------- | ----- | 0 |
| HLC | | ---------- | ----- | 0 |
| HILC | | ---------- | ----- | 0 |
| RPC | | ---------- | ----- | 0 |
| RPC | | ---------- | ----- | 0 |
| | | TOTAL | | 9173090 |

TABLE 6-18

ENDING INVENTORY - CAMPAIGN 1

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| Accountability Tank | 18-D-101 | 352.1 g/l | ----- | 1983535 |
| Dissolver Flush Accumulator | 17-D-111 | 0.473 g/l | ----- | 0 |
| No. 1 Feed Adjustment Tank | 17-D-103 | 349.7 g/l | ----- | 2662582 |
| No. 2 Feed Adjustment Tank | 17-D-104 | 353.7 g/l | ----- | 3433041 |
| HA Feed Tank | 21-D-201 | 0.1435 g/l | ----- | 0 |
| HA Contactor | 21-C-225 | 0.1435 g/l | ----- | 0 |
| 1BU Recycle Tank | 21-D-210 | 0.00142 g/l | 397 | 0.6 |
| 2E Column | 22-C-205 | 0.009985 g/l | 0 | 0 |
| 2EU Concentrator | 24-E-260 | 0.214 g/l | 27 | 5.8 |
| 2UC Head Pot | 24-D-257 | 0.214 g/l | 154 | 33 |
| U Prod. Catch Tank | 24-D-202 | 86.3 | 3962 | 514520 |
| U Prod. Sample Tank | 24-D-203 | 253.3 g/l | ----- | 1745938 |
| Off-Spec. U Tank | 24-D-204 | 13.9 g/l | 4119 | 57254 |
| 1UD/2UD Surge Tank | 62-D-625 | 0.0005 g/l | 0 | 0 |
| 2EU Decanter | 22-D-209 | -------- | 0 | 0 |
| 1BX Anolyte Feed Tank | 21-D-213 | 0.0441 | 21 | 0.9 |
| 1BX Electrocell | 21-C-275 | -------- | 0 | 0 |
| 1BX Column | 21-C-202 | -------- | 0 | 0 |
| 1C Column | 21-C-203 | -------- | 0 | 0 |
| 1CU Concentrator | 21-E-261 | 0.163 g/l | 5.7 | 0.9 |
| 1CU Decanter | 21-D-212 | 0.03845 g/l | 220 | 8.46 |
| 2D Column | 22-C-204 | -------- | 0 | 0 |
| 3P Concentrator | 34-E-360 | 0.337 g/l | 16 | 5.39 |
| Pu Catch Tank | 34-D-302 | 0.8925 g/l | 12.6 | 11.2 |
| Pu Sample Tank | 34-D-303 | 0.8925 g/l | 0.7 | 0.6 |
| No. 1 Pu Prod. Storage Tank | 35-D-304 | 0.8925 g/l | 12.6 | 11.2 |
| No. 2 Pu Prod. Storage Tank | 35-D-305 | 1.52 g/l | 13.4 | 20.4 |
| No. 3 Pu Prod. Storage Tank | 35-D-306 | 0.08075 g/l | 0 | 0 |
| 1BP Surge Tank | 32-D-307 | -------- | 0 | 0 |
| 2A Column | 32-C-301 | -------- | 0 | 0 |
| 3A Column | 33-C-303 | -------- | 0 | 0 |
| 2B Column | 32-C-302 | -------- | 0 | 0 |
| 3B Column | 33-C-306 | 0.8 g/l | 21.8 | 17.4 |
| 3PS Column | 33-C-309 | -------- | 0 | 0 |
| | | TOTAL | | 10396985.1 |

TABLE 6-18 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 1

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| No. 1 Solvent Feed Tank | 51-D-502 | 0.00236 g/l | 12673 | 30 |
| No. 2 Solvent Feed Tank | 52-D-503 | 0.3045 g/l | 5538 | 1686 |
| Carbonate Diversion Tank | 51-D-501 | 0.0151 | 0 | 0 |
| HAW Surge Tank | 41-D-417 | 0.00129 g/l | 0 | 0 |
| HAW Concentrator | 41-E-460 | 0.0676 g/l | 291 | 17 |
| HWW Catch Tank | 41-D-404 | 0.0676 g/l | 32 | 2 |
| HWW Sample Tank | 41-D-405 | 0.0676 g/l | 539 | 36 |
| 1SF Tank | 42-D-433 | 0.856 g/l | 933 | 798 |
| 1S Column | 42-C-401 | 0.111 g/l | 0 | 0 |
| LAW Feed Tank | 42-D-406 | 0.0004 g/l | 0 | 0 |
| LAW Concentrator | 42-E-461 | 0.229 | 1348 | 309 |
| LAWB Check Tank | 42-D-434 | 0.229 | 725 | 166 |
| A.F. Overhead Vaporizer | 54-E-502 | 0.0193 | 0 | 0 |
| Blowdown Transfer Tank | 54-D-510 | 0.0193 | 0 | 0 |
| Solvent Batch Strip Tank | 42-D-401 | 0.0193 | 0 | 0 |
| GP Feed Tank | 43-D-408 | 0.9 | 2201 | 1981 |
| GP Concentrator | 43-E-445 | 0.8285 | 51 | 42.3 |
| GPW Check Tank | 43-D-409 | 0.5 | 278 | 139 |
| No. 1 Iodine Scrubber | 45-K-425 | 0.258 | 532 | 137 |
| No. 2 Iodine Scrubber | 45-K-426 | 0.156 | 1886 | 294 |
| S.C. Feed Tank | 44-D-459 | 0.0005 | 870 | 1 |
| Service Concentrator | 44-E-462 | 0.00205 | 0 | 0 |
| S.C. Check Tank | 44-D-460 | 0.00205 | 529 | 1 |
| HS Column | 21-C-201 | 0.0424 | 0 | 0 |
| Pu Rework Tank | 32-D-301 | 0.0198 | 2 | 0 |
| Sump Collection Tank | 43-D-412 | 18.1 | 9519 | 172294 |
| No. 1 Silica Gel Bed | 24-C-280 | 43 | 0 | 0 |
| No. 2 Silica Gel Bed | 24-C-281 | 43 | 0 | 0 |
| NO Absorber | 45-C-490 | 0 | 0 | 0 |
| HAW Decanter | 21-D-211 | 0.250 | 13 | 3 |
| 1-O Column | 51-C-501 | 0.2 | 2100 | 420 |
| 1-P Column | 51-C-502 | 0.851 | 424 | 36 |
| 1-R Column | 51-C-503 | 0.8403 | 2112 | 1778 |
| 2-O Column | 52-C-504 | 0.0181 | 613 | 111 |
| 2-P Column | 52-C-505 | 0.002 | 322 | 6 |
| Acid Fractionator | 54-C-550 | 0.004 | 9 | 0 |
| DOG Vacuum Breaker | 45-D-432 | 0 | 0 | 0 |
| Acid Fractionator Accumulator | 54-D-505 | 0 | 1165 | 0 |
| Acid Fractionator Diverter | 54-D-506 | two-phase system | | 66 |
| 100 Filter Pump Tank | 51-D-507 | 0.289 | 20 | 6 |
| 200 Filter Pump Tank | 52-D-509 | 1.5 | 62 | 93 |
| Solvent Burner Feed Tank | 42-D-402 | 40.8 | 10698 | 436478 |
| GP Distillate Receiver | 43-D-410 | 0.0135 | 80 | 1 |
| Sump Collection Decanter | 43-D-411 | 1 | 3 | 3 |
| Recovered Acid Storage Tank | 62-D-605 | 0.00109 | 6643 | 7 |
| | | TOTAL | | 616988.1 |

TABLE 6-18 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 1

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| UF Acid Tank | 62-D-621 | 0.000998 | 1941 | 2 |
| 1UC Surge Pot | 21-D-249 | 0.03845 | 119 | 5 |
| Sumps ILC | | 0.6 | 2 | 1 |
| UPC | | 0.021 | 5 | 0 |
| HLC | | 0.7 | 5 | 4 |
| HLC | | 0.8 | 5 | 4 |
| HILC | | 0.7 | 6 | 4 |
| RPC | | 0.7 | 3 | 2 |
| RPC | | 0.129 | 5 | 1 |
| Centrifuge | 16-K-153 | 0.8 | 31 | 25 |
| 1BP Head Pot | | ------- | ---- | |
| Neutralization Pot | 51-Q-573 | 0.8 | 25 | 20 |
| Sol. Treat. Waste Decanter | 51-D-511 | 0.00236 | 95 | 0 |
| 1SF Decanter | | 0.18 | 0 | 0 |
| | | Total This Page | | 68 |
| | | TOTAL INVENTORY | | 11014042 |

TABLE 6-19

ENDING INVENTORY - CAMPAIGN 2

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| Hull Rinse Surge Tank | 61-D-617 | ---------- | -------- | -------- |
| Dissolver Acid Surge Tank | 61-D-602 | ---------- | -------- | -------- |
| No. 1 Dissolver | 15-C-101 | ---------- | -------- | -------- |
| No. 1 Transfer Tank | 15-D-107 | ---------- | -------- | -------- |
| No. 2 Dissolver | 15-C-102 | ---------- | -------- | -------- |
| No. 2 Transfer Tank | 15-D-108 | ---------- | -------- | -------- |
| No. 3 Dissolver | 15-C-103 | ---------- | -------- | -------- |
| No. 3 Transfer Tank | 15-D-109 | ---------- | -------- | -------- |
| No. 4 Transfer Tank | 15-D-112 | ---------- | -------- | -------- |
| Feed Surge Tank | 17-D-113 | ---------- | -------- | -------- |
| Accountability Tank | 18-D-101 | 213.92 mg/g | 7846.7 kg | 1678566 |
| Dissolver Flush Accumulator | 17-D-111 | 0.135 | 787 | 106 |
| No. 1 Feed Adjustment Tank | 17-D-103 | 214.66 mg/g | 14311 kg | 3072038 |
| No. 2 Feed Adjustment Tank | 17-D-104 | 211.57 mg/g | 14266 kg | 3018174 |
| HA Feed Tank | 21-D-201 | 0.160 | 264 | 4 |
| HA Contactor | 21-C-225 | ---------- | 0 | 0 |
| 1BU Recycle Tank | 21-D-210 | 0.235 | 58 | 14 |
| 2E Column | 22-C-205 | 0.6 | 39 | 23 |
| 2EU Concentrator | 24-E-260 | 4.8 | 188 | 902 |
| 2UC Head Pot | 24-D-257 | 4.8 | 163 | 782 |
| U Prod. Catch Tank | 24-D-202 | 79.77 mg/g | 6747 kg | 538192 |
| U Prod. Catch Tank | 24-D-204 | 203.3 mg/g | 6565 kg | 1334665 |
| Off-Spec. U Tank | 24-D-203 | 70.2 | 4189 | 294068 |
| 1UD/2UD Surge Tank | 62-D-625 | <0.01 | 639 | 0 |
| 2EU Decanter | 22-D-209 | <0.01 | 261 | 0 |
| 1BX Anolyte Feed Tank | 21-D-213 | 0.13 | 89 | 11 |
| 1BX Electrocell | 21-C-275 | 0.12 | 86 | 11 |
| 1BX Column | 21-C-202 | 0.12 | 90 | 11 |
| 1C Column | 21-C-203 | 0.13 | 98 | 13 |
| 1CU Concentrator | 21-E-261 | 1.4 | 6 | 9 |
| 1CU Decanter | 21-D-212 | 0.34 | 0 | 0 |
| 2D Column | 22-C-204 | 1.4 | 471 | 659 |
| 3P Concentrator | 34-E-360 | 0.2 | 21 | 4 |
| Pu Catch Tank | 34-D-302 | 0.2 | 16 | 3 |
| Pu Sample Tank | 34-D-303 | 0.2 | 25 | 5 |
| No. 1 Pu Prod. Storage Tank | 35-D-304 | 0.3 | 54 | 14 |
| No. 2 Pu Prod. Storage Tank | 35-D-305 | 0.7 | 68 | 48 |
| No. 3 Pu Prod. Storage Tank | 35-D-306 | 0.6 | 55 | 33 |
| 1BP Surge Tank | 32-D-307 | 0.06 | 263 | 2 |
| 1BP Constant Level Head Pot | 32-D-302 | 0.01 | 170 | 2 |
| 2A Column | 32-C-301 | 0.027 | 135 | 27 |
| 3A Column | 33-C-303 | 0.08 | 110 | 9 |
| 2B Column | 32-C-302 | 0.472 | 24 | 11 |
| 3B Column | 33-C-306 | 0.5 | 21 | 11 |

TABLE 6-19 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 2

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| 3PS Column | 33-C-309 | 0.8 | 0 | 0 |
| No. 1 Solvent Feed Tank | 51-D-502 | 0.469 | 14201 | 6660 |
| No. 2 Solvent Feed Tank | 52-D-503 | 0.6 | 8420 | 5104 |
| Carbonate Diversion Tank | 51-D-501 | <0.01 | 296 | 1 |
| HAW Surge Tank | 41-D-417 | 0.046 | 0 | 0 |
| HAW Concentrator | 41-E-460 | 0.046 | 365 | 17 |
| HWW Catch Tank | 41-D-404 | 0.046 | 196 | 9 |
| HWW Sample Tank | 41-D-405 | 0.046 | 468 | 23 |
| 1SF Tank | 42-D-433 | 0.49 | 564 | 276 |
| 1SF Constant Level Head Pot | 42-D-490 | 0.49 | 100 | 49 |
| 1S Column | 42-C-401 | 0.16 | 164 | 108 |
| LAW Feed Tank | 42-D-406 | 0.239 | 480 | 104 |
| LAW Constant Level Head Pot | 42-D-480 | 0.239 | 0 | 0 |
| LAW Concentrator | 42-E-461 | 3.5 | 1275 | 4463 |
| LAWB Check Tank | 42-D-434 | 3.5 | 224 | 784 |
| A.F. Overhead Vaporizer | 54-E-502 | <0.001 | 0 | 0 |
| Blowdown Transfer Tank | 54-D-510 | <0.001 | 50 | 0 |
| Solvent Batch Strip Tank | 42-D-501 | 5.7 | 5 | 29 |
| GP Feed Tank | 43-D-408 | 4.8 | 1499 | 7195 |
| GP Concentrator | 43-E-445 | 2.6 | 349 | 3188 |
| GPW Check Tank | 43-D-409 | 3.8 | 521 | 1980 |
| No. 1 Iodine Scrubber | 45-K-425 | 0.275 | 0 | 0 |
| No. 2 Iodine Scrubber | 45-K-426 | 0.32 | 1094 | 351 |
| S.C. Feed Tank | 44-D-459 | <0.001 | 1092 | 0 |
| Service Concentrator | 44-E-462 | <0.001 | 455 | 0 |
| S.C. Check Tank | 44-D-460 | <0.001 | 1627 | 0 |
| HS Column | 21-C-201 | 0.009 | 275 | 2 |
| Pu Rework Tank | 32-D-301 | 0.0239 | 5 | 0 |
| Sump Collection Tank | 43-D-412 | 13.9 | 8916 | 123932 |
| No. 1 Silica Gel Bed | 24-C-280 | --- | --- | --- |
| No. 2 Silica Gel Bed | 24-C-281 | --- | --- | --- |
| NO Absorber | 45-C-490 | --- | --- | 0 |
| HAW Decanter | 21-D-211 | <0.001 | 11 | 0 |
| 1-O Column | 51-C-501 | 1 | 904 | 904 |
| 1-P Column | 51-C-502 | 0.005 | 666 | 3 |
| 1-R Column | 51-C-503 | 0.3 | 822 | 247 |
| 2-O Column | 52-C-504 | 0.06 | 666 | 37 |
| 2-P Column | 52-C-505 | 0.002 | 543 | 1 |
| Acid Fractionator | 54-C-550 | <0.001 | 0 | 0 |
| DOG Vacuum Breaker | 45-D-432 | <0.001 | 0 | 0 |

TABLE 6-19 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 2

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| Acid Fractionator Accumulator | 54-D-505 | <0.001 | 729 | 0 |
| Acid Fractionator Diverter | 54-D-506 | <0.001 | 9125 | 2 |
| 100 Filter Pump Tank | 51-D-507 | 0.062 | 62 | 4 |
| 200 Filter Pump Tank | 52-D-509 | 0.35 | 25 | 0 |
| Solvent Burner Feed Tank | 42-D-402 | 40.8 | 10698 | 436478 |
| GP Distillate Receiver | 43-D-410 | <0.001 | 103 | 0 |
| Sump Collection Decanter | 43-D-411 | 7.0 | 4.4 | 31 |
| Recovered Acid Storage Tank | 62-D-605 | 0.0004 | 8059 | 3 |
| $UF_6$ Acid Tank | 62-D-621 | <0.001 | 2774 | 0 |
| 1UC Surge Pot | 21-D-249 | 1.4 | 99 | 139 |
| Sumps ILC | | 0 | 0 | 0 |
| UPC | | 0.007 | 0 | 0 |
| HLC | | 0.1 | 5 | 1 |
| HLC | | ----- | 0 | 0 |
| HILC | | 0.7 | 5 | 3 |
| RPC | | 0.4 | 1 | 0 |
| RPC | | 0.8 | 4 | 3 |
| Sampler Holdups | | 250 | 15 | 3750 |
| | | TOTAL INVENTORY | | 10533296 |

TABLE 6-20

ENDING INVENTORY - CAMPAIGN 3

| Vessel Name | Vessel No. | U Concentration g/l | Volume (liters) | Grams U |
|---|---|---|---|---|
| Hull Rinse Surge Tank | 61-D-617 | 0.0583 | 114 | 7 |
| Dissolver Acid Surge Tank | 61-D-602 | 0.00152 | 714 | 1 |
| No. 1 Dissolver | 15-C-101 | 0.0147 | 39 | 1 |
| No. 1 Transfer Tank | 15-D-107 | 0.0147 | 96 | 1.4 |
| No. 2 Dissolver | 15-C-102 | 0.01145 | 5 | 0 |
| No. 2 Transfer Tank | 15-D-108 | 0.01145 | 81 | 1 |
| No. 3 Dissolver | 15-C-103 | 0.01 | 83 | 1 |
| No. 3 Transfer Tank | 15-D-109 | 0.01 | 103 | 1 |
| No. 4 Transfer Tank | 15-D-112 | ------- | --- | 0 |
| Feed Surge Tank | 17-D-113 | 0.001585 | 77 | 0 |
| Accountability Tank | 18-D-101 | 0.02455 | 342 | 8 |
| Dissolver Flush Accumulator | 17-D-111 | 0.0209 | 15 | 0 |
| No. 1 Feed Adjustment Tank | 17-D-103 | 0.1655 | 274 | 45 |
| No. 2 Feed Adjustment Tank | 17-D-104 | 0.1645 | 143 | 23 |
| HA Feed Tank | 21-D-201 | 0.0803 | 315 | 25 |
| HA Contactor | 21-C-225 | ------- | ---- | 0 |
| 1BU Recycle Tank | 21-D-210 | ------- | ---- | 0 |
| 2E Column | 22-C-205 | 1E-5 | 20 | 0 |
| 2EU Concentrator | 24-E-260 | 0.117 | 3 | 0 |
| 2UC Head Pot | 24-D-257 | 0.117 | 52 | 6 |
| U Prod. Catch Tank | 24-D-202 | 0.7 | 29 | 20 |
| U Prod. Sample Tank | 24-D-203 | 9.65 | 200 | 1930 |
| Off-Spec. U Tank | 24-D-204 | 0.213 | 312 | 66 |
| 1UD/2UD Surge Tank | 62-D-625 | ------- | ---- | 0 |
| 2EU Decanter | 22-D-209 | 1E-5 | 0 | 0 |
| 1BX Anolyte Feed Tank | 21-D-213 | 0.00114 | 21 | 0 |
| 1BX Electrocell | 21-C-275 | 1E-5 | 22 | 0 |
| 1BX Column | 21-C-202 | 1E-5 | 0 | 0 |
| 1C Column | 21-C-203 | 0.7 | 6 | 4 |
| 1CU Concentrator | 21-E-261 | 0.0366 | 6 | 0 |
| 1CU Decanter | 21-D-212 | 0.7 | 18 | 13 |
| 2D Column | 22-C-204 | 0.00577 | 96 | 1 |
| 3P Concentrator | 34-E-360 | 0.139 | 16 | 2 |
| Pu Catch Tank | 34-D-302 | 0.139 | 18 | 3 |
| Pu Sample Tank | 34-D-303 | 0.139 | 17 | 2 |
| No. 1 Pu Prod. Storage Tank | 35-D-304 | 0.02735 | 124 | 3 |
| No. 2 Pu Prod. Storage Tank | 35-D-305 | 0.24 | 89 | 22 |
| No. 3 Pu Prod. Storage Tank | 35-D-306 | 0.0792 | 101 | 8 |
| 1BP Surge Tank | 32-D-307 | 0.006065 | 3 | 0 |
| 2A Column | 32-C-301 | 0.01965 | 129 | 2 |
| 3A Column | 33-C-303 | 0.00155 | 93 | 0 |
| 2B Column | 32-C-302 | 0.0268 | 23 | 1 |
| 3B Column | 33-C-306 | 0.1135 | 17 | 2 |
| 3PS Column | 33-C-309 | 0.4225 | 0 | 0 |

TABLE 6-20 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 3

| Vessel Name | Vessel No. | U Concentration | Volume (liters) | Grams U |
|---|---|---|---|---|
| No. 1 Solvent Feed Tank | 51-D-502 | 0.00118 | 17192 | 20 |
| No. 2 Solvent Feed Tank | 52-D-503 | 0.210 | 6058 | 1272 |
| Carbonate Diversion Tank | 51-D-501 | 0.003 | 1 | 0 |
| HAW Surge Tank | 41-D-417 | 3E-4 | 0 | 0 |
| HAW Concentrator | 41-E-460 | 0.01925 | 253 | 5 |
| HWW Catch Tank | 41-D-404 | 0.01925 | 0 | 0 |
| HWW Sample Tank | 41-D-405 | 0.01925 | 514 | 10 |
| 1SF Tank | 42-D-433 | 0.1205 | 437 | 53 |
| 1S Column | 42-C-401 | 0.1205 | 2 | 0 |
| LAW Feed Tank | 42-D-406 | 0.0177 | 57 | 1 |
| LAW Concentrator | 42-E-461 | 0.179 | 0 | 0 |
| LAWB Check Tank | 42-D-434 | 0.179 | 28 | 5 |
| A.F. Overhead Vaporizer | 54-E-502 | 0.371 | 0 | 0 |
| Blowdown Transfer Tank | 54-D-510 | 0.371 | 0 | 0 |
| Solvent Batch Strip Tank | 42-D-501 | 0.03445 | 0 | 0 |
| GP Feed Tank | 43-D-408 | 0.1695 | 529 | 90 |
| GP Concentrator | 43-E-445 | 0.448 | 355 | 159 |
| GPW Check Tank | 43-D-409 | 0.448 | 81 | 36 |
| No. 1 Iodine Scrubber | 45-K-425 | 0.057 | 555 | 32 |
| No. 2 Iodine Scrubber | 45-K-426 | 0.141 | 1060 | 150 |
| S.C. Feed Tank | 44-D-459 | 0.00026 | 890 | 0 |
| Service Concentrator | 44-E-462 | 0.000682 | 0 | 0 |
| S.C. Check Tank | 44-D-460 | 0.000682 | 1122 | 1 |
| HS Column | 21-C-201 | 0.00648 | 0 | 0 |
| Pu Rework Tank | 32-D-301 | 0.0649 | 4 | 0 |
| Sump Collection Tank | 43-D-412 | 0.0254 | 1128 | 29 |
| $NO_2$ Absorber | 45-C-490 | 8E-5 | 1277 | 0 |
| HAW Decanter | 21-D-211 | 0.172 | 0 | 0 |
| 1-O Column | 51-C-501 | 0.0534 | 4 | 0 |
| 1-P Column | 51-C-502 | 0.4 | 24 | 10 |
| 1-R Column | 51-C-503 | 0.1145 | 5 | 1 |
| 2-O Column | 52-C-504 | 0.00384 | 43 | 0 |
| 2-P Column | 52-C-505 | 0.3 | 73 | 22 |
| Acid Fractionator | 54-C-550 | 0.0005 | 6 | 0 |
| DOG Vacuum Breaker | 45-D-432 | 8E-5 | 0 | 0 |

TABLE 6-20 (CONTINUED)

ENDING INVENTORY - CAMPAIGN 3

| Vessel Name | Vessel No. | U Concentration g/l | Volume (liters) | Grams U |
|---|---|---|---|---|
| Acid Fractionator Accumulator | 54-D-505 | 1E-4 | 0 | 0 |
| Acid Fractionator Diverter | 54-D-506 | 0.00253 | 3898 | 10 |
| 100 Filter Pump Tank | 51-D-507 | 0.2 | 62 | 12 |
| 200 Filter Pump Tank | 52-D-509 | 0.4 | 112 | 45 |
| Solvent Burner Feed Tank | 42-D-404 | 40.2 | 11150 | 453014 |
| GP Distillate Receiver | 43-D-410 | 1.3E-4 | 129 | 0 |
| Sump Collection Decanter | 43-D-411 | 0.0254 | 2 | 0 |
| Recovered Acid Storage Tank | 62-D-605 | 0.000306 | 6248 | 2 |
| UF Acid Tank | 62-D-621 | 6E-5 | 96 | 0 |
| 1UC Surge Pot | 21-D-249 | 0.0366 | 95 | 3 |
| Sumps ILC | | 0.0118 | 0.4 | 0 |
| UPC | | 0.0676 | 2 | 0 |
| HLC | | 0.004 | 0 | 0 |
| HLC | | 0.13 | 0 | 0 |
| HILC | | 0.233 | 4 | 0 |
| RPC | | 0.0168 | 2 | 0 |
| RPC | | 0.0147 | 6 | 0 |
| PPC | | 0.05 | 2 | 1 |

## TABLE 6-21

### 02003 REPLICATE COMPARISONS - BATCHES 206 to 315
### 12-OCT-79 -- 10:41 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 206 | 2213.8 | -17.59** | 9709.4 | .90 | 2213.7 | -17.67** | 9709.4 | .90 |
| 207 | 2504.2 | -1.43 | 10488.5 | -.51 | 2504.2 | -1.42 | 10488.5 | -.51 |
| 208 | 2347.2 | 13.70 | 10959.7 | .08 | 2347.1 | 13.68 | 10959.7 | .08 |
| 209 | 2792.9 | 6.00 | 9903.6 | .80 | 2792.9 | 6.00 | 9903.6 | .80 |
| 210 | 2702.3 | -.24 | 10228.1 | 5.66 | 2702.3 | -.25 | 10228.2 | 5.65 |
| 211 | 2965.2 | 1.99 | 8816.9 | -1.11 | 2965.2 | 2.15 | 8816.8 | -1.11 |
| 212 | 1279.6 | -3.03 | 8817.1 | -.55 | 1279.4 | -3.18 | 8817.1 | -.55 |
| 213 | 943.2 | -2.21 | 7993.5 | -1.41 | 943.2 | -2.21 | 7993.5 | -1.41 |
| 214 | 910.8 | -.43 | 7363.4 | -.41 | 910.8 | -.43 | 7363.4 | -.41 |
| 215 | 865.3 | 4.16 | 6780.9 | .04 | 865.3 | 4.16 | 6780.9 | .04 |
| 216 | 910.7 | -.17 | 7144.1 | -1.57 | 910.7 | -.17 | 7144.1 | -1.57 |
| 217 | 1653.0 | .78 | 7648.0 | .10 | 1653.0 | .77 | 7648.0 | .10 |
| 218 | 704.9 | 4.24 | 8313.4 | .25 | 704.9 | 4.27 | 8313.3 | .24 |
| 219 | 664.6 | 0.00 | 8225.6 | .02 | 664.6 | -.01 | 8225.6 | .02 |
| 220 | 935.4 | -.51 | 7110.8 | 1.59 | 935.4 | -.51 | 7110.8 | 1.59 |
| 221 | 818.9 | -.48 | 6915.3 | 65.11** | 818.9 | -.47 | 6915.3 | 65.12** |
| 222 | 764.9 | -4.44 | 9225.4 | .08 | 764.9 | -4.46 | 9225.4 | .07 |
| 223 | 1360.4 | .17 | 8073.3 | 1.09 | 1360.4 | .17 | 8073.3 | 1.10 |
| 224 | 924.8 | 2.85 | 7325.0 | -.54 | 924.8 | 2.86 | 7325.0 | -.54 |
| 225 | 781.7 | -2.38 | 8373.5 | 1.31 | 781.6 | -2.40 | 8373.5 | 1.30 |
| 226 | 711.7 | .90 | 7284.1 | 11.01 | 711.7 | .90 | 7284.1 | 11.01 |
| 227 | 847.4 | .63 | 7223.6 | .09 | 847.4 | .64 | 7223.6 | .09 |
| 228 | 782.8 | -.71 | 8484.6 | -.48 | 782.8 | -.73 | 8484.6 | -.48 |
| 229 | 859.0 | 2.15 | 7848.2 | .08 | 859.0 | 2.15 | 7848.2 | .08 |
| 230 | 811.0 | 1.73 | 6837.8 | -.44 | 811.0 | 1.73 | 6837.8 | -.44 |
| 231 | 655.2 | -.05 | 7985.9 | .40 | 655.2 | -.05 | 7985.9 | .40 |
| 232 | 725.9 | 711.77** | 6978.1 | 1.19 | 725.9 | 711.77** | 6978.1 | 1.19 |
| 233 | 825.3 | -4.19 | 8990.7 | -.37 | 825.3 | -4.19 | 8990.7 | -.38 |
| 234 | 716.0 | 1.60 | 7515.7 | .07 | 716.0 | 1.65 | 7515.7 | .06 |
| 235 | 778.0 | .99 | 6993.6 | 2.72 | 778.0 | .97 | 6993.5 | 2.71 |
| 236 | 703.2 | -3.15 | 7805.7 | .06 | 703.2 | -3.19 | 7805.7 | .06 |
| 237 | 799.4 | -9.31 | 7805.7 | NA | 799.4 | -9.32 | 7805.7 | 0.00 |
| 238 | 833.5 | 1.64 | 7898.5 | .21 | 833.5 | 1.65 | 7898.5 | .20 |
| 239 | 778.9 | -.79 | 7275.6 | -.52 | 779.0 | -.78 | 7275.6 | -.52 |
| 240 | 784.8 | 6.39 | 7663.1 | 2.81 | 784.8 | 6.40 | 7663.1 | 2.81 |
| 241 | 724.5 | -2.04 | 8152.7 | .96 | 724.5 | -2.05 | 8152.7 | .96 |
| 242 | 853.5 | -1.25 | 7983.4 | .67 | 853.5 | -1.25 | 7983.4 | .67 |
| 243 | 805.7 | -.02 | 8593.0 | .26 | 805.7 | -.01 | 8593.0 | .26 |
| 244 | 860.7 | 1.45 | 7323.0 | 2.51 | 860.7 | 1.47 | 7323.0 | 2.51 |
| 245 | 827.6 | -.16 | 8248.9 | 1.57 | 827.5 | -.19 | 8248.9 | 1.57 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-21 (CONTINUED)

### 02003 REPLICATE COMPARISONS - BATCHES 206 to 315
### 12-OCT-79 -- 10:41 AM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 246 | 898.4 | -1.99 | 8550.1 | 13.44 | 898.3 | -2.00 | 8550.1 | 13.44 |
| 247 | 1045.4 | 1.96 | 8112.0 | .73 | 1045.4 | 1.96 | 8112.0 | .73 |
| 248 | 875.8 | -2.14 | 8116.1 | 1.60 | 875.8 | -2.14 | 8116.1 | 1.60 |
| 249 | 890.1 | -2.50 | 8514.3 | .26 | 890.1 | -2.59 | 8514.4 | .25 |
| 250 | 782.2 | .07 | 7552.6 | -.25 | 782.3 | .16 | 7552.7 | -.25 |
| 251 | 801.6 | 2.23 | 8298.9 | .28 | 801.6 | 2.23 | 8298.9 | .28 |
| 252 | 899.1 | 3.39 | 8547.7 | -.01 | 899.2 | 3.39 | 8547.7 | -.01 |
| 253 | 934.1 | .90 | 8753.8 | -.14 | 934.1 | .91 | 8753.8 | -.14 |
| 254 | 880.0 | -.12 | 7853.6 | -.76 | 880.0 | -.13 | 7853.6 | -.76 |
| 255 | 831.9 | 3.63 | 7892.6 | .63 | 831.9 | 3.62 | 7892.6 | .63 |
| 256 | 708.8 | 1.61 | 7952.5 | -.02 | 708.8 | 1.62 | 7952.5 | -.02 |
| 257 | 896.2 | -1.40 | 7769.2 | -.73 | 896.2 | -1.41 | 7769.2 | -.73 |
| 258 | 700.8 | -1.30 | 8244.0 | .02 | 700.8 | -1.29 | 8244.0 | .01 |
| 259 | 793.8 | .60 | 8258.6 | 1.00 | 793.8 | .59 | 8258.6 | 1.00 |
| 260 | 718.3 | -1.49 | 8044.5 | .43 | 718.3 | -1.49 | 8044.5 | .43 |
| 261 | 816.5 | 22.94** | 7896.9 | .15 | 816.5 | 22.94** | 7896.9 | .15 |
| 262 | 706.2 | -.09 | 7184.5 | .13 | 706.2 | -.09 | 7184.5 | .13 |
| 263 | 680.5 | .65 | 8687.6 | -.03 | 680.5 | .65 | 8687.6 | -.03 |
| 264 | 726.0 | -1.75 | 8112.0 | .10 | 726.0 | -1.75 | 8112.0 | .11 |
| 265 | 864.5 | 1.38 | 8571.9 | .29 | 864.5 | 1.37 | 8571.9 | .29 |
| 266 | 720.7 | -1.57 | 8280.6 | .29 | 720.7 | -1.56 | 8280.7 | .30 |
| 267 | 873.2 | 2.21 | 8157.5 | 3.65 | 873.2 | 2.20 | 8157.5 | 3.65 |
| 268 | 880.9 | -.18 | 8678.4 | 1.08 | 880.9 | -.17 | 8678.4 | 1.09 |
| 269 | 1807.5 | -4.19 | 10444.1 | .03 | 1807.5 | -4.19 | 10444.1 | .04 |
| 270 | 785.0 | 2.74 | 10586.3 | -4.76 | 785.0 | 2.76 | 10586.3 | -4.75 |
| 271 | 7052.1 | .49 | 7858.7 | 4.12 | 7052.1 | .46 | 7858.7 | 4.12 |
| 272 | 7854.3 | 7.29 | 7848.8 | 0.00 | 7854.3 | 7.30 | 7848.8 | 0.00 |
| 273 | 4657.7 | -.35 | 4657.5 | .52 | 4657.7 | -.35 | 4657.5 | .52 |
| 274 | 706.6 | -7.53 | 8096.4 | 1.53 | 706.6 | -7.53 | 8096.4 | 1.53 |
| 275 | 846.0 | -.87 | 9838.3 | .27 | 846.0 | -.88 | 9838.3 | .27 |
| 276 | 1130.9 | 3.47 | 9499.7 | .17 | 1130.9 | 3.47 | 9499.7 | .17 |
| 277 | 882.5 | 2.04 | 8020.3 | .25 | 882.5 | 2.04 | 8020.3 | .25 |
| 278 | 652.0 | 5.99 | 8323.5 | .96 | 652.0 | 5.99 | 8323.5 | .96 |
| 279 | 696.6 | -1.47 | 7683.9 | .51 | 696.6 | -1.47 | 7683.9 | .51 |
| 280 | 718.8 | -6.29 | 8800.9 | 2.79 | 718.8 | -6.27 | 8800.9 | 2.79 |
| 281 | 871.9 | -1.21 | 6523.6 | -.28 | 871.8 | -1.22 | 6523.6 | -.28 |
| 282 | 642.2 | 3.97 | 7767.5 | -.80 | 642.2 | 3.97 | 7767.5 | -.80 |
| 283 | 898.6 | 1.16 | 10426.8 | 1.38 | 898.6 | 1.18 | 10426.8 | 1.37 |
| 284 | 906.8 | .20 | 8874.1 | .11 | 906.8 | .20 | 8874.1 | .11 |
| 285 | 717.0 | 1.17 | 6794.8 | -.55 | 717.0 | 1.18 | 6794.8 | -.55 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-21 (CONTINUED)

### 02003 REPLICATE COMPARISONS - BATCHES 206 to 315
### 12-OCT-79 -- 10:41 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 286 | 865.7 | 4.94 | 8308.2 | -.50 | 865.7 | 4.92 | 8308.2 | -.50 |
| 287 | 886.5 | .60 | 8769.6 | -1.63 | 886.5 | .59 | 8769.6 | -1.63 |
| 288 | 672.3 | -1.06 | 7604.3 | -.19 | 672.3 | -1.04 | 7604.3 | -.19 |
| 289 | 816.1 | -.42 | 9555.1 | .17 | 816.0 | -.41 | 9555.1 | .17 |
| 290 | 929.9 | -5.89 | 8677.6 | -.75 | 929.8 | -5.89 | 8677.5 | -.75 |
| 291 | 836.3 | 1.95 | 9246.2 | -1.17 | 836.3 | 1.93 | 9246.2 | -1.17 |
| 292 | 830.3 | 1.95 | 10510.3 | -.33 | 830.3 | 1.96 | 10510.3 | -.33 |
| 293 | 925.7 | -1.12 | 9380.0 | -1.84 | 925.7 | -1.12 | 9380.0 | -1.84 |
| 294 | 892.8 | -5.29 | 8453.0 | 2.32 | 892.8 | -5.31 | 8453.0 | 2.32 |
| 295 | 703.2 | -.43 | 8392.4 | .68 | 703.2 | -.45 | 8392.5 | .68 |
| 296 | 887.9 | -2.23 | 8632.8 | .50 | 887.9 | -2.21 | 8632.8 | .50 |
| 297 | 624.5 | -7879.87** | 8505.2 | .29 | 624.5 | -7879.94** | 8505.2 | .29 |
| 298 | 677.2 | 1.53 | 8703.3 | -.21 | 677.3 | 1.62 | 8703.2 | -.21 |
| 299 | 646.2 | 1.18 | 7938.5 | .23 | 646.2 | 1.18 | 7938.5 | .23 |
| 300 | 681.9 | .33 | 9248.6 | -.27 | 681.9 | .31 | 9248.6 | -.27 |
| 301 | 923.1 | .86 | 8693.8 | .24 | 923.1 | .84 | 8693.8 | .23 |
| 302 | 707.0 | 6.46 | 8296.7 | -.46 | 707.0 | 6.50 | 8296.7 | -.45 |
| 303 | 702.1 | -7737.68** | 8439.6 | .55 | 702.0 | -7737.70** | 8439.6 | .55 |
| 304 | 697.9 | 1.89 | 7934.4 | -.41 | 697.9 | 1.89 | 7934.3 | -.42 |
| 305 | 888.6 | .47 | 8308.9 | 0.00 | 888.6 | .46 | 8308.9 | 0.00 |
| 306 | 705.9 | -.24 | 7884.1 | -.19 | 705.9 | -.22 | 7884.1 | -.19 |
| 307 | 865.3 | -.38 | 8362.6 | -.09 | 865.2 | -.39 | 8362.5 | -.09 |
| 308 | 696.6 | 6.61 | 8329.2 | -.41 | 696.6 | 6.62 | 8329.2 | -.40 |
| 309 | 794.9 | -.16 | 8597.8 | 1.31 | 794.9 | -.17 | 8597.8 | 1.32 |
| 310 | 1151.6 | -1.03 | 8835.6 | .24 | 1151.6 | -1.04 | 8835.5 | .24 |
| 311 | 901.7 | -91.14** | 3145.4 | 3.46 | 901.7 | -91.22** | 3145.5 | 3.46 |
| 312 | 14.2 | .53 | 2084.9 | 3.54 | 14.2 | .55 | 2085.5 | 3.64 |
| 313 | 470.6 | -3.48 | 474.2 | -.15 | 471.1 | -3.54 | 472.9 | -.18 |
| 314 | 440.7 | -.93 | 5396.4 | 3.04 | 441.3 | -.90 | 5397.1 | 3.05 |
| 315 | 465.1 | 2.78 | 3157.1 | 2.45 | 465.7 | 2.78 | 3157.8 | 2.46 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-21 (CONTINUED)

02003 REPLICATE COMPARISONS - BATCHES 206 to 315
12-OCT-79 -- 10:41 AM

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**  **
**  SUMMARY REPORT  **
**  **
**  **
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| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | 110 | 104 | 110 | 108 | 110 | 104 | 110 | 109 |
| AVERAGE: | 1070.74 | .33 | 8038.62 | .62 | 1070.75 | .33 | 8038.62 | .62 |
| SIGMA: | 1047.04 | 3.15 | 1517.73 | 2.09 | 1047.03 | 3.15 | 1517.72 | 2.08 |
| ACCEPTABLE RANGE: | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 |

THIS SUMMARY INCLUDES 110 BATCHES

## TABLE 6-22

### 02007 REPLICATE COMPARISONS - BATCHES 72 to 186
### 15-AUG-79 -- 12:59 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 72 | NA | NA | 9641.4 | -2.28 | NA | NA | 9641.5 | -2.29 |
| 72 | NA | NA | 9641.3 | -2.28 | NA | NA | NA | NA |
| 73 | NA | NA | 10499.0 | 11.18 | NA | NA | 10499.0 | 11.19 |
| 74 | NA | NA | 10883.8 | -.51 | NA | NA | 10883.8 | -.51 |
| 75 | NA | NA | 9298.3 | -4.96 | NA | NA | 9298.3 | -4.96 |
| 76 | NA | NA | 9699.5 | -5.99 | NA | NA | 9699.5 | -5.99 |
| 77 | NA | NA | 8103.8 | 51.46** | NA | NA | 8103.8 | 51.47 |
| 78 | NA | NA | 9750.6 | -2.72 | NA | NA | 9750.6 | -2.71 |
| 79 | NA | NA | 9267.5 | -2.40 | NA | NA | 9267.5 | -2.40 |
| 80 | NA | NA | 8671.5 | -2.74 | NA | NA | 8671.5 | -2.74 |
| 81 | NA | NA | 8120.9 | -4.56 | NA | NA | 8120.8 | -4.57 |
| 82 | NA | NA | 8430.3 | -12.99 | NA | NA | 8430.3 | -12.99 |
| 83 | NA | NA | 8202.6 | 2.74 | NA | NA | 8202.6 | 2.73 |
| 84 | NA | NA | 9819.3 | 10.88 | NA | NA | 9819.3 | 10.89 |
| 85 | NA | NA | 9758.1 | -4.97 | NA | NA | 9758.1 | -4.97 |
| 86 | NA | NA | 8349.0 | -19.87** | NA | NA | 8349.0 | -19.88 |
| 87 | NA | NA | 8439.1 | 136.22** | NA | NA | 8439.1 | 136.22** |
| 88 | NA | NA | 10669.5 | -4.33 | NA | NA | 10669.5 | -4.32 |
| 89 | NA | NA | 8921.0 | -5.02 | NA | NA | 8921.0 | -5.01 |
| 90 | NA | NA | 8610.4 | -.10 | NA | NA | 8610.4 | -.10 |
| 91 | NA | NA | 9792.7 | -.75 | NA | NA | 9792.7 | -.74 |
| 92 | NA | NA | 8769.3 | -2.35 | NA | NA | 8769.3 | -2.35 |
| 93 | NA | NA | 8583.3 | -6.92 | NA | NA | 8583.6 | -6.91 |
| 94 | NA | NA | 9917.4 | -3.92 | NA | NA | 9917.5 | -3.92 |
| 95 | NA | NA | 9199.6 | -1.39 | NA | NA | 9199.6 | -1.39 |
| 96 | NA | NA | 8233.8 | -6.66 | NA | NA | 8233.8 | -6.65 |
| 97 | NA | NA | 9464.9 | -62.29** | NA | NA | 9464.9 | -62.29 |
| 98 | NA | NA | 8461.6 | .59 | NA | NA | 8461.6 | .59 |
| 99 | NA | NA | 10356.4 | -8.21 | NA | NA | 10356.7 | -8.21 |
| 100 | NA | NA | 9014.0 | -3.78 | NA | NA | 9013.9 | -3.78 |
| 101 | NA | NA | 8423.1 | -2.63 | NA | NA | 8423.1 | -2.63 |
| 102 | NA | NA | 9313.0 | -.19 | NA | NA | 9313.0 | -.19 |
| 103 | NA | NA | 9316.0 | 91.48** | NA | NA | 9316.1 | 91.48** |
| 104 | NA | NA | 9280.2 | .05 | NA | NA | 9280.2 | .05 |
| 105 | NA | NA | 8711.3 | -2.26 | NA | NA | 8711.3 | -2.26 |
| 106 | NA | NA | 9085.3 | .21 | NA | NA | 9085.3 | .22 |
| 107 | NA | NA | 9634.3 | -2.88 | NA | NA | 9634.3 | -2.87 |
| 108 | NA | NA | 9328.7 | -2.75 | NA | NA | 9328.7 | -2.75 |
| 109 | NA | NA | 9994.1 | -.51 | NA | NA | 9994.1 | -.51 |
| 110 | NA | NA | 8665.5 | .80 | NA | NA | 8665.4 | .79 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-22 (CONTINUED)

### 02007 REPLICATE COMPARISONS - BATCHES 72 to 186
### 15-AUG-79 -- 12:59 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 111 | NA | NA | 9636.6 | 9.44 | NA | NA | 9636.6 | 9.44 |
| 112 | NA | NA | 9856.5 | 6.19 | NA | NA | 9856.5 | 6.18 |
| 113 | NA | NA | 9291.1 | 9.14 | NA | NA | 9291.1 | 9.14 |
| 114 | NA | NA | 9451.5 | .18 | NA | NA | 9451.5 | .18 |
| 115 | NA | NA | 9829.1 | -.07 | NA | NA | 9829.1 | -.07 |
| 116 | NA | NA | 8929.0 | -1.26 | NA | NA | 8929.0 | -1.26 |
| 117 | NA | NA | 9725.2 | 3.04 | NA | NA | 9725.2 | 3.03 |
| 118 | NA | NA | 9861.0 | -1.80 | NA | NA | 9861.0 | -1.80 |
| 119 | NA | NA | 10052.8 | -3.57 | NA | NA | 10052.8 | -3.58 |
| 120 | NA | NA | 9221.5 | .05 | NA | NA | 9221.5 | .05 |
| 121 | NA | NA | 9287.9 | 1.04 | NA | NA | 9287.9 | 1.05 |
| 122 | NA | NA | 9482.6 | 6.54 | NA | NA | 9482.6 | 6.54 |
| 123 | NA | NA | 9100.3 | -.11 | NA | NA | 9100.3 | -.11 |
| 124 | NA | NA | 9772.9 | -.31 | NA | NA | 9772.8 | -.31 |
| 125 | NA | NA | 9683.9 | 5.82 | NA | NA | 9683.9 | 5.82 |
| 126 | NA | NA | 9526.1 | -6.37 | NA | NA | 9526.0 | -6.37 |
| 127 | NA | NA | 9354.2 | 45.75** | NA | NA | 9354.2 | 45.75 |
| 128 | NA | NA | 8691.1 | .97 | NA | NA | 8691.1 | .97 |
| 129 | NA | NA | 10214.3 | -2.80 | NA | NA | 10214.3 | -2.80 |
| 130 | NA | NA | 9598.7 | -.23 | NA | NA | 9598.7 | -.23 |
| 131 | NA | NA | 9917.4 | 1.98 | NA | NA | 9917.4 | 1.97 |
| 132 | NA | NA | 9772.3 | .40 | NA | NA | 9772.3 | .40 |
| 133 | NA | NA | 9482.9 | -.95 | NA | NA | 9482.9 | -.94 |
| 134 | NA | NA | 10006.0 | -.09 | NA | NA | 10006.0 | -.09 |
| 135 | NA | NA | 9427.8 | 2.63 | NA | NA | 9427.9 | 2.64 |
| 136 | NA | NA | 16528.9 | .82 | NA | NA | 16528.9 | .82 |
| 137 | NA | NA | 13662.1 | 1.35 | NA | NA | 13662.1 | 1.36 |
| 138 | NA | NA | 5916.4 | 1.94 | NA | NA | 5916.5 | 1.94 |
| 139 | NA | NA | 6565.3 | .28 | NA | NA | 6565.3 | .28 |
| 140 | NA | NA | 6545.8 | -.45 | NA | NA | 6545.8 | -.45 |
| 141 | NA | NA | 11168.2 | -1.69 | NA | NA | 11168.2 | -1.70 |
| 142 | NA | NA | 11967.9 | -1.72 | NA | NA | 11967.9 | -1.72 |
| 143 | NA | NA | 10489.6 | -2.03 | NA | NA | 10489.8 | -2.04 |
| 144 | NA | NA | 9255.9 | 1.20 | NA | NA | 9255.9 | 1.19 |
| 145 | NA | NA | 9777.1 | -1.40 | NA | NA | 9777.1 | -1.41 |
| 146 | NA | NA | 9094.7 | -1.24 | NA | NA | 9094.7 | -1.24 |
| 147 | NA | NA | 10218.2 | .65 | NA | NA | 10218.1 | .65 |
| 148 | NA | NA | 7776.0 | -7.80 | NA | NA | 7776.0 | -7.81 |
| 149 | NA | NA | 9250.9 | .66 | NA | NA | 9250.9 | .66 |
| 150 | NA | NA | 12333.3 | -11.33 | NA | NA | 12333.2 | -11.33 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-22 (CONTINUED)

02007 REPLICATE COMPARISONS - BATCHES 72 to 186
15-AUG-79 -- 12:59 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 151 | NA | NA | 10103.4 | -2.68 | NA | NA | 10103.4 | -2.67 |
| 152 | NA | NA | 8205.1 | -2.26 | NA | NA | 8205.1 | -2.25 |
| 153 | NA | NA | 9576.9 | 13.28 | NA | NA | 9576.9 | 13.27 |
| 154 | NA | NA | 10004.3 | -3.86 | NA | NA | 10004.3 | -3.86 |
| 155 | NA | NA | 9056.2 | .89 | NA | NA | 9056.2 | .89 |
| 156 | NA | NA | 10858.7 | -5.96 | NA | NA | 10858.6 | -5.97 |
| 157 | NA | NA | 9872.6 | -16.50** | NA | NA | 9872.6 | -16.59 |
| 158 | NA | NA | 10542.8 | -1.87 | NA | NA | 10542.8 | -1.87 |
| 159 | NA | NA | 12346.0 | -3.78 | NA | NA | 12346.0 | -3.78 |
| 160 | NA | NA | 10567.4 | -5.15 | NA | NA | 10567.4 | -5.15 |
| 161 | NA | NA | 9674.9 | -4.91 | NA | NA | 9674.9 | -4.91 |
| 162 | NA | NA | 9825.1 | -4.60 | NA | NA | 9825.1 | -4.60 |
| 163 | NA | NA | 9886.9 | -1.10 | NA | NA | 9886.9 | -1.10 |
| 164 | NA | NA | 9991.1 | 57.67** | NA | NA | 9991.1 | 57.68 |
| 165 | NA | NA | 10159.0 | -1.00 | NA | NA | 10158.9 | -1.00 |
| 166 | NA | NA | 9418.1 | -5.11 | NA | NA | 9418.1 | -5.10 |
| 167 | NA | NA | 10697.2 | -3.20 | NA | NA | 10697.1 | -3.19 |
| 168 | NA | NA | 9902.4 | -1.51 | NA | NA | 9902.4 | -1.50 |
| 169 | NA | NA | 9702.2 | -.98 | NA | NA | 9702.2 | -.97 |
| 170 | NA | NA | 9834.5 | -6.47 | NA | NA | 9834.4 | -6.47 |
| 171 | NA | NA | 9340.1 | -.07 | NA | NA | 9340.1 | -.08 |
| 172 | NA | NA | 9529.2 | .96 | NA | NA | 9529.2 | .97 |
| 173 | NA | NA | 9288.0 | .74 | NA | NA | 9288.0 | .74 |
| 174 | NA | NA | 9605.2 | -3.63 | NA | NA | 9605.2 | -3.62 |
| 175 | NA | NA | 9736.0 | -1.36 | NA | NA | 9735.9 | -1.36 |
| 176 | NA | NA | 9908.4 | .30 | NA | NA | 9908.4 | .29 |
| 177 | NA | NA | 9793.3 | -.99 | NA | NA | 9793.3 | -.98 |
| 178 | NA | NA | 10350.6 | -.31 | NA | NA | 10350.5 | -.31 |
| 179 | NA | NA | 11714.4 | -.79 | NA | NA | 11714.4 | -.79 |
| 180 | NA | NA | 10427.1 | -4.73 | NA | NA | 10427.1 | -4.73 |
| 181 | NA | NA | 9853.9 | 1.15 | NA | NA | 9853.9 | 1.15 |
| 182 | NA | NA | 9183.2 | 2.70 | NA | NA | 9183.1 | 2.70 |
| 183 | NA | NA | 9910.2 | -.27 | NA | NA | 9910.2 | -.26 |
| 184 | NA | NA | 9487.6 | -.22 | NA | NA | 9487.8 | -.23 |
| 185 | NA | NA | 6872.5 | -.45 | NA | NA | 6872.9 | -.45 |
| 186 | NA | NA | 2226.9 | -1.29 | NA | NA | 2227.4 | -1.29 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-22 (CONTINUED)

02007 REPLICATE COMPARISONS - BATCHES 72 to 186
15-AUG-79 -- 12:59 PM

**********
SUMMARY REPORT
**********

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | NA | NA | 116 | 108 | NA | NA | 115 | 113 |
| AVERAGE: | NA | NA | 9530.13 | -1.06 | NA | NA | 9529.17 | -.49 |
| SIGMA: | NA | NA | 1415.42 | 4.06 | NA | NA | 1421.51 | 11.37 |
| ACCEPTABLE RANGE: | NA TO NA | NA TO NA | NA TO NA | -15.00 TO 15.00 | NA TO NA | NA TO NA | NA TO NA | -75.00 TO 75.00 |

THIS SUMMARY INCLUDES 116 BATCHES

TABLE 6-23

02023 REPLICATE COMPARISONS - BATCHES 159 to 253
12-SEP-79 -- 03:44 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 159 | NA | NA | NA | NA | NA | NA | 3155.1 | -.41 |
| 160 | NA | NA | NA | NA | NA | NA | 3124.8 | -.71 |
| 161 | NA | NA | NA | NA | NA | NA | 3085.9 | -.21 |
| 162 | NA | NA | NA | NA | NA | NA | 3130.3 | -1.08 |
| 163 | NA | NA | NA | NA | NA | NA | 3385.7 | 11.42 |
| 164 | NA | NA | NA | NA | NA | NA | 3359.7 | .44 |
| 165 | NA | NA | NA | NA | NA | NA | 3007.6 | -5.85 |
| 166 | NA | NA | NA | NA | NA | NA | 3039.5 | -2.00 |
| 167 | NA | NA | NA | NA | NA | NA | 2852.9 | .03 |
| 168 | NA | NA | NA | NA | NA | NA | 3017.0 | -.33 |
| 169 | NA | NA | NA | NA | NA | NA | 3288.5 | -1.68 |
| 170 | NA | NA | NA | NA | NA | NA | 3022.6 | .23 |
| 171 | NA | NA | NA | NA | NA | NA | 3368.7 | -1.25 |
| 172 | NA | NA | NA | NA | NA | NA | 3484.4 | -2.75 |
| 173 | NA | NA | NA | NA | NA | NA | 3405.9 | -2.29 |
| 174 | NA | NA | NA | NA | NA | NA | 3039.4 | -1.15 |
| 175 | NA | NA | NA | NA | NA | NA | 3459.7 | -.24 |
| 176 | NA | NA | NA | NA | NA | NA | 3491.5 | -11.66 |
| 177 | NA | NA | NA | NA | NA | NA | 3570.9 | -2.46 |
| 178 | NA | NA | NA | NA | NA | NA | 3626.9 | -1.37 |
| 179 | NA | NA | NA | NA | NA | NA | 3417.7 | -1.59 |
| 180 | NA | NA | NA | NA | NA | NA | 3448.5 | -1.05 |
| 181 | NA | NA | NA | NA | NA | NA | 3329.5 | -1.43 |
| 182 | NA | NA | NA | NA | NA | NA | 3624.0 | -1.89 |
| 183 | NA | NA | NA | NA | NA | NA | 3666.0 | .25 |
| 184 | NA | NA | NA | NA | NA | NA | 3274.7 | -13.39 |
| 185 | NA | NA | NA | NA | NA | NA | 3609.3 | -.88 |
| 186 | NA | NA | NA | NA | NA | NA | 3606.7 | -.16 |
| 187 | NA | NA | NA | NA | NA | NA | 3444.4 | -1.37 |
| 188 | NA | NA | NA | NA | NA | NA | 3235.6 | -.85 |
| 189 | NA | NA | NA | NA | NA | NA | 2896.8 | -.89 |
| 190 | NA | NA | NA | NA | NA | NA | 2655.3 | -1.65 |
| 191 | NA | NA | NA | NA | NA | NA | 3641.1 | -.23 |
| 192 | NA | NA | NA | NA | NA | NA | 3656.0 | -3.12 |
| 193 | NA | NA | NA | NA | NA | NA | 3432.2 | -.72 |
| 194 | NA | NA | NA | NA | NA | NA | 3212.7 | -1.18 |
| 195 | NA | NA | NA | NA | NA | NA | 3232.6 | -2.04 |
| 196 | NA | NA | NA | NA | NA | NA | 3594.1 | 1.67 |
| 197 | NA | NA | NA | NA | NA | NA | 3196.8 | -1.24 |
| 198 | NA | NA | NA | NA | NA | NA | 2983.3 | 4.94 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-23 (CONTINUED)

### 02023 REPLICATE COMPARISONS - BATCHES 159 to 253
### 12-SEP-79 -- 03:44 PM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 199 | NA | NA | NA | NA | NA | NA | 3917.4 | -1.30 |
| 200 | NA | NA | NA | NA | NA | NA | 3687.4 | 1.27 |
| 201 | NA | NA | NA | NA | NA | NA | 3330.6 | .01 |
| 202 | NA | NA | NA | NA | NA | NA | 1874.4 | -35.09** |
| 203 | NA | NA | NA | NA | NA | NA | 1910.5 | .26 |
| 204 | NA | NA | NA | NA | NA | NA | 1311.7 | .43 |
| 205 | NA | NA | NA | NA | NA | NA | 3300.2 | -3.75 |
| 206 | NA | NA | NA | NA | NA | NA | 3405.9 | -.74 |
| 207 | NA | NA | NA | NA | NA | NA | 3669.3 | -26.11** |
| 208 | NA | NA | NA | NA | NA | NA | 3432.4 | -.74 |
| 209 | NA | NA | NA | NA | NA | NA | 3324.4 | -1.62 |
| 210 | NA | NA | NA | NA | NA | NA | 3204.2 | -1.02 |
| 211 | NA | NA | NA | NA | NA | NA | 3589.8 | -.89 |
| 212 | NA | NA | NA | NA | NA | NA | 3476.7 | .23 |
| 213 | NA | NA | NA | NA | NA | NA | 3785.3 | -.60 |
| 214 | NA | NA | NA | NA | NA | NA | 3436.0 | .08 |
| 215 | NA | NA | NA | NA | NA | NA | 3460.2 | -1.08 |
| 216 | NA | NA | NA | NA | NA | NA | 3385.9 | .75 |
| 217 | NA | NA | NA | NA | NA | NA | 3454.5 | .54 |
| 218 | NA | NA | NA | NA | NA | NA | 3619.0 | -4.86 |
| 219 | NA | NA | NA | NA | NA | NA | 3660.3 | .12 |
| 220 | NA | NA | NA | NA | NA | NA | 3585.3 | -15.45** |
| 221 | NA | NA | NA | NA | NA | NA | 3611.4 | -1.30 |
| 222 | NA | NA | NA | NA | NA | NA | 3430.1 | .56 |
| 223 | NA | NA | NA | NA | NA | NA | 867.9 | 1.84 |
| 224 | NA | NA | NA | NA | NA | NA | 3461.9 | -.45 |
| 225 | NA | NA | NA | NA | NA | NA | 3471.0 | .72 |
| 226 | NA | NA | NA | NA | NA | NA | 2878.3 | -1.69 |
| 227 | NA | NA | NA | NA | NA | NA | 3459.6 | -.48 |
| 228 | NA | NA | NA | NA | NA | NA | 3692.9 | -.05 |
| 229 | NA | NA | NA | NA | NA | NA | 3018.4 | -5.30 |
| 230 | NA | NA | NA | NA | NA | NA | 3587.8 | -.31 |
| 231 | NA | NA | NA | NA | NA | NA | 3633.9 | -5.01 |
| 232 | NA | NA | NA | NA | NA | NA | 3645.3 | -.97 |
| 233 | NA | NA | NA | NA | NA | NA | 3000.2 | -3.68 |
| 234 | NA | NA | NA | NA | NA | NA | 3565.6 | -.83 |
| 235 | NA | NA | NA | NA | NA | NA | 3482.1 | -2.46 |
| 236 | NA | NA | NA | NA | NA | NA | 3248.9 | -.68 |
| 237 | NA | NA | NA | NA | NA | NA | 3651.9 | -3.46 |
| 238 | NA | NA | NA | NA | NA | NA | 3180.1 | -1.37 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-23 (CONTINUED)

02023 REPLICATE COMPARISONS - BATCHES 159 to 253
12-SEP-79 -- 03:44 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 239 | NA | NA | NA | NA | NA | NA | 3446.7 | -1.47 |
| 240 | NA | NA | NA | NA | NA | NA | 3582.9 | .73 |
| 241 | NA | NA | NA | NA | NA | NA | 3295.6 | .51 |
| 242 | NA | NA | NA | NA | NA | NA | 3324.8 | -.29 |
| 243 | NA | NA | NA | NA | NA | NA | 3136.4 | -2.23 |
| 244 | NA | NA | NA | NA | NA | NA | 3652.4 | -.32 |
| 245 | NA | NA | NA | NA | NA | NA | 3194.3 | -.31 |
| 246 | NA | NA | NA | NA | NA | NA | 3673.8 | .10 |
| 247 | NA | NA | NA | NA | NA | NA | 3367.1 | -31.40** |
| 248 | NA | NA | NA | NA | NA | NA | 3449.6 | -3.38 |
| 249 | NA | NA | NA | NA | NA | NA | 3245.9 | -.02 |
| 250 | NA | NA | NA | NA | NA | NA | 2974.5 | -.79 |
| 251 | NA | NA | NA | NA | NA | NA | 3050.6 | -2.72 |
| 252 | NA | NA | NA | NA | NA | NA | 1998.9 | -1.20 |
| 253 | NA | NA | NA | NA | NA | NA | 2010.6 | 1.26 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-23 (CONTINUED)

### 02023 REPLICATE COMPARISONS - BATCHES 159 to 253
### 12-SEP-79 -- 03:44 PM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | NA | NA | NA | NA | NA | NA | 95 | 91 |
| AVERAGE: | NA | NA | NA | NA | NA | NA | 3265.12 | -1.08 |
| SIGMA: | NA | NA | NA | NA | NA | NA | 493.80 | 2.68 |
| ACCEPTABLE RANGE: | NA | NA TO NA | NA | -15.00 TO 15.00 | NA | NA TO NA | NA | -15.00 TO 15.00 |

THIS SUMMARY INCLUDES 95 BATCHES

TABLE 6-24

02028 REPLICATE COMPARISONS - BATCHES 564 to 740
13-SEP-79 -- 10:30 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 564 | NA | NA | NA | NA | NA | NA | 813.1 | -2.30 |
| 565 | NA | NA | NA | NA | NA | NA | 499.7 | -2.03 |
| 566 | NA | NA | NA | NA | NA | NA | 862.2 | -.70 |
| 567 | NA | NA | NA | NA | NA | NA | 477.5 | -3.93 |
| 551 | NA | NA | NA | NA | NA | NA | 613.2 | -.97 |
| 569 | NA | NA | NA | NA | NA | NA | 816.0 | -1.23 |
| 570 | NA | NA | NA | NA | NA | NA | 830.3 | -2.39 |
| 571 | NA | NA | NA | NA | NA | NA | 888.5 | -1.35 |
| 572 | NA | NA | NA | NA | NA | NA | 843.6 | -.09 |
| 573 | NA | NA | NA | NA | NA | NA | 876.2 | -1.13 |
| 568 | NA | NA | NA | NA | NA | NA | 828.2 | .33 |
| 574 | NA | NA | NA | NA | NA | NA | 817.5 | -1.17 |
| 575 | NA | NA | NA | NA | NA | NA | 834.5 | -3.70 |
| 576 | NA | NA | NA | NA | NA | NA | 859.6 | -2.20 |
| 577 | NA | NA | NA | NA | NA | NA | 833.3 | 0.00 |
| 578 | NA | NA | NA | NA | NA | NA | 849.7 | -.70 |
| 579 | NA | NA | NA | NA | NA | NA | 848.8 | 0.00 |
| 580 | NA | NA | NA | NA | NA | NA | 870.1 | -.43 |
| 581 | NA | NA | NA | NA | NA | NA | 868.5 | -4.74 |
| 582 | NA | NA | NA | NA | NA | NA | 848.1 | 0.00 |
| 583 | NA | NA | NA | NA | NA | NA | 900.3 | -3.15 |
| 584 | NA | NA | NA | NA | NA | NA | 899.6 | -1.07 |
| 585 | NA | NA | NA | NA | NA | NA | 893.2 | 0.00 |
| 586 | NA | NA | NA | NA | NA | NA | 845.7 | -1.88 |
| 587 | NA | NA | NA | NA | NA | NA | 888.9 | -.89 |
| 588 | NA | NA | NA | NA | NA | NA | 784.7 | -2.11 |
| 589 | NA | NA | NA | NA | NA | NA | 573.3 | -1.31 |
| 590 | NA | NA | NA | NA | NA | NA | 827.0 | .33 |
| 591 | NA | NA | NA | NA | NA | NA | 891.8 | -2.05 |
| 592 | NA | NA | NA | NA | NA | NA | 875.5 | 6.87 |
| 593 | NA | NA | NA | NA | NA | NA | 870.5 | .11 |
| 594 | NA | NA | NA | NA | NA | NA | 846.4 | -3.49 |
| 595 | NA | NA | NA | NA | NA | NA | 864.8 | -2.89 |
| 596 | NA | NA | NA | NA | NA | NA | 875.4 | -2.07 |
| 597 | NA | NA | NA | NA | NA | NA | 853.2 | -2.27 |
| 598 | NA | NA | NA | NA | NA | NA | 850.6 | -1.15 |
| 599 | NA | NA | NA | NA | NA | NA | 915.3 | -1.22 |
| 600 | NA | NA | NA | NA | NA | NA | 873.2 | -1.94 |
| 601 | NA | NA | NA | NA | NA | NA | 810.2 | -.75 |
| 602 | NA | NA | NA | NA | NA | NA | 921.1 | -3.53 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-24 (CONTINUED)

### 02028 REPLICATE COMPARISONS - BATCHES 564 to 740
### 13-SEP-79 -- 10:30 AM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 603 | NA | NA | NA | NA | NA | NA | 857.1 | -6.64 |
| 604 | NA | NA | NA | NA | NA | NA | 886.8 | -27.87 |
| 606 | NA | NA | NA | NA | NA | NA | 546.3 | -1.38 |
| 607 | NA | NA | NA | NA | NA | NA | 896.6 | -16.58 |
| 608 | NA | NA | NA | NA | NA | NA | 856.1 | -3.17 |
| 609 | NA | NA | NA | NA | NA | NA | 872.0 | -2.21 |
| 610 | NA | NA | NA | NA | NA | NA | 871.4 | -1.92 |
| 611 | NA | NA | NA | NA | NA | NA | 880.8 | -4.28 |
| 612 | NA | NA | NA | NA | NA | NA | 861.4 | -8.20 |
| 613 | NA | NA | NA | NA | NA | NA | 382.8 | -.84 |
| 614 | NA | NA | NA | NA | NA | NA | 858.9 | -2.51 |
| 615 | NA | NA | NA | NA | NA | NA | 840.6 | -2.04 |
| 616 | NA | NA | NA | NA | NA | NA | 847.7 | -.95 |
| 617 | NA | NA | NA | NA | NA | NA | 857.3 | .08 |
| 618 | NA | NA | NA | NA | NA | NA | 821.4 | -1.45 |
| 619 | NA | NA | NA | NA | NA | NA | 980.9 | -2.89 |
| 621 | NA | NA | NA | NA | NA | NA | 858.0 | -7.02 |
| 622 | NA | NA | NA | NA | NA | NA | 870.7 | -3.80 |
| 623 | NA | NA | NA | NA | NA | NA | 862.8 | -5.82 |
| 624 | NA | NA | NA | NA | NA | NA | 779.5 | -1.48 |
| 625 | NA | NA | NA | NA | NA | NA | 880.1 | -4.37 |
| 626 | NA | NA | NA | NA | NA | NA | 942.1 | -6.02 |
| 627 | NA | NA | NA | NA | NA | NA | 920.0 | -2.79 |
| 628 | NA | NA | NA | NA | NA | NA | 876.3 | -5.12 |
| 629 | NA | NA | NA | NA | NA | NA | 867.3 | -4.51 |
| 630 | NA | NA | NA | NA | NA | NA | 882.1 | -4.01 |
| 631 | NA | NA | NA | NA | NA | NA | 826.6 | -5.41 |
| 632 | NA | NA | NA | NA | NA | NA | 849.2 | -1.46 |
| 633 | NA | NA | NA | NA | NA | NA | 961.5 | -3.62 |
| 634 | NA | NA | NA | NA | NA | NA | 960.2 | -5.77 |
| 635 | NA | NA | NA | NA | NA | NA | 877.0 | -1.98 |
| 636 | NA | NA | NA | NA | NA | NA | 965.3 | -1.92 |
| 637 | NA | NA | NA | NA | NA | NA | 993.6 | -.79 |
| 638 | NA | NA | NA | NA | NA | NA | 897.9 | -.25 |
| 639 | NA | NA | NA | NA | NA | NA | 349.7 | -8.22 |
| 640 | NA | NA | NA | NA | NA | NA | 908.0 | -2.59 |
| 641 | NA | NA | NA | NA | NA | NA | 956.3 | -1.93 |
| 642 | NA | NA | NA | NA | NA | NA | 939.2 | -6.58 |
| 643 | NA | NA | NA | NA | NA | NA | 879.8 | -4.41 |
| 644 | NA | NA | NA | NA | NA | NA | 860.0 | -9.11 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-24 (CONTINUED)

02028 REPLICATE COMPARISONS - BATCHES 564 to 740
13-SEP-79 -- 10:30 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 645 | NA | NA | NA | NA | NA | NA | 830.9 | -4.64 |
| 646 | NA | NA | NA | NA | NA | NA | 809.5 | -1.73 |
| 647 | NA | NA | NA | NA | NA | NA | 304.2 | -2.11 |
| 648 | NA | NA | NA | NA | NA | NA | 595.7 | -1.75 |
| 649 | NA | NA | NA | NA | NA | NA | 589.4 | -2.54 |
| 650 | NA | NA | NA | NA | NA | NA | 806.6 | -3.08 |
| 651 | NA | NA | NA | NA | NA | NA | 890.0 | -2.40 |
| 652 | NA | NA | NA | NA | NA | NA | 951.4 | -2.31 |
| 653 | NA | NA | NA | NA | NA | NA | 932.8 | -8.09 |
| 654 | NA | NA | NA | NA | NA | NA | 872.0 | -3.87 |
| 655 | NA | NA | NA | NA | NA | NA | 869.5 | -2.65 |
| 656 | NA | NA | NA | NA | NA | NA | 805.6 | 2.00 |
| 657 | NA | NA | NA | NA | NA | NA | 817.8 | -5.33 |
| 658 | NA | NA | NA | NA | NA | NA | 887.6 | -2.05 |
| 659 | NA | NA | NA | NA | NA | NA | 637.6 | -1.16 |
| 660 | NA | NA | NA | NA | NA | NA | 347.4 | -.50 |
| 661 | NA | NA | NA | NA | NA | NA | 756.8 | -7.67 |
| 662 | NA | NA | NA | NA | NA | NA | 901.6 | -2.92 |
| 663 | NA | NA | NA | NA | NA | NA | 1070.8 | -10.50 |
| 664 | NA | NA | NA | NA | NA | NA | 917.4 | -3.23 |
| 665 | NA | NA | NA | NA | NA | NA | 914.1 | -12.36 |
| 666 | NA | NA | NA | NA | NA | NA | 882.6 | -3.42 |
| 667 | NA | NA | NA | NA | NA | NA | 782.6 | -26.81 |
| 668 | NA | NA | NA | NA | NA | NA | 816.7 | -2.33 |
| 669 | NA | NA | NA | NA | NA | NA | 913.8 | -3.28 |
| 670 | NA | NA | NA | NA | NA | NA | 989.5 | -9.39 |
| 671 | NA | NA | NA | NA | NA | NA | 811.0 | -11.13 |
| 672 | NA | NA | NA | NA | NA | NA | 886.7 | -11.34 |
| 673 | NA | NA | NA | NA | NA | NA | 1056.7 | 6.97 |
| 674 | NA | NA | NA | NA | NA | NA | 347.2 | 6.45 |
| 675 | NA | NA | NA | NA | NA | NA | 599.6 | -3.17 |
| 676 | NA | NA | NA | NA | NA | NA | 333.0 | -3.91 |
| 677 | NA | NA | NA | NA | NA | NA | 667.0 | -11.28 |
| 678 | NA | NA | NA | NA | NA | NA | 899.3 | -3.00 |
| 679 | NA | NA | NA | NA | NA | NA | 953.3 | -9.63 |
| 680 | NA | NA | NA | NA | NA | NA | 774.4 | -2.12 |
| 681 | NA | NA | NA | NA | NA | NA | 824.5 | -7.07 |
| 682 | NA | NA | NA | NA | NA | NA | 826.6 | 5.48 |
| 683 | NA | NA | NA | NA | NA | NA | 913.1 | -3.11 |
| 684 | NA | NA | NA | NA | NA | NA | 831.6 | -3.03 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

## TABLE 6-24 (CONTINUED)

02028 REPLICATE COMPARISONS - BATCHES 564 to 740
13-SEP-79 -- 10:30 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 685 | NA | NA | NA | NA | NA | NA | 894.6 | -3.64 |
| 686 | NA | NA | NA | NA | NA | NA | 832.9 | -2.41 |
| 687 | NA | NA | NA | NA | NA | NA | 873.2 | -12.41 |
| 688 | NA | NA | NA | NA | NA | NA | 850.2 | -3.53 |
| 689 | NA | NA | NA | NA | NA | NA | 694.1 | -22.64 |
| 690 | NA | NA | NA | NA | NA | NA | 704.4 | -5.67 |
| 691 | NA | NA | NA | NA | NA | NA | 853.5 | -2.80 |
| 692 | NA | NA | NA | NA | NA | NA | 844.0 | -7.87 |
| 693 | NA | NA | NA | NA | NA | NA | 755.0 | -5.14 |
| 694 | NA | NA | NA | NA | NA | NA | 968.1 | -.78 |
| 695 | NA | NA | NA | NA | NA | NA | 654.1 | -4.44 |
| 696 | NA | NA | NA | NA | NA | NA | 715.4 | -3.51 |
| 697 | NA | NA | NA | NA | NA | NA | 791.8 | -6.60 |
| 698 | NA | NA | NA | NA | NA | NA | 1086.8 | NA |
| 699 | NA | NA | NA | NA | NA | NA | 846.8 | -29.28 |
| 700 | NA | NA | NA | NA | NA | NA | 935.0 | .47 |
| 701 | NA | NA | NA | NA | NA | NA | 937.7 | -15.46 |
| 702 | NA | NA | NA | NA | NA | NA | 777.8 | -19.02 |
| 703 | NA | NA | NA | NA | NA | NA | 882.2 | -2.17 |
| 704 | NA | NA | NA | NA | NA | NA | 909.5 | -15.39 |
| 705 | NA | NA | NA | NA | NA | NA | 802.8 | -2.05 |
| 706 | NA | NA | NA | NA | NA | NA | 712.5 | -3.84 |
| 707 | NA | NA | NA | NA | NA | NA | 815.8 | 11.91 |
| 708 | NA | NA | NA | NA | NA | NA | 808.7 | -4.01 |
| 709 | NA | NA | NA | NA | NA | NA | 861.8 | -2.42 |
| 710 | NA | NA | NA | NA | NA | NA | 848.3 | -3.25 |
| 711 | NA | NA | NA | NA | NA | NA | 897.3 | -15.55 |
| 712 | NA | NA | NA | NA | NA | NA | 925.2 | -2.63 |
| 713 | NA | NA | NA | NA | NA | NA | 911.7 | -1.04 |
| 714 | NA | NA | NA | NA | NA | NA | 888.6 | -2.59 |
| 715 | NA | NA | NA | NA | NA | NA | 869.4 | -.11 |
| 716 | NA | NA | NA | NA | NA | NA | 926.4 | -4.48 |
| 717 | NA | NA | NA | NA | NA | NA | 850.6 | -2.11 |
| 718 | NA | NA | NA | NA | NA | NA | 826.8 | -6.30 |
| 719 | NA | NA | NA | NA | NA | NA | 778.1 | 4.79 |
| 720 | NA | NA | NA | NA | NA | NA | 803.7 | -5.40 |
| 721 | NA | NA | NA | NA | NA | NA | 581.7 | -3.90 |
| 722 | NA | NA | NA | NA | NA | NA | 866.6 | 7.08 |
| 723 | NA | NA | NA | NA | NA | NA | 754.6 | -4.84 |
| 724 | NA | NA | NA | NA | NA | NA | 833.4 | -.93 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-24 (CONTINUED)

02028 REPLICATE COMPARISONS - BATCHES 564 to 740
13-SEP-79 -- 10:30 AM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 725 | NA | NA | NA | NA | NA | NA | 859.1 | -2.15 |
| 726 | NA | NA | NA | NA | NA | NA | 758.9 | -1.39 |
| 727 | NA | NA | NA | NA | NA | NA | 881.9 | -1.23 |
| 731 | NA | NA | NA | NA | NA | NA | 732.4 | -1.58 |
| 732 | NA | NA | NA | NA | NA | NA | 841.8 | -4.89 |
| 733 | NA | NA | NA | NA | NA | NA | 833.1 | -4.16 |
| 734 | NA | NA | NA | NA | NA | NA | 833.5 | -12.97 |
| 735 | NA | NA | NA | NA | NA | NA | 863.2 | -7.91 |
| 736 | NA | NA | NA | NA | NA | NA | 909.0 | -.35 |
| 737 | NA | NA | NA | NA | NA | NA | 762.0 | -3.36 |
| 738 | NA | NA | NA | NA | NA | NA | 873.6 | .50 |
| 739 | NA | NA | NA | NA | NA | NA | 528.6 | -4.78 |
| 740 | NA | NA | NA | NA | NA | NA | 409.4 | -3.75 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-24 (CONTINUED)

02028 REPLICATE COMPARISONS - BATCHES 564 to 740
13-SEP-79 -- 10:30 AM

**********
SUMMARY REPORT
**********

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | NA | NA | NA | NA | NA | NA | 173 | 172 |
| AVERAGE: | NA | NA | NA | NA | NA | NA | 821.94 | -3.84 |
| SIGMA: | NA | NA | NA | NA | NA | NA | 136.53 | 5.45 |
| ACCEPTABLE RANGE: | NA | NA TO NA | NA | -15.25 TO 10.85 | NA | NA TO NA | NA | -45.00 TO 45.00 |

THIS SUMMARY INCLUDES 173 BATCHES

TABLE 6-25

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION

| Error Component | Tank 02003 Accountability Tank | Tank 02007 Uranium Product | Tank 02023 HWW Sample Tank | Tank 02028 GPW Check Tank | Tank 04001 UN Account-ability Tank |
|---|---|---|---|---|---|
| Net Kilogram Solution Measurement: Random | 3.97322 | 4.06 | 2.68 | 3.81 | 15.0 |
| Net Kilogram Solution Measurement: Systematic | 2.33238 | 3.96989 | 20.0 | 11.6387 | 11.0 |
| Sampling and Analysis: Random - First Method | 1.99(1) | 0.91 | 0.17 | 1.3 | 0.91 |
| Sampling and Analysis: Random - Second Method | 1.3 | 1.3 | 0.17 | 1.3 | -- |
| Analysis: Systematic - First Method | 0.480219(1) | 0.799431 | 0.01772 | 0.0696707 | 0.0799 |
| Analysis: Systematic - Second Method | 0.07 | 0.01772 | 0.01 | 0.01 | -- |
| Sampling: Systematic(2) | 0.00004 | 0.00029 | 0.01 | 0.01 | 0.0003 |

(1) U-MSID data from remote dilutions for Campaign 3.

(2) Values given are expressed as coefficients of variation ($\hat{Y}_{SS}$).

# TABLE 6-26

## 1979 URANIUM RUN DATA
## SUMMARY OF REPLICATE SAMPLES TAKEN FROM THE INPUT ACCOUNTABILITY TANK, SAMPLE POINT N-1

| Run No. | Batch No. | Log No. | QC No. | U-VP-1 (mg U/g) Original Uranium | U-VP-1 (mg U/g) Replicate | U-VP-1 (mg U/g) Difference | ACID-VP-1 (N) Original Acid | ACID-VP-1 (N) Replicate | ACID-VP-1 (N) Difference | DN-DM-1 (mg/ml @ 25°C) Original Density | DN-DM-1 (mg/ml @ 25°C) Replicate | DN-DM-1 (mg/ml @ 25°C) Difference | U-MSID-1 (mg U/g) Original U-ID | U-MSID-1 (mg U/g) Replicate | U-MSID-1 (mg U/g) Difference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 130 | 21509 | 10017 | 228.60 | 227.50 | 1.10 | 1.16 | 1.17 | -0.01 | 1.4813 | 1.4834 | -0.0021 | 226.78 | 228.46 | -1.68 |
| | 131 | 21538 | 10018 | 232.73 | 232.22 | 0.51 | 1.12 | 1.13 | -0.01 | 1.4982 | 1.4979 | 0.0003 | ——— | ——— | ——— |
| | 135 | 22230 | 10036 | 233.23 | 233.63 | -0.40 | ——— | ——— | ——— | 1.5283 | 1.5283 | 0.0000 | ——— | ——— | ——— |
| | 137 | 22340 | 10037 | 273.52 | 274.92 | -1.40 | 1.10 | 1.02 | 0.08 | ——— | ——— | ——— | ——— | ——— | ——— |
| | 138 | 22368 | 10025 | 285.66 | 285.60 | 0.06 | 0.71 | 0.75 | -0.04 | 1.6430 | 1.6437 | -0.0007 | ——— | ——— | ——— |
| | 141 | 22533 | 10019 | 277.21 | 277.30 | -0.09 | 1.01 | 1.02 | -0.01 | 1.6266 | 1.6275 | -0.0009 | 275.85 | 274.73 | 1.12 |
| | 143 | 22622 | 10021a | 279.79 | 280.20 | -0.41 | 0.38 | 0.54 | -0.16 | 1.6164 | 1.6180 | -0.0016 | 279.07 | 279.02 | 0.05 |
| | 144 | 22656 | 10021b | 281.21 | 279.75 | 1.46 | 0.47 | 0.65 | -0.18 | 1.6133 | 1.6139 | -0.0006 | ——— | ——— | ——— |
| | 145 | 22687 | 10020 | 281.54 | 281.12 | 0.42 | 0.35 | 0.37 | -0.02 | 1.6070 | 1.6107 | -0.0037 | ——— | ——— | ——— |
| | 152 | 22978 | 10022 | 287.70 | 288.75 | -1.05 | 0.66 | 0.80 | -0.14 | 1.6399 | 1.6468 | -0.0069 | 280.58 | 285.82 | 2.76 |
| | 155 | 23092 | 10023 | 286.21 | 286.88 | -0.67 | 0.54 | 0.55 | -0.01 | 1.6387 | 1.6391 | -0.0004 | 287.14 | 285.22 | 1.92 |
| | 159 | 23265 | 10024 | 272.11 | 271.08 | 1.03 | 0.70 | 0.71 | -0.01 | 1.5983 | 1.5970 | 0.0013 | 270.93 | 271.29 | -0.36 |
| | 160 | 23319 | 10090 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— |
| | 165 | 23532 | 10026 | ——— | ——— | ——— | 0.65 | 0.66 | -0.01 | 1.5782 | 1.5771 | 0.0011 | 265.81 | 266.33 | -0.52 |
| | 168 | 23648 | 10038 | 272.87 | 273.13 | -0.26 | 1.02 | 0.46 | 0.56 | 1.5944 | 1.5915 | 0.0029 | ——— | ——— | ——— |
| | 169 | 23683 | 10027 | 254.96 | 255.59 | -0.63 | 0.78 | 0.82 | -0.04 | 1.5504 | 1.5478 | 0.0026 | 254.57 | 255.79 | -1.22 |
| | 170 | 23702 | 10091 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 264.16 | 264.82 | -0.66 |
| | 173 | 23792 | 10028 | 248.07 | 248.78 | -0.71 | 0.37 | 0.35 | 0.02 | 1.5086 | 1.5083 | 0.0003 | 247.88 | 248.97 | -1.09 |
| | 179 | 21803 | 10029 | 238.83 | 242.46 | -3.63 | 0.42 | 0.44 | -0.02 | 1.5004 | 1.4967 | 0.0037 | 242.45 | 240.45 | 2.00 |
| | 184 | 24429 | 10030 | 248.21 | 247.37 | 0.84 | 0.36 | 0.36 | 0.00 | 1.5090 | 1.5072 | 0.0018 | 246.73 | 249.45 | -2.72 |
| | 187 | 24928 | 10031 | 250.84 | 251.75 | -0.91 | 0.61 | 0.62 | -0.01 | 1.5249 | 1.5262 | -0.0013 | 249.19 | 252.50 | -3.31 |
| | 192 | 25136 | 10032 | 244.35 | 244.28 | 0.07 | 0.675 | 0.66 | 0.02 | 1.5112 | 1.5109 | 0.0003 | 242.73 | 246.78 | -4.05 |
| | 198 | 25337 | 10033 | 246.11 | 246.19 | -0.08 | 0.51 | 0.40 | 0.11 | 1.5067 | 1.5064 | 0.0023 | 244.56 | 246.20 | -1.62 |
| | 199 | 25394 | 10092 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 243.71 | 244.45 | -0.74 |
| | 202 | 25494 | 10034 | 246.45 | 246.57 | -0.12 | 0.40 | 0.34 | 0.06 | 1.5049 | 1.5045 | 0.0004 | 245.41 | 245.27 | 0.14 |
| | 205 | 25677 | 10035 | ——— | ——— | ——— | ——— | ——— | ——— | 1.4986 | 1.4961 | 0.0025 | ——— | ——— | ——— |
| 2 | 210 | 26147 | 10039 | 239.17 | 238.65 | 0.52 | 0.67 | 0.70 | -0.03 | 1.4976 | 1.4950 | 0.0026 | 238.55 | 238.27 | 0.28 |
| | 215 | 26349 | 10040 | 238.99 | 238.89 | 0.10 | 0.59 | 0.62 | -0.03 | 1.4931 | 1.4923 | 0.0008 | 238.26 | 236.54 | 1.72 |
| | 219 | 26522 | 10041 | 241.07 | 240.96 | 0.11 | 0.93 | 0.99 | -0.06 | 1.5147 | 1.5137 | 0.0010 | 241.01 | 240.69 | 0.32 |
| | 223 | 26665 | 10042 | 240.03 | 240.30 | -0.27 | 0.46 | 0.47 | -0.01 | 1.4894 | 1.4891 | 0.0003 | 239.44 | 239.36 | 0.08 |
| | 229 | 26865 | 10043 | 231.66 | 231.66 | 0.00 | 1.20 | 1.21 | -0.01 | 1.4981 | 1.4974 | 0.0007 | 230.53 | 230.89 | -0.36 |
| | 234 | 27055 | 10044 | ——— | ——— | ——— | 1.05 | 1.20 | -0.15 | 1.5109 | 1.5101 | 0.0007 | 234.93 | 234.69 | 0.24 |
| | 237 | 27281 | 10045 | 228.62 | 228.53 | 0.09 | 1.10 | 1.07 | 0.03 | 1.4822 | 1.4831 | -0.0009 | 227.23 | 227.91 | -0.68 |
| | 241 | 27433 | 10046 | 237.40 | 237.57 | -0.17 | 0.98 | 1.09 | -0.11 | 1.5052 | 1.5044 | 0.0008 | 237.21 | 236.59 | 0.62 |
| | 242 | 27461 | 10093 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 237.20 | 238.30 | -1.10 |
| | 247 | 27678 | 10047 | 235.47 | 235.70 | -0.23 | 0.87 | 0.85 | 0.02 | 1.4944 | 1.4938 | 0.0006 | ——— | ——— | ——— |
| | 249 | 27763 | 10053 | 230.36 | 230.33 | 0.03 | 0.70 | 0.68 | 0.02 | 1.4732 | 1.4715 | 0.0017 | ——— | ——— | ——— |
| | 250 | 27795 | 10054 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— |
| | 251 | 27893 | 10048 | 239.48 | 239.39 | 0.09 | 0.48 | 0.50 | -0.02 | 1.4881 | 1.4875 | 0.0006 | 239.48 | 239.00 | 0.48 |
| | 255 | 28057 | 10049 | 240.18 | 239.76 | 0.42 | 1.00 | 0.96 | 0.04 | 1.5113 | 1.5107 | 0.0006 | 239.11 | 239.76 | -0.65 |
| | 258 | 28170 | 10050 | 234.54 | 234.61 | -0.07 | 1.20 | 1.22 | -0.02 | 1.5073 | 1.5062 | 0.0011 | 233.75 | 233.97 | -0.22 |
| | 262 | 28348 | 10051 | 239.19 | 239.27 | -0.08 | 0.86 | 0.87 | -0.01 | 1.5051 | 1.5038 | 0.0013 | 238.17 | 239.67 | -1.50 |
| | 266 | 28621 | 10052 | 244.97 | 244.92 | 0.05 | 0.49 | 0.50 | -0.01 | 1.5047 | 1.5038 | 0.0009 | 243.66 | 244.64 | -0.98 |
| 3 | 277 | 29425 | 10055 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 230.94 | 233.61 | -2.67 |
| | 278 | 29513 | 10057 | 236.89 | 237.11 | -0.22 | 1.02 | 0.90 | 0.12 | 1.5071 | 1.5061 | 0.0010 | 237.50 | 237.04 | 0.46 |
| | 280 | 29614 | 10061 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 209.90 | 206.51 | 3.39 |
| | 281 | 29660 | 10086 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— |
| | 282 | 29735 | 10075 | 215.19 | 215.10 | 0.09 | 1.37 | 1.44 | -0.07 | 1.4615 | 1.4613 | 0.0002 | ——— | ——— | ——— |
| | 283 | 29758 | 10062 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 219.97 | 221.06 | -1.09 |
| | 285 | 29825 | 10076 | 223.78 | 224.28 | -0.50 | ——— | ——— | ——— | ——— | ——— | ——— | 223.78 | 224.28 | -0.50 |
| | 286 | 29861 | 10065 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 229.31 | 234.43 | -5.12 |
| | 287 | 29897 | 10063 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 237.70 | 236.81 | 0.89 |
| | 288 | 29941 | 10060 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 236.41 | 237.79 | -1.38 |
| | 290 | 30011 | 10077 | 225.73 | 226.63 | -0.90 | 0.48 | 0.50 | -0.02 | 1.4546 | 1.4544 | 0.0002 | 223.78 | 227.78 | -4.00 |
| | 291 | 30053 | 10070 | ——— | ——— | ——— | 0.58 | 0.79 | -0.21 | 1.4628 | 1.4701 | -0.0073 | 228.04 | 228.36 | -0.32 |
| | 292 | 30090 | 10078 | 227.41 | 227.17 | 0.24 | 0.81 | 0.79 | 0.02 | 1.4723 | 1.4701 | 0.0022 | ——— | ——— | ——— |
| | 293 | 30221 | 10074 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 229.06 | 228.93 | 0.13 |
| | 294 | 30296 | 10088 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 225.00 | 226.25 | -1.25 |
| | 295 | 30322 | 10071 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 224.85 | 227.56 | -2.71 |
| | 296 | 30353 | 10065 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 224.59 | 224.33 | 0.26 |
| | 297 | 30422 | 10095 | ——— | ——— | ——— | 1.29 | 1.04 | 0.25 | 1.4642 | 1.4652 | -0.0010 | 221.82 | 221.84 | -0.02 |
| | 298 | 30452 | 10089 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 231.22 | 232.64 | -1.42 |
| | 299 | 30484 | 10079 | 232.34 | 233.58 | -1.24 | ——— | ——— | ——— | 1.4750 | 1.4711 | 0.0039 | ——— | ——— | ——— |
| | 301 | 30538 | 10073 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 230.52 | 227.70 | 2.82 |
| | 302 | 30579 | 10068 | 236.66 | 236.43 | 0.23 | 0.71 | 0.70 | 0.01 | 1.4916 | 1.4708 | 0.0208 | 237.40 | 236.60 | 0.80 |
| | 303 | 30611 | 10080 | 245.65 | 244.36 | 1.29 | 0.58 | 0.59 | -0.01 | 1.5116 | 1.5097 | 0.0019 | ——— | ——— | ——— |
| | 305 | 30686 | 10069 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 246.91 | 249.53 | -2.62 |
| | 305 | 30686 | 10069 | 246.29 | 245.80 | 0.49 | 0.57 | 0.59 | -0.02 | 1.5133 | 1.5119 | 0.0014 | 246.91 | 248.79 | -1.88 |
| | 306 | 30707 | 10066 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 246.72 | 245.75 | 0.97 |
| | 308 | 30771 | 10083 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 249.42 | 249.97 | -0.55 |
| | 309 | 30818 | 10085 | 251.56 | 251.40 | 0.16 | 0.60 | 0.58 | 0.02 | 1.5290 | 1.5278 | 0.0012 | ——— | ——— | ——— |
| | 310 | 30955 | 10081 | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | ——— | 252.94 | 252.13 | 0.81 |
| | $\bar{d}$ | = | | | | -0.10 | | | -0.001 | | | 0.0008 | | -0.34* | -0.65** |
| | $SD_d$ | = | | | | 0.82 | | | 0.11 | | | 0.0036 | | 1.49 | 1.99 |
| | $\frac{KSD_d}{OR}$ | = | | | | 0.33 | | | 15.22 | | | 0.2388 | | 0.60 | 0.86 |
| | | = | | | | 247.45 | | | 0.75 | | | 1.5225 | | 248.39 | 232.70 |
| | $SD_{\bar{OR}}$ | = | | | | 19.29 | | | 0.27 | | | 0.0527 | | 16.62 | 10.90 |
| | N | = | | | | 45 | | | 46 | | | 48 | | 31 | 23 |
| | t | = | | | | 0.85 | | | 0.11 | | | 1.5323 | | 1.29 | 1.57 |
| | df | = | | | | 44 | | | 45 | | | 47 | | 20 | 22 |
| | Table t | = | | | | 2.02 | | | 2.02 | | | 2.013 | | 2.04 | 2.07 |
| | Significant | = | | | | no | | | no | | | no | | no | no |
| | $\bar{R}$ | = | | | | 247.50 | | | 0.57 | | | 1.5221 | | 248.56 | 233.03 |
| | $SD_R$ | = | | | | 19.30 | | | 0.28 | | | 0.0532 | | 16.38 | 11.07 |
| | $\bar{O}$ | = | | | | 247.40 | | | 0.75 | | | 1.5229 | | 248.21 | 232.38 |
| | $SD_O$ | = | | | | 19.29 | | | 0.28 | | | 0.0522 | | 16.88 | 10.82 |
| | F | = | | | | 1.00 | | | 0.96 | | | 1.0371 | | 0.94 | 1.05 |
| | 1/F | = | | | | 1.00 | | | 1.04 | | | 0.9643 | | 1.06 | 0.95 |

*Total for Runs 1 and 2 on the bench.
**Total for Run 3.

## TABLE 6-27

## 1979 URANIUM RUN DATA
## SUMMARY OF REPLICATE SAMPLES TAKEN FROM THE URANIUM PRODUCT SAMPLE TANK, SAMPLE POINT N-21

| | | | | U-VP-1 (mg U/g) | | | ACID-VP-1 (N) | | | DN-DM-1 (g/ml @ 25°C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Batch No. | Log No. | QC No. | Original Uranium | Replicate | Difference | Original Acid | Replicate | Difference | Original Density | Replicate | Difference |
| 1 | 4 | 22185 | 30011 | 235.02 | 235.03 | -0.01 | 1.85 | 1.83 | 0.02 | ------ | ------ | ------ |
| | 15 | 22717 | 30012 | 282.44 | 282.83 | -0.39 | 0.35 | 0.29 | 0.06 | ------ | ------ | ------ |
| | 18 | 22822 | 30013 | 281.27 | 282.46 | -1.19 | 0.66 | 0.64 | 0.02 | 1.6244 | 1.6258 | -0.0014 |
| | 21 | ----- | ----- | ------ | ------ | ---- | ---- | ---- | ---- | 1.6296 | 1.6298 | -0.0002 |
| | 22 | 22986 | 30014 | 279.24 | 283.04 | -3.80 | 0.44 | 0.62 | -0.18 | ------ | ------ | ------ |
| | 24 | 23108 | 30015 | 269.37 | 268.86 | 0.51 | 0.95 | 0.99 | -0.04 | 1.5982 | 1.5977 | 0.0005 |
| | 28 | 23290 | 30017 | 265.36 | 265.63 | -0.27 | 1.35 | 0.69 | 0.66 | 1.5764 | 1.5759 | 0.0005 |
| | 29 | 23325 | 30016 | 270.02 | 270.42 | -0.40 | 1.00 | 1.06 | -0.06 | 1.6015 | 1.6068 | -0.0053 |
| | 31 | 23407 | 30027 | 272.13 | 272.04 | 0.09 | 0.90 | 0.85 | 0.05 | 1.5930 | 1.6065 | -0.0135 |
| | 35 | 23608 | 30018 | 281.94 | 282.46 | -0.52 | 0.55 | 0.52 | 0.03 | 1.6229 | 1.6230 | -0.0001 |
| | 39 | 23757 | 30019 | 254.12 | 254.78 | -0.66 | 0.42 | 0.37 | 0.05 | 1.5286 | 1.5282 | 0.0004 |
| | 42 | 23875 | 30020 | 241.50 | 241.48 | 0.02 | 0.38 | 0.32 | 0.06 | 1.4675 | 1.4870 | 0.0005 |
| | 47 | 21830 | 30021 | 242.80 | 242.91 | -0.11 | 0.38 | 0.35 | 0.03 | 1.4937 | 1.4930 | 0.0007 |
| | 53 | 24478 | 30022 | 251.63 | 252.32 | -0.69 | 0.68 | 0.68 | 0.00 | 1.5342 | 1.5344 | -0.0002 |
| | 56 | 24988 | 30023 | 247.36 | 248.12 | -0.76 | 0.41 | 0.40 | 0.01 | 1.5098 | 1.5092 | 0.0006 |
| | 60 | 25137 | 30024 | 247.77 | 247.83 | -0.06 | 0.73 | 0.62 | 0.11 | 1.5242 | 1.5236 | 0.0006 |
| | 64 | 25282 | 30025 | 243.34 | 243.28 | 0.06 | 0.56 | 0.55 | 0.01 | 1.5034 | 1.5023 | 0.0011 |
| | 69 | 25467 | 30026 | 246.23 | 246.20 | 0.03 | 0.40 | 0.39 | 0.01 | 1.5041 | 1.5036 | 0.0005 |
| 2 | 74 | 26056 | 30028 | 227.59 | 227.74 | -0.15 | 1.16 | 1.13 | 0.03 | 1.4845 | 1.4841 | 0.0004 |
| | 78 | 26211 | 30029 | 239.01 | 239.18 | -0.17 | 0.46 | 0.47 | -0.01 | 1.4873 | 1.4862 | 0.0011 |
| | 84 | 26448 | 30030 | 242.95 | 242.61 | 0.34 | 0.87 | 1.01 | -0.14 | 1.5156 | 1.5150 | 0.0006 |
| | 90 | 26666 | 30031 | 245.28 | 245.40 | -0.12 | 0.32 | 0.33 | -0.01 | 1.4981 | 1.4975 | 0.0006 |
| | 93 | 26767 | 30043 | 244.24 | 244.41 | -0.17 | 0.81 | 0.81 | 0.00 | 1.4944 | 1.5152 | -0.0208 |
| | 94 | 26815 | 30032 | 233.16 | 233.36 | -0.20 | 0.93 | 0.88 | 0.05 | 1.4888 | 1.4880 | 0.0008 |
| | 98 | 26964 | 30033 | 238.06 | 237.85 | 0.21 | 1.01 | 1.02 | -0.01 | 1.5086 | 1.5074 | 0.0012 |
| | 99 | 27019 | 30044 | 242.93 | 243.32 | -0.39 | 1.13 | 0.57 | 0.56 | 1.5025 | 1.5024 | 0.0001 |
| | 102 | 27169 | 30034 | ------ | ------ | ---- | 1.07 | 1.14 | -0.07 | 1.5036 | 1.5012 | 0.0024 |
| | 107 | 27430 | 30035 | 238.51 | 238.52 | -0.01 | 0.79 | 0.92 | -0.13 | 1.5047 | 1.5042 | 0.0005 |
| | 113 | 27650 | 30036 | 235.64 | 235.66 | -0.02 | 0.83 | 0.86 | -0.03 | 1.4945 | 1.4943 | 0.0002 |
| | 117 | 27869 | 30037 | 239.89 | 240.03 | -0.14 | 0.50 | 0.49 | 0.01 | 1.4857 | 1.4895 | -0.0038 |
| | 122 | 28086 | 30038 | 240.75 | 240.78 | -0.03 | 1.00 | 0.98 | 0.02 | 1.5153 | 1.5217 | -0.0064 |
| | 125 | 28186 | 30039 | 234.41 | 235.17 | -0.76 | 1.18 | 1.16 | 0.02 | 1.5073 | 1.5068 | 0.0005 |
| | 128 | 28325 | 30040 | 238.77 | 238.62 | 0.15 | 0.87 | 0.94 | -0.07 | 1.5038 | 1.5028 | 0.0010 |
| | 132 | 28499 | 30041 | 245.07 | 245.06 | 0.01 | 0.49 | 0.50 | -0.01 | 1.5039 | 1.5042 | -0.0003 |
| | 136 | 28788 | 30042 | 231.63 | 231.60 | 0.03 | 1.02 | 1.10 | -0.08 | 1.4908 | 1.4900 | 0.0008 |
| 3 | 142 | 29289 | 30045 | 211.73 | 212.57 | -0.84 | 1.62 | 1.62 | 0.00 | 1.4624 | 1.4603 | 0.0021 |
| | 143 | 29332 | 30056 | 227.22 | 227.47 | -0.25 | 1.43 | 0.96 | 0.47 | 1.4774 | 1.4763 | 0.0011 |
| | 148 | 29638 | 30046 | ------ | ------ | ---- | 1.19 | 1.17 | 0.02 | 1.4466 | 1.4468 | -0.0002 |
| | 152 | 29810 | 30047 | 225.33 | 224.61 | 0.72 | 0.98 | 1.01 | -0.03 | ------ | ------ | ------ |
| | 154 | 29880 | 30048 | 238.34 | 238.01 | 0.33 | ---- | -- | ---- | 1.4945 | 1.4863 | 0.0082 |
| | 159 | 30060 | 30049 | 228.42 | 228.14 | 0.28 | 0.81 | 0.83 | -0.02 | 1.4727 | 1.4724 | 0.0003 |
| | 166 | 30456 | 30050 | 233.25 | 232.16 | 1.09 | 0.51 | 0.53 | -0.02 | ------ | ------ | ------ |
| | 167 | 30489 | 30057 | 225.96 | 228.81 | -2.85 | 0.59 | 0.60 | -0.01 | 1.4643 | 1.4641 | 0.0002 |
| | 168 | 30521 | 30051 | 226.92 | 228.76 | -1.84 | ---- | ---- | ---- | 1.4719 | 1.4721 | -0.0002 |
| | 171 | 20613 | 30052 | 246.14 | 245.02 | 1.12 | 0.58 | 0.56 | 0.02 | 1.5105 | 1.5093 | 0.0007 |
| | 173 | 30702 | 30053 | 247.53 | 246.74 | 0.79 | 0.54 | 0.57 | -0.03 | 1.5148 | 1.5138 | 0.0010 |
| | 175 | 30763 | 30054 | 249.35 | 249.90 | -0.55 | 0.75 | 0.73 | 0.02 | 1.5321 | 1.5320 | 0.0001 |
| | 178 | 30871 | 30057 | 242.10 | 244.50 | -2.40 | 0.47 | 0.46 | 0.01 | 1.5034 | 1.5000 | 0.0034 |
| | 182 | 31166 | 30058 | 199.23 | 199.41 | -0.18 | 1.74 | 1.99 | -0.25 | 1.4452 | 1.4453 | -0.0001 |
| | $\bar{d}$ | | = | | | -0.31 | | | 0.02 | | | -0.0005 |
| | $SD_d$ | | = | | | 0.91 | | | 0.16 | | | 0.0043 |
| | $RSD_d$ | | = | | | 0.37 | | | 19.66 | | | 0.2837 |
| | $\bar{OR}$ | | = | | | 244.31 | | | 0.81 | | | 1.5142 |
| | $SD_{\bar{OR}}$ | | = | | | 17.71 | | | 0.37 | | | 0.0461 |
| | N | | = | | | 46 | | | 46 | | | 44 |
| | t | | = | | | 2.29 | | | 1.07 | | | 0.6949 |
| | df | | = | | | 45 | | | 45 | | | 43 |
| | Table t | | = | | | 2.01 | | | 2.01 | | | 2.018 |
| | Significant | | = | | | yes | | | no | | | no |
| | $\bar{R}$ | | = | | | 244.46 | | | 0.79 | | | 1.5145 |
| | $SD_R$ | | = | | | 17.80 | | | 0.38 | | | 0.0467 |
| | $\bar{O}$ | | = | | | 244.15 | | | 0.82 | | | 1.5140 |
| | $SD_O$ | | = | | | 17.63 | | | 0.38 | | | 0.0456 |
| | F | | = | | | 1.02 | | | 1.01 | | | 1.0458 |
| | 1/F | | = | | | 0.98 | | | 0.99 | | | 0.9562 |

## TABLE 6-28

## 1979 URANIUM RUN DATA
## SUMMARY OF REPLICATE SAMPLES TAKEN FROM HWW HIGH-LEVEL WASTE TANK, SAMPLE POINT N-18

| | | | | U-VI-1 (mg U/ml) | | | ACID-VP-1 (N) | | | DN-DM-1 (g/ml @ 25°C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Batch No. | Log No. | QC No. | Original Uranium | Replicate | Difference | Original Acid | Replicate | Difference | Original Density | Replicate | Difference |
| 1 | 111 | 22128 | 80012 | 16.10 | 17.90 | -1.80 | 7.90 | 7.65 | 0.25 | 1.2589 | 1.2603 | -0.0014 |
| | 120 | 22600 | 80013 | 5.10 | 5.20 | -0.10 | 8.70 | 8.90 | -0.20 | 1.2744 | 1.2747 | -0.0003 |
| | 132 | 23097 | 80014 | 7.70 | 8.50 | -0.80 | 8.12 | 7.91 | 0.21 | 1.2544 | 1.2548 | -0.0004 |
| | 135 | 23328 | 80015 | 3.00 | 4.20 | -1.20 | ---- | ---- | ---- | 1.2586 | 1.2601 | -0.0015 |
| | 138 | 23686 | 80016 | 12.15 | 12.50 | -0.35 | 7.97 | 8.12 | -0.15 | 1.2723 | 1.2721 | 0.0002 |
| | 140 | 23861 | 80017 | 6.10 | 6.20 | -0.10 | 8.74 | 8.80 | -0.06 | 1.2812 | 1.2805 | 0.0007 |
| | 144 | 21814 | 80018 | 4.50 | 4.50 | 0.00 | 7.71 | 7.66 | 0.05 | 1.2418 | 1.2418 | 0.0000 |
| | 149 | 25107 | 80019 | 6.00 | 6.70 | -0.70 | 6.64 | 6.80 | -0.16 | 1.2267 | 1.2255 | 0.0012 |
| | 151 | 25276 | 80020 | 9.70 | 10.50 | -0.80 | 7.06 | 7.07 | -0.01 | 1.2320 | 1.2325 | -0.0005 |
| | 155 | 25568 | 80021 | 5.00 | 4.90 | 0.10 | 6.87 | 7.00 | -0.13 | 1.2211 | 1.2220 | -0.0009 |
| 2 | 159 | 26019 | 80025 | 1.10 | 1.30 | -0.20 | 4.46 | 4.50 | -0.04 | 1.1456 | 1.1457 | -0.0001 |
| | 167 | 26350 | 80023 | 0.33 | 0.24 | 0.09 | 8.11 | 8.10 | 0.01 | 1.2503 | 1.2506 | -0.0003 |
| | 174 | 27434 | 80024 | 2.10 | 2.20 | -0.10 | 2.82 | 2.72 | 0.10 | 1.1829 | 1.1824 | 0.0005 |
| | 176 | 27672 | 80026 | 1.70 | 1.70 | 0.00 | 6.96 | 6.75 | 0.21 | 1.2274 | 1.2272 | 0.0002 |
| | 181 | 27908 | 80027 | 5.60 | 5.40 | 0.20 | ---- | ---- | ---- | 1.1938 | 1.1996 | -0.0058 |
| | 184 | 28050 | 80028 | 5.40 | 5.20 | 0.20 | 7.40 | 7.20 | 0.20 | 1.2298 | 1.2287 | 0.0011 |
| | 187 | 28188 | 80029 | 3.00 | 3.00 | 0.00 | 6.89 | 6.92 | -0.03 | 1.2242 | 1.2243 | -0.0001 |
| | 190 | 28362 | 80030 | 3.10 | 3.10 | 0.00 | 6.74 | 6.60 | 0.14 | 1.2552 | 1.2540 | 0.0012 |
| | 201 | 28902 | 80031 | ---- | ---- | ---- | 4.67 | 4.61 | 0.06 | 1.2145 | 1.2137 | 0.0008 |
| 3 | 208 | 29399 | 80032 | 11.90 | 11.90 | 0.00 | 7.12 | 6.36 | 0.76 | ---- | ---- | ---- |
| | 209 | 29510 | 80033 | ---- | ---- | ---- | 6.66 | 6.56 | 0.10 | ---- | ---- | ---- |
| | 214 | 29714 | 80034 | 0.90 | 1.50 | -0.60 | 6.46 | 6.43 | 0.03 | 1.2278 | 1.2279 | -0.0001 |
| | 118 | 29917 | 80035 | 8.60 | 8.30 | 0.30 | 7.42 | 7.51 | -0.09 | 1.2604 | 1.2603 | 0.0001 |
| | 221 | 30050 | 80036 | 14.30 | 14.90 | -0.60 | 7.40 | 7.36 | 0.04 | 1.2924 | 1.2918 | 0.0006 |
| | 224 | 30157 | 80037 | 5.15 | 5.20 | -0.05 | 5.78 | 5.73 | 0.05 | 1.2739 | 1.2736 | 0.0003 |
| | 228 | 30297 | 80038 | ---- | ---- | ---- | 5.60 | 5.68 | -0.08 | 1.2027 | 1.2034 | -0.0007 |
| | 232 | 30493 | 80039 | ---- | ---- | ---- | 7.43 | 7.45 | -0.02 | 1.2613 | 1.2608 | 0.0005 |
| | 234 | 305-0 | 80040 | 6.45 | 6.50 | -0.05 | 6.40 | 6.53 | -0.13 | 1.2385 | 1.2381 | 0.0004 |
| | 235 | 30616 | 80041 | 5.00 | 5.70 | -0.70 | 6.65 | 6.86 | -0.21 | 1.2395 | 1.2385 | 0.0010 |
| | 239 | 30833 | 80042 | ---- | ---- | ---- | 7.05 | 6.98 | 0.07 | 1.2674 | 1.2665 | 0.0009 |
| | $\bar{d}$ | = | | | | -0.29 | | | 0.03 | | | -0.0001 |
| | $SD_d$ | = | | | | 0.50 | | | 0.19 | | | 0.0013 |
| | $RSD_d$ | = | | | | 8.09 | | | 2.79 | | | 0.1073 |
| | $\bar{OR}$ | = | | | | 6.14 | | | 6.83 | | | 1.2397 |
| | $SD_{\bar{OR}}$ | = | | | | 4.27 | | | 1.29 | | | 0.0322 |
| | N | = | | | | 25 | | | 28 | | | 28 |
| | t | = | | | | 2.92 | | | 0.96 | | | 0.3409 |
| | df | = | | | | 24 | | | 27 | | | 27 |
| | Table t | = | | | | 2.06 | | | 2.05 | | | 2.052 |
| | Significant | = | | | | yes | | | no | | | no |
| | $\bar{R}$ | = | | | | 6.29 | | | 6.81 | | | 1.2397 |
| | $SD_R$ | = | | | | 4.39 | | | 1.30 | | | 0.0320 |
| | $\bar{O}$ | = | | | | 6.00 | | | 6.85 | | | 1.2396 |
| | $SD_O$ | = | | | | 4.16 | | | 1.29 | | | 0.0324 |
| | F | = | | | | 1.11 | | | 1.02 | | | 0.9801 |
| | 1/F | = | | | | 0.90 | | | 0.98 | | | 1.0203 |

## TABLE 6-29

### 1979 URANIUM RUN DATA
### SUMMARY OF REPLICATE SAMPLES TAKEN FROM THE GPW WASTE TANK, SAMPLE POINT N-34

| | | | | U-VI-1 (mg U/ml) | | | ACID-VP-1 (N) | | | DN-DM-1 (g/ml @ 25°C) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Batch No. | Log No. | QC No. | Original Uranium | Replicate | Difference | Original Acid | Replicate | Difference | Original Density | Replicate | Difference |
| 1 | 493 | 22578 | 40021 | 6.90 | 7.10 | -0.20 | 1.48 | 1.44 | 0.04 | 1.1277 | 1.1288 | -0.0011 |
| | 499 | 23007 | 40023 | 9.15 | 8.50 | 0.65 | 6.91 | 6.87 | 0.04 | 1.2246 | 1.2246 | 0.0000 |
| | 507 | 23372 | 40022 | 17.90 | 17.30 | 0.60 | 3.34 | 3.56 | -0.22 | 1.2687 | 1.2684 | 0.0003 |
| | 515 | 23750 | 40024 | 26.80 | 26.20 | 0.60 | 2.78 | 2.80 | -0.02 | 1.2932 | 1.2925 | 0.0007 |
| | 516 | 23759 | 40025 | 23.10 | 22.60 | 0.50 | 2.98 | 2.98 | 0.00 | 1.2654 | 1.2651 | 0.0003 |
| | 520 | 21813 | 40026 | 8.90 | 8.90 | 0.00 | 6.57 | 6.67 | -0.10 | 1.2147 | 1.2144 | 0.0003 |
| | 529 | 25108 | 40027 | 11.40 | 12.50 | -1.10 | 2.24 | 2.35 | -0.11 | 1.1954 | 1.1955 | -0.0001 |
| | 531 | 25317 | 40028 | 0.60 | 0.70 | -0.10 | 4.25 | 4.25 | 0.00 | 1.1920 | 1.1917 | 0.0003 |
| | 538 | 25511 | 40029 | 0.85 | 1.20 | -0.35 | ---- | ---- | ---- | ------ | ------ | ------ |
| | 542 | 25552 | 40030 | 0.70 | 0.70 | 0.00 | 0.67 | 0.64 | 0.03 | 1.0421 | 1.0418 | 0.0003 |
| 2 | 546 | 25659 | 40031 | 49.70 | 47.80 | 1.90 | 5.32 | 5.42 | -0.10 | 1.2895 | 1.2889 | 0.0006 |
| | 549 | 25719 | 40032 | 2.80 | 6.00 | -3.20 | 6.33 | 6.28 | 0.05 | 1.2021 | 1.2016 | 0.0005 |
| | 553 | 25730 | 40033 | 6.25 | 6.20 | 0.05 | 2.75 | 2.72 | 0.03 | 1.2326 | 1.2317 | 0.0009 |
| | 559 | 25763 | 40034 | ---- | ---- | ---- | 3.28 | 3.65 | -0.37 | 1.1144 | 1.1139 | 0.0005 |
| | 565 | 26020 | 40035 | 2.25 | 3.90 | -1.65 | 6.85 | 6.88 | -0.03 | 1.2363 | 1.2360 | 0.0003 |
| | 568 | 26288 | 40036 | ---- | ---- | ---- | ---- | ---- | ---- | ------ | ------ | ------ |
| | 572 | 26498 | 40037 | 20.95 | 20.90 | 0.05 | ---- | ---- | ---- | ------ | ------ | ------ |
| | 577 | 26637 | 40038 | 2.90 | 3.00 | -0.10 | 8.14 | 8.16 | -0.02 | 1.2653 | 1.2651 | 0.0002 |
| | 583 | 26799 | 40039 | 2.90 | 3.60 | -0.70 | 8.22 | 8.19 | 0.03 | 1.2645 | 1.2639 | 0.0006 |
| | 585 | 26836 | 40040 | 5.70 | 6.20 | -0.50 | 8.16 | 8.18 | -0.02 | 1.2664 | 1.2659 | 0.0005 |
| | 589 | 26946 | 40041 | 7.30 | 7.30 | 0.00 | 5.47 | 5.32 | 0.15 | 1.2486 | 1.2480 | 0.0006 |
| | 592 | 27020 | 40042 | 68.40 | 65.50 | 2.90 | 7.52 | 7.47 | 0.05 | 1.3184 | 1.3186 | -0.0002 |
| | 599 | 27220 | 40043 | 32.70 | 32.10 | 0.60 | 5.80 | 6.21 | -0.41 | 1.2993 | 1.2990 | 0.0003 |
| | 609 | 27452 | 40044 | 3.50 | 3.90 | -0.40 | 4.26 | 4.20 | 0.06 | 1.2496 | 1.2497 | -0.0001 |
| | 612 | 27503 | 40046 | 4.00 | 4.00 | 0.00 | 5.54 | 5.42 | 0.12 | 1.2409 | 1.2349 | 0.0060 |
| | 614 | 27550 | 40046 | 3.65 | 3.60 | 0.05 | 6.86 | 6.93 | -0.07 | 1.2712 | 1.2713 | -0.0001 |
| | 618 | 27636 | 40047 | ---- | ---- | ---- | ---- | ---- | ---- | ------ | ------ | ------ |
| | 622 | 27794 | 40048 | 1.15 | 1.20 | -0.05 | 6.40 | 6.47 | -0.07 | 1.2793 | 1.2795 | -0.0002 |
| | 625 | 27867 | 40049 | 0.90 | 0.90 | 0.00 | 5.98 | 6.09 | -0.11 | 1.2798 | 1.2797 | 0.0001 |
| | 631 | 28143 | 40050 | 4.90 | 4.90 | 0.00 | 3.25 | 3.32 | -0.07 | 1.1827 | 1.1828 | -0.0001 |
| | 636 | 28244 | 40051 | 2.40 | 1.50 | 0.90 | 2.14 | 2.22 | -0.08 | 1.1478 | 1.1479 | -0.0001 |
| | 369 | 28405 | 40053 | 13.40 | 14.00 | -0.60 | 4.52 | 4.56 | -0.04 | 1.1866 | 1.1896 | -0.0030 |
| | 640 | 28417 | 40052 | 8.93 | 10.40 | -1.47 | 3.80 | 3.75 | 0.05 | 1.2849 | 1.2893 | -0.0044 |
| | 647 | 28850 | 40053 | 1.20 | 1.20 | 0.00 | 1.28 | 1.31 | -0.03 | 1.1896 | 1.1905 | -0.0009 |
| | 648 | 28861 | 40054 | 0.20 | 0.27 | -0.07 | 5.29 | 5.34 | -0.05 | 1.1921 | 1.1922 | -0.0001 |
| 3 | 661 | 29432 | 40055 | 24.55 | 24.40 | 0.15 | ---- | ---- | ---- | ------ | ------ | ------ |
| | 669 | 29808 | 40056 | 3.40 | 3.00 | 0.40 | 5.70 | 5.62 | 0.08 | ------ | ------ | ------ |
| | 671 | 29863 | 40057 | 33.00 | 33.90 | -0.90 | 2.48 | 2.52 | -0.04 | 1.2489 | 1.2490 | -0.0001 |
| | 673 | 30058 | 40058 | 37.80 | 37.80 | 0.00 | 1.01 | 1.07 | -0.06 | 1.1905 | 1.1907 | -0.0002 |
| | 680 | 30265 | 40060 | 36.90 | 35.10 | 1.80 | 0.84 | 0.86 | -0.02 | 1.1419 | 1.1415 | 0.0004 |
| | 667 | 30401 | 40061 | 2.85 | 2.70 | 0.15 | 4.50 | 4.56 | -0.06 | 1.2371 | 1.2351 | 0.0020 |
| | 690 | 30520 | 40062 | ---- | ---- | ---- | 2.36 | 2.37 | -0.01 | 1.0769 | 1.0768 | 0.0001 |
| | 692 | 30607 | 40063 | 12.50 | 12.50 | 0.00 | 3.72 | 3.69 | 0.03 | 1.2158 | 1.2158 | 0.0000 |
| | 693 | 30708 | 40064 | 7.35 | 6.80 | 0.55 | 2.10 | 2.06 | 0.04 | 1.1091 | 1.1092 | -0.0001 |
| | 696 | 30882 | 40065 | 10.70 | 10.40 | 0.30 | 2.59 | 2.53 | 0.06 | 1.1944 | 1.1942 | 0.0002 |
| | $\bar{d}$ | = | | | 0.02 | | -0.03 | | | | 0.0001 | |
| | $SD_d$ | = | | | 0.96 | | 0.11 | | | | 0.0014 | |
| | $RSD_d$ | = | | | 7.57 | | 2.50 | | | | 0.1146 | |
| | $\bar{OR}$ | = | | | 12.71 | | 4.36 | | | | 1.2174 | |
| | $SD_{\bar{OR}}$ | = | | | 14.93 | | 2.19 | | | | 0.0643 | |
| | N | = | | | 41 | | 40 | | | | 39 | |
| | t | = | | | 0.12 | | 1.82 | | | | 0.5971 | |
| | df | = | | | 40 | | 39 | | | | 38 | |
| | Table t | = | | | 2.02 | | 2.02 | | | | 2.037 | |
| | Significant | = | | | no | | no | | | | no | |
| | $\bar{R}$ | = | | | 12.70 | | 4.37 | | | | 1.2173 | |
| | $SD_R$ | = | | | 14.66 | | 2.19 | | | | 0.0642 | |
| | $\bar{O}$ | = | | | 12.72 | | 4.34 | | | | 1.2174 | |
| | $SD_O$ | = | | | 15.21 | | 2.19 | | | | 0.0643 | |
| | F | = | | | 0.93 | | 1.00 | | | | 0.9982 | |
| | 1/F | = | | | 1.08 | | 1.00 | | | | 1.0018 | |

TABLE 6-30

SUMMARY OF ANALYTICAL QUALITY CONTROL DATA FOR ACCOUNTABILITY METHODS

| Method | U-VP-1 | U-VI[a] | U-ID[b] |
|---|---|---|---|
| Number of QC Samples | 43 | 89 | 17 |
| Average Difference (Experimental - Known) | (0.061) | 6.33[c] | 0.40 |
| Standard Deviation | 0.30 | 5.10 | 1.99 |
| Standard Deviation of Average | 0.080 | 1.15 | 0.48 |

(a) Campaign 3 remote dilution data.

(b) Relative values to account for multiple levels.

(c) Significant bias at 95% C/L.

TABLE 6-31

CONCENTRATION COMPARISONS - BATCHES 206 TO 271
06-SEP-79 -- 10:22 AM

| BATCH | MSID | VP | DIFFERENCE |
|---|---|---|---|
| 206 | 189.2500 | 190.7600 | -1.5100 |
| 207 | 186.6500 | 186.7100 | -.0600 |
| 208 | 218.6100 | 218.8200 | -.2100 |
| 209 | 231.9500 | 233.4500 | -1.5000 |
| 210 | 238.3700 | 239.1700 | -.8000 |
| 211 | 241.9000 | 242.1200 | -.2200 |
| 212 | 236.7000 | 239.0100 | -2.3100 |
| 213 | 234.6600 | 234.9800 | -.3200 |
| 214 | 232.4100 | 234.1200 | -1.7100 |
| 215 | 238.0800 | 238.9900 | -.9100 |
| 216 | 242.2300 | 242.2100 | .0200 |
| 217 | 243.6100 | 243.7400 | -.1300 |
| 218 | 242.0500 | 242.5600 | -.5100 |
| 219 | 240.8200 | 241.0700 | -.2500 |
| 220 | 239.2300 | 239.3000 | -.0700 |
| 221 | 241.3000 | 241.5500 | -.2500 |
| 222 | 236.2800 | 237.6000 | -1.3200 |
| 223 | 239.2600 | 240.0300 | -.7700 |
| 224 | 245.1800 | 244.8100 | .3700 |
| 225 | 236.4000 | 237.3100 | -.9100 |
| 226 | 235.5500 | 236.0100 | -.4600 |
| 227 | 238.3400 | 236.3100 | 2.0300 |
| 228 | 232.5900 | 233.7800 | -1.1900 |
| 229 | 230.3500 | 231.6600 | -1.3100 |
| 230 | 232.4900 | 233.2000 | -.7100 |
| 231 | 229.7500 | 229.6500 | .1000 |
| 232 | 235.8300 | 236.9900 | -1.1600 |
| 233 | 240.9700 | 242.3700 | -1.4000 |
| 234 | 234.7500 | 235.3000 | -.5500 |
| 235 | 225.7000 | 226.6300 | -.9300 |
| 236 | 233.2300 | 234.0200 | -.7900 |
| 237 | 227.0900 | 228.6200 | -1.5300 |
| 238 | 234.7400 | 235.2700 | -.5300 |
| 239 | 220.9800 | 221.5500 | -.5700 |
| 240 | 229.7600 | 230.7900 | -1.0300 |
| 241 | 237.0400 | 237.4000 | -.3600 |
| 242 | 237.0200 | 239.5800 | -2.5600 |
| 243 | 245.5600 | 246.4400 | -.8800 |
| 244 | 242.3800 | 242.9400 | -.5600 |
| 245 | 237.9800 | 240.2600 | -2.2800 |

**INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-31 (CONTINUED)

CONCENTRATION COMPARISONS - BATCHES 206 TO 271
06-SEP-79 -- 10:22 AM

| BATCH | MSID | VP | DIFFERENCE |
|---|---|---|---|
| 246 | 235.8400 | 236.6900 | -.8500 |
| 247 | 234.6700 | 235.4700 | -.8000 |
| 248 | 232.9700 | 234.7400 | -1.7700 |
| 249 | 230.2600 | 230.3600 | -.1000 |
| 250 | 233.6600 | 234.8200 | -1.1600 |
| 251 | 238.1100 | 239.4800 | -1.3700 |
| 252 | 243.2600 | 243.8900 | -.6300 |
| 253 | 237.3500 | 238.4500 | -1.1000 |
| 254 | 234.8800 | 234.5500 | .3300 |
| 255 | 239.1100 | 240.1800 | -1.0700 |
| 256 | 239.0000 | 240.6500 | -1.6500 |
| 257 | 237.9000 | 237.8400 | .0600 |
| 258 | 233.7500 | 234.5400 | -.7900 |
| 259 | 233.3800 | 235.2800 | -1.9000 |
| 260 | 237.6400 | 237.0300 | .6100 |
| 261 | 240.2400 | 241.0600 | -.8200 |
| 262 | 238.1700 | 239.1900 | -1.0200 |
| 263 | 240.0000 | 241.4700 | -1.4700 |
| 264 | 241.8000 | 242.6700 | -.8700 |
| 265 | 246.3000 | 247.1900 | -.8900 |
| 266 | 243.6600 | 244.9700 | -1.3100 |
| 267 | 239.8000 | 240.6200 | -.8200 |
| 268 | 236.7200 | 238.3500 | -1.6300 |
| 269 | 232.3300 | 232.7500 | -.4200 |
| 270 | 236.7500 | 237.2500 | -.5000 |
| 271 | 212.3100 | 213.6300 | -1.3200 |

**INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-31 (CONTINUED)

CONCENTRATION COMPARISONS - BATCHES 206 TO 271
06-SEP-79 -- 10:22 AM

**********
**********
**  SUMMARY REPORT  **
**********
**********

DIFFERENCE

N: 66

AVERAGE: -.8076

SIGMA: .7414

ACCEPTABLE RANGE: -6.6700 TO 5.3300

THIS SUMMARY INCLUDES 66 BATCHES

TABLE 6-32

CONCENTRATION COMPARISONS - BATCHES 274 TO 311
06-SEP-79 -- 10:24 AM

| BATCH | MSID | VP | DIFFERENCE |
|---|---|---|---|
| 274 | 198.4500 | 196.9600 | 1.4900 |
| 275 | 212.6500 | 210.4200 | 2.2300 |
| 276 | 226.2000 | 226.0300 | .1700 |
| 277 | 230.9400 | 231.6800 | -.7400 |
| 278 | 237.5000 | 236.8900 | .6100 |
| 279 | 232.7000 | 231.5600 | 1.1400 |
| 280 | 209.9000 | 205.1000 | 4.8000 |
| 281 | 215.3800 | 211.7400 | 3.6400 |
| 282 | 215.8300 | 215.1900 | .6400 |
| 283 | 219.9700 | 220.2500 | -.2800 |
| 284 | 223.4000 | 222.1500 | 1.2500 |
| 285 | 225.7700 | 223.7800 | 1.9900 |
| 286 | 229.3100 | 231.5000 | -2.1900 |
| 287 | 237.7000 | 236.7900 | .9100 |
| 288 | 236.4100 | 236.9600 | -.5500 |
| 289 | 239.6100 | 236.0600 | 3.5500 |
| 290 | 223.7800 | 225.7300 | -1.9500 |
| 291 | 228.0400 | 228.1700 | -.1300 |
| 292 | 228.9300 | 227.4100 | 1.5200 |
| 293 | 229.0600 | 229.5800 | -.5200 |
| 294 | 223.1600 | 225.4000 | -2.2400 |
| 295 | 224.8500 | 227.6000 | -2.7500 |
| 296 | 224.5900 | 224.6600 | -.0700 |
| 297 | 221.8200 | 221.5000 | .3200 |
| 298 | 231.2200 | 229.5400 | 1.6800 |
| 299 | 233.1100 | 232.3400 | .7700 |
| 300 | 228.5800 | 229.8800 | -1.3000 |
| 301 | 230.5200 | 229.4200 | 1.1000 |
| 302 | 237.4100 | 235.0000 | 2.4100 |
| 303 | 246.1900 | 245.3600 | .8300 |
| 304 | 245.6100 | 244.8700 | .7400 |
| 305 | 246.9100 | 246.2900 | .6200 |
| 306 | 246.7200 | 245.6200 | 1.1000 |
| 307 | 244.8400 | 244.1300 | .7100 |
| 308 | 249.4200 | 248.5400 | .8800 |
| 309 | 251.5600 | 250.2400 | 1.3200 |
| 310 | 252.9400 | 250.8900 | 2.0500 |
| 311 | 75.7300 | 75.4300 | .3000 |

**INDICATES EXTREME VALUE OMITTED FROM SUMMARY

TABLE 6-32 (CONTINUED)

CONCENTRATION COMPARISONS - BATCHES 274 TO 311
06-SEP-79 -- 10:24 AM

```
**************************************
**************************************
**                                  **
**                                  **
**         SUMMARY REPORT           **
**                                  **
**                                  **
**************************************
**************************************
```

DIFFERENCE

| | |
|---|---|
| N: | 38 |
| AVERAGE: | .6855 |
| SIGMA: | 1.5919 |
| ACCEPTABLE RANGE: | -6.6700 TO 5.3300 |

THIS SUMMARY INCLUDES 38 BATCHES

TABLE 6-33

$UF_6$ TO SEPARATIONS TRANSFERS

| $UF_6$ Values | | | Separations Values | | | Difference ($UF_6$ - SEP) | |
|---|---|---|---|---|---|---|---|
| Batch Number | Kilograms Solution | Kilograms Uranium | Batch Number | Kilograms Solution | Kilograms Uranium | Kilograms Solution | Kilograms Uranium |
| 30 | 12,771.4 | 2,985.7 | 127 | 12,547.0 | 2,920.9 | 224.4 | 64.8 |
| 31 | 8,908.8 | 1,863.8 | 128 | 8,857.2 | 1,859.4 | 51.6 | 4.4 |
| 32A | 9,185.9 | 2,089.4 | 129 | 9,195.4 | 2,096.8 | (9.5) | (7.4) |
| 32B | 9,215.6 | 2,095.7 | 130 | 9,201.0 | 2,105.6 | 14.6 | (9.9) |
| 33 | 8,389.2 | 1,935.1 | 131 | 8,413.7 | 1,963.8 | (24.5) | (28.7) |
| 34 | 3,957.7 | 912.9 | 169 | 3,361.7 | 788.8 | 596.0 | 124.1 |
| Subtotal: | 52,428.6 | 11,882.6 | | 51,576.0 | 11,735.3 | 852.6 | 147.3 |
| Flush: | (699.8) | (161.3) | | | | (699.8) | (161.3) |
| | 51,728.8 | 11,721.3 | | 51,576.0 | 11,735.3 | 152.8<br>0.30% | (14.0)<br>(0.12%) |
| Limit of Error: | | ±53<br>±0.45% | | | ±26<br>±0.22% | | ±59<br>±0.50 |

TABLE 6-34

SEPARATIONS TO $UF_6$ TRANSFERS

| | Separations Values | | $UF_6$ Values | | Difference (SEP - $UF_6$) | |
|---|---|---|---|---|---|---|
| | Kilograms Solution | Kilograms Uranium | Kilograms Solution | Kilograms Uranium | Kilograms Solution | Kilograms Uranium |
| | 16,189.8 | 3,809.63 | 16,028.2 | 3,789.98 | 161.6 | 19.65 |
| | 14,723.7 | 3,437.61 | 14,397.8 | 3,361.17 | 325.9 | 76.44 |
| | 13,168.2 | 1,906.04 | 13,437.8 | 2,005.34 | (269.6) | (99.30) |
| | 12,588.7 | 394.37 | 12,537.8 | 402.16 | 50.9 | (7.79) |
| | 1,482.6 | 13.00 | 1,505.1 | 24.72* | (22.5) | (11.72) |
| Subtotal: | 58,153.0 | 9,560.65 | 57,906.7 | 9,583.37 | 246.3 | (22.72) |
| | | | | | 0.42% | (0.24%) |
| Flush: | 0 | 0 | 4,321.6 | 2.16* | 0 | (2.16) |
| TOTALS: | | 9,560.65 | | 9,585.53 | | (24.88) |
| | | | | | | 0.26% |
| Limits of Error: | | ±40.1 | | ±49 | | ±63 |
| | | ±0.42% | | ±0.51% | | ±0.66% |

*Calculated Values.

TABLE 6-35

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 02:26 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 206- 271 | TANK 02007 BATCHES 72- 139 | TANK 02023 BATCHES 159- 204 | TANK 02028 BATCHES 564- 657 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 60.5666 | 89.1442 | 2.68833 | 8.35377 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | .82 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | 0 | 0 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

TABLE 6-35 (CONTINUED)

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 02:26 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 11014 | 100 | .0908454 |
| INPUT (02003) BATCHES 206 - 271 | 110077 | 121.133 | .110044 |
| PRODUCT (02007) BATCHES 72 - 139 | 110172 | 178.288 | .161967 |
| WASTE (02023) BATCHES 159 - 204 | 97.3392 | 5.37667 | .00488445 |
| WASTE (02028) BATCHES 564 - 657 | 213.215 | 16.7075 | .015178 |
| ENDING INVENTORY | 10598 | 100 | .0908454 |
| TOTAL (INVENTORY DIFFERENCE) | 10.375 | 258.395 | .23474 |

TABLE 6-36

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 02:19 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 272- 315 | TANK 02007 BATCHES 139- 186 | TANK 02023 BATCHES 205- 253 | TANK 02028 BATCHES 658- 740 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 45.4267 | 66.3593 | 3.10247 | 10.3541 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | .82 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | 0 | 0 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

TABLE 6-36 (CONTINUED)

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 02:19 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 10633 | 100 | .151557 |
| INPUT (02003) BATCHES 272 - 315 | 65981.8 | 90.8533 | .137694 |
| PRODUCT (02007) BATCHES 139 - 186 | 75605.2 | 132.719 | .201144 |
| WASTE (02023) BATCHES 205 - 253 | 153.97 | 6.20493 | .009404 |
| WASTE (02028) BATCHES 658 - 740 | 359.182 | 20.7081 | .0313846 |
| ENDING INVENTORY | 462 | 18 | .0272802 |
| TOTAL (INVENTORY DIFFERENCE) | 34.5276 | 191.468 | .290182 |

TABLE 6-37

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 01:30 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 206- 315 | TANK 02007 BATCHES 72- 186 | TANK 02023 BATCHES 159- 253 | TANK 02028 BATCHES 564- 740 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 85.3236 | 136.933 | 4.81561 | 15.7669 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | .82 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | 0 | 0 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

TABLE 6-37 (CONTINUED)

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 01:30 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 11118 | 100 | .0567991 |
| INPUT (02003) BATCHES 206 - 315 | 176059 | 170.647 | .0969262 |
| PRODUCT (02007) BATCHES 72 - 186 | 185777 | 273.866 | .155554 |
| WASTE (02023) BATCHES 159 - 253 | 251.309 | 9.63121 | .00547045 |
| WASTE (02028) BATCHES 564 - 740 | 572.397 | 31.5338 | .0179109 |
| ENDING INVENTORY | 531 | 18 | .0102238 |
| TOTAL (INVENTORY DIFFERENCE) | 45.3715 | 339.903 | .193062 |

TABLE 6-38

OVERALL MATERIAL BALANCE LIMIT-OF-ERROR SUMMARY

| Material Balance Component | | Kilograms Uranium | LE Kilograms Uranium | LE Percent of Input |
|---|---|---|---|---|
| BI | = | 21 | 2 | <0.01 |
| INPUT | = | 310,545 | 301 | 0.10 |
| PRODUCT | = | 308,478 | 455 | 0.15 |
| WASTE | = | 1,645 | 66 | 0.02 |
| EI | = | 462 | 5 | <0.01 |
| ID | = | (19) | ±550 | 0.18 |

TABLE 6-39

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 03:48 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 206- 271 | TANK 02007 BATCHES 72- 139 | TANK 02023 BATCHES 159- 204 | TANK 02028 BATCHES 564- 657 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 255.376 | 96.6753 | 2.68833 | 8.35377 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | 1.99 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | .480219 | .0799431 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

*For MSID method using remote dilutions.

TABLE 6-39 (CONTINUED)

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 03:48 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 11014 | 100 | .0908454 |
| INPUT (02003) BATCHES 206 - 271 | 110077 | 510.753 | .463995 |
| PRODUCT (02007) BATCHES 72 - 139 | 110172 | 193.351 | .17565 |
| WASTE (02023) BATCHES 159 - 204 | 97.3392 | 5.37667 | .00488445 |
| WASTE (02028) BATCHES 564 - 657 | 213.215 | 16.7075 | .015178 |
| ENDING INVENTORY | 10598 | 100 | .0908454 |
| TOTAL (INVENTORY DIFFERENCE) | 10.375 | 564.412 | .512742 |

TABLE 6-40

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 03:51 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 272- 315 | TANK 02007 BATCHES 139- 186 | TANK 02023 BATCHES 205- 253 | TANK 02028 BATCHES 658- 740 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 176.874 | 71.6887 | 3.10247 | 10.3541 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | 1.99 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | .480219 | .0799431 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

*For MSID method using remote dilutions.

TABLE 6-40 (CONTINUED)

SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION
11-SEP-79 -- 03:51 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 10633 | 100 | .151557 |
| INPUT (02003) BATCHES 272 - 315 | 65981.8 | 353.747 | .536128 |
| PRODUCT (02007) BATCHES 139 - 186 | 75605.2 | 143.377 | .217298 |
| WASTE (02023) BATCHES 205 - 253 | 153.97 | 6.20493 | .009404 |
| WASTE (02028) BATCHES 658 - 740 | 359.182 | 20.7081 | .0313846 |
| ENDING INVENTORY | 462 | 18 | .0272802 |
| TOTAL (INVENTORY DIFFERENCE) | 34.5276 | 395.582 | .599532 |

TABLE 6-41

LIMIT OF ERROR SUMMARY
11-SEP-79 -- 03:56 PM

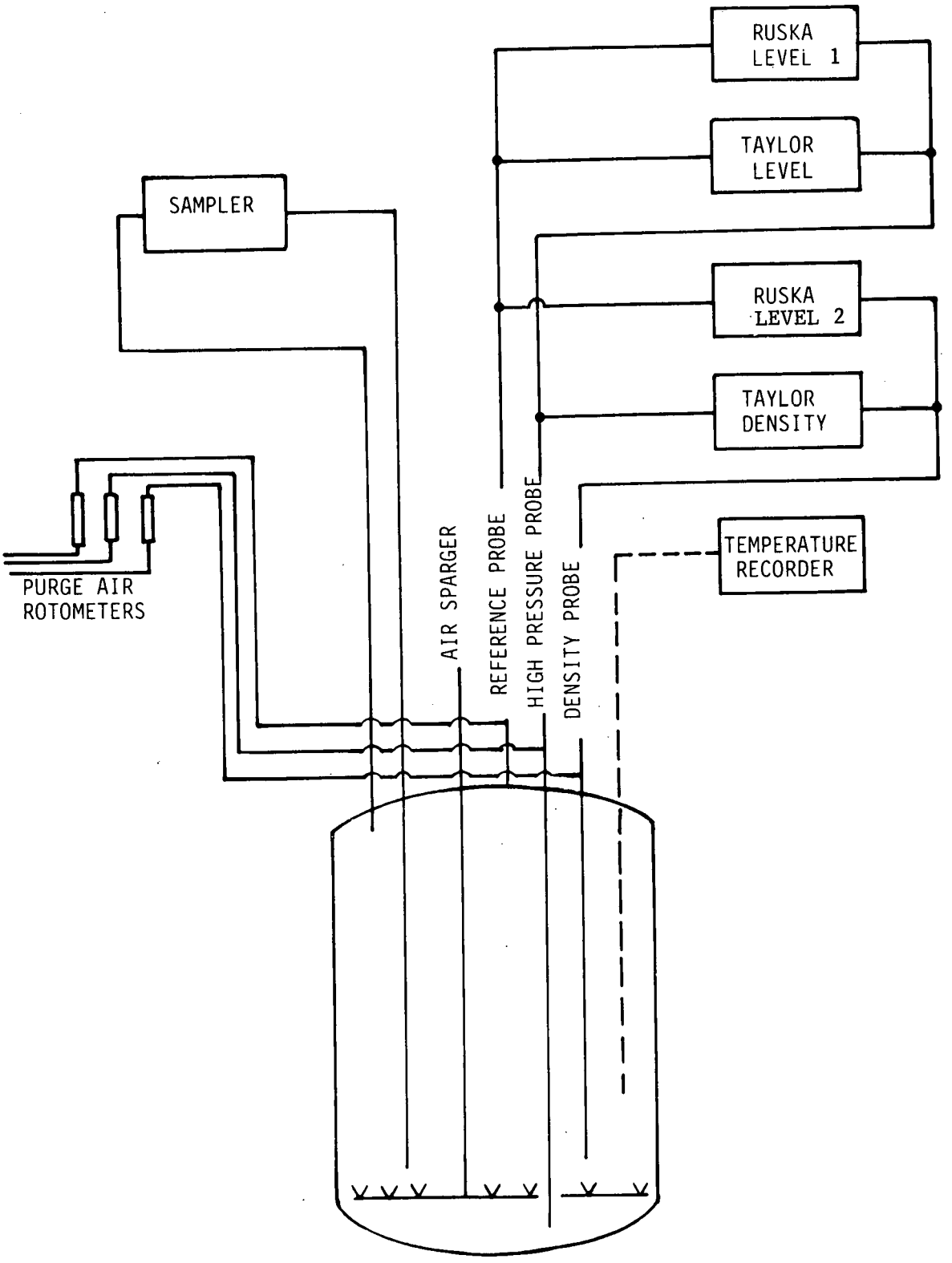
| STANDARD DEVIATION | TANK 02003 BATCHES 206- 315 | TANK 02007 BATCHES 72- 186 | TANK 02023 BATCHES 159- 253 | TANK 02028 BATCHES 564- 740 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 404.731 | 151.313 | 4.81561 | 15.7669 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | 1.99 | .91 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | .480219 | .0799431 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .07 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

*For MSID method using remote dilutions.

TABLE 6-41 (CONTINUED)

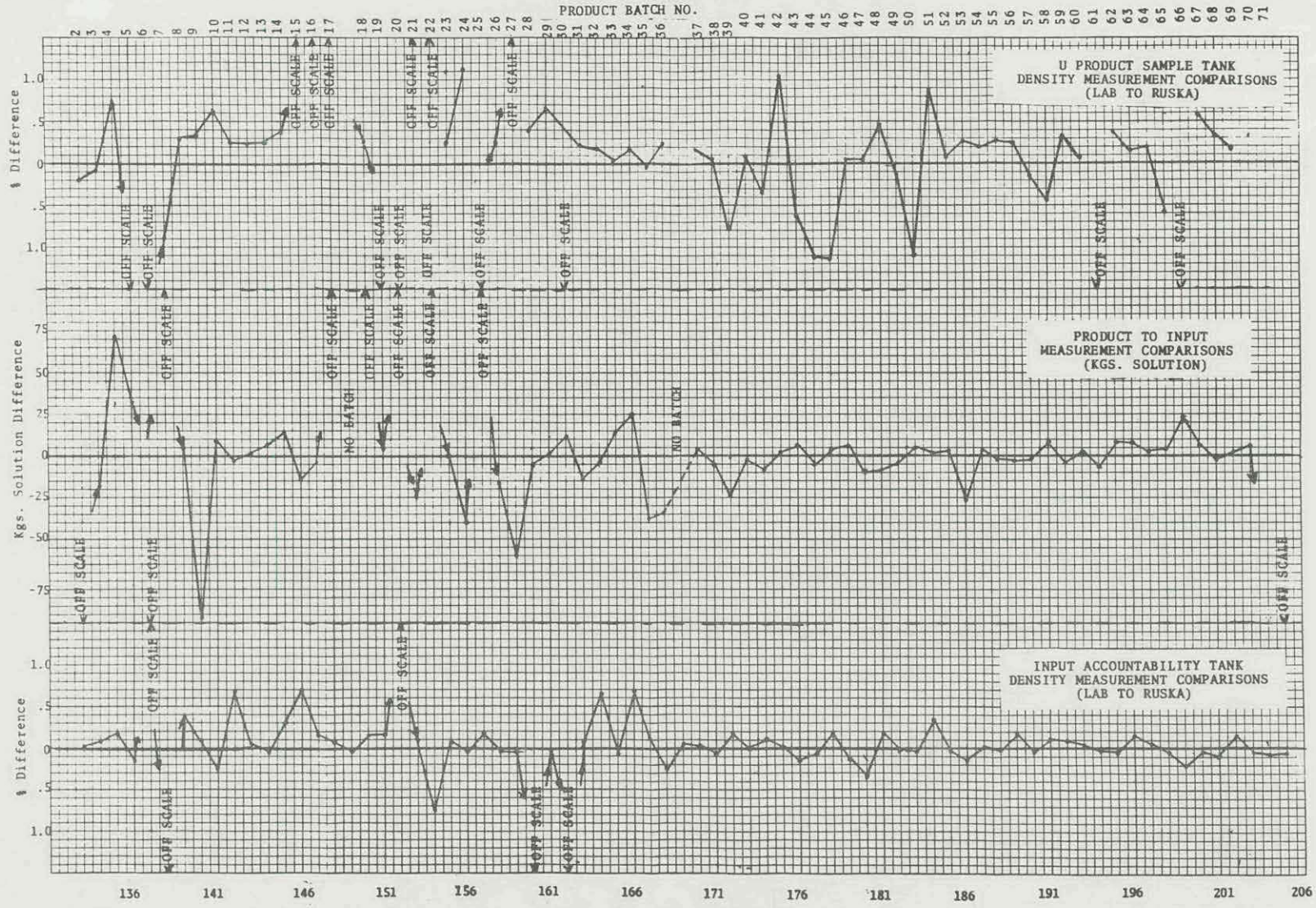
LIMIT OF ERROR SUMMARY
11-SEP-79 -- 03:56 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 11118 | 100 | .0567991 |
| INPUT (02003) BATCHES 206 - 315 | 176059 | 809.461 | .459767 |
| PRODUCT (02007) BATCHES 72 - 186 | 185777 | 302.626 | .171889 |
| WASTE (02023) BATCHES 159 - 253 | 251.309 | 9.63121 | .00547045 |
| WASTE (02028) BATCHES 564 - 740 | 572.397 | 31.5338 | .0179109 |
| ENDING INVENTORY | 531 | 18 | .0102238 |
| TOTAL (INVENTORY DIFFERENCE) | 45.3715 | 870.759 | .494583 |



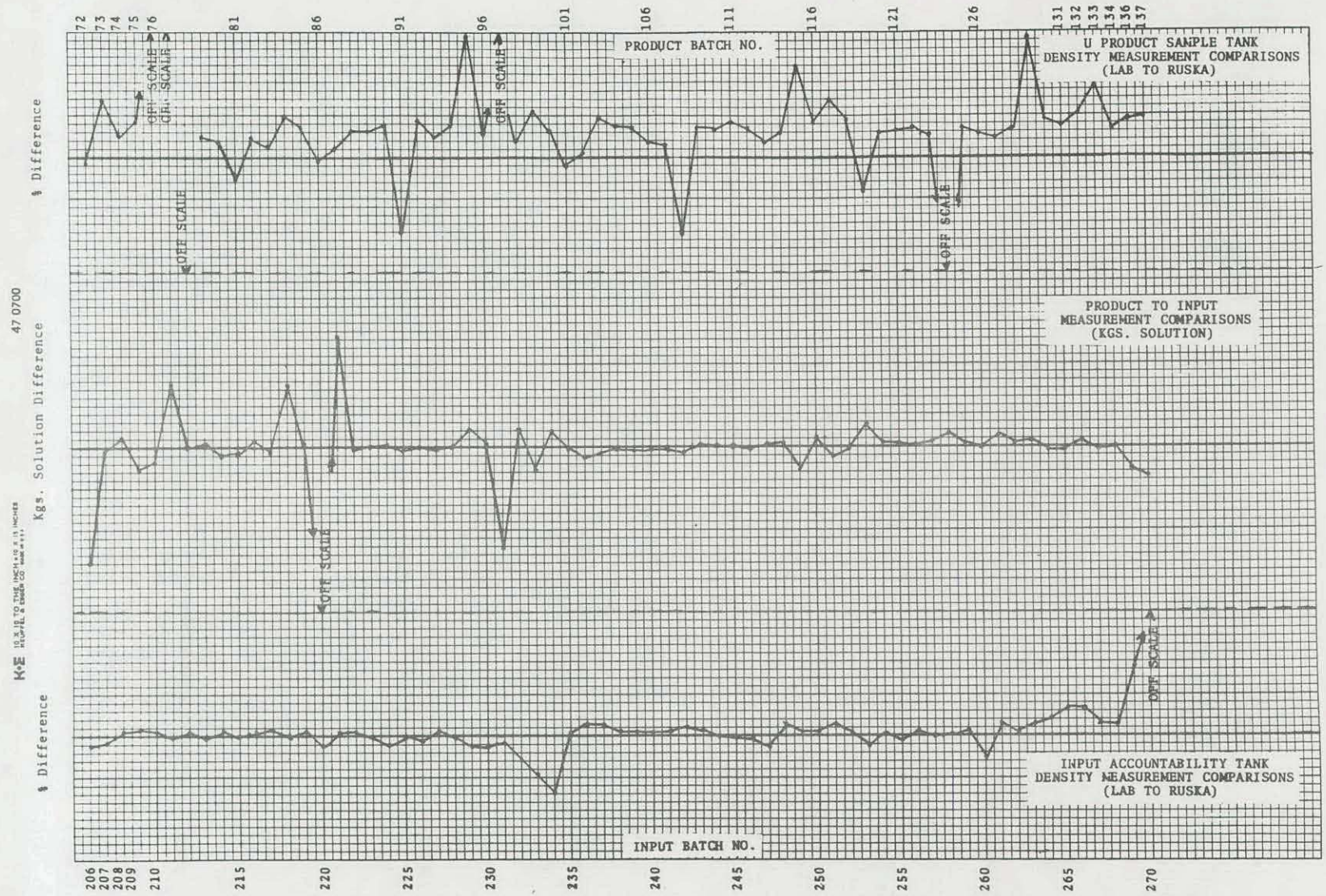

PRODUCT AND INPUT TANK INSTRUMENTATION
(Uranium Product Sample Tank and Accountability Tank)

FIGURE 6-1




MEASUREMENT COMPARISONS CAMPAIGN NO. 1

FIGURE 6-2



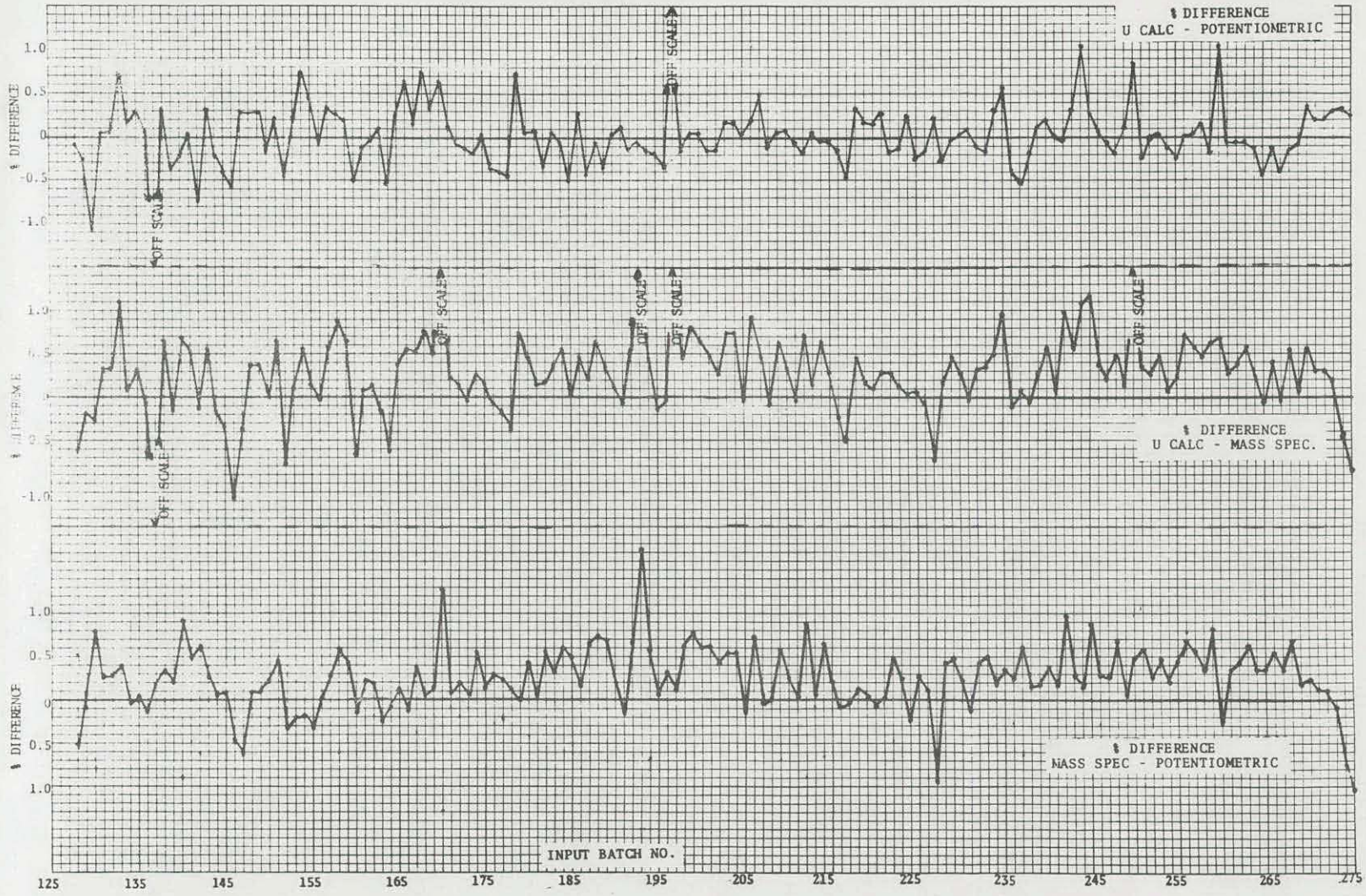

MEASUREMENT COMPARISONS CAMPAIGN NO. 2

FIGURE 6-3




MEASUREMENT COMPARISONS CAMPAIGN NO. 3

FIGURE 6-4



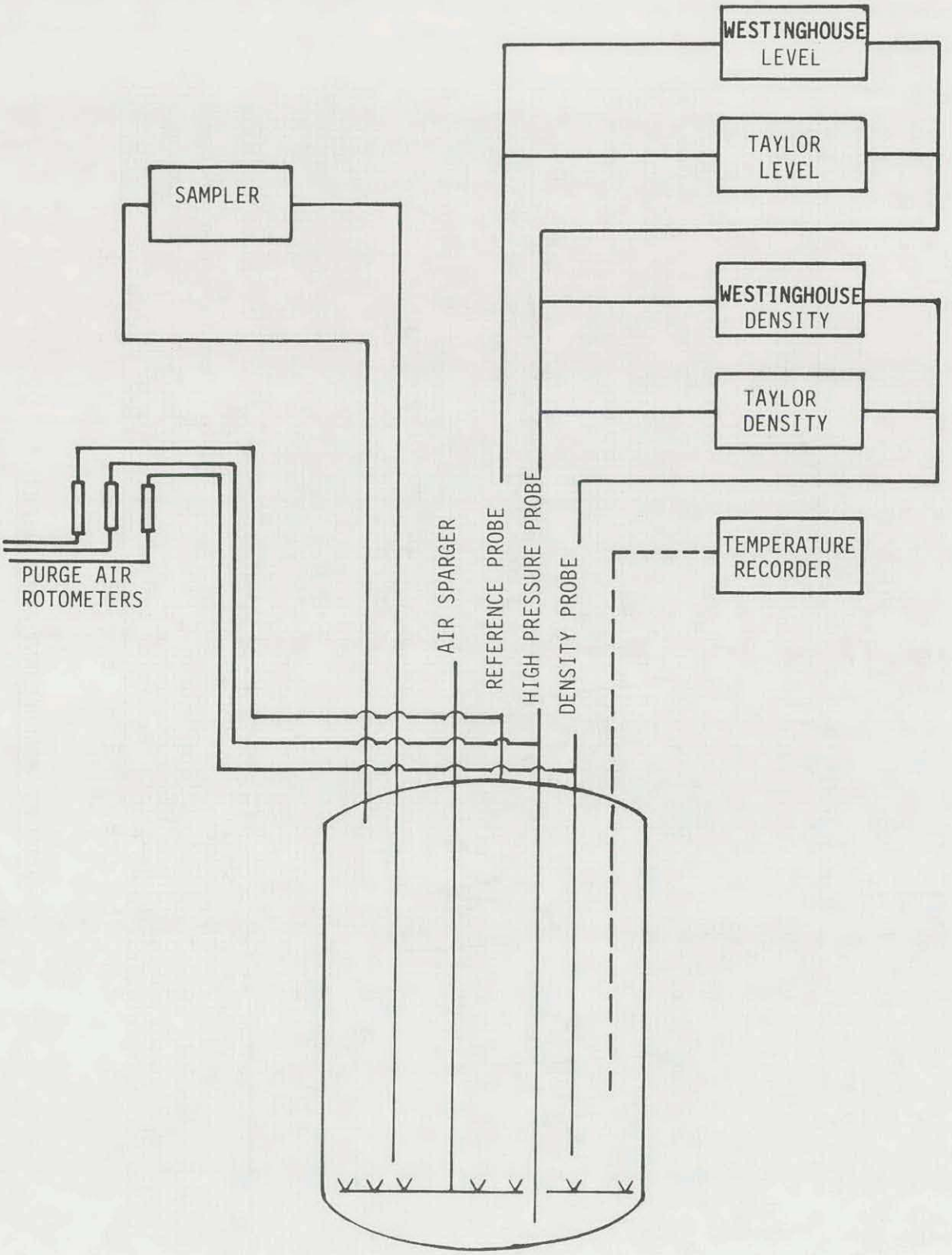

ANALYTICAL MEASUREMENT COMPARISONS

FIGURE 6-5




COMBINED MEASUREMENT COMPARISONS

FIGURE 6-6




GPW CHECK AND HWW SAMPLE TANK INSTRUMENTATION

FIGURE 6-7

## 7.0 REFERENCES


(1) J. M. Crawford, M. H. Ehinger, C. Joseph, and M. L. Madeen; "Conceptual Design of a Computerized Nuclear Materials Control and Accounting System - Preliminary," AGNS-1040-2.2-18.

(2) J. M. Crawford, M. H. Ehinger, C. Joseph, and M. L. Madeen; "Nuclear Materials Control and Accounting System Evaluation Report - FY 1978 Integrated Uranium Run," AGNS-1040-2.2-50.

(3) J. M. Crawford, M. H. Ehinger, C. Joseph, and M. L. Madeen; "Computerized Nuclear Materials Control and Accounting System Development Evaluation Report - 1978," AGNS-1040-2.2-9.

(4) AGNS-35900-2.2-23.

(5) Harry R. Kight; "Process Monitoring and Process Surveillance Demonstration Program," AGNS-35900-2.2-24.

NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

# APPENDIX A

# CONTROL-SPEC® FOR THE URANIUM INPUT/OUTPUT DEMONSTRATION PROGRAM

Scientific Systems Services, Inc.

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

EXCERPTS FROM CHAPTERS 1 THROUGH 6 AND 9.

# CONTROL-SPEC ®

FOR THE

URANIUM INPUT/OUTPUT DEMONSTRATION PROGRAM

Prepared for: Allied-General Nuclear Services
P.O. Box 847
Barnwell, South Carolina 29812

Prepared by: Scientific Systems Services, Inc.
1135 John Rodes Boulevard
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Melbourne, Florida 32901

Date: February 1, 1979

Document No: 1155-100E

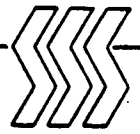


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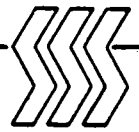


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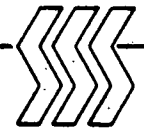


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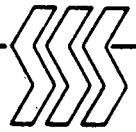


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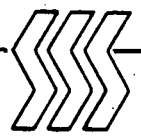


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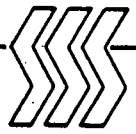


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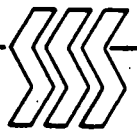


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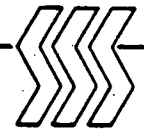


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SECTION I

INTRODUCTION

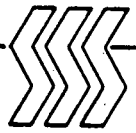
This CONTROL-SPEC ® is written in response to Allied-General Nuclear Services purchase order #E7-78-C-09-1040. It provides a complete definition of the Uranium Input/Output Demonstration Program.

This software described is intended to run on a DEC PDP11/35 computer system using the RSX-11M (V3.1) operating system. All programs will be written in BASIC Plus$^2$ language wherever practical.

This CONTROL-SPEC ® includes the following sections:

Section II provides a functional description of the vessel measurement programs. There are four vessels (tanks) being measured during the Input/Output Demonstration Program: Input, Product, HWW waste, and GPW waste.

Section III provides a detailed description of all calculation processes used throughout the system.



Section IV provides a functional description of the Nuclear Materials Accounting programs.

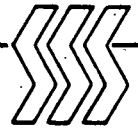
Section V provides a functional description of the Measurement Control program.

Section VI provides a functional description of the Lab Data System (LDS) Driver/File Update Program, Data Acquisition System (RTP) Driver, Data Base Maintenance Program, and the Data Base Edit Program.

Section VII provides a detailed layout of the Data Base.

Section VIII provides an implementation plan.

Section IX provides a description of the deliverable items.



SECTION II

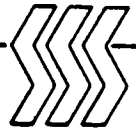
PROGRAM DESCRIPTIONS

## 2.1 VESSEL MEASUREMENT PROGRAMS

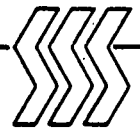
There are four (4) vessel measurement programs associated with the Uranium Input/Output Demonstration. These programs are Input, Product, General Purpose Waste, and Hi-Level Waste. Since all four vessel measurement procedures have common elements, a set of building blocks called STATES have been constructed to satisfy particular functions. Selection of a particular combination of building blocks or STATES will satisfy most individual vessel measurement criteria.

These STATES consist of executable code, modularized so that each module performs a particular function (for example, writes a message to the terminal). Data tables and message tables are used to support these functions. Each module or function is identified as a STATE module with a STATE number.

Since more measurements are taken on the Input tank measurement program than on any other, it is used as the reference program for constructing the total set of STATES to be used. By using a state driven program, new states can be added with minimal or no impact to existing programs.



Data tables are used to minimize the number of state programs required to satisfy the total Computerized Nuclear Materials Control and Accounting System (CNMCAS) program. These tables are described in Section 2.1.2.



### 2.1.1 STATE Descriptions

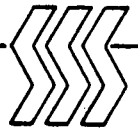
During the processing of the Uranium Input/Output (U I/O) Demonstration Program, the quantity of material received in a tank, as well as the quantity transferred, must be measured. These measurements are accomplished by a group of measurement programs.

Because these measurement programs have many common elements, a series of STATES has been constructed to satisfy these common elements.

This section is not intended to show the details of any unique measurement program. The sections of this document which describe individual measurement programs include each program's unique characteristics.

The purpose of this section is to provide STATE descriptions of the common elements of the measurement programs. The processing sequence is in the STATE order presented in the following text.

The messages referenced are typical rather than specific. Only the message numbers are valid. Message numbers referenced are defined in Section 2.1.1.1, Typical Messages.



STATE 1

The operator activates the program at the terminal. The program first retrieves the temporary data file and copies it into the temporary data area. (See Figure 2-1.) Control is then transferred to the routine pointed to by the current state pointer.

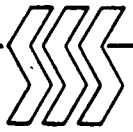
STATE 2

The sequence opens by getting operator initials (Message #22) and a new Batch ID number from the Batch ID processor, and saving them in the temporary data area. Using the MCA transfer table, the program determines if this vessel is a candidate for an MCA transfer. If so, Message #20 is written to the terminal, and waits for operator response. The state pointer is updated to STATE 3, and control is passed to that STATE.

STATE 3

The program now writes Messages #1, #1A on the terminal and waits for the operator to respond. The operator answers with "YES" or (CR) if preparation has been completed. He answers "NO" to stop the sequence until he has completed preparation. If the answer is "NO", the program responds with Message #2.

The state pointer is unchanged in order to bring the program back to STATE 3 when it is next activated. The program now signs off.



| | |
|---|---|
| STATE POINTER | |
| BATCH NUMBER | |
| MISC PROGRAM PARAMETERS | |
| OPR INITIALS | (4) |
| TIME OF YEAR | (4) |
| LEVEL READINGS | (4) |
| DENSITY READINGS | (4) |
| TEMPERATURE READINGS | (4) |
| QUANTITY OF SOLUTION | (4) |
| SIGNIFICANT EVENTS TIME OF YEAR | (6) |
| UNIQUE PROGRAM PARAMETERS | |
| TOY-LDS TO SAMPLE | |
| SAMPLE LOG NUMBER | |
| LAB DENSITY | |
| LAB ACID CONCENTRATION | |
| TOY-LDS SAMPLE COMPLETE | |
| | |

NOTE: NUMBERS IN PARENTHESES INDICATE THE QUANTITY OF ITEMS IN AN ENTRY

FIGURE 2-1. TYPICAL TEMPORARY DATA AREA



STATE 4

When sparger and purges are set, the program calls the RTP system for before-receipt (BR) measurement data (liquid level, density, and temperature). Enough liquid level samples are retrieved to determine that the tank level is constant. If the liquid level is determined to be changing, an error Message #3 is printed on the terminal and the current state pointer is set to 5. The program now signs off.

STATE 5

When the operator reactivates the program after an exit from STATE 4, Message #10 is written to the terminal.

The supervisor enters his password, which is checked against a predefined list. In the event no match is found, the program transfers control to the beginning of this STATE. When a password match is found, the state pointer is updated to STATE 6 and control is passed to that STATE.

STATE 6

The program now makes the appropriate instrument performance tests based on the Control Limits Table (described in Section 2.1.2, Figure 2-3).



The program then proceeds according to the results of the comparison. When the difference is:

≤2s, the state pointer is updated to STATE 8, and control is passed to that STATE.

>2s ≤3s, Message #23 is written to the terminal and the NMC office. Measurement is marked as marginal in the temporary data area; the state pointer is updated to STATE 8; and control is passed to that STATE. Two contiguous measurements in this range are treated as being in the following range (>3s).

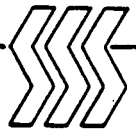
>3s, Message #24 is written to the terminal and the NMC office. The state pointer is updated to STATE 7, and the program signs off.

NOTE: See appropriate measurement program for specific details.

STATE 7

When the program is restarted, Messages #10 and #24 are written to the terminal and enough space is left on the printout to document the problem and corrective action.

The supervisor now enters his password, which is checked against an internal password list. If this check fails,



the program signs off leaving the state pointer, at STATE 7.

When the password check passes the data, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 3 for remeasurement
3) Use after-transfer measurement data

These options are activated in the program via the terminal. The program writes Message #28 to the terminal and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements

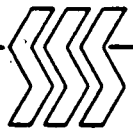
2 = Remeasure

3 = Use after-transfer measurement data

STATE 8

The program calculates the mass (Kg) solution currently in the heel, and compares it with the calculated mass (Kg) solution that was left in the heel of the last Batch. If the heel quantities differ by more than the control limit, the program prints Message #4.

The STATE pointer is updated to point to STATE 8A and control is passed to that STATE.



STATE 8A

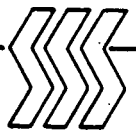
When the program is restarted, Messages #10 and #24 are written to the terminal.

The supervisor now enters his password, which is checked against an internal password list. If this check fails, the program signs off leaving the state pointer, at STATE 7. When the password check passes the data, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 3 for remeasurement
3) Use after-transfer measurement data

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements
2 = Remeasure
3 = Use after-transfer measurement data



STATE 9

With BR measurements made, the program writes Message #5 and #6 on the terminal.

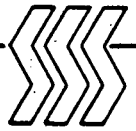
The BR measurement data is saved in temporary storage, the state pointer is set to STATE 10, and the program signs off.

STATE 10

When the operator next activates the program after the Batch has been received, the program again opens the file and transfers program control to STATE 10. Message #7 is written to the terminal, and waits for operator response.

With a "NO" response, the program proceeds to STATE 11.

With a "YES" response, the program proceeds to STATE 12.



STATE 11

If "NO" was the response, the program writes Message #8 on the terminal.

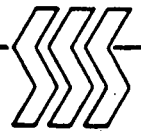
The state pointer is updated to point to STATE 10, to bring the program back to that point after the operator corrects the situation and calls back. The program now signs off.

STATE 12

The program begins the before-sample (BS) measurements by requesting from the RTP system, the transducer readings (Figure 2-3, Section 2.1.2) for measuring liquid level, density, and temperature. This raw data is recorded in temporary storage for later use.

Using the data just acquired, a test is made for constant liquid level in the vessel. If the liquid level is found to be constant, the state pointer is updated to STATE 14 and control is passed to that STATE. If the liquid level is not constant, Message #9 is written to the terminal.

The state pointer is updated to STATE 13 and the program signs off.



STATE 13

When the operator reactivates the program after an exit from STATE 12, Message #10 is written to the terminal.

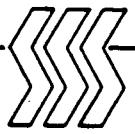
The supervisor enters his password. The password is checked against a predefined list. In the event no match is found the program will transfer control to the beginning of this STATE. When a password match is found, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 12 for remeasurement

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following:

1 = Proceed with measurements

2 = Remeasure



STATE 14

The program makes the appropriate instrument performance tests based on the Control Limits Table (described in Section 2.1.1, Figure 2-3).

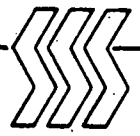
The program then proceeds according to the results of the comparison. When the difference is:

≤2s, the state pointer is updated to STATE 16, and control is passed to that STATE.

>2s ≤3s, Message #23 is written to the terminal and the NMC office. Measurement is marked as marginal in the temporary data area; the state pointer is updated to STATE 16; and control is passed to that STATE. Two contiguous measurements in this range are treated as being in the following range.

>3s, Message #24 is written to the terminal and the NMC office. The state pointer is updated to STATE 15, and the program signs off.

NOTE: See appropriate measurement program for specific details.



STATE 15

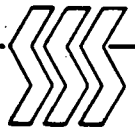
When the program is restarted, Message #10 is written to the terminal leaving enough space for the problem and the corrective action to be documented.

The supervisor now enters his password, which is checked against an internal password list. If this check fails, the program signs off leaving the state pointer at STATE 15.

If the password check passed the data stored in the temporary area, it is written to the ERROR file for later disposition. The state pointer is updated to STATE 12 and control is passed to that STATE for remeasurement using the same Batch number.

STATE 16

The kilograms and liters of solution are now calculated, and Messages #17 and #12 are printed on the terminal. The program now accesses the MCA transfer file to determine if an MCA transfer was made. If an MCA transfer was made, it compares the quantity of solution sent against the quantity received, and prints a report on the terminal and in the NMC office. It also determines if the difference



is within limits. If the difference is outside the predetermined limit, the program indicates this in the report and prints Message #13 on the terminal.

The program now updates the state pointer to STATE 17 and transfers control to that state.

STATE 17

The program prints Message #10 on the terminal. When the operator enters an acceptable password, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 12 for remeasurement

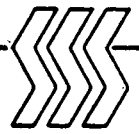
These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements

2 = Remeasure

STATE 18

The program now prints Message 15 on the terminal. At this time the supervisor enters his password, and if accepted by the system, the state pointer is updated to point to STATE 19 and the hold condition is released in the measurement program.



STATE 19

When the comparison between the two quantities is satisfied (quantity of solution sent compared to quantity received), the program communicates with the LDS system requesting it to begin sampling. The state pointer is now updated to point to STATE 20, and control passes to that STATE.

STATE 20

The program suspends itself for 1-minute intervals, waiting for word from the LDS system to confirm that sampling is complete. When the LDS signals that sampling is complete, the proper data is received from the LDS and saved in the temporary data area. Message #16 is printed on the terminal at this time. The state pointer is updated to point to STATE 21, and the program now signs off.

STATE 21

The program begins the after-sample (AS) measurements by writing Message # 21 on the terminal, and waits for operator response.



If "NO" is the response, the program signs off. If "YES" is the response, the state pointer is updated to point to STATE 22 and control is passed to that STATE.

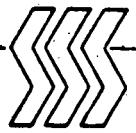
STATE 22

The program communicates with the RTP system to acquire the transducer readings (Figure 2-3, Section 2.1.1) for measuring liquid level, density, and temperature. This raw data is recorded in temporary storage for later use.

Using the data just acquired, a test is made for constant liquid level in the vessel. If the liquid level is found to be constant, the state pointer is updated to STATE 24 and control is passed to that STATE. If the liquid level is not constant, Message #9 is written to the terminal. The state pointer is updated to STATE 23 and the program signs off.

STATE 23

When the operator restarts the program after an exit from STATE 22, Message #10 is written to the terminal. The supervisor enters his password, and the password



is checked against a predefined list. In the event no match is found, the program transfers control to the beginning of this STATE. When a password match is found, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 12 for remeasurement
3) Recycle to STATE 21 for remeasurement

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

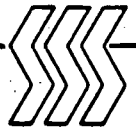
1 = Proceed with measurements
2 = Remeasure
3 = Recycle to before-sample

STATE 24

The program now makes the appropriate instrument performance tests based on the Control Limits Table (described in Section 2.1.2, Figure 2-3).

The program then proceeds according to the results of the comparison. When the difference is:

$\leq$2s, the state pointer is updated to STATE 26, and control is passed to that STATE.



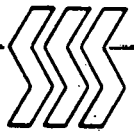
>2s $\leq$ 3s, Message #23 is written to the terminal and the NMC office. Measurement is marked as marginal in the temporary data area; the state pointer is updated to STATE 26; and control is passed to that STATE. When two contiguous measurements fall within this range, it is treated as the next range.

>3s, Message #24 is written to the terminal and the NMC office. The state point is updated to STATE 25, and the program signs off.

NOTE: See appropriate measurement program for specific details.

STATE 25

When the program is restarted, Message #10 is written to the terminal leaving enough space for the problem and corrective action to be documented. The supervisor now enters his password, which is checked against an internal password list. If this check fails, the program signs off leaving the state pointer at STATE 25.



When the password check passes, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 12 for remeasurement
3) Recycle to STATE 21 for remeasurement

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements
2 = Remeasure
3 = Recycle to before-sample

STATE 26

The kilograms and liters of solution are now calculated, and Messages #12, #18, and #19 are printed on the terminal. The state pointer is updated to point to STATE 27. The program now signs off.



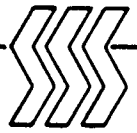
STATE 27

When the program is next activated, it accesses the source/destination table to determine if transfer routing information is required. If so, the program writes Message #25 to the terminal and waits for operator response. The operator response is used to determine the next state to be executed, which could be unique to each vessel measurement program. After execution of the unique STATE, the state pointer is set to STATE 28 and control is passed to that STATE. When transfer routing information is not required, the state pointer is set to STATE 28, and control is passed to that STATE.

STATE 28

The program communicates with the RTP system to acquire the transducer readings (Figure 3-2, Section 2.1.2) for measuring liquid level, density, and temperature. This raw data is recorded in temporary storage for later use.

Using the data just acquired, a test is made for constant liquid level in the vessel. If the liquid level is found to be constant, the state pointer is updated to STATE 30 and control is passed to that



STATE. If the liquid level is not constant, Message #9 is written to the terminal. The state pointer is updated to STATE 29 and the program signs off.

STATE 29

When the operator restarts the program after an exit from STATE 28, Message #10 is written to the terminal.

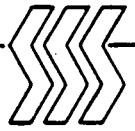
The supervisor enters his password, which is checked against a predefined list. In the event no match is found, the program transfers control to the beginning of this STATE. When a password match is found, the operator has the following options:

1) Proceed with measurements
2) Recycle to STATE 28 for remeasurement

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements

2 = Remeasure



STATE 30

The program now makes the appropriate instrument performance tests based on the Control Limits Table.

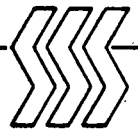
The program then proceeds according to the results of the comparison. When the difference is:

≤2s, the state pointer is updated to STATE 32 and control is passed to that STATE.

>2s≤3s, Message #23 is written to the terminal, and the NMC office. Measurement is marked as marginal in the temporary data area; the state pointer is updated to STATE 32; and control is passed to that STATE. When two contiguous measurements fall within the range, it is treated as the next range (>3s).

>3s, Message #24 is written to the terminal and the NMC office. The state pointer is updated to STATE 31, and the program signs off.

NOTE: See appropriate measurement program for specific details.



STATE 31

When the program is restarted, Message #10 is written to the terminal leaving enough space for the problem and corrective action to be documented. The supervisor now enters his password, which is checked against an internal password list. If this check fails, the program signs off leaving the state pointer at STATE 13.

When the password check passes the data, the operator has the following options:

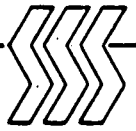
1) Proceed with measurements

2) Recycle to STATE 28 for remeasurement

These options are activated in the program via the terminal. The program writes Message #28 to the terminal, and waits for the operator to enter one of the following decimal digits:

1 = Proceed with measurements

2 = Remeasure



STATE 32

The kilograms and liters of solution are now calculated and Messages #19 and #28 are printed on the terminal. The program waits for the operator response. If the response is "Y", the program continues to terminate this Batch. If the response is "N", the state pointer is updated to point to STATE 33 and control is passed to that STATE.

At this point the program prints a Batch summary (see Figure 2-2) in the NMC office. Using data from the temporary data area, the Batch Index, Raw Data, and Analytical Data files are updated. The Analytical Data file entry for this Batch is examined for completion of all Lab analysis data. If all data are in the file, the Batch Index File is marked Final. If all data are not in the Analytical Data File, it is marked Preliminary. The files are closed at this time. The temporary data area is initialized to a new Batch condition; the state pointer is updated to point to STATE 2; and the program signs off.

INPUT ACCOUNTABILITY MEASUREMENT RECORD
VESSEL NO. 18-D-101 MEASUREMENT POINT 2-03

INPUT ACCOUNTABILITY
BATCH ID 2-03-123 DATE 13-MAR-78

| | BEFORE-RECEIPT | BEFORE-SAMPLE | AFTER-SAMPLE | AFTER-TRANSFER |
|---|---|---|---|---|
| DATE/TIME | | | | |
| LEVEL LR-125 | | | | |
| RUSKA(LR-125R) | | | | |
| RUSKA ZERO | | | | |
| DENSITY DR-166 | | | | |
| RUSKA | | | | |
| RUSKA ZERO | | | | |
| TEMPERATURE TJR-108-10 | | | | |
| TI-109 | | | | |
| SAMPLE RESULTS | | | | |
| LOG NO. | | | | |
| DENSITY | | | | |
| U CONC | | | | |

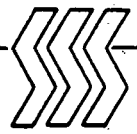
VOLUME

| | | | |
|---|---|---|---|
| VOLUME RECEIVED | | VOLUME TRANSFERRED | |
| Kg RECEIVED | | Kg TRANSFERRED | |
| Kg U RECEIVED | | Kg U TRANSFERRED | |

BATCH STATUS =

FIGURE 2-2. TYPICAL NMC BATCH REPORT FORMAT

Scientific Systems Services
1135 JOHN RODES BOULEVARD • P.O. BOX 610 • MELBOURNE, FLORIDA 32901 • (305) 725-1300



STATE 33

The terminal is put in a read mode and waits for the operator to enter a KEYWORD. When the correct entry is made, the program recycles to just after Batch number assignment and begins a total remeasurement.

STATE 40

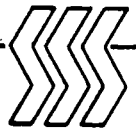
If the response in STATE 27 was "W", the program now calculates the U concentration quantity. If it is greater then a predetermined limit, the following message is written to the terminal:

U CONCENTRATION ___ G U/L EXCEEDS LIMIT FOR WASTE

The state pointer is now updated to point to STATE 27 and control is passed to that STATE. Otherwise, the following message is written to the terminal:

TURN SPARGER ON FOR TRANSFER.

LET ME KNOW WHEN THE TRANSFER IS COMPLETE AND YOU HAVE SET PURGES AND SHUT DOWN SPARGER.



The state pointer is now set to STATE 28, and control is passed to that STATE.

If the response is "R", the following message is written to the terminal:

LEAVE SPARGER OFF DURING TRANSFER AND
LET ME KNOW WHEN THE TRANSFER IS COMPLETE.

The state pointer is now set to STATE 28, and control is passed to that STATE.

If the response was "H", the state pointer is set to STATE 27, and the program signs off.



2.1.1.1 Typical Messages

MESSAGE #1 — I'M READY TO MEASURE BEFORE-RECEIPT DATA. YOU SHOULD HAVE INSTRUMENT PURGES AT 0.5 SCFH AND THE SPARGER OFF.

MESSAGE #1A — ARE YOU READY (YES OR NO)?

MESSAGE #2 — PURGES AT W835 EL 308
SPARGER AT W835 EL 300
I'LL WAIT TO HEAR FROM YOU

MESSAGE #3 — VESSEL LEVEL IS CHANGING

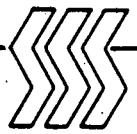
SUPERVISOR IS REQUIRED

MESSAGE #4 — "HEEL QUANTITY IS DIFFERENT." YOU WERE SUPPOSED TO HAVE ____KG SOL AND YOU'VE GOT ____KG SOL. SUPERVISOR REQUIRED.

MESSAGE #5 — YOU'VE GOT ____KG SOL WITH _____KG U AS THE HEEL QUANTITY.

MESSAGE #6 — YOUR NEXT STEP IS TO BRING IN THE NEW BATCH. IT WILL BE BATCH 02-003-_____. WHEN RECEIVED, MIX FOR 10 MINUTES AND CALL ME.

MESSAGE #7 — YOU SHOULD HAVE SPARGED FOR 10 MINUTES, SHUT DOWN SPARGER, AND SET INSTRUMENT AIR PURGES TO 0.5 SCFH. SHALL I TAKE MEASUREMENTS (YES OR NO)?



MESSAGE #8 SPARGER AT W835 EL 300
PURGES LOCATED W835 EL 308

I'LL WAIT TO HEAR FROM YOU.

MESSAGE #9 LIQUID LEVEL IN TANK _____ IS CHANGING.

SUPERVISOR IS REQUIRED.

MESSAGE #10 SUPERVISOR PASSWORD IS REQUIRED TO PROCEED

PASSWORD>

MESSAGE #11 INSTRUMENT PERFORMANCE TEST FAILED

INSTRUMENTS LOCATED AT _____AND _____

SUPERVISOR IS REQUIRED.

MESSAGE #12 BATCH 02-003-n NOW CONTAINS APPROX. _____KG,
_____LITERS OF SOLUTION. TURN ON SPARGER
FOR SAMPLE.

MESSAGE #13 (BELL) TRANSFER FROM PRODUCT TANK OUT-OF-LIMIT(BELL)

QTY TRANSFERRED _____ KG

QTY RECEIVED _____ KG

SUPERVISOR APPROVAL REQUIRED TO PROCEED

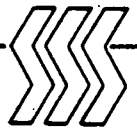
MESSAGE #14 DO YOU WISH THE TANK PUT ON HOLD

(YES OR NO?)

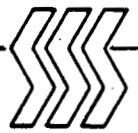
MESSAGE #15 TANK 02-003 IS IN A HOLD STAGE

SUPERVISOR PASSWORD REQUIRED TO REMOVE HOLD

PASSWORD>

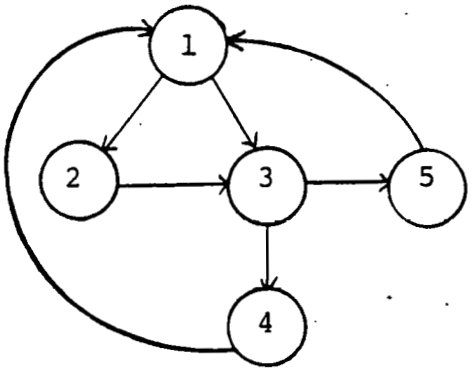


| | |
|---|---|
| MESSAGE #16 | LOG NUMBER _____<br><br>RESULTS SHOW _____ G/ML DENSITY, _____M ACID<br><br>INDICATED _____G U/L<br>SHUT THE SPARGER OFF<br><br>LET ME KNOW WHEN YOU ARE READY. |
| MESSAGE #17 | WILL CALL WHEN SAMPLING COMPLETE |
| MESSAGE #18 | RESTORE SPARGER AND<br>CALL BACK WHEN TRANSFER IS COMPLETED AND SPARGER IS OFF |
| MESSAGE #19 | YOU HAVE TRANSFERRED _____ KG U IN _____ KG,<br>_____ LITERS OF SOLUTION WITH A CALCULATED CONCENTRATION OF _____ G U/L AND H+ OF _____ M. |
| MESSAGE #20 | IS THIS AN MCA TRANSFER? IF ANSWER IS YES,<br>PLEASE ENTER SOURCE VESSEL ID<br>VESSEL ID> _____ |
| MESSAGE #21 | SHALL I PROCEED WITH AFTER-SAMPLE MEASUREMENTS<br>NOW (YES OR NO)? |
| MESSAGE #22 | OPERATORS INITIALS> |
| MESSAGE #23 | REPLICATE MEASUREMENT DATA FOR BATCH _____ ARE<br>MARGINALLY ACCEPTABLE - INVESTIGATE TO DETERMINE<br>AND CORRECT CAUSE. |
| MESSAGE #24 | REPLICATE MEASUREMENT DATA FOR BATCH _____<br>INDICATE THAT THE MEASUREMENT SYSTEM IS OUT-OF-CONTROL. PROBLEM TO BE CORRECTED BEFORE DATA<br>ARE ACCEPTABLE. |
| MESSAGE #25 | DID THIS GO TO $UF_6$ (ENTER $UF_6$), INPUT ACCOUNTABILITY<br>(ENTER INPUT) OR OFF-SPEC. U<br>(ENTER OFF-SPEC)? |
| MESSAGE #28 | ENTER OPTION> |

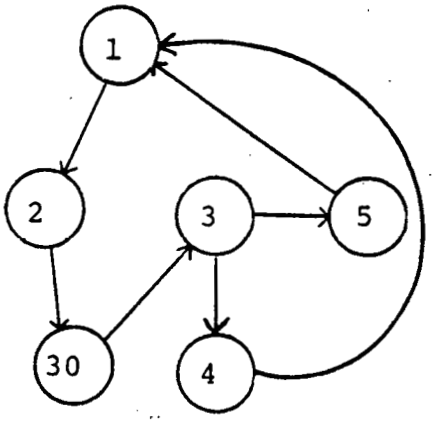


2.1.1.2 State Table Definitions

The State Table is used to describe the individual functions that a measurement program is to perform. It is a list of the STATE numbers in the order that they are to be performed. These numbers may or may not be in sequential ascending order. The advantage of using a State Table is that a new function can be conceived at any time in the future and implemented into a measurement program simply by changing the State Table. See example below.

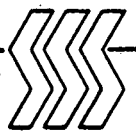



Example 1: STATE TABLE



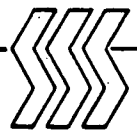

Example 2: REVISED STATE TABLE

In Example 1, the program moves from STATE 2 to STATE 3. It might become necessary at some future point in time to add a new function to be performed after STATE 2 and before STATE 3. As seen in Example 2, the new function is called STATE 30, and the State Table is modified so that the function performed after STATE 2 is STATE 30.



### 2.1.2 Data/Message Tables

The data/message tables used by the Vessel Measurement Programs are described in Figure 2-3. The detailed construction of these tables will be defined during program preparation.



| TABLE NAME | DESCRIPTION |
|---|---|
| STATE Table | Constructed for each Vessel Measurement program. Its function is to guide the program through the prescribed sequences to satisfy the measurement criteria for that vessel. |
| Terminal Message Table | Used to write the unique, vessel-dependent messages to the terminal. One for each measurement program is required. |
| Calibration Constants Table | Contains all calibration constants required to each vessel. One for each vessel is required. |
| Source/Destination Table | Used when the source and/or destination of a vessel solution is not operator selectable. |
| MCA Transfer Table | Used to determine MCA transfer candidates. |
| File Names Table | Identifies to the measurement program the names of the Data Base elements associated with the unique vessel. |
| Vessel-Transducers Identification Table | Identifies to the measurement program all transducer numbers connected to that vessel. Used to acquire data from the RTP system. |
| Control Limits Table | Contains the control limits for all measurement control functions. It is organized by vessel ID and type of measurement. Allows control limits to be updated as the need arises. |

FIGURE 2-3. DATA/MESSAGE TABLES DESCRIPTIONS



## 2.2 INPUT MEASUREMENT PROGRAM

### 2.2.1 Description

The Input Measurement Program provides for input measurement data acquisition, manipulation, review, and transfer to file storage. Input measurement data is generated for batches of uranium feed solution measured in and transferred through the accountability tank (18-D-101). See Figure 2-4. The program (1) directs operator actions for measurement and transfer of input solutions to be processed, and (2) receives measurement data from remote terminals or directly from RTP equipment linked to process instrumentation. The sequence of events is described in Section 2.2.2; temporary data storage and base file descriptions are presented in Section VII; and specific calculation routines are described in Section 3.2.

The Input Measurement Program is addressable from the remote terminals located in operating areas of the facility. It consists of the base program and an associated temporary data storage. The program is addressable by the operator with a minimum of computer-operator dialogue. The operator calls the program and gives his initials. The program includes an internal code that will tell the operator where he is in the measurement sequence. The program may take up to four hours

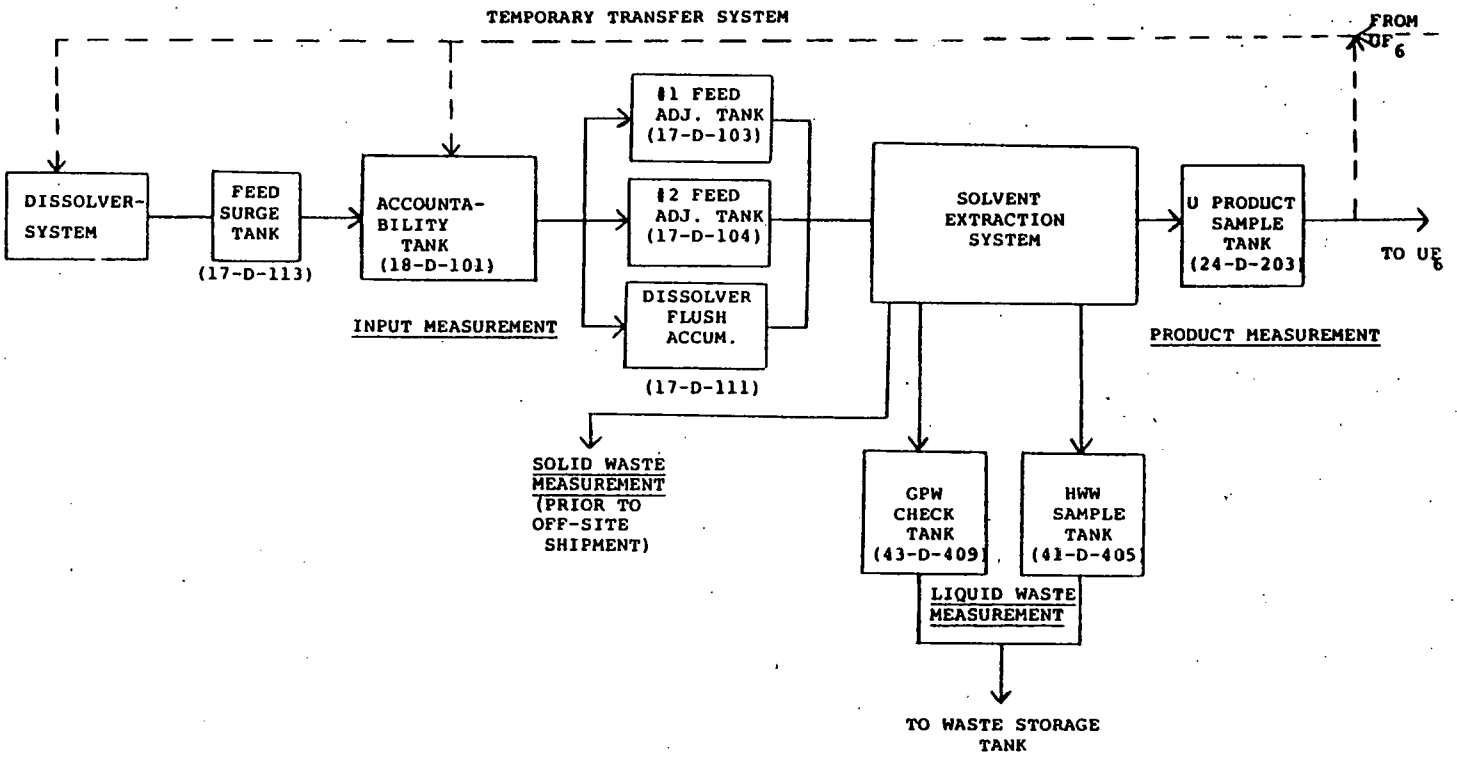
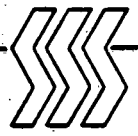



FIGURE 2-4. SIMPLIFIED PROCESS FLOWSHEET FOR URANIUM ACCOUNTABILITY

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for a single complete batch measurement. During this four-hour period, there are long periods of time that the program is idling. When these idle periods occur, the program is suspended so the terminal can be used for other functions. When the operator reactivates the program, it retrieves the current measurement data from the temporary data storage area, and transfers control to the current state in the program. It advises the operator of status and the next measurement step.

During the input measurement sequence, various measurement comparisons are made to detect measurement problems. Descriptions of these comparisons, cross references to the applicable calculation routine in Section III, and appropriate levels of response are provided in Figure 2-5.

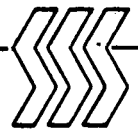
INPUT MEASUREMENT COMPARISONS

| Reference | Comparison | Difference <2s | Difference >2s & <3s | Consecutive Differences >2s & <3s | Difference >3s |
|---|---|---|---|---|---|
| 3.2.13a | Redundant Inst. Comparison, Level (use Ruska to Taylor) | a | b | c | c |
| | Redundant Inst. Comparison, Density | NA | NA | NA | NA |
| 3.2.13c | Temperature to Temperature | a | b | c | c |
| 3.2.13d | Lab Density to Process Density (use Taylor) | a | b | c | c |
| 3.2.13e | Process Density to Process Density | a | b | b | b |
| 3.2.13b | After-Transfer to Before-Receipt | a | b | d | d |
| 3.2.13i | Before-Sample to After-Sample | a | b | d | d |
| 3.2.11a<br>3.3.11b | Quantity Sent to Quantity Received | a | b | d | d |

(a) Comparison good, no action required.
(b) Flag result for investigation - measurement sequence continues.
(c) Flag result for investigation supervisory approval needed before proceeding.
(d) Out-of-control - correction action taken to be documented and approved by supervision.

FIGURE 2-5. INPUT MEASUREMENT COMPARISONS

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2.2.2 State Table Summary

The following is a list of all STATES used in the Input Tank Measurement Program. For a detail description of each STATE see Section 2.1.1.

STATE 1 Initialize and transfer control to current state pointer.

STATE 2 Begin new batch.

STATE 3 Beginning of BR measurement.

STATE 4 Read RTP data and check liquid level constant.

STATE 5 Liquid level changing.

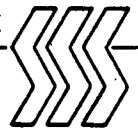
STATE 6 Instrument performance test.

STATE 7 Instrument performance failed.

STATE 8 Calculation of heel solution and compare with last batch.

STATE 8a Allow options.

STATE 9 Print results of BR measurement.



STATE 10 Wait for receipt of new batch.

STATE 11 Tell operator what to do.

STATE 12 Begin before-sample measurements and test liquid level constant.

STATE 13 Liquid level changing.

STATE 14 Get operator initials and check instrument performance.

STATE 15 Instrument performance failed.

STATE 16 Calculate solution in tank. Test for MCA transfer, and print report in NMC office.

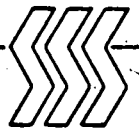
STATE 17 MCA transfer quantity test failed, ask operator what to do.

STATE 18 Tell operator tank is on hold.

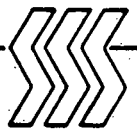
STATE 19 Tell LDS to begin sampling.

STATE 20 Wait for LDS to complete sampling.

STATE 21 Tell operator to set-up for after-sample measurement.



| | |
|---|---|
| STATE 22 | Get data from RTP and check liquid level constant. |
| STATE 23 | Liquid level changing. |
| STATE 24 | Test instrument performance. |
| STATE 25 | Instrument performance test failed. |
| STATE 26 | Calculate solution in tank after-sample and compare with before-sample. |
| STATE 27 | Check transfer routing. |
| STATE 28 | Begin after-transfer measurement. Get RTP data, and check liquid level constant. |
| STATE 29 | Liquid level changing. |
| STATE 30 | Check instrument performance. |
| STATE 31 | Instrument performance test failed. |
| STATE 32 | Calculate solution in heel; print summary report in NMC; update data base; initialize for new batch. |
| STATE 33 | Allow remeasurement. |



### 2.2.3 Input Program Messages

Detail messages will be prepared during program preparation.

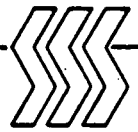


## 2.3 PRODUCT MEASUREMENT PROGRAM

### 2.3.1 Description

Measurements of uranium product solutions are made in the U product sample tank (24-D-204), measurement point 2-07. See Figure 2-4 in Section 2.2.1. The Product Measurement Program enables the computer to direct operator activities to set measurement sequences and accomplish batch transfers, with the program taking and recording measurement data through the RTP System. At each stage of measurement, the program provides appropriate measurement information to the operator, receives measurement data from the RTP System, provides cursory measurement data review, accumulates measurement data, and moves data to storage at completion of the measurement transfer sequences.

The Product Measurement Program (1) directs operator actions for measurement and transfer of input solutions to be processed, and (2) receives measurement data from remote terminals or directly from RTP equipment linked to process instrumentation. The sequence of events is described is Section 2.3.2; temporary data storage and base file descriptions are presented in Section VII; and specific calculation routines are described in Section 3.3.



The Product Measurement Program is addressable from the remote terminals located in operating areas of the facility. It consists of the base program and an associated temporary data storage. The program is addressable by the operator with a minimum of computer-operator dialogue. The operator calls the program and gives his initials. The program includes an internal code that tells the operator where he is in the measurement sequence. The program may take up to four hours for a single complete batch measurement. During this four-hour period, there are long periods of time that the program is idling. When these idle periods occur, the program is suspended so the terminal can be used for other functions. When the operator reactivates the program it retrieves the current measurement data from the temporary data storage area, and transfers control to the current state in the program. It advises the operator of status and the next measurement step.

During the product measurement sequence, various measurement comparisons are made to detect measurement problems. Descriptions of these comparisons, cross references to the applicable calculation routine in Section III, and appropriate levels of response are provided in Figure 2-6.

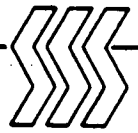
PRODUCT MEASUREMENT COMPARISONS

| Reference | Comparison | Difference $< 2s$ | Difference $> 2s$ & $< 3s$ | Consecutive Differences $> 2s$ & $< 3s$ | Difference $> 3s$ |
|---|---|---|---|---|---|
| 3.3.13a | Redundant Inst. Comparison, Level (use Ruska to Taylor) | a | b | c | c |
| | Redundant Inst. Comparison, Density | NA | NA | NA | NA |
| 3.3.13c | Lab Density to Process Density (use Taylor) | a | b | c | c |
| 3.3.13d | Process Density to Process Density | a | b | b | b |
| | After-Transfer to Before-Receipt | NA | NA | NA | NA |
| 3.3.13g | Before-Sample to After-Sample | a | b | d | d |
| | Quantity Sent to Quantity Received | NA | NA | NA | NA |

(a) Comparison good, no action required.
(b) Flag result for investigation - measurement sequence continues.
(c) Flag result for investigation supervisory approval needed before proceeding.
(d) Out-of-control - correction action taken to be documented and approved by supervision.

FIGURE 2-6. PRODUCT MEASUREMENT COMPARISONS

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2.3.2 State Table Summary

The following is a list of all STATES used in the U Product Tank Measurement Program. For a detailed description of each STATE see Section 2.1.1

STATE 1 Initialize and transfer control to current state pointer.

STATE 2 Begin new batch.

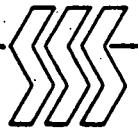
STATE 12 Begin before-sample measurements and test liquid level constant.

STATE 13 Liquid level changing.

STATE 14 Get operator initials and check instrument performance.

STATE 15 Instrument performance failed.

STATE 16 Calculate solution in tank. Test for MCA transfer, and print report in NMC office.



STATE 19 Tell LDS to begin sampling.

STATE 20 Wait for LDS to complete sampling.

STATE 21 Tell operator to set-up for after-sample measurement.

STATE 22 Get data from RTP and check liquid level constant.

STATE 23 Liquid level changing.

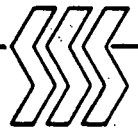
STATE 24 Test instrument performance.

STATE 25 Instrument performance test failed.

STATE 26 Calculate solution in tank after-sample and compare with before-sample.

STATE 27 Check transfer routing.

STATE 28 Begin after-transfer measurement. Get RTP data, and check liquid level constant.



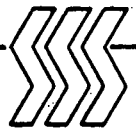
STATE 29 Liquid level changing.

STATE 30 Check instrument performance.

STATE 31 Instrument performance test failed.

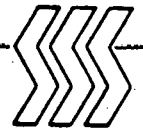
STATE 32 Calculate solution in heel; print summary report in NMC; update data base; initialize for a new batch.

STATE 33 Allow remeasurement.



### 2.3.3 Product Program Messages

Detail messages will be prepared during program preparation.

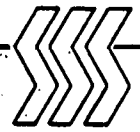


## 2.4 WASTE MEASUREMENT PROGRAMS

### 2.4.1 Description

Liquid waste measurements are made in either of two tanks: the General Purpose Waste (GPW) Check Tank, or the HI-LEVEL Waste (HWW) Sample Tank. See Figure 2-4. The GPW and HWW measurement programs for each tank are the same, with differences in measurement instruments and calculation procedures. The programs (1) direct operator actions for measurement and transfer of input solutions to be processed, and (2) receive measurement data from RTP equipment. The sequence of events is described in Section 2.4.2; temporary data storage and base file descriptions are presented in Section VII; and specific calculation routines are described in Section 3.4.

The Waste Measurement programs are addressable from the remote terminals located in operating areas of the facility. Each program consists of the base program and an associated temporary data storage. Each program is addressable by the operator with a minimum of computer-operator dialogue. The operator calls the program and gives his initials. The program includes an internal code that will tell the operator where he is



in the measurement sequence. The program may take up to four hours for a single complete batch measurement. During this four-hour period, there are long periods of time that the program is idling. When these idle periods occur, the program will be suspended so the terminal can be used for other functions. When the operator reactivates the program, it retrieves the current measurement data from the temporary data storage area, and transfers control to the current state in the program. It advises the operator of status and the next measurement step.

During the liquid waste measurement sequence, various measurement comparisons are made to detect measurement problems. Descriptions of these comparisons, cross references to the applicable calculation routine in Section III, and appropriate levels of response are provided in Figure 2-7 for the GPW Check Tank, and in Figure 2-8 for the HWW Sample Tank.

GPW MEASUREMENT COMPARISONS

| Reference | Comparison | Difference <2s | Difference >2s & <3s | Consecutive Differences >2s & <3s | Difference >3s |
|---|---|---|---|---|---|
| 3.4.8a | Redundant Inst. Comparison, Level (use Taylor to Westinghouse) | a | b | c | c |
| 3.4.8b | Redundant Inst. Comparison, Density (use Taylor to Westinghouse) | a | b | b | b |
| 3.4.8c | Lab Density to Process Density (use Westinghouse) | a | b | c | c |
| | Process Density to Process Density | NA | NA | NA | NA |
| | After-Transfer to Before-Receipt | NA | NA | NA | NA |
| 3.4.8d | Before-Sample to After-Sample | a | b | d | d |
| | Quantity Sent to Quantity Received | NA | NA | NA | NA |

(a) Comparison good, no action required.
(b) Flag result for investigation - measurement sequence continues.
(c) Flag result for investigation supervisory approval needed before proceeding.
(d) Out-of-control - corrective action taken to be documented and approved by supervision.

FIGURE 2-7. GPW MEASUREMENT COMPARISONS

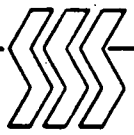
HWW MEASUREMENT COMPARISONS

| Reference | Comparison | Difference <2s | Difference >2s & <3s | Consecutive Differences >2s & <3s | Difference >3s |
|---|---|---|---|---|---|
| 3.4.8a | Redundant Inst. Comparison, Level (use Taylor to Westing-House) | a | b | c | c |
| 3.4.8b | Redundant Inst. Comparison, Density (use Taylor to West-inghouse) | a | b | c | c |
| 3.4.8c | Lab Density to Process Density (use Westinghouse) | a | b | c | c |
| | Process Density to Process Density | NA | NA | NA | NA |
| | After-Transfer to Before-Receipt | NA | NA | NA | NA |
| 3.4.8d | Before-Sample to After-Sample | a | b | d | d |
| | Quantity Sent to Quantity Received | NA | NA | NA | NA |

(a) Comparison good, no action required.
(b) Flag result for investigation - measurement sequence continues.
(c) Flag result for investigation supervisory approval needed before proceeding.
(d) Out-of-control - corrective action taken to be documented and approved by supervision.

FIGURE 2-8. HWW MEASUREMENT COMPARISONS

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2.4.2 State Table Summary

The following is a list of all STATES used in the Waste Measurement Programs (GPW and HWW). For a detailed description of each STATE, see Section 2.1.1.

STATE 1 Initialize and transfer control to current state pointer.

STATE 2 Begin new batch.

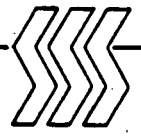
STATE 12 Begin before-sample measurements and test liquid level constant.

STATE 13 Liquid level changing.

STATE 14 Get operator initials and check instrument performance.

STATE 15 Instrument performance failed.

STATE 16 Calculate solution in tank. Test for MCA transfer, and print report in NMC office.



STATE 19 Tell LDS to begin sampling.

STATE 20 Wait for LDS to complete sampling.

STATE 21 Tell operator to set-up for after-sample measurement.

STATE 22 Get data from RTP and check liquid level constant.

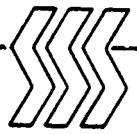
STATE 23 Liquid level changing.

STATE 24 Test instrument performance.

STATE 25 Instrument performance test failed.

STATE 26 Calculate solution and U quantity in tank after-sample and compare with before-sample.

STATE 27 Check transfer routing. (See STATE 40)



STATE 28 Begin after-transfer measurement. Get RTP data, and check liquid level constant.

STATE 29 Liquid level changing.

STATE 30 Check instrument performance.

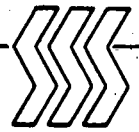
STATE 31 Instrument performance test failed.

STATE 32 Calculate solution in heel; print summary report in NMC; update data base; initialize for new batch.

STATE 33 Allow remeasurement.

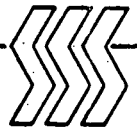
STATE 40 Determine transfer routing.

NOTE: Entered from STATE 27.



### 2.4.3 Waste Program Messages

Detail messages will be prepared during program preparation.



SECTION III

CALCULATION PROGRAMS

This section provides the detailed calculation routines to be applied throughout the U I/O demonstration program. For this section the term "Process Control" is used to describe calculations that are made on measurement data at the time it is generated using a calculated value for uranium concentration. The term "Accountability" is used to describe the equations to provide the most accurate data to be applied to material balance calculations using analytical results for the uranium concentration.

For those equations that apply to reading and converting an instrument raw data value into engineering units, that portion of the equation that changes the raw instrument reading to inches of $H_2O$ is performed in the RTP system, and the conversion to centimeters is performed in the CNMCAS system. See example below:

EXAMPLE:

| ←——— RTP ———→ | ←——— CNMCAS ———→ |
|---|---|
| LT = (LR-125 in %)x(2.15) | $X(2.54) = \frac{\text{xxx.xx}}{\text{CM}}$ |

## 3.1 CALCULATION PROCEDURE FOR LAB DENSITY AT TANK TEMPERATURE

### 3.1.1 $D_L$ at T For Input Tank And Product Tank - Process Control

The specific equation to relate measured density (at 25° C) to density at specified (tank) temperature is as follows:

$$
\begin{aligned}
(D_L \text{ at } T)_{PC} = {} & -0.0208 \\
& -1.1\ E\text{-}5(U) \\
& +1.02507(D_L) \\
& +3.317\ E\text{-}3(M/D_L) \\
& -9.65\ E\text{-}5(M)\ (T_S) \\
& -1.09591\ E\text{-}6(T_S)\ (U)\ (D_L) \\
& -1.0418\ E\text{-}4(T_S) \\
& -2.78\ E\text{-}11(T_S)^2 \\
& -2.4812\ E\text{-}7(T_S)^3 \\
& +9.236\ E\text{-}9(T_S)^4 \\
& -1.5614\ E\text{-}10(T_S)^5 \\
& +1.0202\ E\text{-}12(T_S)^6
\end{aligned}
$$

Where: $T_S$ = Tank Temp in °C

$M$ = Acid Molarity (Analysis)

$D_L$ = Laboratory Analysis of Density (at 25.0°C)

$U$ = Uranium Concentration in mg U/g (Calculated)

$(D_L \text{ at } T)$ = Calculated Density at Tank Temperature

3.1.2 $D_L$ at T For Input Tank And Product Tank-Accountability

The specific equation to relate measured density (at 25°C) to density at specified (tank) temperature is as follows:

$$
\begin{aligned}
(D_L \text{ at } T)_A = {} & -0.0208 \\
& -1.1\ E\text{-}5(U) \\
& +1.02507(D_L) \\
& +3.317\ E\text{-}3(M/D_L) \\
& -9.65\ E\text{-}5(M)\ (T_s) \\
& -1.09591\ E\text{-}6\ (T_s)\ (U)\ (D_L) \\
& -1.0418\ E\text{-}4\ (T_s) \\
& -2.78\ E\text{-}11(T_s)^2 \\
& -2.4812\ E\text{-}7(T_s)^3 \\
& +9.236\ E\text{-}9(T_s)^4 \\
& -1.5614\ E\text{-}10(T_s)^5 \\
& +1.0202\ E\text{-}12(T_s)^6
\end{aligned}
$$

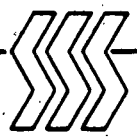
Where: $T_s$ = Tank Temp in °C

$M$ = Acid Molarity (Analysis)

$D_L$ = Laboratory Analysis of Density at 25.0°C)

$U$ = Uranium Concentration in mg U/g (Analysis)

$(D_L \text{ at } T)$ = Calculated Density at Tank Temperature



3.1.3 $D_L$ at T For HWW Sample Tank And GPW Check Tank

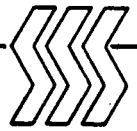
The specific equation to relate measured density (at 25° C) of waste solution to density at specified (tank) temperature is as follows:

$(D_L \text{ at } T) = D_L + (25-T_s)\ (4.0E-4)$

Where: $T_s$ = Tank Temp in °C

$D_L$ = Laboratory Analysis of Density at 25.0°C

$(D_L \text{ at } T)$ = Calculated Density at Tank Temperature



3.2 INPUT TANK

3.2.1 Measurement Parameter Calculations

a) Taylor Level

$L_T = [(\text{LR-125 in \%}) \times (2.15)] \times (2.54) = \underline{\quad xxx.xx \quad}$ cm.

b) Ruska (primary)

$L_{R_1} = [(\text{LR-125R}) - (\text{LR-125R zero value})] = \underline{\quad xxx.xx \quad}$ cm.

c) Ruska (backup)

$L_{R_2} = [(\text{DR-166R}) - (\text{DR-166R zero value})] = \underline{\quad xxx.xx \quad}$ cm.

d) Taylor Density

$D_T = \dfrac{[(\text{DR-166 in \%}) \times .09 + 10]}{9.941} = \underline{\quad x.xxxx \quad}$ g/ml

e) Ruska Density

$D_R = (L_{R1} - L_{R2})/25.25 = \underline{\quad x.xxxx \quad}$ g/ml $(L_{R1} - L_{R2})$

Note: Both Ruskas corrected for zero.

f) Lab Density at 25°C

$D_L$ at 25 = direct from lab results = $\underline{\quad x.xxxx \quad}$ g/ml

This quantity is the average of two lab density analyses.

g) Lab Density at Tank Temperature

$D_L$ at T = adjusted from lab result = _____ g/ml
x.xxxx

Note: Conversion formula presented in 3.1.1

h) Tank Temperature (primary)

TJR = TJR-108-10 direct read in °C = ___ °C
xx.x

i) Tank Temperature (backup)

TI=TI-109 direct read in °C = ___ °C
xx.x

3.2.2 Liquid Level Calculation - Process Control (PC)

a) For Before-Receipt (BR)

$LL_{PC}$ for BR = ($L_{Rl}$ for BR)/($D_L$ at BR-TJR)

= _____ cm.
xxx.xx

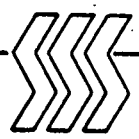
Note: $D_L$ from previous batch.

b) For Before-Sample (BS)

$LL_{PC}$ for BS = ($L_{Rl}$ for BS)/($D_R$ for BS) = _____ cm.
xxx.xx

Or when lab data is available

$LL_{PC}$ for BS = ($L_{Rl}$ for BS)/($D_L$ at BS-TJR for this batch) = _____ cm.
xxx.xx



c) For After-Sample (AS)

$LL_{PC}$ for AS = ($L_{R1}$ for AS)/($D_L$ at AS-TJR for this batch) = _____ cm.
xxx.xx

d) For After-Transfer (AT)

$LL_{PC}$ for AT = ($L_{R1}$ for AT)/($D_L$ at AT-TJR for this batch) = _____ cm.
xxx.xx

3.2.3 Liquid Level - Accountability

a) For Before-Receipt

$LL_A$ for BR = ($L_{R1}$ for BR)/($D_L$ at BR-TJR from previous batch) = _____
xxx.xx

b) For Before-Sample

$LL_A$ for BS = $L_{R1}$ for BS)/($D_L$ at BS-TJR for this batch) = _____
xxx.xx

c) For After-Sample

$LL_A$ for AS = ($L_{R1}$ for AS)/($D_L$ at AS-TJR for this batch) = _____
xxx.xx

d) For After-Transfer

$LL_A$ for AT = ($L_{R1}$ for AT)/($D_L$ at AT-TJR for this batch) = _____
xxx.xx

e) Liquid Level using Backup Ruska

$$LL = \frac{L_{R2}}{D_L \text{ at tank temp}} + (25.25)$$

In any calculation (BS, AS etc.) = $\underline{\quad xxx.xx \quad}$ cm.

OR

$$LL = \frac{L_{R2}}{D_L \text{ at tank temp}}$$ and use alternate calibration equations (See Section 3.1)

3.2.4 Volume - Process Control

$$V_{PC} = 9.4 + 0.9791 \times LL_{PC} + 0.73154 \times LL_{PC}^2 \; 0\text{-}0.00644532 \times LL_{PC}^3$$

IF $0 < LL_{PC} < 23.1$

$$V_{PC} = -217.62 + 24.010061 \times LL_{PC} + 0.011118 \times LL_{PC}^2 - 0.000046 \times LL_{PC}^3$$

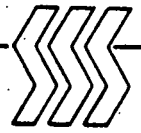
IF $23.1 \leq LL_{PC} < 85.0$

$$V_{PC} = -245.9 + 24.9569 \times LL_{PC}$$

IF $85.0 \leq LL_{PC} \leq 325$

= $\underline{\quad xxxx \quad}$ liters

Use appropriate $LL_{PC}$ for BR, BS, AS and AT to calculate $V_{PC}$ for BR, BS, AS, and AT.



3.2.5 Volume - Accountability

$V_A = 9.4 + 0.9791 \times LL_A + 0.73154 \times LL_A^2$ 0-0.00644532 $\times LL_A^3$

IF $0 < LL_A < 23.1$

$V_A = -217.62 + 24.010061 \times LL_A + 0.011118 \times LL_A^2 - 0.000046 \times LL_A^3$

IF $23.1 \leq LL_A < 85.0$

$V_A = -245.9 + 24.9569 \times LL_A$

IF $85.0 \leq LL_A \leq 325$

$= \frac{\quad}{xxxx}$ liters

Use appropriate $LL_A$ for BR, BS, AS AT to calculate $V_A$ for BR, BS, AS and AT

3.2.6 Solution Quantity - Process Control

a) For Before-Receipt

$W_{PC}$ for BR = ($V_{PC}$ for BR) x ($D_L$ at BR-TJR) = $\frac{\quad}{xxxx.x}$ kgs

Note: $D_L$ from previous batch

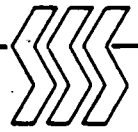
b) For Before-Sample

$W_{PC}$ for BS = ($V_{PC}$ for BS) x ($D_R$ for BS) = $\frac{\quad}{xxxx.x}$ kgs

Or when analytical results become available.

$W_{PC}$ for BS = ($V_{PC}$ for BS) x ($D_L$ at BS-TJR for this batch

= $\frac{\quad}{xxxx.x}$ kgs



c) For After-Sample

$W_{PC}$ for AS = ($V_{PC}$ for AS) x ($D_L$ at AS-TJR for this batch) = _____kgs
xxxx.x

d) For After-Transfer

$W_{PC}$ for AT = ($V_{PC}$ for AT) x ($D_L$ at AT-TJR for this batch) = _____kgs
xxxx.x

3.2.7 Solution Quantity - Accountability

a) For Before-Receipt

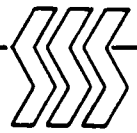
$W_A$ for BR = ($V_A$ for BR) x ($D_L$ for previous batch at BR-TJR) = _____kgs
xxxx.x

b) For Before-Sample

$W_A$ for BS = ($V_A$ for BS) x ($D_L$ for this batch at BS-TJR) = _____kgs
xxxx.x

c) For After-Sample

$W_A$ for AS = ($V_A$ for AS) x ($D_L$ for this batch at AS-TJR) = _____kgs
xxxx.x



d) For After-Transfer

$W_A$ for AT = ($W_A$ for AT) x ($D_L$ for this batch at AT-TJR) = _____ kgs
xxxx.x

3.2.8 U Concentration

a) For Process Control

$U_{PC} = A_0 + (A_1 \times \text{Acid Molarity}) + (A_2 \times D_L \text{ at } 25°C)$

= _____ mg/g
xxx.xx

b) For Accountability

$U_A$ = direct from lab results = _____ mg/g
xxx.xx

3.2.9 U Quantities

a) For Process Control

$M_{PC} = W_{PC} \times U_{PC} \times .001$ = _____ kg U
xxxx.x

Calculate $M_{PC}$ for BR from $U_{PC}$ from previous batch

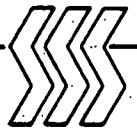
Calculate $M_{PC}$ for BS, AS and AT from $U_{PC}$ for this batch.

b) For Accountability

$M_A = W_A \times U_A \times .001$ = _____ kg U
xxxx.x

Calculate $M_A$ for BR from $U_A$ from previous batch.

Calculate $M_A$ for BS,AS, and AT from $U_A$ for this batch.



3.2.10 U Quantities Transferred/Received

a) For PC quantities received

$Q_{PC-R}$ = ($M_{PC}$ from this batch AS) - ($M_{PC}$ from previous batch AT) = _____ kg U
xxxx.x

b) For PC quantities sent

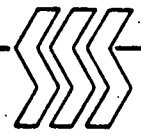
$Q_{PC-S}$ = ($M_{PC}$ from this batch AS) - ($M_{PC}$ from this batch AT) = _____ kg U
xxxx.x

c) For A quantities received

$Q_{A-R}$ = ($M_A$ from this batch AS) - ($M_A$ from previous batch AT) = _____ kg U
xxxx.x

d) For A quantities sent

$Q_{A-S}$ = ($M_A$ from this batch AS) - ($M_A$ from this batch AT) = _____ kg U
xxxx.x



3.2.11 Solution Quantities Transferred/Received

a) For PC quantities received

$S_{PC-R}$ = ($W_{PC}$ from this batch BS) - ($W_{PC}$ from previous batch AT) = _____ kg sol
xxxx.x

or when lab data is available

$S_{PC-R}$ = ($W_{PC}$ from this batch AS) -($W_{PC}$ from previous batch AT) = _____ kg sol
xxxx.x

b) For PC quantities transferred

$S_{PC-S}$ = ($W_{PC}$ from this batch AS) - ($W_{PC}$ for this batch AT) = _____ kgs sol
xxxx.x

Note: $W_{PC}$ for this quantity only calculated by the second method of Section 3.2.6 (b)

c) For A quantities received

$S_{A-R}$ = ($W_A$ for this batch AS) - ($W_A$ from previous batch AT) = _____ kgs sol
xxxx.x

d) For A quantities transferred

$S_{A-S}$ = ($W_A$ for this batch AS) - ($W_A$ from this batch AT) = _____ kgs sol
xxxx.x



3.2.12 Solution Volume Transferred/Received

a) For PC quantities received

$R_{PC-R}$ = ($V_{PC}$ from this batch AS) - ($V_{PC}$ from previous batch AT) = $\frac{\text{xxxx}}{}$ liters

b) For PC quantities transferred

$R_{PC-S}$ = ($V_{PC}$ from this batch AS) - ($V_{PC}$ from this batch AT) = $\frac{\text{xxxx}}{}$ liters

c) In A quantities received

$R_{A-R}$ = ($V_A$ for this batch AS) - ($V_A$ for previous batch AT) = $\frac{\text{xxxx}}{}$ liters

d) For A quantities transferred

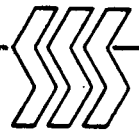
$R_{A-S}$ = ($V_A$ for this batch AS) - ($V_A$ for this batch AT) = $\frac{\text{xxxx}}{}$ liters

3.2.13 Measurement Control Calculations

a) Ruska (primary) to Taylor

$C_1 = (L_{R_1}) - (L_T) = \frac{\text{xx.xx}}{}$ cm.

$C_1$ calculated for BR, BS, AS and AT measurements.



b) Temperature

$C_2$ = (TJR-108-10) - (TI-109) = ____ °C
xx.x

c) Ruska density to Taylor density

$C_3 = D_R - D_T =$ _____ g/ml
x.xxxx

For both Before-Sample (BS) and After-Sample (AS) data

d) Lab density at Tank Temperature to Ruska

$C_4 = (D_L$ at TJR) - $(D_R) =$ _____ g/ml
x.xxxx

For both Before-Sample (BS) and After-Sample (AS) data.

e) Lab density at Tank Temperature to Taylor

$C_5 = (D_L$ at TJR) - $(D_T) =$ _____ g/ml
x.xxxx

For both Before-Sample (BS) and After-Sample (AS) data.

f) Process density to process density - Process Control

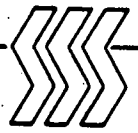
$C_6 = D_{T_1} - D_{T_2} =$ _____ g/ml
x.xxxx

For Before-Sample (BS) measurement only

g) After-Transfer to Before-Receipt - Process Control

$C_7 = (W_{PC}$ for AT) - $(W_{PC}$ for BR) = ____ kgs
xx.x

Note: AT is from previous batch



h) Before-Sample to After-Sample - Process Control

$C_8 = (W_{PC}$ for BS) - ($W_{PC}$ for AS) = $\frac{\quad}{xxx}$ kgs

i) After-Transfer to Before-Receipt - Accountability

$C_9 = (W_A$ for AT) - $W_A$ for BR) = $\frac{\quad}{xx.x}$ kgs

Note: At is from previous batch

j) Before-Sample to After-Sample - Accountability

$C_{10} = (W_A$ for BS) - ($W_A$ for AS) = $\frac{\quad}{xx.x}$ kgs

## 3.3 U PRODUCT SAMPLE TANK

### 3.3.1 Measurement Parameter Calculation

a) Taylor Level

$$L_T = [(\text{LR-235 in \%}) \times (.97)] \times (2.54) = \underline{\quad xxx.xx \quad} \text{ cm}$$

b) Ruska (primary)

$$L_{R_1} = [\text{direct read from LR-235R}] = \underline{\quad xxx.xx \quad} \text{ cm}$$

c) Ruska (backup)

$$L_{R_2} = [\text{direct read from DR-269R}] = \underline{\quad xx.xx \quad} \text{ cm}$$

d) Taylor Density

$$D_T = \frac{[(\text{direct read from DR-269})]}{9.83}$$

e) Ruska Density

$$D_R = \frac{L_{R_1} - L_{R_2}}{24.97} = \underline{\quad x.xxxx \quad} \text{ g/ml}$$

f) Lab Density at 25°C

$D_L$ at 25°C = direct from lab results = _____ g/ml
x.xxxx

This quantity is the average of two reported lab densities.

g) Lab density at tank temperature

$D_L$ at T = adjusted from lab results = _____ g/ml
x.xxxx

Note: Conversion fromula presented in 3.1.1

h) Temperature

TJR = TJR-108-14 direct read = ____ °C
xx.x

i) Liquid Level using backup Ruska

$$LL = \frac{L_{R_2}}{D_L \text{ at tank temp}} + 24.97 = \underset{xxx.xx}{_____} \text{ cm}$$

or

$$LL = \frac{L_{R_2}}{D_L \text{ at tank temp}}$$

and use the alternate calibration equation (See Section 3.1.2).

3.3.2 Liquid Level - Process Control

a) For Before-Sample

$LL_{PC}$ for BS = $(L_{R_1}$ for BS$)/D_R$ = _____ cm
xxx.xx

or

$LL_{PC}$ for BS = $(L_{R_1}$ for BS$)/(D_L$ at BS-TJR$)$= _____ cm
xxx.xx

When analytical density available

b) For After-Sample

$LL_{PC}$ for AS = $(L_{R_1}$ for AS$)/(D_L$ at AS-TJR$)$ = _____ cm
xxx.xx

c) For After-Transfer

$LL_{PC}$ for AT = $(L_{R_1}$ for AT$)/(D_L$ at AT-TJR$)$ = _____ cm
xxx.xx

3.3.3 Liquid Level - Accountability

a) For Before-Sample

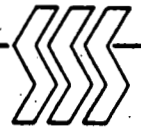
$LL_A$ for BS = $(L_{R_1}$ for BS$)/(D_L$ at BS-TJR$)$ = _____ cm
xxx.xx

b) For After-Sample

$LL_A$ for AS = $(L_{R_1}$ for AS$)/(D_L$ at BS-TJR$)$ = _____ cm
xxx.xx

c) For After-Transfer

$LL_A$ for AT = $(L_A$ for AT$)/(D_L$ at AS-TJR$)$ = _____ cm
xxx.xx



3.3.4 Volume - Process Control

$$V_{PC} = 68.63 + 10.80859 \times LL_{PC} + 0.7543094 \times LL_{PC}^2 - 0.009221 \times LL_{PC}^3$$

IF $0 < LL_{PC} < 22.1$

$$V_{PC} = 2.613 + 18.63934 \times LL_{PC} + 0.36537 \times LL_{PC}^2 - 0.0015362 \times LL_{PC}^3$$

IF $22.1 \leq LL_{PC} < 92.5$

$$V_{PC} = 651.938 + 0.79564 \times LL_{PC} + 0.523177 \times LL_{PC}^2 - 0.001977 \times LL_{PC}^3$$

IF $92.5 \leq LL_{PC} < 154$

$= \underline{\quad xxxx.x \quad}$ liters

Use appropriate $LL_{PC}$ for BS, AS, and AT to calculate $V_{PC}$ for BS, AS, and AT.

3.3.5 Volume - Accountability

$$V_A = 68.63 + 10.80859 \times LL_A + 0.7543094 \times LL_A^2 - 0.009221 \times LL_A^3$$

IF $0 < LL_A < 22.1$

$$V_A = 2.613 + 18.63934 \times LL_A + 0.36537 \times LL_A^2 - 0.0015362 \times LL_A^3$$

IF $22.1 \leq LL_A < 92.5$

$$V_A = 651.938 + 0.79564 \times LL_A + 0.523177 \times LL_A^2 - 0.001977 \times LL_A^3$$

IF $92.5 \leq LL_A < 154$

$= \underline{\quad xxxx.x \quad}$ liters



Use appropriate $LL_A$ for BS, AS, and AT to calculate $V_A$ for BS, AS, and AT.

3.3.6 Solution Quantity - Process Control

a) For Before-Sample

$W_{PC}$ for BS = ($V_{PC}$ for BS) x ($D_T$ for BS) =

$\frac{\text{_____}}{\text{xxxx.x}}$ kgs

Or when analytical results become available

$W_{PC}$ for BS = ($V_{PC}$ for BS) x ($D_L$ at BS-TJR for this batch) = $\frac{\text{_____}}{\text{xxxx.x}}$ kgs

b) For After-Sample

$W_{PC}$ for AS = ($V_{PC}$ for AS) x ($D_L$ at AS-TJR for this batch = $\frac{\text{_____}}{\text{xxxx.x}}$ kgs

c) For After-Transfer

$W_{PC}$ for AT = ($V_{PC}$ for AT) x ($D_L$ at AT-TJR for this batch) = $\frac{\text{_____}}{\text{xxxx.x}}$ kgs

3.3.7 Solution Quantity - Accountability

a) For Before-Sample

$W_A$ for BS = ($V_A$ for BS) x ($D_L$ for this batch at BS-TJR) = $\frac{\text{_____}}{\text{xxxx.x}}$ kgs

b) For After-Sample

$W_A$ for AS = ($V_A$ for AS) x ($D_L$ for this batch at AS-TJR) = _____ kgs
xxxx.x

c) For After-Transfer

$W_A$ for AT = ($W_A$ for AT) x ($D_L$ for this batch at AT-TJR) = _____ kgs
xxxx.x

3.3.8 U Concentrations

a) For Process Control

$U_{PC} = A_0 + (A_1 \times \text{Acid Molarity}) + (A_2 \times D_L \text{ at } 25°C)$

= xxx.xx mg/g

b) For Accountability

$U_A$ = direct from lab results = _____ mg/g
xxx.xx

3.3.9 U Quantities

a) For Process Control

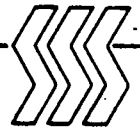
$M_{PC} = W_{PC} \times U_{PC} \times .001$ = _____ kg U
xxxx.x

Calculate $M_{PC}$ for BS, AS, and AT.

b) For Accountability

$M_A = W_A \times U_A \times .001$ = _____ kg U
xxxx.x

Calculate $M_A$ for BS, AS, and AT.



3.3.10 U Quantities Transferred/Received

a) For PC quantities received

$Q_{PC-R}$ = ($M_{PC}$ from this batch AS) - ($M_{PC}$ from previous batch AT) = _____ kg U
xxxx.x

b) For PC quantities sent

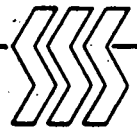
$Q_{PC-S}$ = ($M_{PC}$ from this batch AS) - ($M_{PC}$ for this batch AT) = _____ kg U
xxxx.x

c) For A quantities received

$Q_{A-R}$ = ($M_A$ from this batch AS) - ($M_A$ from previous batch AT) = _____ kg U
xxxx.x

d) For A quantities sent

$Q_{A-S}$ = ($M_A$ from this batch AS) - ($M_A$ from this batch AT) = _____ kg U
xxxx.x



3.3.11 Solution Quantities Transferred/Received

a) For PC quantities received

$S_{PC-R}$ = ($W_{PC}$ from this batch AS) - ($W_{PC}$ from previous batch AT) = _____ kgs sol
xxxx.x

b) For PC quantities transferred

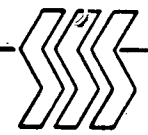
$S_{PC-S}$ = ($W_{PC}$ from this batch AS) - ($W_{PC}$ for this batch AT) = _____ kgs sol
xxxx.x

c) For A quantities received

$S_{A-R}$ = ($W_A$ for this batch AS) - ($W_A$ from previous batch AT) = _____ kgs sol
xxxx.x

d) For A quantities transferred

$S_{A-S}$ = ($W_A$ for this batch AS) - ($W_A$ from previous batch AT) = _____ kgs sol
xxxx.x



3.3.12 Solution Volumes Transferred/Received

a) For PC quantities transferred

$R_{PC-S}$ = ($V_{PC}$ from this batch AS) - ($V_{PC}$ from this batch AT) = ____ liters
xxxx

b) For A quantities received

$R_{A-R}$ = ($V_A$ for this batch AS) - ($V_A$ for previous batch AT) = ____ liters
xxxx

c) For A quantitites transferred

$R_{A-S}$ = ($V_A$ for this batch AS) - ($V_A$ for this batch AT) = ____ liters
xxxx

3.3.13 Measurement Control Calculations

a) Ruska (primary) to Taylor

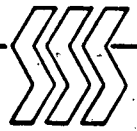
$C_1 = (L_R) - (L_T) =$ _____ cm
xx.xx

$C_1$ calculated for BS, AS and AT measurements.

b) Ruska density to Taylor density

$C_2 = (D_R) - (D_T) =$ _____ g/ml
x.xxxx

$C_2$ is calculated for BS and AS.



c) Lab density at tank temperature to Ruska density

$C_3 = (D_L \text{ at TJR}) - (D_R) = \underline{\quad x.xxxx \quad}$ g/ml

$C_3$ is calculated for BS and AS.

d) Lab density at tank temperature to Taylor density

$C_4 = (D_L \text{ at TJR}) - (D_T) = \underline{\quad x.xxxx \quad}$ g/ml

$C_4$ ia calculated for BS and AS.

e) Before-Sample to After-Sample - Process Control

$C_5 = (W_{PC} \text{ for BS}) - (W_{PC} \text{ for AS}) = \underline{\quad xx.x \quad}$ kgs

f) Before-Sample to After-Sample - Accountability

$C_6 = (W_A \text{ for BS}) - (W_A \text{ for AS}) = \underline{\quad xx.x \quad}$ kgs

## 3.4 HWW SAMPLE TANK

### 3.4.1 Measurement Parameter Calculations

a) Westinghouse Level

$$L_W = [(\text{LR-419W in \%}) \times (2.50)] \times 2.54 = \underline{\quad xxx.x \quad} \text{ cm}$$

b) Taylor Level

$$L_T = [(\text{LR-419 in \%}) \ (2.04)] \times 2.54 = \underline{\quad xx.x \quad} \text{ cm}$$

c) Westinghouse Density

$$D_W = \frac{[(\text{DR-430W in \%}) \times (.50)]}{9.50} = \underline{\quad x.xxxx \quad} \text{ g/ml}$$

d) Taylor Density

$$D_T = \frac{[(\text{DR-430 in \%}) \times .9 + 10]}{9.50} = \underline{\quad x.xxxx \quad} \text{ g/ml}$$

e) Lab Density at 25°C

$D_L$ at 25 = direct from lab result = $\underline{\quad x.xxxx \quad}$ g/ml

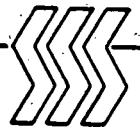
f) Lab Density at Tank Temperature

$D_L$ at T = adjusted from lab result = $\underline{\quad x.xxxx \quad}$ g/ml

Note: Conversion formula presented in Section 3.1.3.

g) Temperature

TJR = direct read from TJR-414-5 = $\underline{\quad xx.x \quad}$ °C



3.4.2 Liquid Level

$LL = L_W/D_W = \underset{xxx.x}{_____}$ cm

3.4.3 Volume

$V = 128.5 + 8.2544 \times LL = \underset{xxxx.x}{_____}$ liters

3.4.4 Solution Quantity

$W = V \times D_W = \underset{xxx.x}{_____}$ kg

3.4.5 U Concentration

U = direct from lab results $\underset{xx.xx}{_____}$ mg/g

3.4.6 U Quantities

$M = 0.001 \times W \times U = \underset{.xxxx}{_____}$ kg U

Calculate M for BS, AS, and AT quantities

3.4.7 U Quantities Received/Transferred

a) For quantities received

$Q_R$ = (M from this batch AS) - (M from previous batch AT) = $\underset{.xxxx}{_____}$ kg

b) For quantities sent

$Q_S$ = (M from this batch AS) - (M from this batch AT) = $\underset{.xxxx}{_____}$ kg



3.4.8 Solution Quantities Received/Transferred

a) For quantities received

$S_R$ = (W from this batch AS) - (W from previous batch AT) = _____ kg
xxxx.x

b) For quantities sent

$S_S$ = (W from this batch AS) - (W from this batch AT) = _____ kg
xxxx.x

3.4.9 Solution Volume Received/Transferred

a) For quantities received

$R_R$ = (V from this batch AS) - (V from previous batch AT) = _____ liters
xxxx.x

b) For quantities sent

$R_S$ = (V from this batch AS) - (V from this batch AT) = _____ liters
xxxx.x

3.4.10 Measurement Control Calculations

a) Westinghouse to Taylor Level

$C_1 = (L_W) - (L_T)$ = _____ cm
xx.x



b) Taylor to Westinghouse Density

$C_2 = (D_W) - (D_T) =$ _____ g/ml
x.xxxx

$C_2$ is calculated for BS and AS data.

c) Westinghouse to Lab Density

$C_3 = (D_W) - (D_L$ at 25°C) = _____ g/ml
x.xxxx

$C_3$ is calculated for AS data.

d) Westinghouse to Lab Density at tank temperature

$C_4 = D_W - (D_L$ at AS-TJR) = _____ g/ml
x.xxxx

Calculated for AS measurement only.

e) Before-Sample to After-Sample

$C_5$ = (W for BS) - (W for AS) = _____ kgs
xx.x

## 3.5 GPW CHECK TANK

### 3.5.1 Measurement Parameter Calculations

a) Westinghouse Level

$$L_W = [(\text{LR-412W in \%}) \times (1.00)] \times 2.54 = \underline{\quad}_{xx.x} \text{ cm}$$

b) Taylor Level

$$L_T = [(\text{LR-412 in \%}) \ (.713)] \times 2.54 = \underline{\quad}_{xx.x} \text{ cm}$$

c) Westinghouse Density

$$D_W = \frac{[(D_R\text{-}416W \text{ in \%}) \times (.50)]}{9.86} = \underline{\quad}_{x.xxxx} \text{ g/ml}$$

d) Taylor Density

$$D_T = \frac{[(DR\text{-}416 \text{ in \%}) \times .( + 10)]}{9.86} = \underline{\quad}_{x.xxxx} \text{ g/ml}$$

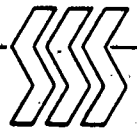
e) Lab Density at 25°C

$D_L$ at 25 = direct from lab result = $\underline{\quad}_{x.xxxx}$ g/ml

f) Lab Density at Tank Temperature

$D_L$ at T = adjusted from lab result = $\underline{\quad}_{x.xxxx}$ g/ml

Note: Conversion formula presented in Section 3.1.3



g) Temperature

TJR = direct from TJR-415-7 = $\frac{\text{xx.x}}{}$ °C

3.5.2 Liquid Level

$LL = L_W/D_W$ = $\frac{\text{xxx.x}}{}$ cm

3.5.3 Volume

$V = 24.86 + 6.0144 \times LL$ = $\frac{\text{xxxx.x}}{}$ liters

3.5.4 Solution Quantity

$W = V \times D_W$ = $\frac{\text{xxx.x}}{}$ kg

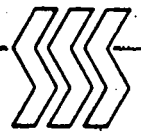
3.5.5 U Concentrations

U = direct from lab results $\frac{\text{xx.xx}}{}$ mg/g

3.5.6 U Quantities

$M = 0.001 \times W \times U$ = $\frac{\text{.xxxx}}{}$ kg U

Calculate M for BS, AS and AT quantities.



3.5.7 U Quantities Received/Transferred

a) For quantities received

$Q_R$ = (M from this batch AS) - (M from previous batch AT) = _____ kg
xxxx.x

b) For quantities sent

$Q_S$ = (M from this batch AS) - (M from this batch AT) = _____ kg
xxxx.x

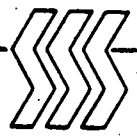
3.5.8 Solution Quantities Received/Transferred

a) For quantities received

$S_R$ = (W from this batch AS) - (W from previous batch AT) = _____ kg
xxxx.x

b) For quantities sent

$S_S$ = (W from this batch AS) - (W from this batch AT) = _____ kg
xxxx.x



3.5.9 Solution Volume Received/Transferred

a) For quantities received

$R_R$ = (V from this batch AS) - (V from previous batch AT) = _____ liters
xxxx.x

b) For quantities sent

$R_S$ = (V from this batch AS) - (V from this batch AT) = _____ liters
xxxx.x

3.5.10 Measurement Control Calculations

a) Westinghouse to Taylor Level

$C_1 = (L_W) - (L_T) =$ _____ cm
xx.x

b) Taylor to Westinghouse Density

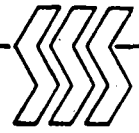
$C_2 = (D_W) - D_T) =$ _____ g/ml
x.xxxx

$C_2$ is calculated for BS and AS data.

c) Westinghouse to Lab Density

$C_3 = (D_W) - (D_L$ at 25°C) = _____ g/ml
x.xxxx

$C_3$ is calculated for AS data.



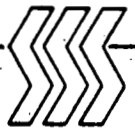
d) Westinghouse to Lab Density at tank temperature

$C_4$ $D_W$ - ($D_L$ at AS-TJR) = $\frac{\text{x.xxxx}}{\text{x.xxxx}}$ g/ml

Calculated for AS measurement only

e) Before-Sample to After-Sample

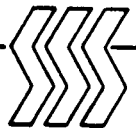
$C_5$ = (W for BS) - (W for AS) = $\frac{\text{xx.x}}{\text{xx.x}}$ kgs



SECTION IV

ACCOUNTING PROGRAMS

The two Accounting Program modules are the Lot/Inventory Definition Task and the Report Generation Task. The Lot/Inventory Definition Task creates new Lots and/or Inventory Periods, as defined by the operator. The Report Generation Task produces three types of reports: the Accounting Report, Summary Report, and Material Balance Report. Descriptions of these two tasks and details of the generated reports are described in the sub-sections that follow.



## 4.1 DEFINITIONS

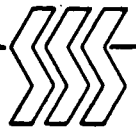
Terms and definitions used in the accounting programs are listed in this section.

Measurement Point - a point at which material is generated or measured.

Report - a statement of the Material Balance at a particular measurement point.

Material Transfer - a sequence of operations taken from the following group.

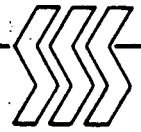
a. Measure the heel quantity
b. Fill the vessel
c. Measure the material
d. Sample the material
e. Measure material again
f. Transfer the material
g. Measure the heel quantity



Batch - an identifiable unit of material for measurement and accounting purposes

Lot - a number assigned to a group of one or more batches

Inventory Period - a number assigned to a group of one or more lots; it may be open ended. Example: "Lot number 12 and all following lots-to-date constitute the current Inventory Period."



## 4.2 LOT/INVENTORY DEFINITION TASK

This task creates new Lots and/or Inventory Periods, as defined by the operator.

The user initiates the task by typing "LO" for Lot definition or "IP" for Inventory Period definition. The task response is described in the following text.

### 4.2.1 Dialogue in Response to "LO"

Question #1: ENTER MEASUREMENT POINT NUMBER (NN)

Operator Input: NN

where NN = a valid measurement point number or the word "ALL".

Error: If other than a legal measurement point number is entered, Question #1 is repeated.

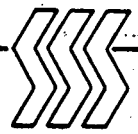
Question #2: ENTER BATCH NUMBERS (LL, HH) FOR TANK NN

Operator Input: LL, HH

where LL = low batch number for lot being defined

HH = high batch number for lot being defined (optional)

NN = measurement point number.



Question #3: LOT NUMBER m INCLUDES BATCHES LL-HH
IS THIS CORRECT? (Y/N)

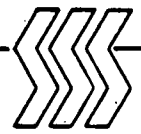
where m = next available contiguous
lot number

LL-HH = batch numbers that have just
been entered by the user.

Operator Input: Y or N

where Y indicates the information is correct
and the program will end.

N indicates the information is not
correct and the program goes back
to Question #2.



4.2.2 Dialogue in Response to "IP"

Question #1: ENTER MEASUREMENT POINT NUMBER (NN)

Operator Input: NN

where NN = a valid measurement point number or the word "ALL"

Error: Question #1 is repeated if other than a legal measurement point number is entered.

Question #2: ENTER LOT NUMBERS (LL, HH) FOR TANK NN

Operator Input: LL, HH

where LL = low lot number for the Inventory Period being defined

HH = high lot number for the Inventory Period being defined (optional)

NN = measurement point number.



Question #3: INVENTORY PERIOD NUMBER m
INCLUDES LOTS LL-HH
IS THIS CORRECT? (Y/N)

where m = next available contiguous Inventory Period number.

LL-HH = batch numbers that have just been entered by the user.

Operator Input:

where Y indicates the information is correct and the program ends.

N indicates the information is not correct and the program goes back to Question #2.



### 4.2.3 Lot/Inventory Definition Task Function

When the Lot/Inventory Definition task is activated, the task requests the measurement point as described in Section 4.2 and waits for the user's response.

After the user enters a correct measurement point, the Lot Definition task (LO) searches through the Lot Index File for that measurement point. (The format of the Lot Index File is shown in Figure 7-3, Section VII.) The task allows the operator to verify that the batch numbers LL, HH entered by the user are correct. If correct, a new entry is made at the end of the Lot Index File with the user-defined batch numbers.

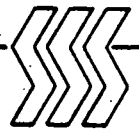
The Inventory Period Definition function, IP, is the same as LO, except the user-entered lot numbers make up a new entry in the Inventory Period Index File. (See Figure 7-2, Section VII.)



## 4.3 REPORT GENERATION TASK

The Report Generation Task produces three types of reports: The Accounting Report, Summary Report, and Material Balance Report. Sample reports are shown in Figures 4-1 and 4-2. The Summary Report format (not shown) is similar to the Accounting Report. A detailed description is provided in Section 4.3.3.

The Report Generation Task is activated by typing "RP" for Report Generation. The program responds with a request for the type of report to be generated: Accounting, Summary, or Material Balance. After supplying the report type, the program requests the measurement point number when applicable.



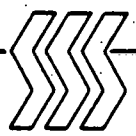
### 4.3.1 Report Formulation

Four primary measurement points are used to demonstrate accounting and material balance routines. Output data is based on preliminary results as well as final results, because the turn-around time for obtaining analytical results of samples can be lengthy. The use of less accurate preliminary results, however, does offer a means of reporting status as near real-time as possible. Each reported quantity is coded as preliminary (P) or final (F), and each summary total is segregated by (P) or (F) status to advise the user accordingly.

Other items reported include:

1. "Received from" and "transfer to" points

   The points from which the material was received and the points to which the material was transferred are reported. Batches re-cycled back into process are excluded from input/output material balances, and must be segregated. Therefore all line items are segregated by "from" and "to" points.



2. Quantitative data

   Liters of solution, kilograms of solution, and grams of uranium are reported on all reports, even though liters or kilograms of solution do not enter into material balance determinations.

3. Sample log numbers

   This information is for reference purposes.

4. Uranium concentration

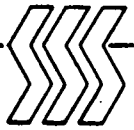
   The uranium concentration as mg U/g is used for overchecking and evaluation needs.

5. The time of year applicable to the measurements used

6. Beginning inventory, total receipts, total removals, and ending balance

The Report Generation Task locates data for the reports as follows:

- Refers to the Lot Index File to find appropriate batch numbers(s) (Figure 7-3, in Section VII.)



- Refers to the Batch Index File to find the relative location of data in the Raw Data File and in the Analytical Data File (Figures 7-4, 7-5, 7-6, in Section VII).

- Uses the selected data to formulate the report.



4.3.2 Accounting Report Description

The Accounting Report is a detailed report for each measurement point, which lists all the individual batches and lots. A detailed format is shown in Figure 4-1. Column headings and contents are described in the text that follows.

1. LOT NO. - This heading identifies the lot number, and subdivides the report into lot groupings.

2. BATCH NO. - A unique number assigned to a batch. Batch numbers are assigned consecutively for a measurement point.

3. AS MEASUREMENT DATE - The date indicates when the after-sample measurement was made.

4. LOG NO. - This is the log number assigned by the analytical laboratory.

5. CODE - There are two types of calculations made. One is the preliminary (P), which is based on density and acidity level; and the second is final (F), which is based on the reported uranium concentrations. Whenever

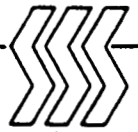
NMC - ACCOUNTING
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 2-003
DATE OF REPORT--1/19/78

| LOT NO. | BATCH NO. | MANUAL CHANGE | DATE | LOG NO. | CODE* | BATCH NO. | REC. FROM | U-CONC $M_G$-U/G | QUANTITY RECVD. LITERS | QUANTITY RECVD. Kg SOL | QUANTITY RECVD. U-CONTENT | QUANTITY TRANSFERRED LITERS | QUANTITY TRANSFERRED Kg SOL | QUANTITY TRANSFERRED U-CONTENT | DEST. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beginning Inventory | | | | | | | | | XX | XX | XX | | | | |
| 1 | 1 | | 1-10-78 | 35606 | F | | 2-001 | 235.89 | 10 | 15 | 12 | 8 | 13 | 10 | 2-005 |
| 1 | 2 | C | 1-11-78 | 35610 | F | | 2-001 | 236.81 | 12 | 18 | 14 | 10 | 15 | 12 | 2-005 |
| 1 | 3 | | 1-12-78 | 35614 | F | | 2-001 | 237 | 8 | 12 | 10 | 10 | 15 | 12 | 2-006 |
| 1 | 4 | | 1-12-78 | 35618 | F | | 2-002 | 240 | 12 | 18 | 14 | 10 | 15 | 12 | 2-005 |
| Lot Totals | | | | | F | | | | 42 | 63 | 50 | 38 | 58 | 46 | |
| 2 | 5 | | 1-13-78 | 35620 | F | | 2-001 | 239.00 | 16 | 24 | 12 | 12 | 18 | 8 | 2-005 |
| 2 | 6 | | 1-14-78 | 35624 | P | | 2-001 | 241.30 | 20 | 30 | 15 | 15 | 23 | 11 | 2-005 |
| 2 | 7 | | 1-15-78 | 35628 | P | | 2-001 | 227.62 | 14 | 21 | 10 | 0 | 0 | 0 | |
| Lot Totals | | | | | | | | | 50 | 75 | 37 | 27 | 41 | 19 | |
| Cummulative Totals | | | | | F | | 2-001 | | 46 | 69 | 48 | 40 | 61 | 42 | 2-005 |
| Lots - 1 thru 2 | | | | | F | | 2-002 | | 12 | 18 | 14 | 10 | 15 | 12 | 2-006 |
| | | | Sub Total | | | | | | 58 | 87 | 62 | 50 | 76 | 54 | |
| | | | | | P | | 2-001 | | 34 | 51 | 25 | 15 | 23 | 11 | 2-005 |
| | | | Grand Total | | | | | | 92 | 138 | 87 | 65 | 99 | 65 | |
| | | | Ending Balance | | | | | | | | | 27 | 39 | 22 | |

*Preliminary (P) or Final (F) Code

FIGURE 4-1. TYPICAL NMC ACCOUNTING REPORT

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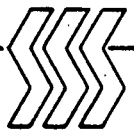
a report is requested, the program goes to the final uranium concentrations first to make the calculations. If the final data are available, they are used and coded as (F) on the report. If not, then, the preliminary data are used and coded (P) on the report.

6. RECEIVED FROM - This is the measurement point from which the material was received and the batch number for the quantity transferred. It is used to provide a ready means for comparing quantities transferred and received between two points.

7. U CONC. Mg-U/g - This is the uranium concentration calculated for the preliminary results or the results from the analytical determinations for the final values.

8. QUANTITY RECEIVED - Three quantities are reported consisting of the liters and kilograms of solution, and kilograms of uranium. Values are reported to the nearest tenth of a liter or kilogram.

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9. QUANTITY TRANSFERRED - The three quantities transferred from the reporting point are recorded to the nearest tenth of a unit.

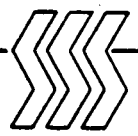
10. DESTINATION - This is the measurement point to which the material was transferred. It is also coded with an (R) when material is recycled.

11. BATCH LISTING - Below the lot heading, each batch number and all detail, Items 2 through 10, are recorded.

12. LOT TOTALS - The quantities received and transferred are summed for all the batches in the lot. These totals are subdivided into the "received from" points for quantity received and "destination" points for quantity transferred and by (P) or (F) codes.

13. CUMULATIVE TOTALS

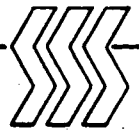
    Subtotals - This section consists of the summations of the lot totals by subtotals for preliminary and final results and by each "received from" measurement point and "destination" point.



Grand Total - This is the total of all receipts and removals for all the batches listed on the report.

14. BEGINNING BALANCE - This balance is the Ending Balance from the previous lot not requested on the report. Each time a report is requested, the lot numbers are provided. The program then calculates the previous Ending Balance and enters this quantity in Beginning Balance for the report being generated. This Beginning Balance is not always the same unless it is based on all final results. Each time, it may be different depending on the status of the preliminary values used. For this reason, the status code (P) or (F) is shown for the Beginning Balance to advise the user accordingly.

15. ENDING BALANCE - The Ending Balance is the difference between the Beginning Inventory plus receipts, less the quantity transferred.



### 4.3.3 Summary Report

The Summary Report is a report for each measurement point similar to the Accounting Report, except that the Summary Report shows lot totals without individual batch details. Other sections not required are:

1. Batch Number
2. After-Sample Measurement Date
3. Sample Log Number
4. Uranium Concentration - mg U/g

The Beginning Balance in a Summary Report is the same as for the corresponding point in the Accounting Report. The lot totals are provided in the same manner, based on "received from" points and "destination" points for receipts and transfers respectively. The appropriate (P or F) code is shown for each line entry.

The only difference is that the individual batches are not listed or shown on the Summary Report. All of the lots on record for the inventory interval are reported unless otherwise specified.



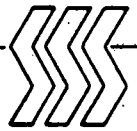
### 4.3.4 Material Balance Report

The Material Balance Report (MBR) is primarily a consolidated report of the Accounting Reports for the four measurement points. However, the Material Balance Report does not include the quantities recycled (rerouted back into the process from output points) in the output totals when calculating the Ending Balance.

The Material Balance Report is formulated as follows:

1. A beginning balance is retrieved from the Inventory File (See Section 7.2), and stored in the program for use as needed.

2. The input accountability point (2-003) derives the quantities as calculated and summarized from the Summary Reports for the quantity received. These received subtotals provided in the Summary Reports are the same used in the MBR.



3. The output points also derive the quantities as obtained in the summary reports. Since some of the batches at output points are of a recycled (R) category, these are not output quantities for the MBR. The (R) batches are included in the detail section of the report, and are shown as (R) in the CODE column. The totals recorded in the MBR section, however, do not have these (R) quantities included.

The detail format for the Materials Balance Report is provided in Figure 4-2. Column headings and contents are described in the text that follows.

1. REPORT PERIOD - operator selectable by beginning and ending inventory period number.
2. DATE OF REPORT - the time of year the report was prepared.
3. FROM and TO - the points from which the material was received as input, and the destination points for the output. Reports are summarized for each "To" and "From" within an input or output point.



4. CODE - the standard (P) and (F) for preliminary or final, and (R) for recycle. Each of the "To" and "From" points are also subdivided for this status. All totals and details are always coded by (P), (F), or (R) to advise the user accordingly.

5. DETAIL - this column shows the volumes and quantities.

6. MBR - this column shows volumes and quantities as totals of the detail columns.

7. BEGINNING INVENTORY - the starting quantity for the MBR interval.

8. INPUT - in this section, the lots and batches are included within the report. Since lots and batches are sequentially numbered, only inclusive numbers need be shown (for example, Lot 1, Batch 20 through Lot 4, Batch 66). The total input is the summation of all the "From" points and (P) and (F) status. If any (P) status are shown, then the total is (P).

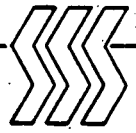
NUCLEAR MATERIAL ACCOUNTING
MATERIAL BALANCE REPORT FOR PERIOD _____

DATE OF REPORT _____

| | FROM/TO | CODE | DETAIL LITERS | DETAIL Kg.SOL. | DETAIL Kg U | MBR LITERS | MBR Kg.SOL. | MBR Kg U |
|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | XX.XXX |
| INPUT | | | | | | | | |
| 2-003 ACCT TANK | | | | | | | | |
| LOTS 1-1 THRU 6-62 | XX | P | XXX.X | XXX.X | XX.XXX | | | |
| | XX | RP | XXX.X | XXX.X | XX.XXX | | | |
| 2-003 TOTAL FOR MBA | | | XXX.X | XXX.X | XX.XXX | XXX.X | XXX.X | XX.XXX |
| OUTPUT | | | | | | | | |
| 2-009 PROD SAMPLE TANK | | | | | | | | |
| LOTS 1-3 THRU 4-25 | XX | P | XXX.X | XXX.X | XX.XXX | | | |
| 2-009 TOTAL FOR MBA | | | XXX.X | XXX.X | XX.XXX | XXX.X | XXX.X | XX.XXX |
| 2-023 HWW SAMPLE TANK | | | | | | | | |
| LOTS 1-1 THRU 1-3 | XX | F | XXX.X | XXX.X | XX.XXX | | | |
| 2-023 TOTAL FOR MBA | | | XXX.X | XXX.X | XX.XXX | XXX.X | XXX.X | XX.XXX |
| 2-028 GPW CHECK TANK | | | | | | | | |
| LOTS 1-2 THRU 2-4 | XX | RF | XXX.X | XXX.X | XX.XXX | | | |
| 2-028 TOTAL FOR MBA | | | XXX.X | XXX.X | XX.XXX | XXX.X | XXX.X | XX.XXX |
| ENDING BALANCE | | | | | | | | XX.XXX |

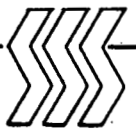
FIGURE 4-2. TYPICAL MATERIALS BALANCE REPORT

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9. OUTPUT - This is the same as described in the input for lots and batches. An additional category is shown, which is the "R" for recycle. The total for the MBR, however, does not have the recycle included in it.

10. The ending balance is the difference between the beginning inventory plus the input, less the output.



SECTION V

MEASUREMENT CONTROL PROGRAM

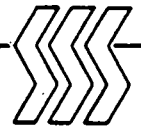
## 5.1 PROGRAM DESCRIPTION

The Measurement Control Program provides for various checks and comparisons of measurement data to control measurement anomalies prior to acceptance into the base file, for trend and error analysis of stored measurement data, and for propagation of errors into limits of error for material balance calculation. The various checks and comparisons used to ensure reliable data are an integral part of the measurement sequence. These are specifically included in the discussions of measurement sequences. They are presented here for continuity of measurement control discussions. The methods, procedures, and output formats for the trend and error analysis programs are specifically discussed below.

Software development for error propagation into limits of error will be included in the Uranium Input/Output (U I/O) Demonstration Program.

### 5.1.1 Controlling Measurement Anomalies

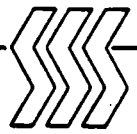
Comparisons of measurement data are made to maintain measurement anomalies at a minimum. These comparisons are made at the time of data generation using available measurement data. This allows timely application of



these comparisons and associated limits. Notification of indicated problems is provided to initiate supervisor corrective action and ensure proper measurement data are recorded.

For each control limit, there is a corresponding offset ($\bar{D}$) and sigma (s). Also associated with each control limit is a lower and upper limit corresponding to the liquid level in the tank; that is, lower limits are assigned for Before-Receipt and After-Transfer and upper limits are assigned for Before-Sample and After-Sample.

The comparisons applied to control measurement anomalies are discussed below. Methods to assign control limits are also presented and levels of action to respond to indicated problems are outlined.



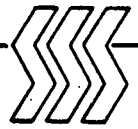
5.1.2 Specific Comparisions Within an Individual Measurement

Specific instrument comparisions can be made using the data collected for an individual measurement. Timely evaluation of these data and notification to supervision when problems are indicated can indicate instrument or measurement problems. Investigation and corrective actions provide the control of measurement anomalies within individual measurements.

5.1.2.1 Redundant Instrument Comparisions

Specific instrument comparisions are made at the time of measurement where two or more instruments are installed in parallel and are reading the same differential pressure (whether level or density indications). These comparisons are used to flag potential instrument problems. In these cases, the second instrument is considered backup to the primary and comparision is made to the primary.

Example: Ruska and Taylor instruments in parallel reading pressure differential indicating liquid level. The Ruska instrument is considered primary and the Taylor is considered backup.



This comparision consists of:

$$|(\text{Ruska liquid level}) - (\text{Taylor liquid level})| \leq \text{control limit}$$

where liquid levels are the calculated liquid levels from the raw instrument readings. It should also be noted that the control limits are specific to the instrument application. They may change from measurement point to measurement point.

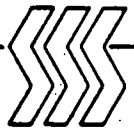
5.1.2.2 Process Density to Lab Density Comparisons

Process density to lab density (at 25°C) comparisions are made to provide timely assurances that tank solution is mixed and that both instrument and associated purge lines are functioning satisfactorily. The calculated density from the primary density instruments are compared to the laboratory density result (at 25°C).

Process density is calculated as follows:

$$\text{Process Density} = \frac{(\text{differential pressure across density probes in in. } H_2O^*)}{(\text{probe separation in inches})}$$

*NOTE: The differential pressure across the density probes may be obtained in two ways depending on instrument hookups. A differential pressure



transmitter installed across the two density probes measures the differential pressure directly. A second method uses Ruska instruments to measure differential pressure from the in-tank reference to the high pressure density probe (the same as level measurement) and to measure differential pressure from the in-tank reference probe to the low pressure density probe. The difference between these two measurements is the differential pressure across the density probes.

Process density is now compared to lab density (at 25°C) as follows:

$$\left|(\text{process density})-(\text{lab density})\right| \leq \text{control limit}$$

5.1.2.3 Process Density to Process Density

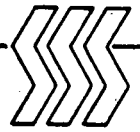
When process density is measured by the second method (Section 5.2.1.2) using Ruska instruments, Taylor determined density from direct measurement of differential pressure across the density probes is also available.



Comparison of these two determinations of density provides an additional check on instrument performance.

The comparison between the two densities is as follows:

$|(\text{Taylor density}) - (\text{Ruska density})| \leq \text{control limits}$



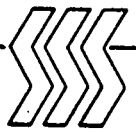
5.1.3 Comparisons Between Measurements

During the routine measurement sequences, a number of "remeasurement" situations occur, where a specific quantity of solution is remeasured at a later time and comparison of the two quantities can be made. These may take the form of "Before-Sample" to "After-Sample" measurement comparisons and "After-Transfer" to "Before-Receipt" measurement comparisons (referred to as repeat measurements), or between tank transfer comparisons (referred to as redundant measurements).

Timely application of these comparisons and supervisory review of indicated problems serves to further control measurement anomalies or indicate operational problems which may invalidate measurement problems.

5.1.3.1 Mass of Solution Comparisons - Repeat Measurements

Repeat measurements are provided in "Before-Sample" to "After-Sample" data and "After-Transfer" to "Before-Receipt" data when it is available. The mass of solution is calculated from data associated with each individual measurement. These repeat measurements and associated repeat determinations of solution quantities form the basis of solution comparisons to evaluate measurement system performance.



Comparison of repeat measurements of solution masses involves the following calculations:

(1) Calculation of process density from process instrument data:

$$D = \text{process density} = \frac{(\text{differential pressure in in. } H_2O}{\text{probe separation}}$$

NOTE: In the case of comparison of heel measurements, (AT to BR) solution level may be below density probes and AS measurement of density from previous batch is used for both calculations.

(2) Calculation of "true" liquid level from primary liquid level measurement data:

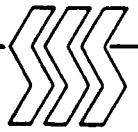
$$L = \text{liquid level} = \frac{(\text{liquid level differential pressure})}{\text{process density}}$$

NOTE: Liquid level differential pressure is usually in inches of water.

(3) Calculation of solution mass:

$$M - \text{mass (kg sol)} = \left[a_0 + a_1(L) + a_2(L)^2 + a_3(L)^3 \ldots\right]\left[D\right]$$

where $a_0$, $a_1$, $a_2$, ..., are coefficients of vessel calibration equations.



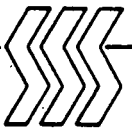
The comparison of the initial measurement ($M_1$) and the remeasurement ($M_2$) is as follows:

$$M_1 - M_2 \leq \text{control limits.}$$

5.1.3.2 Mass of Solution Comparisons - Redundant Measurements

Redundant measurements are provided when a batch of solution is transferred from one tank to another. Quantities sent are calculated from measurement data of the sending tank. Quantities received are independently measured and calculated in the receiving tank. These redundant measurements and comparisons allow timely review and indication of potential problems with transfer mechanisms/procedures or individual measurement performance.

For the U I/O program, this comparison is only applied in the U Product Sample Tank to Input Accountability Tank Transfer sequence. The specific calculations used in this comparison are provided in the measurement description for the Solution Quantities Transferred/Received (Section 3.2.11).



5.1.4 Establishing Control Limits

For each type of measurement comparison, a specific control limit is established at the 0.05 and 0.01 levels of significance. These control limits are based on historical comparison data when available (or are assigned by NMC when data are not available). Data for each comparison are summarized over an inventory period (or a period determined by NMC). By their nature, the comparison data are paired. The differences between the pairs are subjected to statistical analysis to calculate random error variance. This random error variance is the basis for calculation of the specific control limit.

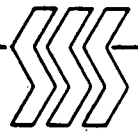
The random error variance estimate for the paired data are calculated by the following formula:

$$s^2 = \frac{n \sum_{i=1}^{n} \left( d_i \right)^2 - \left( \sum_{i=1}^{n} d_i \right)^2}{n(n-1)}$$

where: $d_i$ = difference between original and repeat or replicate measurement i.

$n$ = number of measurements.

$$\bar{d} = \sum_{i=1}^{n} d_i / n$$



$s$ = standard deviation for the difference between measurements.

$s/\sqrt{2}$ = standard deviation for an individual measurement.

Alternately, the variance may be calculated on a relative basis as follows:

$$\hat{\gamma}^2 = \frac{n \sum_{i=1}^{n} \left(d_{ri}\right)^2 - \left(\sum_{i=1}^{n} d_{ri}\right)^2}{n(n-1)}$$

where: $d_{ri}$ = relative difference between original (O) and replicate (R) measure i.

$$d_{ri} = \frac{O_i - R_i}{(O_i + R_i)/2}$$

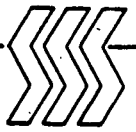
$n$ = number of measurements.

$\hat{\gamma}$ = coefficient of variation for the difference between two measurements.

$$\bar{d}_r = \sum_{i=1}^{n} d_{ri}/n$$

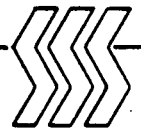
$\hat{\gamma}/\sqrt{2}$ = coefficient of variation for an individual measurement.

After calculation of the applicable s or $\hat{\gamma}$, a confidence interval of $\bar{d} \pm 3s$ (or $\bar{d}_r \pm 3\hat{\gamma}$) is established. A comparison of each $d_i$ or $d_{ri}$ is made to the appropriate



interval. Any $d_i$ or $d_{ri}$ that exceeds the limit is "flagged." If any "flags" are encountered, the appropriate statistics are recalculated excluding the "flagged" value and the interval recalculated. Remaining $d_i$ or $d_{ri}$ quantities are compared. This iterative process is applied until all remaining $d_i$ or $d_{ri}$ fall within the confidence interval.

Control limits are then set at 0.05 and 0.01 levels of significance corresponding to 2 and 3 times the final calculated standard deviation or coefficient of variation. This calculation is applied to historical data for each of the measurement comparisons detailed above at the end of an inventory period. The resulting control limits are used during the subsequent period for measurement comparisons.

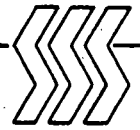


5.1.5 Response Levels of Action

The above calculated control limits are applied to measurement data as they are generated to effect timely review and indication of potential problems. This allows supervisory review and timely corrective action when required to control measurement anomalies.

Specific applications of the various measurement comparisons detailed above are included in discussions of measurement sequences, when control limits at the 0.05 and 0.01 levels of significance alarm and corrective action may be indicated. The specific responses to alarms are detailed in measurement sequences. They are specific for each type of comparison. The level of response depend on the importance of the measurement to NMC calculations. For example, an instrument comparison between a Ruska and a Taylor that is outside the established control limit may result in a calibration request for the Taylor. However, a before- and after-sample measurement comparison that is outside the control limit would require a remeasurement or other corrective action.

For each measurement comparison, the difference ($d_i$ or $d_{ri}$) is calculated and compared to the applicable control limit.



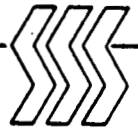
1. If $d_i$ or $d_{ri} \leq$ control limit at 0.05 level of significance, data are acceptable and stored in appropriate file.

2. If $d_i$ or $d_{ri}$ > control limit at 0.05 level of significance but $\leq$ control limit at 0.01 level of significance, data are acceptable for storage into the appropriate file. However, the measurement is flagged and a message is printed to the NMC office and to the Operations output terminal.

3. If consecutive $d_i$ or $d_{ri}$ exceed control limits of 0.05 level of significance; or

4. If $d_i$ or $d_{ri}$ exceed control limits at the 0.01 level of significance, the measurement data are not acceptable for use in the materials control and accounting program. A message is printed to the NMC office and to the Operations output terminal. These out of control situations may require immediate corrective action depending on importance to NMC measurements.

The specific options for supervisor response and corrective action are detailed in measurement sequences. The level of response is dependent upon the type of comparison



and the importance of the measurement with respect to NMC calculations. In general, three levels of response can be identified for measurement comparison:

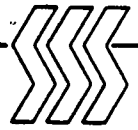
1. The first level corresponds to data being acceptable. No action is required and measurement sequences continue.

2. At the second level of response, a problem is indicated. The problem, in relation to importance in nuclear material control calculations, is of a minor nature. It does not directly impact measurement performance but warrants attention in future comparisons. This level of response provides notification to the NMC office and to Operations similar to the following:

   MESSAGE FOR TANK _____ BATCH_____ DATE_____ TIME_____

   (Type of Comparison) IS MARGINAL.

   The message is followed by the instrument or calculation discrepancy to be investegated. Further operator response is not required. The measurement sequences continue.



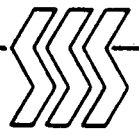
3. The third level of response results when a problem that impacts nuclear material control has been detected. Notification is provided to the NMC office and to Operations as follows:

MESSAGE FOR TANK_____ BATCH_____ DATE_____ TIME_____

__(Type of Comparison)___ COMPARISON IS OUT-OF-LIMITS.

The message is followed by the instrument or calculation discrepancy to be investigated.

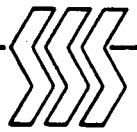
The message to Operations includes blank space for the supervisor to document his finding and report corrective action to NMC. He must investigate and resolve the discrepancy in the comparison prior to restarting the sequence. Restart requires supervisor initials and nonprinting code. The measurement sequences may not proceed until resolution of the out of control comparison is accomplished by remeasurement; resample, etc.



5.1.6 Measurement Control Summary Output Reports

Summary reports of measurement control activities are required on a routine basis to (1) allow assessment of measurement performance, (2) establish control limits for the measurement comparisons, and (3) generate applicable random error estimates for application to limits of error calculations. Each of the output summaries programs include protection codes to allow access by NMC only. Each of the programs allows summaries to be generated by batch numbers only. The output is structured to allow batchwise listings in the summary or allow summary totals only.

These output summaries repeat the measurement control comparisons performed during solution measurement. This must be accomplished to establish control limits. Most of the summaries also recalculate the same comparisons and additional comparisons using additional measurement data not available at the initial measurement. This allows review and evaluation of measurement performance and estimates of random error components.



## 5.2 MEASUREMENT CONTROL PROGRAM DETAIL

The Measurement Control Program routines compare measurements that are printed in a report (Figures 5-1, 5-2, and 5-3) on user request. The measurements compared are made by different instruments or replicate measurements by the same instrument. The user may request measurement comparisons for a group of batches only.

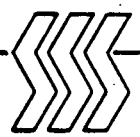
There are six types of measurement comparisons performed.

Instrument Comparisons - Compare two or more instruments which are reading the same pressure.

Liquid Level Comparisons - Level versus density probe. Liquid level may be computed from the level probe or from the density probe in a tank.

Mass of Solution Comparisons - Replicate pressure readings from the same tank at two different times in the process are used to compute mass of solution.

Process Density to Lab Density Comparisons - Density may be calculated from either tank sensors or a sample in the lab.



Process Density to Process Density Comparisons - Process density may be computed from differential pressure between level and density probes, or between level probe and reference and density probe and reference.

Mass of Solution Transferred to Mass of Solution Received Comparisons - When an MBA transfer occurs, the mass of solution for an input Batch may be compared to the mass of the corresponding product Batch.

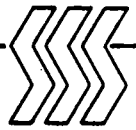
5.2.1 User Communication Syntax for Measurement Comparisons

In order to initiate the Measurement Control Program, the user must LOG into account 1,50 and then type "RUN MEACON" on the terminal. The following dialog presents the user communication syntax for enabling the comparison routines.

QUESTION #1: REPORT TYPES ARE: LV = LEVEL
DN = DENSITY
RP = REPLICATE
PI = PRODUCT TO INPUT
UC = U CONCENTRATION
CARRIAGE RETURN = END OF REPORTS

ENTER REPORT TYPE?

RESPONSE: User enters one of the five valid codes listed above or a <CR> to end program.



QUESTION #2: (For LV, DN, or RP reports only) ENTER TANK ID OR 'ALL'?

RESPONSE: User enters the five-digit measurement point ID of the tank for which comparisons are desired or the 'ALL' command if comparisons are desired on all tanks.

QUESTION #3: ENTER BEGINNING BATCH NUMBER?

RESPONSE: User enters Batch number of the first Batch for which comparisons are desired (must be a valid Batch number).

QUESTION #4: ENTER ENDING BATCH NUMBER?

RESPONSE: User enters Batch number of the last Batch for which comparisons are desired (must be a valid Batch number).

QUESTION #5: ENTER EXTREME VALUE?

RESPONSE: User enters the extreme value of the comparison being made. If the calculated comparison is greater than this value, the comparison will be excluded from the comparison summary.

The program now cycles back to QUESTION #1.

(NAME OF TANK) TANK DENSITY COMPARISONS
SUMMARY REPORT
FOR (Range of Report)

| Batch No. | Before-Sample | | | | After-Sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rus To Tay | Lab at T To Rus | Lab at T To Tay | Lab Den. at 25 | Lab Den. To Tay | Lab at 25 to Rus | Lab at 25 To Tay | Lab at T To Rus | Lab at T To Tay | Rus To Tay |

The following items are printed under these headings.

| $C_3$ for BS | $C_4$ for BS | $C_5$ for BS | $D_L$ at 25 | $D_L$ at T | $C_1$ for AS | $C_2$ for AS | $C_4$ for AS | $C_5$ for AS | $C_3$ for AS |
|---|---|---|---|---|---|---|---|---|---|
| x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx |

Summary statistics are provided for each of the comparisons.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| N = | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Avg diff= | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx |
| $S_{diff}$ = | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx | x.xxxx |

FIGURE 5-1. DENSITY COMPARISONS
(TYPICAL REPORT)

Scientific Systems Services
1135 JOHN RODES BOULEVARD • P.O. BOX 610 • MELBOURNE, FLORIDA 32901 • (305) 725-1300

(NAME OF TANK) TANK REPEAT MEASUREMENTS
SUMMARY REPORT
FOR (Range of Report)

| Batch No. | Process Control | | | | Accountability | | | |
|---|---|---|---|---|---|---|---|---|
| | AT to BR | | BS to AS | | AT to BR | | BS to AS | |
| | Kg Sol | AT-BR | Kg Sol | BS-AS | Kg Sol | BS-AS | Kg Sol | BS-AS |

The following items are printed under these headings.

| $W_{PC}$ at AT | $C_1$ | $W_{PC}$ at BS | $C_2$ | $W_A$ at AT | $C_3$ | $W_A$ at BS | $C_4$ |
|---|---|---|---|---|---|---|---|
| xxxx.x | xx.x | xxxx.x | xx.x | xxxx.x | xx.x | xxxx.x | xx.x |

Summary statistics are provided for each of the comparisons.

| | | | | | |
|---|---|---|---|---|---|
| N = | xxx | xxx | N = | xxx | xxx |
| Avg diff = | xx.x | xx.x | Avg diff = | xx.x | xx.x |
| $S_{diff}$ = | xx.xx | xx.xx | $S_{diff}$ = | xx.xx | xx.xx |

FIGURE 5-2. REPEAT MEASUREMENTS

(TYPICAL REPORT)

Scientific Systems Services
1135 JOHN RODES BOULEVARD • P.O. BOX 610 • MELBOURNE, FLORIDA 32901 • (305) 725-1300

(NAME OF TANK) TANK LEVEL COMPARISONS
SUMMARY REPORT
FOR (Range of Report)

| Batch No. | Before Receipt | | | Before Sample | | | After Sample | | | After Transfer | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ruska Level cm. | Rus(1)-Tay cm. | TJR-TI °C | Ruska Level cm. | Rus(1)-Tay cm. | TJR-TI °C | Ruska Level cm. | Rus(1)-Tay cm. | TJR-TI °C | Ruska Level cm. | Rus(1)-Tay cm. | TJR-TI °C |

The following items are printed (BR = Before Receipt, BS = Before-Sample, AS = After-Sample, AT = After-Transfer)

| $BR\text{-}L_{R1}$ | $BR\text{-}C_1$ | $BR\text{-}C_2$ | $BS\text{-}L_{R1}$ | $BS\text{-}C_1$ | $BS\text{-}C_2$ | $AS\text{-}L_{R1}$ | $AS\text{-}C_1$ | $AS\text{-}C_2$ | $AT\text{-}L_{R1}$ | $AT\text{-}C_1$ | $AT\text{-}C_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| xxx.xx | xx.xx | xx.xx | xxx.xx | xx.xx | xx.xx | xxx.xx | xx.xx | xx.xx | xxx.xx | xx.xx | xx.xx |

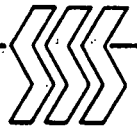
Summaries are provided for Before Sample and After Transfer Data Only.

Summaries:

| | | | | | |
|---|---|---|---|---|---|
| N = | xxx | xxx | N = | xx | xx |
| Avg diff = | xx.xx | xx.xx | Avg diff = | xx.xx | xx.xx |
| $S_{diff}$ = | xx.xx | xx.xx | $S_{diff}$ = | xx.xx | xx.xx |

FIGURE 5-3. LEVEL COMPARISONS
(TYPICAL REPORT)

Scientific Systems Services
1135 JOHN RODES BOULEVARD • P.O. BOX 610 • MELBOURNE, FLORIDA 32901 • (305) 725-1300



Response to #3 - DN

Question: PROCESS OR PROCESS/LAB

Response: PR for process density/process density comparisons

PL for process density/lab density comparisons

NEXT QUESTION: END OF DIALOGUE

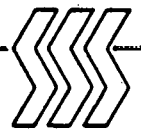
5.2.2 Measurement Program Operation

The measurement program calculates the requested information with reference to the Raw Data File and Analytical Data File. Standard deviation S is calculated according to the formula:

$$S = \sqrt{\frac{n \sum_{i=1}^{n} d_i^2 - \sum_{i=1}^{n} d_i^2}{n(n-1)}}$$

where: n = number of measurements

$d_i$ is calcuated according to the type of comparisons being made.



5.2.2.1 Instrument to Instrument Comparison

This comparison consists of:

$$d_i = \frac{P_1 - P_2}{P_1}$$

where: $P_1$ = net pressure differential of primary pressure measurement.

$P_2$ = net pressure differential of secondary pressure measurement.

for $P_1$ and $P_2$ see the following references:

| | |
|---|---|
| INPUT TANK | Section 3.2.13 (a)(c) |
| PRODUCT TANK | Section 3.3.13 (a) |
| GPW TANK | Section 3.4.8 (a)(b) |
| HWW TANK | Section 3.4.8 (a)(b) |

5.2.2.2 Liquid Level Comparisons

$$d_i = \left| LL - (DL + K) \right|$$

$$LL = \frac{(P_1)\ K}{P_1 - P_2}$$

$$DL = \frac{P_2\ K}{(P_1 - P_2)}$$

where: LL, DL = liquid level using bottom level probe and density probe, respectively.

$P_1, P_2$ = differential pressure between reference probe and the level and density probes, respectively.

K = probe separation.

For details of LL, DL, $P_1$, $P_2$, and K see the following references:

| | |
|---|---|
| INPUT TANK | Section 3.2.3 (d)(e) |
| PRODUCT TANK | Section 3.3.2, 3.3.1 (i) |

5.2.2.3 Mass of Solution Comparisons

$$d_i = M_1 - M_2$$

$$M_1 = \left[a_0 + a_1\left(\frac{P_1}{D_1}\right) + a_2\left(\frac{P_1}{D_1}\right)^2 + a_3\left(\frac{P_1}{D_1}\right)^3\right]\left[D_1\right]$$

$$M_2 = \left[\acute{a}_0 + \acute{a}_1\left(\frac{P_2}{D_2}\right) + \acute{a}_2\left(\frac{P_2}{D_2}\right)^2 + \acute{a}_3\left(\frac{P_2}{D_2}\right)^3\right]\left[D_2\right]$$

$$M_1 - M_2 = a_1(P_1 - P_2) + a_2\left(\frac{P_1^2}{D_1} - \frac{P_2}{D_2}^2\right) + a_3\left(\frac{P_1^3}{D_1^2} - \frac{P_2^3}{D_2^2}\right)$$

where:

$M_1$ = mass of solution for first measurement.

$M_2$ = mass of solution for second measurement.

$a_0, a_1, a_2, a_3$ = coefficients from vessel calibration equation.

$P_1, P_2$ = net pressure reading for the first and second measurements, respectively (i.e., adjusted for zero reading).

$D_1, D_2$ = lab density at 25°C connected to the corresponding density at tank temperature for the first and second measurements, respectively.

For details see the following references:

INPUT TANK - Section 3.2.7, 3.1, 3.2.13 (j) (k)

PRODUCT TANK - Section 3.3.7, 3.1, 3.3.13 (h)

WASTE TANKS - Section 3.4.2, 3.4.8 (d)



5.2.2.4 Process Density to Lab Density

Lab density at 25°C is connected to corresponding density at tank temperature according to the equations given in Section 2.5. The process density is compared to lab density as follows:

$$d_i = \left( \frac{D_T - PD}{D_T} \right) 100$$

where: $D_T$ = lab density at tank temperature

PD - process density

Process density is calculated as follows:

(1) $$P\ D = \frac{P_1 - P_2}{K}$$

where: PD = process density

$P_1$ = pressure reading-level to reference probe.

$P_2$ = pressure reading-density to reference probe.

K = probe separation

or

(2) $$P\ D = \frac{P_3}{K}$$

where: $P_3$ = pressure reading between level and density probes.

K = probe separation.

For details see the following references:

INPUT TANK - Section 3.2.13 f, g

PRODUCT TANK - Section 3.3.13 e, f

5.2.2.5 Process Density to Process Density Calculation

$$d_i = \left| PD_1 - PD_2 \right|$$

$$PD_1 = \frac{P_1}{K}$$

$$PD_2 = \frac{(P_2 - P_3)}{K}$$

where: $PD_1, PD_2$ = process desnity from Taylor and Ruska, respectively.

$P_1, P_2, P_3$ = differential pressure reading from the three instruments

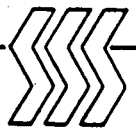
$K$ = probe separation

For details see the following references:

INPUT TANK - Section 3.2.13 e

PRODUCT TANK - Section 3.3.13 d

WASTE TANKS - Section 3.4.8 b



5.2.2.6 Mass of Solution Transferred to Mass of Solution Received

$$d_i = m_1 - m_2$$

The mass ($m_1$) of solution transferred and the mass ($m_2$) of solution received are calculated as follows:

$$m_1 = \left[a_0 + a_1\left(\frac{P_1}{D_1}\right) + a_2\left(\frac{P_1}{D_1}\right)^2 + a_3\left(\frac{P_1}{D_1}\right)^3\right]\left[D_1\right]$$

$$m_2 = \left[a_0{}^1 + a_1{}^1\left(\frac{P_2}{D_2}\right) + a_2{}^1\left(\frac{P_2}{D_2}\right)^2 + a_3{}^1\left(\frac{P_2}{D_2}\right)^3\right]\left[D_2\right]$$

where: $m_1 + m_2$ are the respective kgs solution

$a_0, a_1, a_2, a_3$,

$a_0{}^1, a_1{}^1, a_2{}^1, a_3{}^1$ = the respective volume calibration coefficients

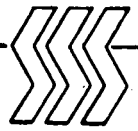
$P_1, P_2$ = the respective net pressure readings

$D_1, D_2$ = the respective lab densities converted to densities at tank temperature

For details see the following references:

INPUT TANK - Section 3.2.11 c

PRODUCT TANK - Section 3.3.11 d



## 5.3 MEASUREMENT CONTROL VARIANCE CALCULATIONS

### 5.3.1 Calculation of Individual Variances

The variance for each measurement point is calculated by combining measurement data from the data base with data contained in error variance tables. The following equation is used:

$$s^2 = \sum_{i=1}^{n} x_i^2 \left( \frac{s_{br}^2}{w_i} + \frac{s_{ar}^2}{y_i} \right) + \left( \sum_{i=1}^{n} x_i \right)^2 \left( \frac{s_{bs}^2}{\bar{w}} + \frac{s_{as}^2}{\bar{y}} + \hat{\gamma}_{ss} \right)$$

where:

$n$ = number of batches in analysis

$x_i$ = kilograms uranium for batch i.

$w_i$ = kilograms solution in batch i.

$y_i$ = analytical concentration (milligrams uranium per gram) of batch i.

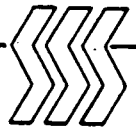
$s_{br}$ = estimated standard deviation of the random error associated with a net kilogram solution measurement.

$s_{bs}$ = estimated standard deviation of the systematic error assoicated with a net kilogram solution measurement.

$s_{ar}$ = estimated standard deviation of the random error associated with sampling and analyses.

$s_{as}$ = estimated standard deviation of the systematic error associated with analytical method.

$\hat{\gamma}_{ss}$ = estimated coefficient of variation for the systematic error associated with sampling.



5.3.2 Combining Variances

The individual variances are combined with the variances for beginning and ending inventory to produce a single variance. The formula used is

$$s^2 = s_i^2 + s_p^2 + s_h^2 + s_g^2 + s_b^2 + s_e^2$$

where:

$s_i^2$ = variance of input measurements.

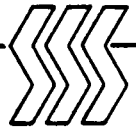
$s_p^2$ = variance of product measurements.

$s_h^2$ = variance of HWW waste measurements not recycled.

$s_g^2$ = variance of GPW waste measurements not recycled

$s_b^2$ = variance of beginning inventory.

$s_e^2$ = variance of ending inventory.



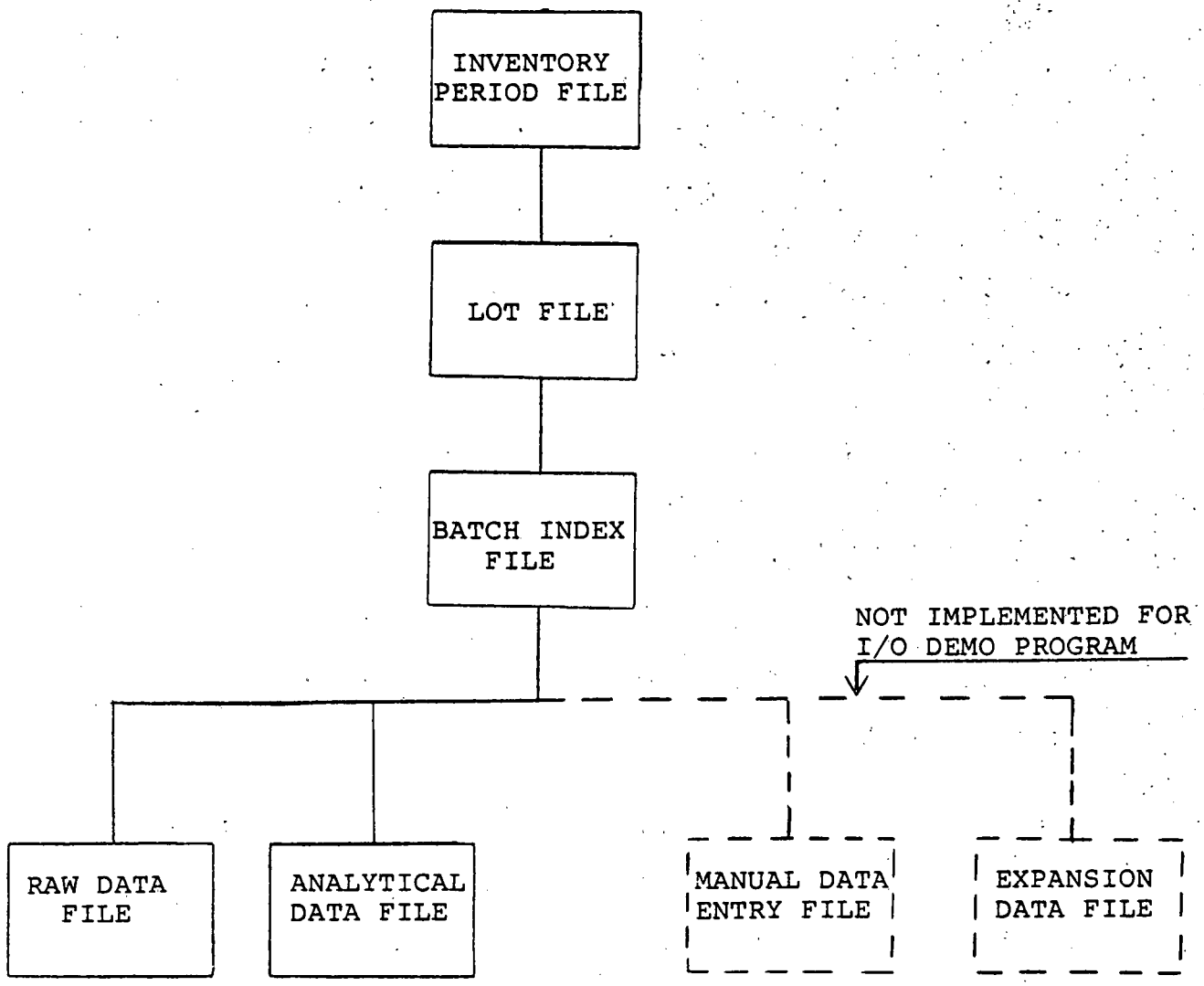
# SECTION VI

# DATA BASE SYSTEM FOR MEASUREMENT AND ACCOUNTING PROGRAMS

## 6.1 DESCRIPTION

The Data Base for CNMCAS is composed of a collection of files linked together in a hierarchical structure. (See Figure 6-1). Each measurement point has one of these Data Bases. The collection of all measurement point Data Bases is called the Data Base System.

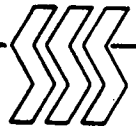
A detailed layout of each file in a data base is shown in Figures 6-2 through 6-6.




MAXIMUM SIZE - APPROX 941 BLOCKS

% OF RP04 - APPROX .54%

FIGURE 6-1. MEASUREMENT POINT DATA BASE

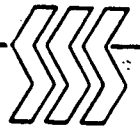


## 6.2 INVENTORY PERIOD INDEX FILE

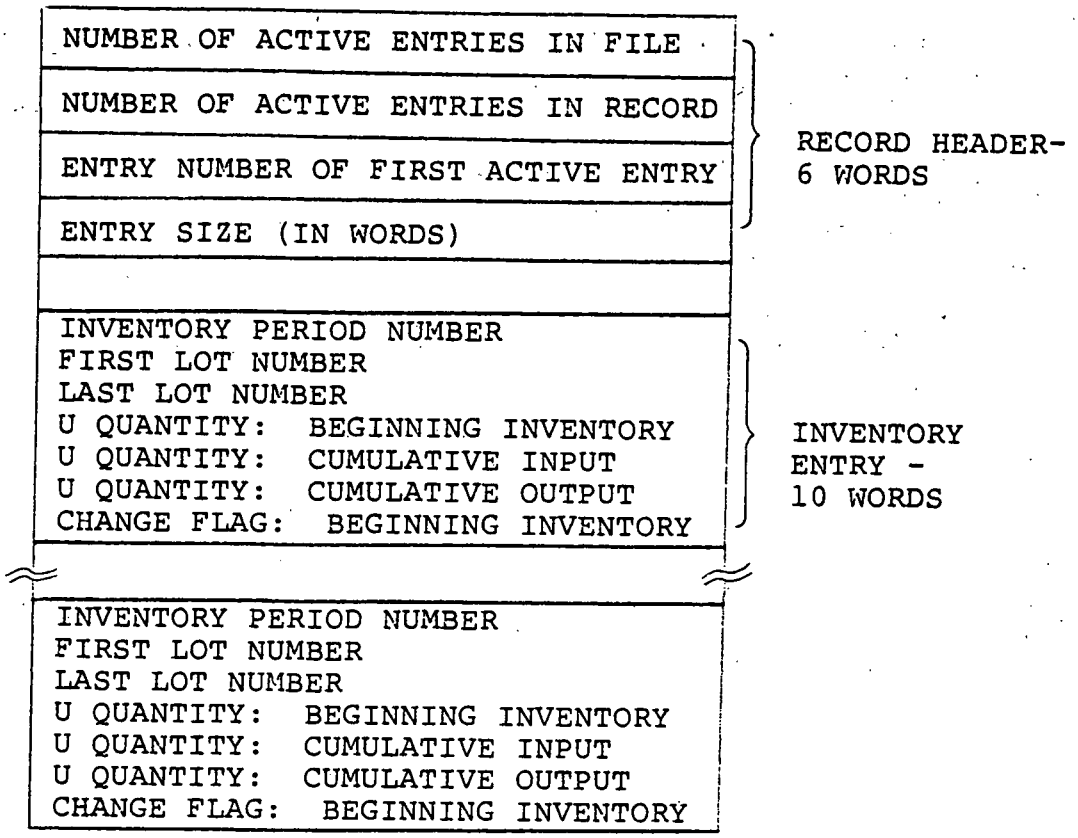
The Inventory Index File is used to associate an inventory period with a collection of lots (See Figure 6-2). This file is managed by the Accounting program. Each entry is created by an operator when he wishes to create an inventory period. Lot numbers for an inventory period need not exist at the time an inventory period is created.

The estimated size of this file for a six-month collection of historical data is approximately 24 disk blocks. Each disk block contains up to 25 entries or inventory periods. There is no maximum size limitation.

Each disk block within the file is structured exactly alike. That is, each contains a six-word header, followed by up to 25 ten-word entries. Since the lot and inventory period numbers are contained in one 16-bit computer word, the maximum value of each is $65536_{(10)}$. This merely means that when the numbers reach that point, the numbers roll over and start with zero again.

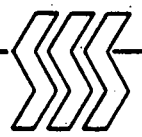


INVENTORY PERIOD INDEX FILE




ENTRIES/BLOCK - 25
SIX MONTH SIZE - 24 BLOCKS

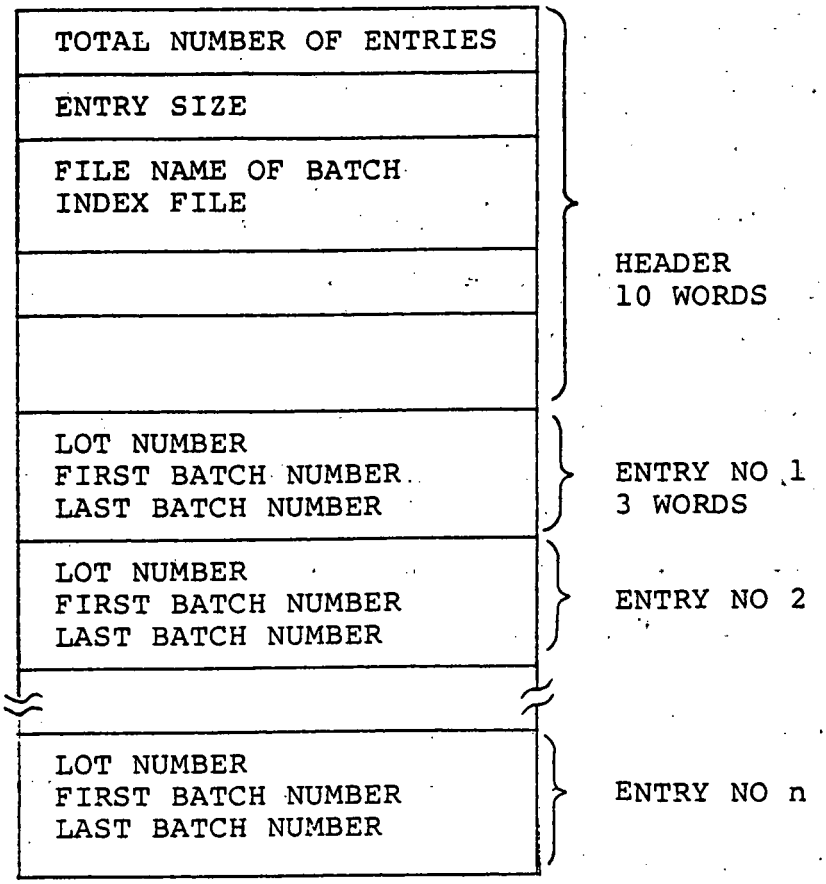
FIGURE 6-2. INVENTORY PERIOD INDEX FILE



## 6.3 LOT INDEX FILE

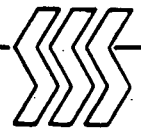
The Lot Index File associates a collection of Batches with a Lot number. This file, like the Inventory Period File, is managed by the Accounting program. When the operator wishes to create a Lot, he does it through the Create Lot function in the Accounting program. All limitations correspond to the Inventory Period Index File.

Figure 6-3 shows a detailed layout of the Lot Index File.




ENTRIES/BLOCK - 82
SIX MONTH SIZE - 14 BLOCKS

FIGURE 6-3. LOT INDEX FILE

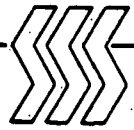


## 6.4 BATCH INDEX FILE

The Batch Index File is the primary file used to record information about a Batch measurement. This file contains such things as the total number of batches currently in the Data Base, the time and date of batch creation, and indexes into all lower level files. These files are managed by the measurement programs. For every measurement program there is one Batch Index File. Figure 6-4 shows a detailed layout of the Batch Index File.

Each disk block is composed of a 16-word header and up to 15 entries of 16 words each.

This file can identify up to (4) four lower levels or files. There must be at least one lower level file per Data Base. The Data Base Type Code entry identifies the structure of the lower level files.

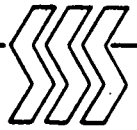


| | |
|---|---|
| NUMBER OF ACTIVE ENTRIES IN FILE | RECORD HEADER- 16 WORDS |
| NUMBER OF ACTIVE ENTRIES IN RECORD | |
| ENTRY SIZE (IN WORDS) | |
| FILE TYPE CODE | |
| | |
| BATCH NUMBER | BATCH ENTRY - 16 WORDS |
| CREATION TIME/DATE (Y,M,D,H,M) | |
| SOURCE TANK ID | |
| BATCH NUMBER IN SOURCE TANK | |
| DESTINATION TANK ID | |
| REL. REC. # IN RAW DATA FILE | |
| REL. REC. # IN ANALYTICAL DATA FILE | |
| REL. REC. # IN MANUAL DATA FILE | |
| REL. REC. # IN EXPANSION DATA FILE | |
| | |

ENTRIES/BLOCK - 15

SIX MONTH SIZE - 48

FIGURE 6-4. BATCH INDEX FILE

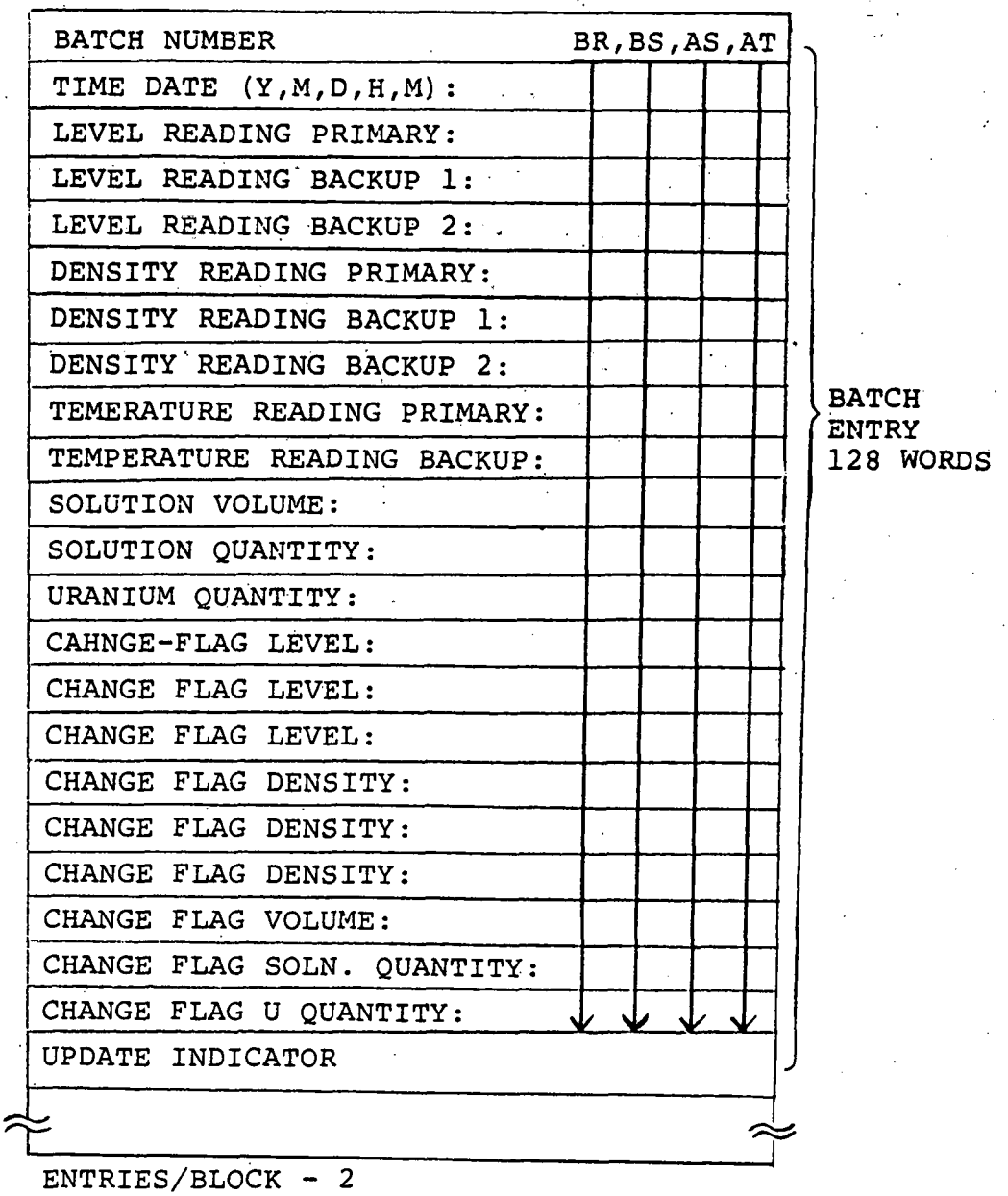


## 6.5 RAW DATA FILE

The Raw Data File is used to store raw data taken during the execution of a measurement program. The data is normally that data acquired from the RTP system. Each entry in the file contains the information about one batch.

Each entry contains eleven elements, each of which contains four items. (See Figure 6-5.) These items are in the order that the measurement programs acquire them. Any item not required by a given measurement program is left null, indicating it is not used. This structure allows the applications program to access and use the raw data, treating all raw measurement data the same.

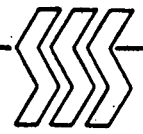
All data stored in the Raw Data File is single-precision, floating-point with the exception of the Time/Date and Batch number (integer) and the change flags (strings).




ENTRIES/BLOCK - 2

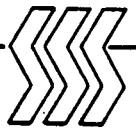
SIX MONTH SIZE - 540 BLOCKS

FIGURE 6-5. RAW DATA FILE



## 6.6 ANALYTICAL DATA FILE

The Analytical Data File is used to store the analytical data received from the LDS. It is managed by the measurement programs. The LDS Driver Program accesses this file in a background mode to complete the insertion of analytical data to the file. The detailed layout of each entry in this file is shown in Figure 6-6.



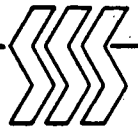
| |
|---|
| BATCH NUMBER |
| LOG NUMBER |
| TIME/DATE (Y,M,D,H,M) |
| P/F INDICATOR |
| LAB DENSITY |
| LAB TEMPERATURE |
| LAB ACID |
| LAB DENSITY AT TANK TEMPERATURE: BR, BS, AS, AT |
| U CONCENTRATION #1 PRIMARY |
| U CONCENTRATION #2: PRIMARY |
| U CONCENTRATION #1: BACKUP |
| U CONCENTRATION #2: BACKUP |
| METHOD #1: PRIMARY |
| METHOD #2: PRIMARY |
| METHOD #1: BACKUP |
| METHOD #2: BACKUP |
| U ISOTOPIC #1: |
| U ISOTOPIC #2: |
| U ISOTOPIC #3: |
| U ISOTOPIC #4: |
| CHANGE FLAG: DENSITY |
| CHANGE FLAG: TEMPERATURE |
| CHANGE FLAG: ACID |
| CHANGE FLAG: DENSITY AT T (BR,BS,AS,AT) |
| CHANGE FLAG: U CONCENTRATION (#1P,#2P,#1B. #2B) |
| CHANGE FLAG: METHOD (#1P, #2P, #1B, #2B) |
| CHANGE FLAG: U ISOTIOPC (#1, #2, #3, #4) |
| UPDATE INDICATOR |
| |

BATCH ENTRY 64 WORDS

ENTRIES/BLOCK - 4
SIX MONTH SIZE - 270 BLOCKS

METHOD: 1 = U-VI
2 = U-VP
3 = U-F
4 = U-MSID

FIGURE 6-6. ANALYTICAL DATA FILE



SECTION IX

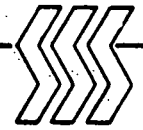
MISCELLANEOUS PROGRAMS

## 9.1 LDS DRIVER/FILE UPDATE PROGRAM

The LDS Driver/File Update Program is the interface between the CNMCAS systems and the Lab Data system. All communications with the LDS is passed through this program.

When the LDS Driver is activated, a Function Code is passed (to the Driver) indicating a Sample Request or Sample Cancellation. The LDS Driver then activates the Sample Request Program in the LDS System, sending all parameters that are required. The Driver sleeps until data is received on the LDS output-only terminal in the Control Room. (All data sent to this terminal is also routed to the LDS Driver.)

The Driver determines if a request is pending for the data just received. If so, the density, temperature, and acid data are sent to the program that requested the data, the U concentration is entered into the Analytical File for that measurement point, and the Batch is marked final. In either case, all data from the LDS output-only terminal is saved in a file for future recall.



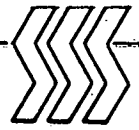
## 9.2 RTP DRIVER PROGRAM

The RTP Driver Program is used to interface the CNMCAS programs to the RTP system. It is a queue-driven program, which means that requests for data from the RTP system are logged into a queue and serviced in an orderly fashion to insure data integrity. It services requests on a first-come-first-serve basis. This program is always in execution, but is not using CPU time unless there are active requests for data from the RTP system.

Parameter passed to this program are:

1) Number of transducers to read
2) Transducer ID #1
3) Transducer ID #n
4) The address of a data buffer to put the transducer readings

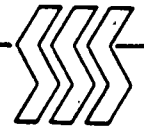
The RTP Driver communicates with the RTP system as if it were a terminal. The Driver puts the terminal in binary mode and sends the request for transducer reads one at a time, waiting for the response before making the next request. When the RTP driver has retrived all of the readings that a user has requested, it puts them into the user's data buffer and signals that user that the transaction is complete. The Driver then examines



the input queue for any pending requests. If there are more requests, it will service the next one. When the queue is empty, the Driver suspends itself waiting for more activity.

Program Download

The RTP Driver Program is built and permanently stored in the CNMCAS system, and is downloaded to the RTP system on command from the RTP system.



## 9.3 DATA BASE MAINTENANCE PROGRAM

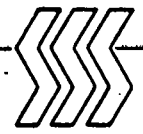
The Data Base Maintenance Program is used to (1) create new Data Bases, and (2) move portions of Data Bases to magnetic tape when their size gets too large. The program is activated by a systems manager, when he wishes to perform one or more of the above functions. He communicates with the program via a system terminal, with dialogue in the form of questions and answers.

When the program is activated when the following message is written to the terminal:

ENTER FUNCTION>

The operator now enters one of the following functions:

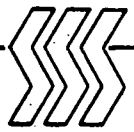
| FUNCTION NAME | DESCRIPTION |
|---|---|
| CREATE | This function is used to create a new measurement point Data Base. The program responds with:<br>ENTER MEASUREMENT POINT ID> XX-XXX<br>The operator now enters XX-XXX, identifying the measurement point the new data base is to apply to. The program responds with:<br>ENTER DATA TYPES> R,A,M,E |



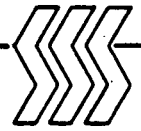
| FUNCTION NAME | DESCRIPTION |
|---|---|
| | The operator now enters all of the data types contained in the Data Base.<br>R = RAW<br>A = ANALYTICAL<br>M = MANUAL<br>E = EXPANSION<br>If there are any errors in the above answers, the program recycles and asks that question again. |

When all questions have been answered correctly, the program builds the Data Base as defined.

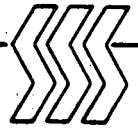
| FUNCTION NAME | DESCRIPTION |
|---|---|
| SAVE | This function is used to save portions of the Data Base System on magnetic tape for historical purposes. The program responds with:<br>ENTER OPTIONS> .Data Base name or ALL.<br>The operator enters the unique Data Base name that he wishes to save, or the word ALL if he wants to save the entire Data Base System. |



| FUNCTION NAME | DESCRIPTION |
|---|---|
| | The program now responds with:<br>ENTER TYPE> IP,n-m or<br>> DA,DD-MMM-YY/DD-MM-YY<br><br>If IP is entered, the program saves the inventory periods n through m of the defined Data Base(s). If DA is entered, the program saves the defined Data Base(s) beginning at DD-MMM-YY through DD-MMM-YY batch entry dates.<br><br>If any errors are detected during entry of the above parameters, the program recycles back to the point of error and allows correction.<br><br>Having successfully entered all parameters, the program responds with:<br>MOUNT TAPE AND ENTER DRIVE ID > mto:<br><br>The operator now must mount a clean magnetic tape on a tape drive and enter the drive ID.<br><br>The program moves all data defined to magnetic tape, and upon completion, performs a read/verify operation or all data that was saved. |



| FUNCTION NAME | DESCRIPTION |
|---|---|
| | After the verify function is complete, the program asks the operator if he would like to delete all saved data from the disk. If the answer is yes, the program deletes all saved data and updates the files. Otherwise, it prompts the ENTER FUNCTION again. |
| NULL | Entry of this function causes the program to terminate. |
| | At the completion of a function execution, the program always recycles to the enter function point. |



## 9.4 DATA BASE EDIT PROGRAM

The Data Base Edit Program is used to edit the master Data Base, which is the primary source of historical data for the CNMCAS system. The program uses a double-password technique, with a timer running between the two passwords for safeguard. This means that in order to activate the program, the operator must correctly enter the second password within a specified period of time.

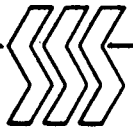
The Edit program provides the capability to change several parameters. Each parameter is listed below by the file that contains that parameter.

Inventory Index File

- Beginning inventory of Uranium quantity

Raw Data File

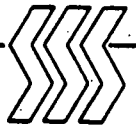
- Level Reading Primary
- Level Reading Backup 1
- Level Reading Backup 2
- Density Reading Primary
- Density Reading Backup 1
- Density Reading Backup 2
- Solution Volume
- Solution Quantity
- Uranium Quantity



Analytical Data File

- Lab Density
- Lab Temperature
- Lab Acid
- Lab Density at Tank Temperature
- U Concentration #1 Primary
- U Concentration #2 Primary
- U Concentration #1 Backup
- U Concentration #2 Backup
- Method #1 Primary
- Method #2 Primary
- Method #1 Backup
- Method #2 Backup
- U Isotopic #1
- U Isotopic #2
- U Isotopic #3
- U Isotopic #4

A change to any of these parameters causes that parameter's unique change flag to be set to a C (indicating Change) and sets the update indicator for that entry (containing the edited parameters). At the completion of the editing session, the Edit program activates the Data Base Edit Update program.



This update program adjusts all other related parameters in the entire Data Base System on the basis of the changed parameter. The update indicator is then reset to show that the Data Base has been updated.

The operator communicates with the Edit program through a system terminal. Unique commands will be defined during detail design.

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX B

## CONTROL-SPEC® FOR THE DATA ACQUISITION SYSTEM (RTP) PROGRAM

Scientific Systems Services, Inc.

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

CONTROL-SPEC ®

FOR THE

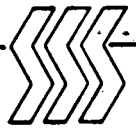
DATA ACQUISITION SYSTEM (RTP) PROGRAM

Prepared for: Allied-General Nuclear Services
P.O. Box 847
Barnwell, South Carolina 29812

Prepared by: Scientific Systems Services, Inc.
1135 John Rodes Boulevard
P.O. Box 610
Melbourne, Florida 32901

Date: February 6, 1979

Document: 1155-101D



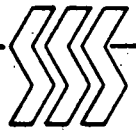
## REVISION HISTORY

The following modifications were made January 17, 1979.

| Page | Modification |
|---|---|
| 1-1 | Paragraph 2 added |
| 2-2 | New equipment added |
| 2-3 | Paragraph 2 added |
| 2-14 | Last paragraph replaced |
| 2-15 | New information |
| 2-16 | New information |
| 2-21 | New information |

The modifications made on February 6, 1979 are:

| Page | Modification |
|---|---|
| 2-4, 2-5, 2-6 | Addition of scan mode four |
| 2-7 | Figure replaced |
| 2-8 | Additional information |
| 2-14, 2-15, 2-16 | Pages replaced |
| 2-22 | Addition of scan mode four |
| 3-4 | Figure replaced |



| Page | Modification |
|---|---|
| 3-5 | Additional information |
| 3-8 | Additional figures |
| 3-9 | |
| 3-10 | |
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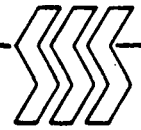
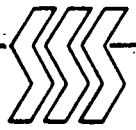


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| 3-7 | CPDT: CALIBRATION POINT DEFINITION TABLE | 3-8 |
| 3-8 | RPDT: RUSKA PDT TABLE | 3-9 |
| 3-9 | RP2T: RUSKA PRIORITY 2 TABLE | 3-10 |
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| 3-11 | DEV: DEVICE TABLE | 3-12 |



# SECTION I

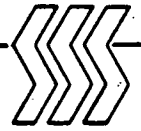
# INTRODUCTION

This CONTROL-SPEC ® is written in response to Allied-General Nuclear Services purchase order #E7-78-C-09-1040. It provides a complete definition of the Data Acquisition System (RTP) program.

This CONTROL-SPEC ® is a revision of CONTROL-SPEC ® FOR THE DATA ACQUISITION SYSTEM (RTP) PROGRAM, SSS document number 1155-101B, dated October 12, 1978. Revisions are marked with a solid vertical bar (1) in the margin for quick identification. A revision history is also included on page i.

The software described is intended to run on a DEC PDP11/04 computer system, with Computer Products, Inc.'s Wide Range Analog Input System. All software will be written in DEC assembly language, using the Computerized Nuclear Materials Control and Accounting System (CNMCAS) hardware.

This CONTROL-SPEC ® includes the following sections: Section II provides a functional description of the software.



# SECTION II

# FUNCTIONAL DESCRIPTION

## 2.1 OVERVIEW

The RTP system is a stand-alone system that constantly monitors up to 1024 transducers connected to it through one or more wide range multiplexers. It is essentially a table driven system in that a set of tables describes all of the transducers, their physical characteristics, and sampling rates.

As the system executes, raw data is stored in memory as a function of the scan mode assigned to each transducer. When the CNMCAS system requests information about a unique transducer, the software retrieves that data from memory, converts it to engineering units, and then sends it to the requestor.

A block diagram of the RTP system hardware is shown in Figure 2-1.

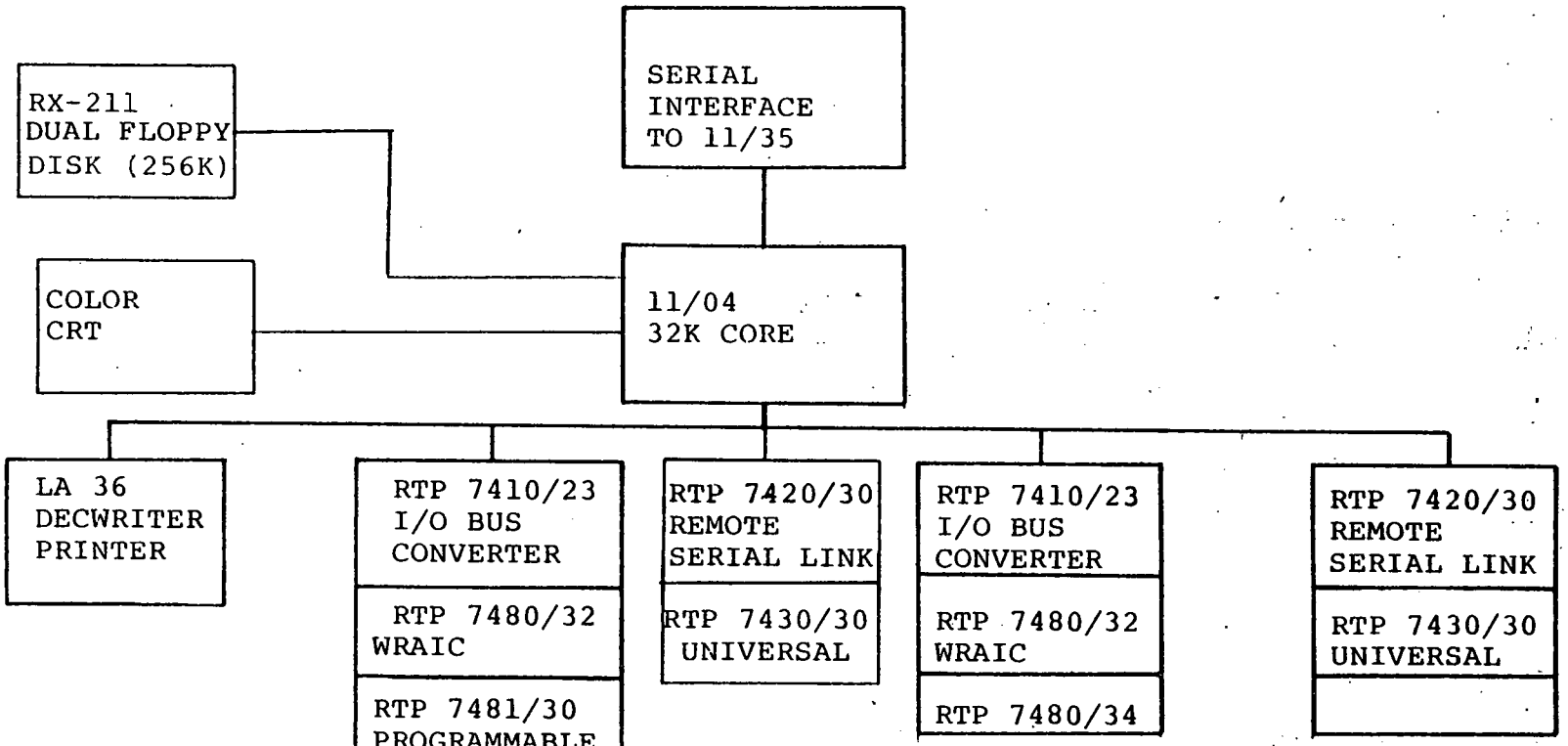



FIGURE 2-1. RTP SYSTEM HARDWARE



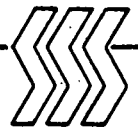
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## 2.2 SYSTEM SOFTWARE LOADING

The RTP software is stored on disk in the CNMCAS system, and downloaded to the RTP system via the serial link. A small bootstrap loader, resident in the 11/04, is activated through the console emulator. The Download program retrieves the load module file from the CNMCAS system disk and sends it to the RTP system. The protocol for sending the load module will be defined in detail during implementation of the RTP system software.

The RTP software is also stored on the floppy disk in the RTP system. A second bootstrap loader, also activiated through the console emulator, loads the RTP software from the floppy.



## 2.3 DATA ACQUISITION

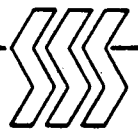
The RTP system will continuously input raw data samples from the Wide Range Analog Input System (WRAIS). Processing of previously read samples may occur while another sample is being taken. Also, samples from different WRAIS controllers may be taken simultaneously.

Each point (see Appendix Definitions) in the system belongs to a unique scan mode, and the subset of points being sampled is defined by the current scan mode.

There are four scan modes which are described in the paragraphs that follow.

Scan Mode 1

Scan Mode 1 is the background scan mode. Samples of points in this mode are continuously input unless a higher scan mode is invoked. The raw data reading (R) of a point in this mode is equivalent to the raw data sample(s).



Scan Modes 2, 3, and 4

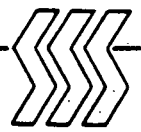
Scan modes higher than 1 are invoked periodically, as defined by the priority scan frequency parameter(PSF). This is a value expressed in minutes. Each of these scan modes has a scan interval parameter (SI) expressed in seconds, and a scan time offset (STO) expressed in seconds.

The scan time interval (SI) defines the length of time that the system will continuously input samples of points in that scan mode. A running accumulation of samples, a count of samples (SC), and the highest and lowest sample values are kept for each point in the scan mode.

At the end of the interval SI, the raw data readings ($R_N$) are computed for each point N in the scan mode as:

$$R_N = \sum_{i=1}^{SC_N} S_i / SC_N$$

For points in Scan Mode 2, the five latest N values of $R_N$ will be held internally for conversion and transmission to CNMCAS on demand.



For points in Scan Mode 3 and 4, the three latest values of $R_N$ will be held.

The scan time offset (STO) defines the relative time within the PSF that the scan mode will be invoked.

Figure 2-2 shows the operation of the RTP subsystem on the basis of some typical scan mode parameter values.

Figure 2-3 shows the typical number of samples per reading, on the basis of the number of points in a high level scan mode versus the scan interval (SI) parameter for that mode.

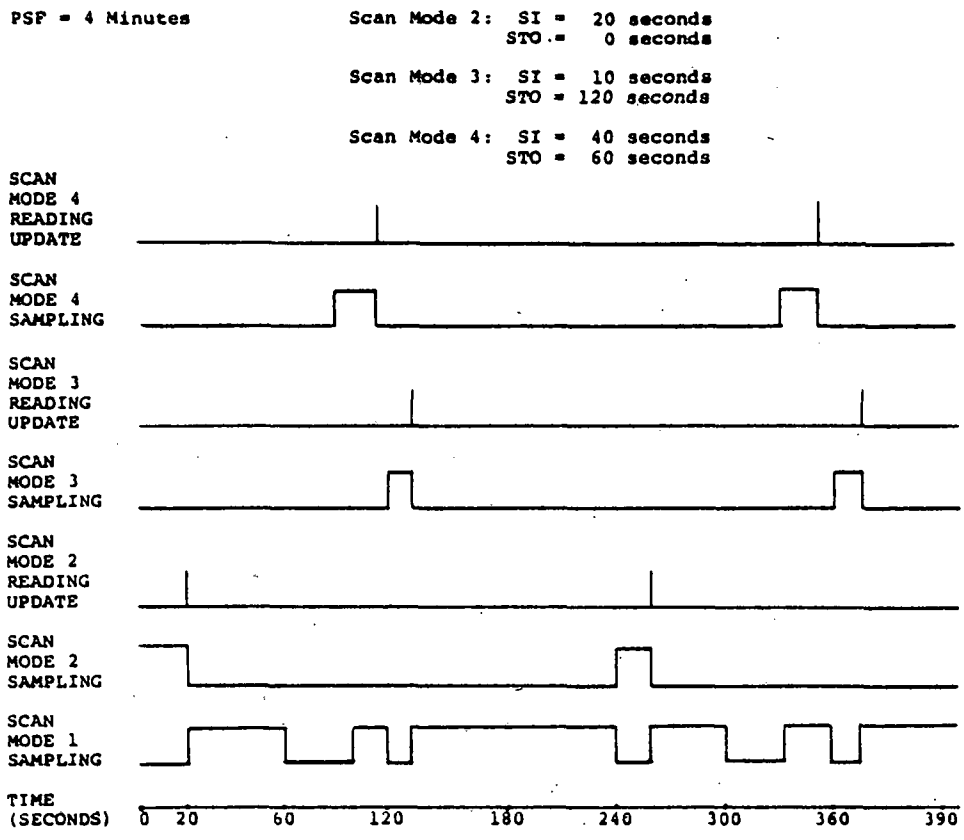



FIGURE 2-2. RTP DATA ACQUISITION FUNCTION WITH TYPICAL SCAN PARAMETERS

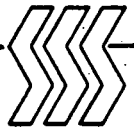
SAMPLES/READING AT 40 SAMPLES/SECOND SCAN INTERVAL
VERSUS NUMBER OF POINTS IN SCAN

| SI | NUMBER OF POINTS IN SCAN | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| SCAN INTERVAL IN SECONDS | | | | | | | | | | | |
| 5 | 40 | 20 | 10 | 6 | 5 | 4 | | | | | |
| 10 | 80 | 40 | 20 | 13 | 10 | 8 | 6 | 5 | 5 | 4 | 4 |
| 20 | 160 | 80 | 40 | 26 | 20 | 16 | 13 | 11 | 10 | 8 | 8 |
| 30 | 240 | 120 | 60 | 40 | 30 | 24 | 20 | 17 | 15 | 13 | 12 |
| 40 | 320 | 160 | 80 | 53 | 40 | 32 | 26 | 22 | 20 | 17 | 16 |

FIGURE 2-3. TYPICAL SAMPLES PER READING



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## 2.4 DATA CONVERSION

Conversion of raw data readings to engineering units (measurements) takes place when:

1. CNMCAS requests a measurement
2. An alarm limit is being checked

Two classes of transducers may be connected to RTP points: standard instruments and thermocouples.

### 2.4.1 Conversion of Standard Instrument Readings

Standard instruments are those whose conversion from voltage to engineering units is a linear function or piecewise-linear function. Taylor, Ruska, and Westinghouse pressure transducers and pressure differential transducers fall into this class. Standard instrument samples are input from the RTP as a 15-bit binary number or as a 5-digit Binary Coded Decimal (BCD) number plus sign (21 bits).

The conversion of a reading (R) of point N, connected to a standard instrument into a measurement M, is defined as:

$$M_N = \text{LIF } (CV_N, LITP_N) \text{ or PLIF } (CV_N, PLITP_N)$$

where

$LITP_N$ or $PLITP_N$ is the pointer to the linear or piecewise-linear interpolation

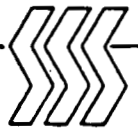


table (PLIT) entry associated with point N. (See Definition Appendix for definitions of the LIF and PLIF functions.)

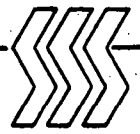
2.4.2 Conversion of Thermocouple Class Readings

Thermocouple class measurements are expressed in degrees Celsius. The range of these measurements is from $0^{o}C$ to $132^{o}C$. They are converted from millivolts using the piecewise-linear interpolation function (PLIF), with a maximum of 16 interpolation points.

Before the conversion from voltage to degrees Celsius can take place, a correction for thermocouple-to-copper junction error is made. This is done by first computing the temperature of the unithermal reference plate ($T_{UTR}$) in which the junctions occur. (See Section 2.5.) The degrees Celsius reading is converted to millivolts, and this correction is added to the calibrated voltage reading of the thermocouple point.

Symbolically, a temperature measurement, M, of a thermocouple point N in degrees Celsius is:

$$M_N = PLIF(PLIF(T_{UTR}, PLIT_{UTR}) + CV_N, PLIT_N)$$



## 2.5 UTR PLATE TEMPERATURE COMPUTATION

Each UTR plate has two analog inputs attached to RTP points, D1 and D2. (Refer to CPI document PM 070-052/53B for detailed description of hardware.)

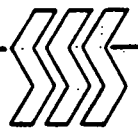
Points D1 and D2 are placed in Scan Mode 1 so that their readings are always current.

A UTR Temperature $T_{UTR}$ is defined as:

$$T_{UTR} = K_1 \left( \frac{CV_{D2}}{CV_{D1}} - K_2 \right) + K_3$$

where

$K_1$ and $K_2$ are constants associated with this particular UTR plate, and $K_3$ is a temperature correction constant.



## 2.6 AUTOMATIC VOLTAGE CALIBRATION

If a WRAIS includes a programmable voltage calibrator (PVC), raw voltage readings of points are converted to calibrated voltage readings before being converted to measurement (engineering units).

There are 13 consecutive entries in the Linear Interpolation Table (LIT), one for each gain value. Conversion of a raw voltage reading of point n, $R_N$, into a calibrated voltage reading $CV_N$ is defined as:

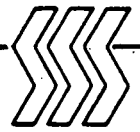
$$CV_N = LIF(RV_N, LITP_{GAIN_N})$$

If a WRAIS does not have a PVC:

$$CV_N = RV_N$$

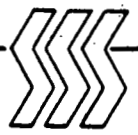
Calibration Data Update Task

Each programmable voltage calibrator has eight analog inputs attached to eight RTP points. These points are not contained in any of the scanning modes.



Periodically, normal scanning is suspended and 26 readings are taken, two for each of the 13 gains (one each at 0.0V and one each at 40% or 80% of full scale). These readings are converted to millivolts held as the Y-values of the calibration entries in the LIT.

The frequency of execution of this task is specified by the Calibration Task Frequency parameter (CTF) in minutes.

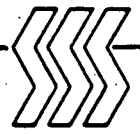


## 2.7 ALARM LIMITS CHECKING AND REPORTING

The Alarm Limits Checking task examines each point in the system. If a point has associated alarm limits, the latest reading is converted to a measurement in engineering units. This measurement is compared to the point's associated alarm limits. If the measurement falls outside these limits, alarm messages are sent to three devices:

1. Intecolor 8001 color CRT
2. Computer link to the Safeguards computer
3. Floppy disk

As each alarm value is detected, a display line is built and stored in one of four page buffers dedicated to the color CRT. Each page buffer contains a header and a maximum of 23 alarm messages. Two unique colors emphasize whether the alarm value is above or below limits. When page one is filled, a special color key is inserted in the header and page two is filled. If an alarm is generated after page four is filled, the last message in page four is overwritten. Also, the same special color key is inserted in the header on page four. The format of each 80-byte alarm



message is as follows:

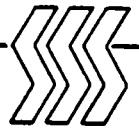
| TIME | DATE | MEAS PT # | MEAS PT NAME | INSTR # | LO LIMIT | HI LIMIT | MEASUREMENT |
|---|---|---|---|---|---|---|---|
| XX:XX:XX | XX-XX-XX | XX-XX | XX-X-XXXX | XXX-XXXX-XX | XXX.XX | XXX.XX | XXX.XX |

When all measurement points have been checked, one of the page buffers is displayed on the color CRT. The operator can select which page is displayed or let the program default to page one.

As each alarm value is detected, a message identical to the one put in the page buffer is transmitted to the Safeguards computer via a communication link. In addition, when the value of a point returns to within alarm limits, the following message is sent to the Safeguards computer:

TIME DATE MEAS. PT # XX-XX WITHIN RANGE

As each alarm value is detected, a message similar to the one put in the page buffer is sent to the floppy disk system. The message contains no color information and is 64 bytes long. One-half of a Floppy diskette is reserved for alarm data allowing a maximum of 2048 alarm messages to be stored. When this number is exceeded, the file is rewound and overwritten. When the value of a point returns to



within alarm limits, the "within range" message described above is stored on the floppy. The operator can request a printout of the alarm data stored on the floppy disk. The data is printed on the LA36 Decwriter.

The operator can also request a hard copy printout of all alarming points. The Alarm task examines each point in the system. For each point whose value is out of range, a message similar to the one for the CRT is built and printed on the LA36.

From the console device the operator can inhibit and re-enable alarm reporting. This can be done both for individual points or for all points.



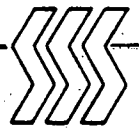
## 2.8 CNMCAS - RTP COMMUNICATIONS

The purpose of CNMCAS - RTP communications is to allow CNMCAS to obtain the most recent readings on any specified transducer.

The RTP system is always ready to accept a request for information, except when it is in the process of transferring information due to a previous request.

A request for a reading comes from CNMCAS on a 3-word command specifying a function code, a transducer point number, and an instrument type. (See Figure 2-4.)

RTP responds with a 13-word buffer specifying the number of readings, success code, transducer point number, and the requested readings. (See Figure 2-5.) Each reading is a 32-bit, single-precision, floating-point number representing the value of the reading in engineering units associated with that transducer. If multiple readings are requested, they are transmitted in reverse chronological order (for example, the most recent and then the next most recent). An example of CNMCAS - RTP communications is presented in Figure 2-6.



RTP DATA REQUEST FORMAT

| | |
|---|---|
| WORD 0 (16 Bits) | FUNCTION CODE |
| | 1 = send most recent reading of a point. |
| | 2 = send last 2 readings of a point. |
| | 3 = send last 3 readings of a point. |
| | 4 = send last 4 readings of a point. |
| | 5 = send last 5 readings of a point. |
| | 6 = send all readings outside of alarm limits. |
| WORD 1 (16 Bits) | TRANSDUCER POINT NUMBER |
| WORD 2 (16 Bits) | INSTRUMENT TYPE |
| | 0 = Analog |
| | 1 = Ruska |

FIGURE 2-4. RTP DATA REQUEST FORMAT



RTP RESPONSE FORMAT

| | | |
|---|---|---|
| WORD 0 | (16 Bits) | NUMBER OF GOOD DATA VALUES RETURNED |
| WORD 1 | (16 Bits) | SUCCESS CODE |
| | | Equal to requested function code implies successful |
| | | 7 = have sent all points outside alarm limits |
| | | -1 = illegal function code requested |
| | | -2 = illegal transducer point number requested |
| WORD 2 | (16 Bits) | TRANSDUCER POINT NUMBER |
| WORD 3 | (16 Bits) | FLOATING-POINT VALUE (most significant half) |
| WORD 4 | (16 Bits) | FLOATING-POINT VALUE (least significant half) |
| WORD 5 | (16 Bits) | FLOATING-POINT VALUE (most significant half) |
| WORD 6 | (16 Bits) | FLOATING-POINT VALUE (least significant half) |
| WORD 7 | (16 Bits) | FLOATING-POINT VALUE (most significant half) |
| WORD 8 | (16 Bits) | FLOATING-POINT VALUE (least significant half) |
| WORD 9 | (16 Bits) | FLOATING-POINT VALUE (most significant half) |
| WORD 10 | (16 Bits) | FLOATING-POINT VALUE (least significant half) |
| WORD 11 | (16 Bits) | FLOATING-POINT VALUE (most significant half) |
| WORD 12 | (16 Bits) | FLOATING-POINT VALUE (least significant half) |

FIGURE 2-5. RTP RESPONSE FORMAT

EXAMPLE OF CNMCAS-RTP COMMUNICATIONS

| CNMCAS Sends: | | | RTP Sends: | | |
|---|---|---|---|---|---|
| WORD 0: | 2 | Request two most | WORD 0: | 1 | Number of good data values |
| WORD 1: | 9 | recent readings of | WORD 1: | 2 | Success code:OK |
| WORD 2: | 0 | transducer number 9 | WORD 2: | 9 | Transducer number 9 |
| | | | WORD 3: | XX | |
| | | | WORD 4: | XX | Floating-point data value |
| | | | WORD 5: | XX | |
| | | | WORD 6: | XX | Floating-point data value |
| | | | WORD 7: | YY | |
| | | | WORD 8: | YY | Floating-point representation of 999.99 |
| | | | WORD 9: | YY | |
| | | | WORD 10: | YY | |
| | | | WORD 11: | YY | |
| | | | WORD 12: | YY | |

END OF DIALOGUE

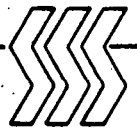
| | | | | | |
|---|---|---|---|---|---|
| WORD 0: | 3 | Request 3 most recent | WORD 0: | | Number of good data values |
| WORD 1: | 1500 | readings of transducer | WORD 1: | -2 | Success code: Illegal transducer number |
| WORD 2: | 0 | number 1500 | WORD 2: | 1500 | Transducer number 1500 |
| | | | WORD 5: | YY | |
| | | | WORD 6: | YY | Floating-point representation of 999.99 |
| | | | WORD 7: | YY | |
| | | | WORD 8: | YY | |
| | | | WORD 9: | YY | |
| | | | WORD 10: | YY | |
| | | | WORD 11: | YY | |
| | | | WORD 12: | YY | |

END OF DIALOGUE

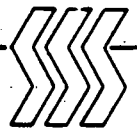
FIGURE 2-6. EXAMPLE OF CNMCAS-RTP COMMUNICATIONS



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In response to requests for readings from Ruska Instruments, data values sent to CNMCAS are adjusted by the Ruska zero value. After the Ruska data values are collected, the Ruska instrument is zeroed and a zero reading is taken. This zero reading is subtracted from the data value and the result is sent to CNMCAS. The zero reading is taken when the active scan mode is equal to one to ensure that the zero readings are not included in the historical averages.



## 2.9 POWER FAIL/RESTORE PROCEDURES

The power fail software logic operates in the following manner. When power is restored after a power failure, the system will reinitialize itself and continue to operate as defined. This obviates downloading the program from CNMCAS after a power failure affecting the RTP subsystem only.

Reinitialization includes all historical readings of points in scan priorities 2, 3 and 4.



# SECTION III

## CNMCAS RTP DATA BASE STRUCTURE

The data base is designed to be independent of the software logic, easily changed and expandable.

The data base is divided into two sections (Figure 3-1). The first section contains table pointers and parameter values, which are accessed as an absolute offset from the data base start. The second section contains the tabular information as shown in Figures 3-2 through 3-6. Each table is individually expandable, and contains a variable number of entries. Additional tables and parameters are easily added.

Figure 3-1 shows the general structure of the data base and Figures 3-2 through 3-11 define the entry and data formats of all tables.

CNMCAS AGNS RTP SYSTEM DATA BASE STRUCTURE

(All Table pointers are byte address offsets from the data base start.)

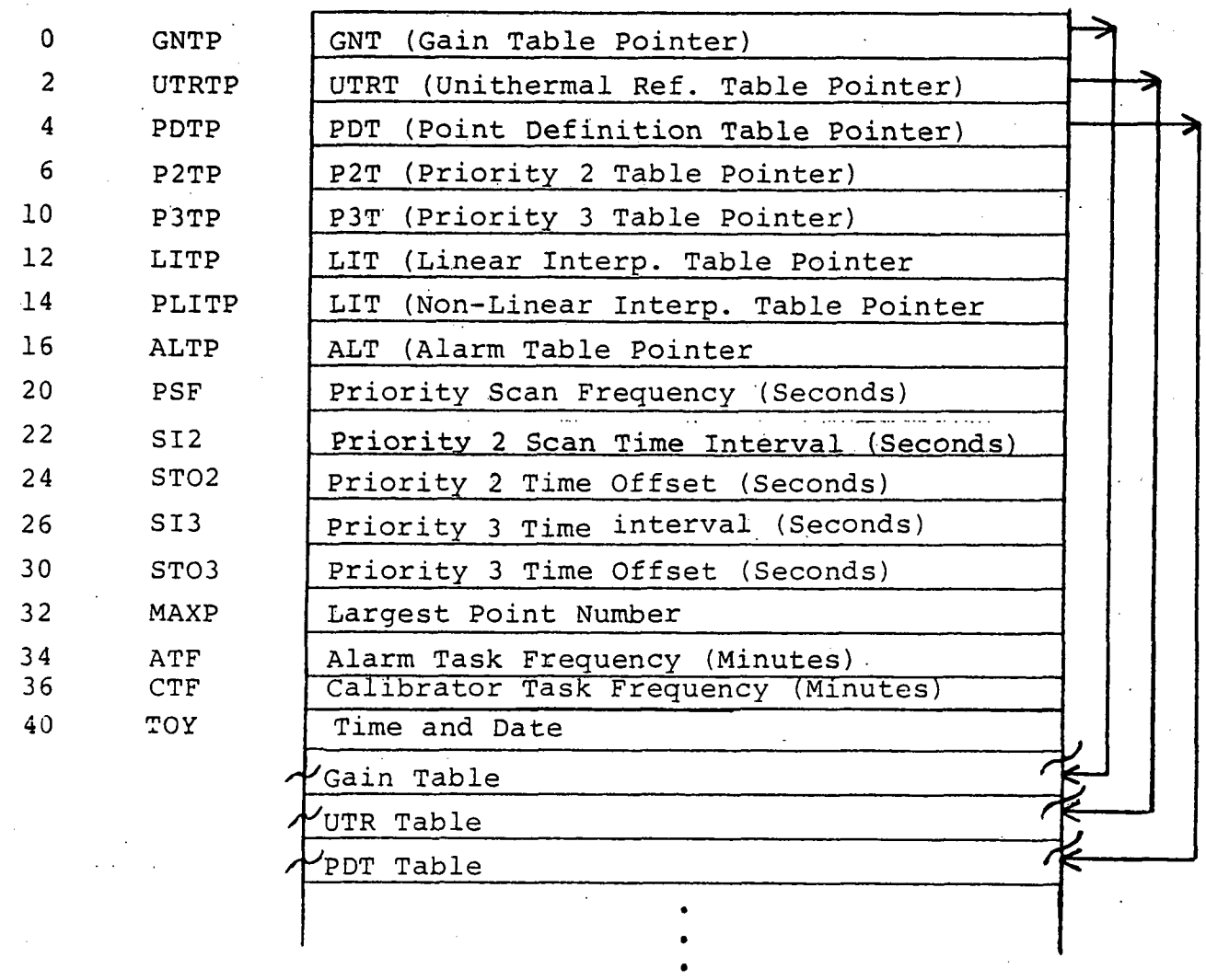



FIGURE 3-1. CNMCAS AGNS RTP SYSTEM DATA BASE STRUCTURE

GNT: Gain Table

26 words as 13 floating-point numbers, one for each gain range representing a constant which, when multiplied by a raw datum, gives a reading in millivolts.

UTRT: Unithermal Reference Table

8 words/entry

16 entries maximum

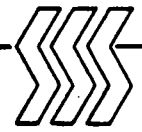
| | | |
|---|---|---|
| Word 1 | PDT Pointer to $D_1$ | |
| Word 2 | PDT Pointer to $D_2$ | |
| Words 3 & 4 | $K_1 = 5500./(R_A - R_C)$ | F. P. Number |
| Words 5 & 6 | $K_2 = R_C/100.$ | F. P. Number |
| Word 7 | PLIT Pointer (°C → mv) | F. P. Number |
| Word 8 | Unused | |

where: $R_A$ and $R_C$ are constants associated with each UTR plate, $K_3 = -.045$ °C

and temperature of the UTR plate in °C is:

$$T_{UTR} = K_1 (CV_{D2}/CV_{D1} - K_2) + K_3$$

FIGURE 3-2. GNT AND UTRT TABLES



FOUR WORDS PER ENTRY
MAXIMUM 1024 ENTRIES
POSITION IN TABLE IMPLIES
WRAIS CHANNEL AND ADDRESS

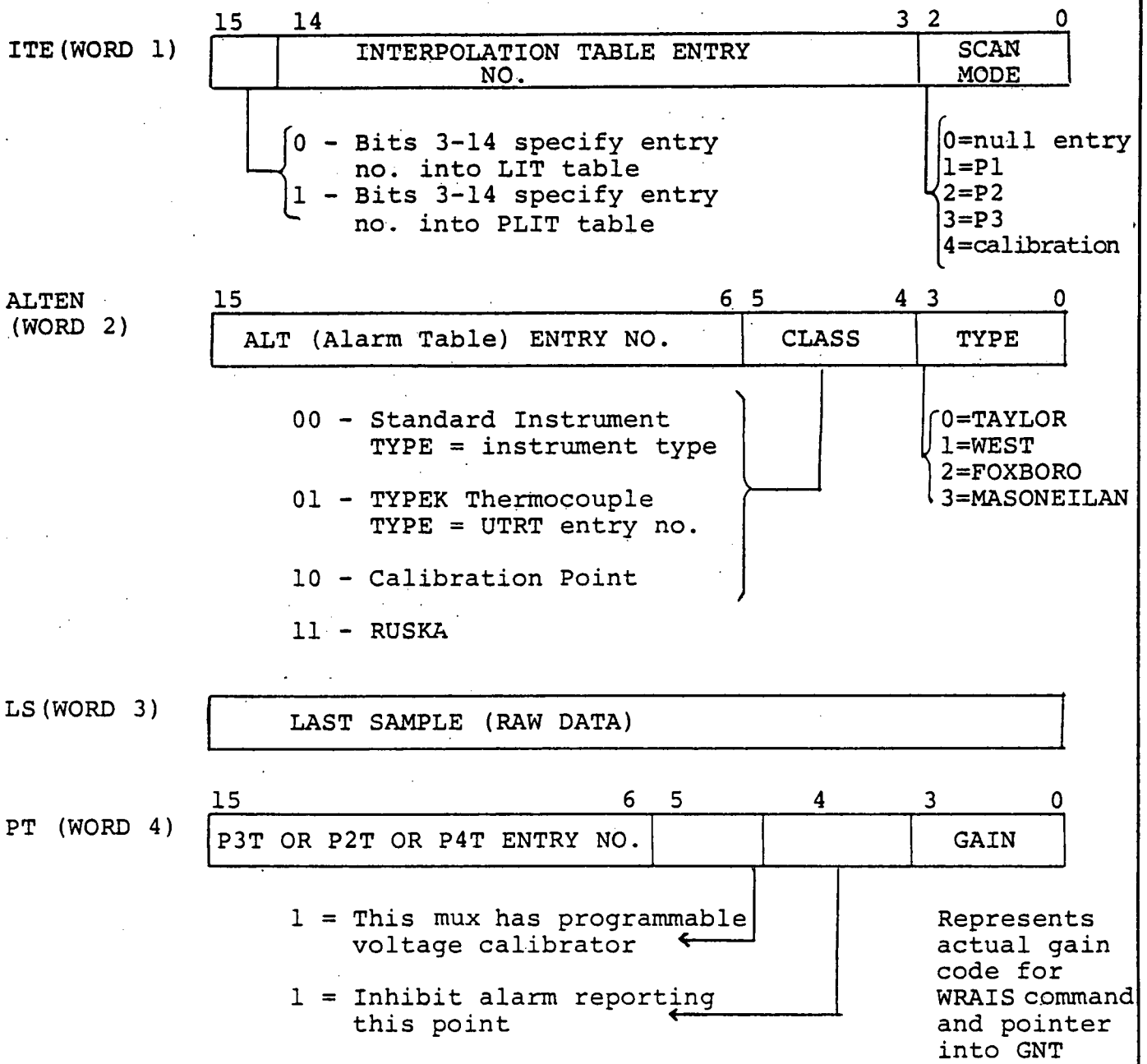
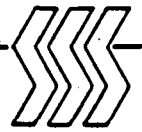



FIGURE 3-3. PDT: TRANSDUCER POINT DEFINITION TABLE



P2T: PRIORITY 2 TABLE -10 WORDS/ENTRY

P3T: PRIORITY 3 TABLE - 8 WORDS/ENTRY

P4T: PRIORITY 4 TABLE - 8 WORDS/ENTRY

| | | |
|---|---|---|
| WORD 1<br>WORD 2 | DOUBLE PRECISION INTEGER<br>SUM OF SAMPLES ( S) | |
| WORD 3 | SAMPLE COUNT (SC) | |
| WORD 4 | LO SAMPLE | |
| WORD 5 | HI SAMPLE | |
| WORD 6 | MOST RECENT READING ( Σ S/SC) | |
| WORD 7 | 2ND MOST RECENT READING | |
| WORD 8 | 3RD MOST RECENT READING | |
| WORD 9 | 4TH MOST RECENT READING | P2T Only |
| WORD 10 | 5TH MOST RECENT READING | |

FIGURE 3-4. P2T, P3T, and P4T TABLES

LIT: LINEAR INTERPOLATION TABLE

8 Words/entry as 2 pairs of floating point numbers

Words 1 + 2: Point 1($X_1$) value (millivolts)
Words 3 + 4: Point 1($Y_1$) value (EGUs)
Words 5 + 6: Point 2($X_2$) value (millivolts)
Words 7 + 8: Point 2($Y_2$) value (EGUs)

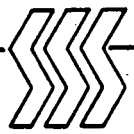
The first 13 entries of the LIT are calibration correction functions for automatic voltage correction. The Y values are computed by the Calibration task.

| | $X_1$ | $Y_1$ | $X_2$ | $Y_2$ |
|---|---|---|---|---|
| Entry 1 | 0.0 | Gain 1 Reading @0.0 | 8192. | Gain 1 Reading @8192 mv |
| 2 | 0.0 | Gain 2 Reading @0.0 | 2048. | Gain 2 Reading @2048 mv |
| 3 | 0.0 | Gain 3 Reading @0.0 | 2048. | Gain 3 Reading @2048 mv |
| 4 | 0.0 | Gain 4 Reading @0.0 | 512. | Gain 4 Reading @ 512 mv |
| 5 | 0.0 | Gain 5 Reading @0.0 | 512. | Gain 5 Reading @ 512 mv |
| 6 | 0.0 | Gain 6 Reading @0.0 | 128. | Gain 6 Reading @ 128 mv |
| 7 | 0.0 | Gain 7 Reading @0.0 | 128. | Gain 7 Reading @ 128 mv |
| 8 | 0.0 | Gain 8 Reading @0.0 | 32. | Gain 8 Reading @ 32 mv |
| 9 | 0.0 | Gain 9 Reading @0.0 | 32. | Gain 9 Reading @ 32 mv |
| 10 | 0.0 | Gain 10 Reading @0.0 | 8. | Gain 10 Reading @ 8 mv |
| 11 | 0.0 | Gain 11 Reading @0.0 | 8. | Gain 11 Reading @ 8 mv |
| 12 | 0.0 | Gain 12 Reading @ 0.0 | 2. | Gain 12 Reading @ 2 mv |
| 13 | 0.0 | Gain 13 Reading @ 0.0 | 2. | Gain 13 Reading @ 2 mv |

FIGURE 3-5. LINEAR INTERPOLATION TABLE



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PLIT: PIECEWISE-LINEAR INTERPOLATION TABLE

2n Words/entry as M-1 pairs of floating point numbers as per LIT, giving a variable number of linear interpolation pairs, maximum. M=16

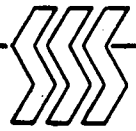
ALT: ALARM TABLE

4 Words/entry as 2 floating point values

Words 1 + 2: Low Alarm Value

Words 3 + 4: High Alarm Value

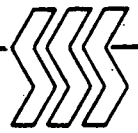
FIGURE 3-6. PLIT AND ALT TABLES



SIX WORDS PER ENTRY

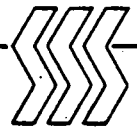
| MNEMONIC | |
|---|---|
| CN (Word 1) | CHANNEL NUMBER |
| GAIN (Word 2) | GAIN |
| RAWV (Word 3) | RAW VALUE |
| LADD (Word 4) | LIT TABLE ADDRESS |
| LOFF (Word 5) | LIT TABLE OFFSET |
| LENT (Word 6) | LIT TABLE ENTRY NUMBER |

FIGURE 3-7. CPDT: CALIBRATION POINT DEFINITION TABLE



| OFFSET | MNEMONIC | 3WORDS/ENTRY |
|---|---|---|
| 0 | RLS | LAST SAMPLE MOST SIGNIFICANT |
| 2 | | LAST SAMPLE LEAST SIGNIFICANT |
| 4 | RPT | RP2T ENTRY NUMBER |

FIGURE 3-8 . RPDT: RUSKA PDT TABLE



| OFFSET | | WORD | 18 WORDS/ENTRY |
|---|---|---|---|
| 0 | RSS | 1 | SUM MOST SIGNIFICANT |
| 2 | | 2 | SUM LEAST SIGNIFICANT |
| 4 | | 3 | SUM FRACTION |
| 6 | RSC | 4 | SAMPLE COUNT |
| 10 | RLOSAM | 5 | LOWEST SAMPLE MOST SIGNIFICANT |
| 12 | | 6 | LOWEST SAMPLE LEAST SIGNIFICANT |
| 14 | RHISAM | 7 | HIGHEST SAMPLE MOST SIGNIFICANT |
| 16 | | 8 | HIGHEST SAMPLE LEAST SIGNIFICANT |
| 20 | RMRR | 9 | MOST RECENT READ MOST SIGNIFICANT |
| 22 | | 10 | MOST RECENT READ LEAST SIGNIFICANT |
| 24 | | 11 | 2nd READ MOST SIGNIFICANT |
| 26 | | 12 | 2nd READ LEAST SIGNIFICANT |
| 30 | | 13 | 3rd READ MOST SIGNIFICANT |
| 32 | | 14 | 3rd READ LEAST SIGNIFICANT |
| 34 | | 15 | 4th READ MOST SIGNIFICANT |
| 36 | | 16 | 4th READ LEAST SIGNIFICANT |
| 40 | | 17 | 5th READ MOST SIGNIFICANT |
| 42 | | 18 | 5th READ LEAST SIGNIFICANT |

FIGURE 3-9. RP2T: RUSKA PRIORITY 2 TABLE

EACH ENTRY IS 8 WORDS IN LENGTH

| | OFFSET | WORD 1 | WORD 2 | WORD 3 | WORD 4 | WORD 5 |
|---|---|---|---|---|---|---|
| ENTRY 0 | 000000 | YEAR | DAYS | HRS | MIN | SEC |

| OFFSET | WORD 6 | WORD 7 | WORD 8 |
|---|---|---|---|
| 000014 | FUNCTION CODE 1 | POINTER OF FREQUENCY TIME | POINTER TO OFFSET TIME |
| | | PSF | STO2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ENTRY 1 | 000020 | YEAR | DAYS | HRS | MIN | SEC |

| | | | |
|---|---|---|---|
| 000034 | FUNCTION CODE 2 | POINTER OF FREQUENCY TIME | POINTER TO OFFSET TIME |
| | | PSF | STO3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ENTRY 2 | 000040 | YEAR | DAYS | HRS | MIN | SEC |

| | | | |
|---|---|---|---|
| 000054 | FUNCTION CODE 3 | POINTER OF FREQUENCY TIME | POINTER TO OFFSET TIME |
| | | PSF | SICO2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ENTRY 3 | 000060 | YEAR | DAYS | HRS | MIN | SEC |

| | | | |
|---|---|---|---|
| 000074 | FUNCTION CODE 4 | POINTER TO FREQUENCY TIME | POINTER TO OFFSET TIME |
| | | PSF | SICO3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ENTRY 4 | 000100 | YEAR | DAYS | HRS | MIN | SEC |

| | | | |
|---|---|---|---|
| 000114 | FUNCTION CODE 5 | POINTER TO FREQUENCY TIME | POINTER TO OFFSET TIME |
| | | CTF | CTO |

FIGURE 3-10. TTBL: TIME TABLE

EACH ENTRY IS TEN WORDS IN LENGTH

| | OFFSET 0<br>WORD 2 | WORD 2 | WORD 3 | WORD 4 |
|---|---|---|---|---|
| ENTRY 0 FOR CPI 7480 | CPICO-ADDRESS OF COMMAND OUT | CPIDO-ADDRESS OF DATA OUT | CPIDI-ADDRESS OF DATA IN | CPISI-ADDRESS OF STATUS IN |

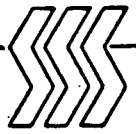
| | OFFSET 000012<br>WORD 6 | WORD 7 |
|---|---|---|
| WORD 5 | | |
| NCHW-NO. OF CHANNELS WIRED | PTCHO-PT. NO. OF CHO IN THIS DEVICE | PVC INFO WORD BIT0=1 THEN DEVICE CONTAINS PVC |

| WORD 8 | WORD 9 | WORD 10 |
|---|---|---|
| DISP-DI SCRATCH PAD | PRCH-PRESENT CHANNEL NO INDEX | ERROR COUNT WORD USED BY "INPUT" AND "COLLECT" |

FIGURE 3-11. DEV: DEVICE TABLE



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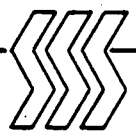
# SECTION IV

## DELIVERABLE ITEMS

Scientific Systems Services, Inc. intends to supply the following items with the RTP system software:

- Program Source Listings
- Source Code on Disc
- Object/Load Modules on Disc
- Program Documentation (flow diagrams, write-ups)
- Operational Instruction Manual
- Acceptance Test Procedure (ATP)

All of the above items will be delivered at the conclusion of the software effort except for the Acceptance Test Procedure. It will be written and submitted to AGNS for approval sometime before completion of the project. After AGNS has ratified the ATP procedure, an ATP demonstration will be scheduled and performed at the end of the checkout phase.



APPENDIX

DEFINITIONS



DEFINITIONS

Point (N): A number N, $0 \leq N \leq 1023$ uniquely specifying an analog input channel of the WRAIS

Sample $(S_N)$: A sample (Raw Data) input from point N

A 16-bit 2s complement number:

$$-16384 \leq S < 16384$$

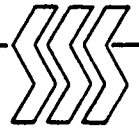
Reading $(R_N)$ : A raw data reading of point N. Defined as $R_N = \sum_{i=1}^{SC_N} Si/SC_N$

where: SC is the sample count.

R is a 16 bit 2's complement number: $-16384 \leq R < 16384$

(For single sample readings, SC=1 and $R_N \equiv S_N$

Raw Voltage Reading $(RV_N)$: Raw Voltage Reading of point N. A floating-point number representing a reading of point N in millivolts. Calculated as: $(R_N)$ X (Gain Table Entry for point N)



Calibrated Voltage Reading ($CV_N$): Calibrated Voltage Reading of point N.

Calculated as: $CV_N = LIF\ (RV_N, LITP_{GAIN_N})$

Linear Interpolation function $LIF\ (X, LITP_x)$: Linear Interpolation function of X and pointer. X is a floating-point number. $LITP_x$ point to four consecutive floating-point numbers: $X_1, Y_1, X_2, Y_2 =$

$$\frac{X-X_1}{X_2-X_1}\left(Y_2-Y_1\right) + Y_1$$

Piecewise-Linear Interpolation function:

$$PLIF(X, PLIT_x) = LIF(X, LITP_{x_i})$$

where: $LITP_{x_i}$ points to four consecutive values: $X_i, y_i, x_{i+1}, y_{i+1}$

so that: $x_i \leq X < X_{i+1}$

PSF = 4 Minutes

Scan Mode 2: SI = 20 seconds
STO = 0 seconds

Scan Mode 3: SI = 10 seconds
STO = 120 seconds

Scan Mode 4: SI = 40 seconds
STO = 60 seconds

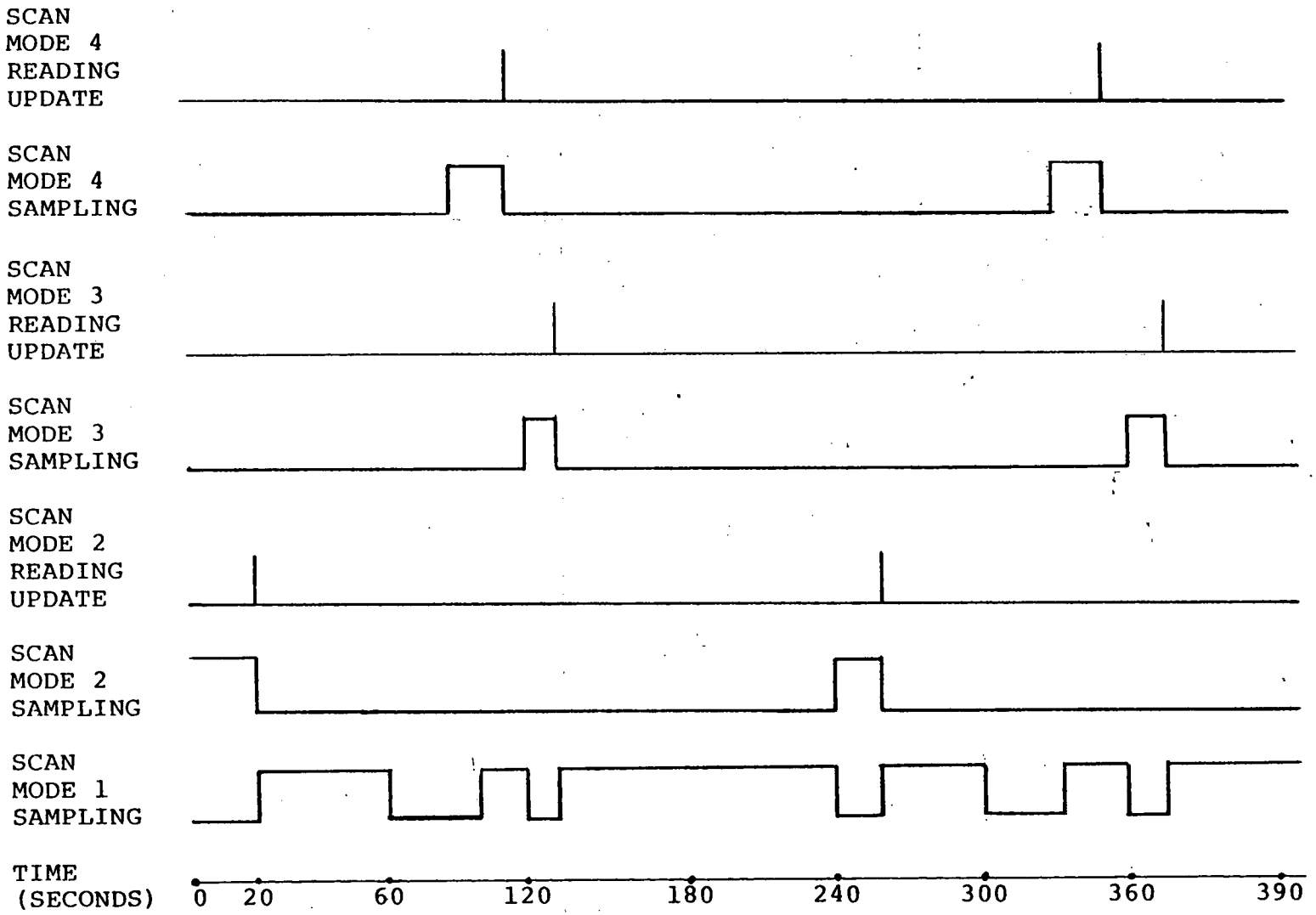



Fig. 2-2 Master List CS

| TIME | DATE | MEAS PT # | MEAS PT NAME | INSTR # | LO LIMIT | HI LIMIT | MEASUREMENT |
|---|---|---|---|---|---|---|---|
| XX:XX:XX | XX-XX-XX | XX-XX | XX-X-XXXX | XXX-XXXX-XX | XXX.XX | XXX.XX | XXX.XX |

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX C

## CNMCAS SOFTWARE/DATA BASE - FY 1979

B. Wesley Rogers

November 1979

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Appendix C lists the programs, modules, and data base files developed and used for the Uranium Input/Output Demonstration Program for FY 1979. The lists are tabulated as follows:

- Table C-1: Measurement Programs and Modules
- Table C-2: Data Base/Accounting Programs and Modules
- Table C-3: Measurement Control Programs and Modules
- Table C-4: Laboratory Data System Communication Programs and Modules
- Table C-5: Remote Data Acquisition System Programs and Modules
- Table C-6: Miscellaneous/Support Programs
- Table C-7: Data Base Files

Information presented in the tables includes program/module/file name, identifier, and purpose.

Many of the data base files are represented by a letter followed by a five-digit number. In this representation, the five-digit number corresponds to the measurement point number associated with a particular vessel, while the prefixing letter denotes the type of data file. Table C-7 identifies these files with the letter followed by "nnnnn" (Ex. Xnnnnn). The "nnnnn" stands for the five-digit measurement point number.

## TABLE C-1

## MEASUREMENT PROGRAMS AND MODULES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Accountability Tank Measurement Program -- installed as: | P02003 M03 | Coordinate the measurement sequence for the Accountability Tank. |
| 2. | Uranium Product Sample Tank Measurement Program -- installed as: | P02007 M07 | Coordinate the measurement sequence for the Uranium Product Sample Tank. |
| 3. | HWW Sample Tank Measurement Program -- installed as: | P02023 M23 | Coordinate the measurement sequence for the HWW Sample Tank. |
| 4. | GPW Check Tank Measurement Program -- installed as: | P02028 M28 | Coordinate the measurement sequence for the GPW Check Tank. |
| 5. | Calculation Module | CALC | Make instrument and solution comparisons, convert RTP readings, calculate liquid level, volume (via TVOL), and solution quantities; initialize batch parameters, mark option and marginal indicators. |
| 6. | Volume Calculation Module | TVOL | Calculates solution volume given level and density. |
| 7. | Password module | PAS | Determines if an entered supervisor password is valid. |
| 8. | Operator Initials Module | OPI | Requests and stores the operator's initials at each step of the measurement sequence. |
| 9. | Branch Option Module | OPT | Based on operator decision, performs a branch to the desired step in the measurement sequence. (Ex. If, for any reason, an invalid measurement is taken, the operator can decide to remeasure.) |
| 10. | Measurement Data Collection Module | RTP | Assembles measurement request parameters and initiates measurement requests and recieves measurement data from the preprocessor. |
| 11. | Reading Summary Module | RUS | Summarizes measurement readings for operator approval. |
| 12. | LDS Communication Module | LDS | Puts a request for laboratory sample in the LDS request buffer. |
| 13. | Time and Date Module | YMDHM | Get the current time and date utilizing the system clock. |
| 14. | Initialization Module | INIT | Initialize the temporary data file and common area at the start of each batch. |
| 15. | Response Module | RES | Get a 'YES' or 'NO' response from the terminal. |
| 16. | Quantity Transferred Versus Recieved | QTVRC | Compare the quantity transferred from the Product Tank with that recieved at the Accountability Tank. |
| 17. | Measurement Status Module | STAT | Update the Measurement Status data file to indicate the current stage of the measurement sequence. |
| 18. | Vessel Input Module | VES | Get a vessel ID from the terminal and store it in the temporary data file. |
| 19. | Data Base Update Module | DBUD | Update the permanent data base with batch measurement data at the end of a batch measurement sequence. |
| 20. | Lab Uranium Concentration Module | LUC | Check to see if the uranium concentration results have returned from the laboratory yet. |

TABLE C-1 (CONTINUED)

MEASUREMENT PROGRAMS AND MODULES

| | Name | ID | Purpose |
|---|---|---|---|
| 21. | Lab Data Module | LDAT | Check to see if all lab data except for uranium concentration has returned from the lab yet. |
| 22. | Send RTP Request Module | SEND | Format the RTP Measurement request parameters and place the measurement request in the RTP request buffer queue in preparation for transmittal to the RTP system. |
| 23. | Temporary File Update Module | TPUD | Update the temporary data file. |
| 24. | Measurement Trend History Table Module | TABLE | Print a table of measurement trend history at the operator's terminal after each measurement in a batch measurement sequence. |
| 25. | Batch Summary Module | SUM | Print the batch summary form at the operator's terminal and at the NMC Administration office. |

## TABLE C-2

## DATA BASE/ACCOUNTING PROGRAMS AND MODULES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Accounting Main Program | ACCPGM | To update the solution volumes and quantities whenever new information is added to the data base from either additional laboratory data input from the lab data recieving program or from a data base editing session; and to generate an Accounting Summary Report, or a Material Balance Report. |
| 2. | Accounting Summary Report Module | ACCASR | Generates an Accounting Summary Report |
| 3. | Material Balance Report Module | ACCMBR | Generates an Material Balance Report |
| 4. | Data Base Update Module | DBUPD | To update the data base based on new information since the last update at the discretion of the NMC accountant. |
| 5. | Data Base Create Program | DBCRE | To create new inventory, lot, batch, raw, and analytical data files and initialize the header records for a new material balance measurement point. |
| 6. | Data Base Modify Program | DBMOD | To add-on or redefine the inventory and/or lot files for any or all meterial balance measurement points. |
| 7. | Upper Hierarchy Data Base List Program | DBLST | To list inventory spans, lot spans, and batch spans for any or all material balance measurement points. |
| 8. | Lower Hierarchy Data Base List Program | LSTDB | To list batch, raw, and analytical data for one or more batches for a material balance measurement point. |
| 9. | Data Base Save Program | DBSAV | To save all of one or all material balance measurement point data bases on Mag Tape from the beginning of a specified inventory period. The saved portion is then deleted from the disk file upon request. |
| 10. | Data Base Find Module | DFND | Module of the DBSAV program which locates all files which are to be written to Mag Tape. |
| 11. | Data Base Save Module | DSAV | Module of the DBSAV program which writes the desisnated data from the system data base disk files to mag tape files. |
| 12. | Data Base Verify Module | DVFY | Module of the DBSAV program which verifies the saved files on magnetic tape against the original disk files. |
| 13. | Data Base Delete Module | DDEL | Module of the DBSAV program which deletes, at the operator's request, the portions of the disk data base files which have been saved on mag tape. |
| 14. | Data Base Edit Program | DBEDI | To edit the Inventory, Batch, Raw, or Analytical data files. |
| 15. | Accounting Dump Program | ACCDMP | To dump the solution volumes, solution quantities, and uranium quantities from the raw file for a range of operator requested batches. |
| 16. | Password Program | PASSWD | Creates the password file, permitting the periodic alterring of the set of Measurement and Accounting subsystem passwords. |
| 17. | Tank Input/Output Program | TANKIO | Creates the TANKIO file to be used by the data base/accounting programs. The file contains the tank ID and the type of I/O associated with the tank. |

## TABLE C-3

## MEASUREMENT CONTROL PROGRAMS AND MODULES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Measurement Control Main Program | MEACON | Controls the execution of Measurement Control Subprograms. |
| 2. | Level Report | LEVEL | Calculates and prints Level Measurement Control Report. |
| 3. | Density Report | DNSTY | Calculates and prints Density Measurement Control Report. |
| 4. | Replicate Report | REPLC | Calculates and prints Replicate Measurement Control Report. |
| 5. | Product-to-Input Report | PRDIN | Calculates and prints Product-to-Input Measurement Control Report. |
| 6. | Uranium Concentration Report | UCONC | Calculates and prints Uranium Concentration Measurement Control Report. |
| 7. | Uranium Calculation Subroutine | CALCUD | Calculates Uranium Quantity |
| 8. | Volume Calculation Subroutine | TVOL | Calculates the solution volume for any vessel. |
| 9. | Outlier Subroutine | OUTLER | Subroutine to calculate the acceptable range for measurement control comparisons. |
| 10. | Error Variance Report Program | ERRVAR | Calculates the limit of error for each material balance measurement point, prints report, and calculates the total system variance. |

## TABLE C-4

## LABORATORY DATA SYSTEM COMMUNICATION PROGRAMS AND MODULES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | LDS Data Recieving Program | LDSLN2 * | Recieves laboratory data at the Central System as sent from the LDS via the DATA program. The data type is determined, the data properly formatted and stored in the Analytical Summary Data File. If the data is associated with the Accountability Tank or the Uranium Product Sample Tank, Uranium Concentration data is filed in the permanent Analytical file for that tank and a flag is set which will cause the DBUPD module of the Accounting Program to update the data base for this tank on its next pass. |
| 2. | LDS Read Module | LDSRED * | Subprogram of LDSLN2 which queues nine reads on the LDS channel for processing by LDSLN2. |
| 3. | Analytical Sample Request Sending Program -- installed as: | LDSLN1 *<br>LDSCOM * | Processes sample requests from the request queue buffer, formats the sample request parameters, and passes the request over the communication line to the LDS Sample Authorization Program. |
| 4. | Request Getter Module | LDSGET * | Module of the LDSLN1 Program which gets sample requests from the request queue buffer. The requests are put in the buffer by the LDS module of the Measurement Programs. |
| 5. | LDS Intermediate Module | LDSINT * | Subroutine of the LDS Module of the Measurement Programs which puts sample requests in the request queue buffer. |
| 6. | Analytical Chemistry Methods Programs (n = a sequenced digit, aaaa = an acronym for the method name) | Mnaaaa ** | Accepts analytical data, computes results, sends results to control room and the Central System Computer, reports them to the analyst, and stores the results on disk. |
| 7. | Data Reporting Program | DATA ** | Selects and controls the execution of the appropriate Methods Program. |
| 8. | Sample Authorization Program | SPLAUT ** | Accepts requests for analysis from any device on the LDS configured as a terminal including the CNMCAS Central System. The request is passed on to Analytical personnel, with an updated (if necessary) batch number. |

* Denotes Programs and Modules resident on the CNMCAS Central System
** Denotes Programs and Modules resident on the Laboratory Data System

## TABLE C-5

## REMOTE DATA ACQUISITION SYSTEM PROGRAM -- MAIN FUNCTIONS

| Name | ID | Purpose |
|---|---|---|
| 1. Executive Operating System | 3SXMOD | As a priority interrupt executive, this routine initializes system parameters and contains the entry point to start system operation. |
| 2. Scheduler Function | SCHED | Controls execution of other main functions. |
| 3. Collect Function | COLECT | Collects data from process instruments interfaced via the Computer Products, Inc. RTP equipment. |
| 4. Operator Function | OPR | To allow the operator to enter the system time, activate alarm edit, request dumps, ask for help, activate floppy data logging, and activate hard copy alarm reports. |
| 5. Communication Function | COMMC | To process requests for data from the Central System communication link. |
| 6. Calibrate Function | CALIBR | To calibrate the programmable voltage calibration devices. |
| 7. Alarm Checking Function | TMPALM | To examine each point in the system and report any that are alarming. |
| 8. Ruska Collect Function | RUSCOL | To collect data from the Ruska transducers. |

TABLE C-5 (CONTINUED)

REMOTE DATA ACQUISITION SYSTEM PROGRAM -- SUBROUTINES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Address Find | ADDFND | To find any word location in any table. |
| 2. | Alarm Edit | AEDIT | To enable or disable alarming for one or all channels. |
| 3. | ASCII to Binary | ATOB | To convert ASCII data in contiguous memory locations to an absolute binary value in one 16-bit word. |
| 4. | Average | AVRGE | To average scan mode 2, 3, and 4 point readings. Calculates the most recent reading by dividing the accumulation by the sample count. The most recent reading becomes the first reading while the oldest reading is deleted. The accumulation and sample count are cleared. |
| 5. | BCD to Binary Conversion | BCDB | To convert a BCD number to a positive binary integer. |
| 6. | Binary to ASCII Decimal Conversion | BTOA | To convert a single 16-bit binary value into five decimal ASCII characters. |
| 7. | Check Device Readiness | CHECK | To check if input device is clear and wait until clear if the device is busy. |
| 8. | Clear History | CHIST | To clear the priority tables; P2T, P3T, P4T, and Ruska P2T. |
| 9. | Interrupt Service Routine for CPI gear | CPIDT1 | Handles data interrupt from the CPI 7480 Analog Input System on parallel link. |
| 10. | Julian Date | DAYMON | To convert Julian days to months and days. |
| 11. | Fixed Point to ASCII | FP2A | To convert fixed point to binary, and then to its decimal ASCII equivalent. |
| 12. | Gain Value | GAINVL | To find the gain value associated with a point number. |
| 13. | High-Low Sample Routine | HILOW | To compare the last sample with the high and low values accumulated and replace them if appropriate. |
| 14. | Input | INPUT | To request data from CPI channel. |
| 15. | Interpolation Table Entry Point | ITEP | To find the interpolation table entry point number and determine whether the LIT or PLIT tables are to be accessed. |
| 16. | Linear Interpolation Function | LIF | To determine Y on a set curve with the following equation: Y = (X-X1) / (X2-X1) * (Y2-Y1) + Y1 |
| 17. | Measure | MEASURE | To calculate via interpolation in the interpolation table the engineering units for measurements of all instrument types. |
| 18. | Month-Day to Julian Date | MONDAY | To convert the month and day to the Julian date. |
| 19. | Multiply and Divide | MUDIV | To perform software multiply and divide opeeations. |
| 20. | Piecewise Linear Interpolation Function | PLIF | To convert raw readings to engineering units via interpolation in the Piecewise Linear Interpolation table. |

TABLE C-5 (CONTINUED)

REMOTE DATA ACQUISITION SYSTEM PROGRAM -- SUBROUTINES

| | Name | ID | Purpose |
|---|---|---|---|
| 21. | Point Device Locator | PNTDEV | To determine device number from point number. |
| 22. | Put Current Time In Global Common | PUTTIM | To convert current time and date to ASCII and store in global common memory. |
| 23. | Programmable Voltage Calibration Device Routine | PVCDEV | To determine the device number from the point number, check for PVC on device, and return the calobrated voltage. |
| 24. | Convert Rad 50 to ASCII | RD50TA | To convert Rad 50 format to 3 ASCII characters. |
| 25. | Read All Ruska Points | RRPT | To zero if necessary, lock up the DVMs, and read all Ruska transducers. |
| 26. | Request Time and Date | RTD | To request time and date from the operator; and to update the system clock and time table. |
| 27. | Short Integer Multiply | SMUL | To perform a short integer multiplication. |
| 28. | Target Update | TARGET | To update a Time Table Entry. |
| 29. | Time Check | TIMCHK | To adjust the time for 60 seconds/minute, 60 minutes/hour, 24 hours/day, and 365 days/year (except leap years, 366 days/year). |
| 30. | Fixed to Floating Subroutine | TOFLT | To convert a fixed point number to floating point. |
| 31. | Word to Serial Output Format | W2SOF | To convert a data stream to a serial link format. |

TABLE C-5 (CONTINUED)

REMOTE DATA ACQUISITION SYSTEM PROGRAM -- TABLES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Alarm Table | ALT | Entries in the Alarm Table provide high and low alarm limit values. The value of minus one (-1) implies there is no alarm limit. |
| 2. | Calibration Point Definition | CPDT | Contains 26 entries for each programmable voltage calibrator which describe the calibration points. |
| 3. | Data Base Table | DBASE | Contains general information including addresses and offsets for other tables in the Data Base Table structure. |
| 4. | Device Table | DEVT | Contains hardware interface information required to communicate with CPI front end gear equipment. |
| 5. | Gain Table | GNT | The gain table is 26 words configured as 13 fixed point numbers, one for each gain range. The values are constants (in units of millivolts/bit) which, when multiplied by a raw datum gives a reading in millivolts. |
| 6. | Interpolation Tables | LIT | Defines the Linear Interpolation Table, the Piecewise Linear Interpolation Table, and the Calibration Linear Interpolation Table. These tables provide the means to convert raw values in millivolts to engineering units. |
| 7. | Transducer Point Definition Table | PDT | The PDT table contains pertinent information describing the measurement point (scan mode, instrument class and type, etc.) and pointers to other applicable tables. |
| 8. | Priority Tables | PRIOR | Each scan mode 2, 3, and 4 measurement point has a unique entry in one of the priority tables; the P2T, the P3T, or the P4T respectively. Each entry in these tables provides data storage for multiple readings and high and low samples. |
| 9. | Ruska Device Table | RDEVT | The RDEVT contains information for each remote serial link universal controller pair. |
| 10. | Ruska Transducer Point Definition Table | RPDT | Describes each Ruska measurement point. The RPDT provides storage for the last data sample and the Ruska Priority Table entry number. |
| 11. | Time Table | TTBL | The Time Table provides target time data for each of the eight function codes; FC 1 = Start scan mode 2, FC 2 = Start scan mode 3, FC 3 = Scan interval 2 complete, FC 4 = Scan interval 3 complete, FC 5 = Start calibration, FC 6 = Trigger alarm function, FC 7 = Start scan mode 4, and FC 8 = Scan interval 4 complete. |
| 12. | Unithermal Reference Table | UTRT | Contains the scale factors and variability constants required to carry out the temperature conversion calculations involving the thermocouples. |

## TABLE C-6

## MISCELLANEOUS/SUPPORT PROGRAMS

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Analytical Summary Program | ASP | Print report listing the contents of any 'X' file of analytical results. |
| 2. | Create Analytical Summary File Program | ASPCRE | Create a circular file for laboratory analytical data for an operator entered measurement point. |
| 3. | Downloader Program | DWNLDR | Download the RTP Program to the remote data acquisition system computer from the host system. |
| 4. | Flow Rate Program | FLOW | Calculate the through-put of uranium through the HA Feed Tank. Results are printed by the status program in MTU / Day and are updated every 10 minutes. |
| 5. | Laboratory Data Find, List and Edit Program | LAB | Check to see if a laboratory analytical sample request was properly sent and to list the results for the current batch at any material balance measurement point. The operator may edit the results if any are in error. |
| 6. | RTP Communication Program | RTPCOM | To transmit requests for process data to the remote data acquisition system and to recieve the data response. |
| 7. | Measurement Programs Status Program | STATUS | Runs in the background mode once every minute to constantly update the color CRT monitor display of the progress of every measurement program through the measurement sequence. Also prints plant flow rate on the color monitor. |
| 8. | Temporary, Miscellaneous and Support Data File List Programs | LSTxxx | To list the contents of the various temporary, miscellaneous, and support data files. (xxx = a mnemonic identifying which file is to be listed.) |
| 9. | Temporary, Miscellaneous and Support Data File Edit Programs | EDxxx | To edit the contents of the various temporary, miscellaneous, and support data files. (xxx = a mnemonic identifying which file is to be editted.) |

## TABLE C-7

## DATA BASE FILES

| | Name | ID | Purpose |
|---|---|---|---|
| 1. | Inventory Files | Innnnn | Defines inventory periods for material balance measurement points. Each inventory period is associated with a beginning and ending lot number and beginning inventory solution volume and quantity and beginning inventory uranium quantity as well as cumulative uranium quantities. |
| 2. | Lot Files | Lnnnnn | Specifies the beginning and ending batch number associated with each lot for each material balance measurement point. |
| 3. | Batch Files | Bnnnnn | Contains batch creation information for each material balance measurement point. Includes batch number, creation time and date, source and destination tank IDs, and the preliminary/final indicator for the batch. |
| 4. | Raw Data Files | Rnnnnn | Contains process raw data obtained via measurement programs for each material balance measurement point organized according to batch number. |
| 5. | Analytical Data Files | Annnnn | Contains laboratory analytical data for material balance measurement points resulting from measurement program analytical requests and organized by batch number. |
| 6. | Analytical Summary Data Files | Xnnnnn | Circular files containing the 50 most recent sample results of laboratory analytical data for every measurement point. |
| 7. | Temporary Measurement Data Files | Tnnnnn | During each batch transfer for a material balance measurement point the measurement program retains the collected data in the appropriate Temporary file until the end of the batch at which time the results are transferred into the permanent data base. |
| 8. | State Table Files | Snnnnn | Each measurement program has a state table. Its function is to direct the progression of the measurement program through its various modules. The state table concept is responsible for the versatility of the measurement programs. |
| 9. | Miscellaneous Files | Znnnnn | Each measurement program has an associated miscellaneous file which contains various indicies and message table pointers used by the various states of the measurement programs. |
| 10. | Calculation File | CALCUL | Contains indexes into the Temporary file for the storage of the results produced by the CALC module of the measurement programs. |
| 11. | Control Limits File | CONLIM | Contains the limits for the various comparisons made during execution of a measurement program. |
| 12. | Data Base Temporary File | DBTEMP | Internal scratch pad temporary file used by the Data Base Edit Program in leaving an audit trail of edits to the data base. |
| 13. | Error Variance File | ERRVAR | Table of variances associated with batch measurements used by the Error Variance Program in producing the limit of error summary table. |
| 14. | Message File | MESAGE | Contains message text used by the measurement programs in constructing their dialog and operator information messages. |
| 15. | Message Help File | MESHLP | Contains numerical fields for use by measurement programs in printing message text containing numerical data. |

TABLE C-7 (CONTINUED)

DATA BASE FILES

| Name | ID | Purpose |
|---|---|---|
| 16. Password File | PASSWD | Contains a list of supervisor passwords against which password input is compared whenever the supervisor password is required by a measurement or data base program. |
| 17. Print File | PRINT | An empty file whose open or closed status is monitored by the measurement programs to prevent messages from several simultaneously executing programs from interleaving at the same terminal. |
| 18. RTP Instrument Data File | RTPID | Contains instrument and channel identification parameters and cross-referrences used by the various programs which access RTP data. |
| 19. Measurement Programs Status File | STATUS | Contains the measurement point number, current batch number, and status of progression through the measurement sequence for each material balance measurement point. The status file also contains the most recent plant flow rate data. Its contents are always displayed on the color CRT monitor. |
| 20. Tank Identification File | TANKID | Contains measurement point cross referrence information widely used by most subsystems of the CNMCAS. Two identical copies are maintained to avoid conflicting access situations. (One has the suffix '.DAT' and the other has the suffix '.PIM') |
| 21. Tank Input / Output File | TANKIO | Defines and names the set of material balance measurement points and indicates whether the vessel is an input point or an output point. |
| 22. Volume File | VOLUME | Contains the necessary coefficients for use in calculating the volume for any vessel. |

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# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX D

## FY 1979 DEMONSTRATION PROGRAM PREPARATIONS

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## FY 1979 DEMONSTRATION PROGRAM PREPARATIONS

To accomplish the program objectives, several long lead time preparatory activities had to be conducted to phase the system and plant components in an upgraded and modified condition. These major activities and design modifications had to be completed prior to the integrated uranium run. They were as follows:

(1) Alternate Transmitter Tests
(2) Vessel Mixing/Sampler Accuracy Tests
(3) Instrument Air Supply Modifications
(4) Interfacing Plutonium Nitrate Storage Area with RTP System
(5) Ruska "Zero" Automation
(6) LDS-CNMCAS Interface Improvement
(7) Calibration of "New" Uranium Product Sample Tanks
(8) CNMCAS and RTP System Hardware Upgrade
(9) Plutonium Product Tank Calibrations.

(1) Alternate Transmitter Tests - These tests involved the removal of the transmitters from their operational placements, performing various tests on them in the Special Systems Laboratory, and reinstalling them. In addition, other types were evaluated for possible use. A complete report of these tests and evaluations is presented in Appendix H.

(2) Vessel Mixing/Sampler Accuracy Tests - Vessel mixing tests were performed on the new uranium product sample tank and uranium product off-specification tank. In addition, sampler accuracy tests were performed on these two tanks and on the input accountability tank. A complete report of these tests is presented in Appendix F.

(3) Instrument Air Supply Modifications - Probe pluggage has been one of the primary sources causing measurement problems. To remedy this, tests were run using bubbler-type air humidifiers on air purge supply lines to high- and low-pressure probes in selected tanks. A report on this activity is included as Appendix K in this report.

(4) Interfacing Plutonium Nitrate Storage Area with RTP System - Tie-in of the existing liquid level, density, and temperature instruments in the plutonium nitrate storage area had to be accomplished to have this area on-line within CNMCAS. These connections were made via an analog controller located in the PNSA Control Room.

(5) Ruska "Zero" Automation - During the FY 1978 demonstration, Ruskas had to be zeroed manually prior to taking measurement readings. This condition caused delays and was a source of potential errors. To rectify this, some hardware and software modifications were made to control the Ruska "zero" operation by computer. Also included was an accumulation and manipulation of the "zero" readings.

(6) LDS-CNMCAS Interface Improvement - The LDS-CNMCAS communications link used during FY 1978 proved unreliable. To correct this, hardware was modified and software prepared. The existing transmission line from the LDS to the Separations Main Control Room was used for receiving and storing all analytical data in CNMCAS, and retrieving the data by process point on demand. The previously used interface was only used for transmitting analytical requests from the CNMCAS to LDS.

(7) Calibration of "New" Uranium Product Sample Tank - For FY 1979 it was decided to change the functions of the uranium product sample tank and the off-specification uranium product tank as they were used during the FY 1978 Demonstration. The previous calibrations for the off-specification uranium product tank had not been performed with the Ruska instruments. In addition, other piping changes were made to the tank. This necessitated recalibrating the tank to obtain the most current accurate data.

(8) CNMCAS/RTP System* Hardware Upgrade - The experience gained during FY 1978 CNMCAS development work identified several improvements to be made to the CNMCAS including the RTP system. These were as follows:

(a) The memory of the CNMCAS PDP 11/35 will be converted from core to MOS (mixed-oxide semiconductor) and capacity increased from 64K words to 128K words. The 64K of core memory removed from the CNMCAS CPU will be installed in the Laboratory Data System (LDS) PDP 11/35.

(b) A DEC VT-100 CRT terminal will be added for programmer use in the Separations Main Control Room.

(c) A Portable Data Terminal is to be added for communication with CNMCAS from off-site via telephone line. This unit will be used in troubleshooting and correcting problems during the CNMCAS demonstrations.

(d) The core memory of the RTP system preprocessor will be increased from 32K byte to 64K byte.

(e) Mass data storage will be provided by the preprocessor by the addition of an RX-211 (256 K) dual floppy disk and controller.

(f) RTP system troubleshooting will be improved by the addition of a KY11-LB programmer's console with octal key pad and display.

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*RTP System - Remote Data Acquisition System.

(g) The thermocouple signals routed to the RTP sytem via Taylor transmitters in the Separations Main Control Room will be rerouted through a uniform temperature reference assembly to improve accuracy and stability.

(h) Alternate transmitters installed in parallel with existing Taylor transmitters will be tied into the RTP system to improve volume measurement capability and transmitter performance evaluations.

(i) Two new decanters have been added to the Separations Process Area. Instruments associated with the decanters will be tied into the RTP system to improve process monitoring capability.

(j) An LA-35 DEC writer will replace the ASR-33 teletype as an I/O terminal for the RTP system. A line printer (DEC LA-180) to be installed in the NMC area.

(9) Plutonium Product Tank Calibrations - These vessels, located in the Separations Process Area, were calibrated using a Ruska precision pressure gauge to improve calibration accuracy. Data evaluation indicates problems with the method of adding calibration water (via the sparger air supply lines). An acceptable calibration will be obtained on one storage tank using a temporary water addition line. This tank will be used for planned PM/PS transfer tests.

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# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX E

## REMOTE SAMPLE PREPARATION

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## 1.0 INTRODUCTION

In an attempt to predict the variance in input measurements by Mass Spectrometry Isotope Dilution (MSID), the input samples were diluted remotely to simulate operating conditions. The standard deviation for quality control standards diluted remotely increased from 0.45 milligrams uranium/gram to 1.98 milligrams uranium/gram. This is in line with previous predictions.

## 2.0 TEST DESCRIPTION

Multiple samples (six) are routinely taken for the input tank. At least one sample from each input batch for Campaign 3 was diluted remotely. For many of these batches, a second sample was selected by Analytical Quality Control personnel, coded as a Quality Control sample, and submitted for remote dilution and mass specification analyses. The coded samples are replicates and are used to estimate the random error associated with sampling, sample preparation, and analysis.

Quality Control standards were remotely diluted and analyzed by mass spectrometry. These results were used to estimate the systematic error associated with sample preparation and mass spectrometry analyses. These results were also used to determine and correct for any method bias.

## 3.0 DATA ANALYSIS

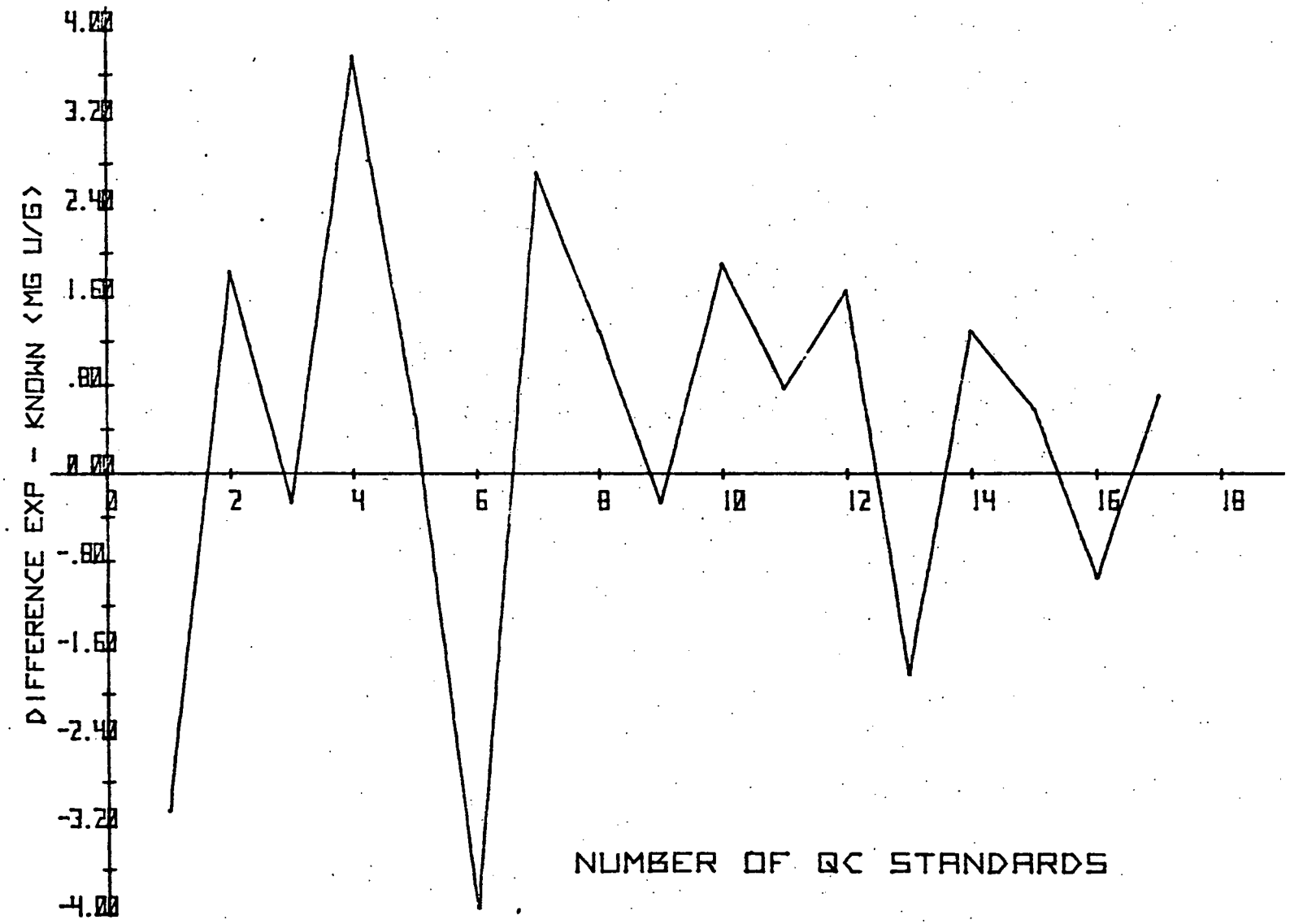
The data collected for the Quality Control standard indicated an apparent bias of 0.40 milligrams uranium/gram with a standard deviation of 1.98 milligrams uranium/gram. These data are presented graphically in Figure E-1. For these 17 results, the average difference was not statistically significant at 95% C/L. However, an "F" test of this variance with earlier data obtained from "bench" dilutions was significant at the 0.05 level of significance.

The replicate data are presented graphically in Figure E-2. As expected, the data from the remotely diluted samples are much more variable than the "bench" dilutions.

A plot of MSID results minus potentiometer results for the entire FY 1979 uranium run shows the increased varibility introduced by remote dilutions.

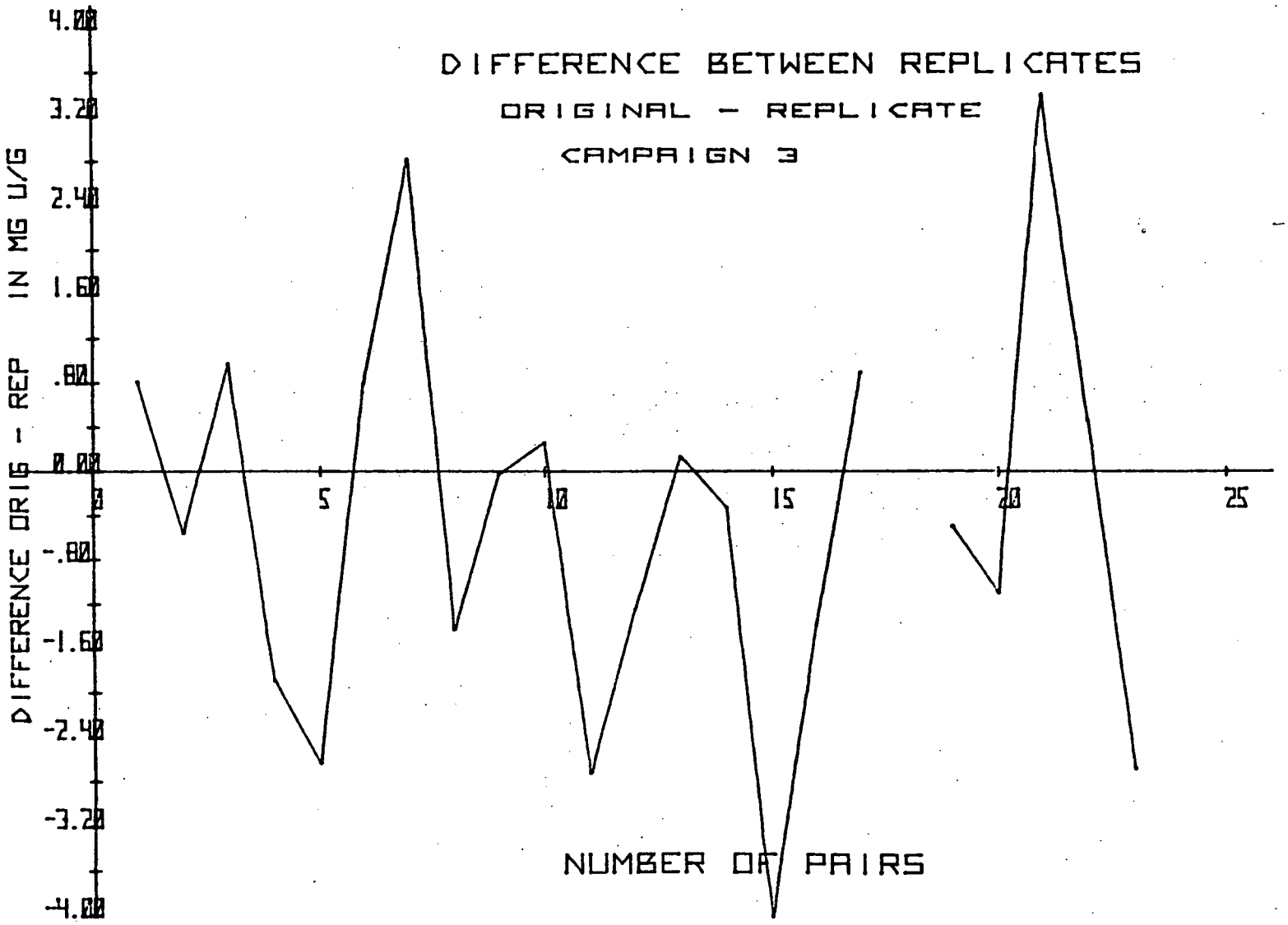
The effect of using remote dilutions and mass spectrometry analyses for the input concentrations is described in more detail in Section 6.6 on limit of error calculations. However, it is apparent that the regulation of or limit of error of less than 0.7% of input for a six-month

material balance in a reprocessing plant can be met using the mass spectrometry isotope dilution method for uranium concentration. The data indicate that limits of error of less than 0.5% of input for a six-month balance are obtainable with current technology.




DIFFERENCE IN URANIUM CONCENTRATIONS
REMOTE PREP U-MSID-1
CAMPAIGN 3

FIGURE E-1




DIFFERENCE BETWEEN REPLICATES
ORIGINAL - REPLICATE
CAMPAIGN 3

FIGURE E-2

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# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX F

## VESSEL MIXING AND SAMPLE ACCURACY TESTS USING URANYL NITRATE SOLUTION

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One of the more difficult sources of measurement uncertainty to assess is sampling. Because there are no sampling standards, sampling studies and/or tests are required to determine any sampling system bias and to estimate the sampling system systematic error variance. The tests described in this appendix are designed to provide these data. The tests and data are separated into mixing tests for assessing homogeneity and accuracy tests for detecting bias and estimating sampling systematic error variance.

## Mixing Test

Mixing tests were conducted to verify the mixing requirements for the uranium product sample tank and the uranium product off-specification tank. These tests confirmed that slightly longer sparging times were required for the horizontal off-specification tank than the upright product tank. In either case, the mixing times were not excessive.

## Mixing Test Procedure

The mixing test consisted of adding nitric acid to a homogeneous uranyl nitrate solution, mixing the resulting mixture, and pulling dip samples at randomly selected heights at specified sparging intervals. Density was used as the test parameter.

## Analysis of Mixing Test Data

The data obtained are in tabular form in Table F-1 and graphically in Figure F-1 for the uranium product sample tank and similarly in Table F-2 and Figure F-2 for the uranium off-specification tank. The data indicated that "perfect" mixing was not obtained but that the sampling uncertainty introduced by "imperfect" mixing was small.

The solution homogeneity judgment is based on a comparison of between sample variability to within sample variability. These data are included in Tables F-1 and F-2 for the two tests. The standard deviation of the density method was $9.4 \times 10^{-6}$ grams/milliliter for the first test and $6.4 \times 10^{-6}$ grams/milliliter for the second test. Since all of the original densities were obtained prior to running the duplicate densities, a reasonable estimate of the density method precision was obtained.

## Sampling Accuracy Tests

Sampling system tests were conducted using uranyl nitrate solution at nominal operating temperature for both the input and product tanks. These tests were designed to quantify the systematic error variance for the sampling systems and to assess any bias introduced by the sampling system.

A small concentration effect by the remote sampling system was expected. The concentration effect was expected based on the assumption that the temperature of the air used in lifting the sample would be raised and

that the exiting air would be saturated. The initial results for both tanks did not provide the expected results. An additional test at the end of the FY 1979 uranium run did provide an indicate of the expected concentration effect.

Accuracy Test Procedure

The accuracy tests consisted of simultaneously taking dip and remote samples from a homogeneous uranyl nitrate solution at an elevated temperature (40 to 60°C). The role of the dip sample is that of the standard with the difference between dip and remote samples used as the indication of bias.

Analysis of Accuracy Test Data

Data from the three tests are attached as Tables F-3, F-4, and F-5. An examination of these data did not show the expected concentration effect. In fact, Tables F-3 and F-4 include a considerable dilution effect. Possible causes of the dilution effects noted for the initial tests at elevated temperatures and for the first portion of the final test are as follows:

- A buildup of condensate from the moist air used for lifting the sample was consistently bled into the sample.
- The sample circulation time was not sufficient to establish equilibrium conditions.
- The uranyl nitrate solution was not adequately mixed. That is a "layering effect" at the sample intake below the sparger may have been a cause.
- Evaporation of dip sample prior to capping sample and/or through the lid.

These data indicate that the sampling system effects at higher temperatures are not as straight-forward as expected. Future work includes the following:

- Modification of the sampling system is planned to eliminate the possibility of the lift air condensing and diluting samples.
- Tests are planned to verify that sample circulation times are adequate for high-density solutions.
- Tests are planned to verify that mixing times are adequate to ensure solution homogeneity, including any layering below the sparger.

TABLE F-1

MIXING TEST DATA FOR
URANIUM PRODUCT SAMPLE TANK

| Log No. | Sparge Time (min.) | Sampling Depth (ft.) | Density (g/ml) Original | Duplicate | Difference |
|---|---|---|---|---|---|
| 21394 | initial | surface | 1.48749 | 1.48749 | -- |
| 21395 | 0 | surface | 1.21579 | 1.21580 | (0.00001) |
| 21396 | 5 | 5 | 1.42984 | 1.42985 | (0.00001) |
| 21397 | 10 | 3 | 1.42679 | 1.42678 | 0.00001 |
| 21398 | 15 | 1 | 1.42697 | 1.42699 | (0.00002) |
| 21399 | 20 | 5 | 1.42735 | 1.42736 | (0.00001) |
| 21400 | 25 | surface | 1.42781 | 1.42782 | (0.00001) |
| 21401 | 30 | 4 | 1.42696 | 1.42698 | (0.00002) |
| 21402 | 35 | 5 | 1.42783 | 1.42787 | (0.00004) |
| 21403 | 40 | 4 | 1.42714 | 1.42715 | (0.00001) |
| Number | | | 7 | 7 | 10 |
| Average | | | 1.427264 | 1.427279 | (0.0000100) |
| Standard Deviation | | | 0.0004163 | 0.0004262 | 0.0000133 |

Standard deviation of the density method is estimated within the test as follows:

$$s_m = \frac{s_d}{\sqrt{2}} = 9.4 \times 10^{-6}$$

TABLE F-2

MIXING TEST DATA FOR
URANIUM PRODUCT OFF-SPECIFICATION TANK

| Log No. | Sparge Time (min.) | Sampling Depth (ft.) | Density (g/ml) Original | Duplicate | Difference |
|---|---|---|---|---|---|
| 21433 | initial | surface | 1.43635 | 1.43634 | 0.00001 |
| 21434 | 0 | surface | 1.12124 | 1.12125 | (0.00001) |
| 21435 | 10 | 3 | 1.34667 | 1.34667 | -- |
| 21436 | 20 | 2 | 1.34696 | 1.34696 | -- |
| 21437 | 30 | 4-1/2 | 1.34693 | 1.34692 | 0.00001 |
| 21438 | 40 | 1 | 1.34717 | 1.34717 | -- |
| 21439 | 50 | 2 | 1.34704 | 1.34706 | (0.00002) |
| 21440 | 60 | 4-1/2 | 1.34716 | 1.34715 | 0.00001 |
| 21441 | 70 | 4 | 1.34715 | 1.34715 | -- |
| 21442 | 73 | 4-1/2 | 1.34706 | 1.34705 | 0.00001 |
| 21443 | 73 | 1-1/2 | 1.34680 | 1.34680 | -- |
| 21444 | 73 | 2-1/2 | 1.34680 | 1.34679 | 0.00001 |
| 21445 | 73 | 3-1/2 | 1.34681 | 1.34680 | 0.00001 |
| Number | | | 10 | 10 | 10 |
| Average | | | 1.346988 | 1.346985 | 0.0000023 |
| Standard Deviation | | | 0.0001528 | 0.000149 | 0.000009 |

Standard deviation of the density method is estimated within the test as follows:

$$s_m = \frac{s_d}{\sqrt{2}} = 6.4 \times 10^{-6}$$

TABLE F-3

SAMPLING ACCURACY TEST
URANIUM PRODUCT SAMPLE TANK

| Air Lift Sample Density g/ml | Dip Sample Density g/ml | Air Lift-Dip Density g/ml | Tank Temp °C | Sample Circulation Time (min.) |
|---|---|---|---|---|
| 1.43720 | 1.43854 | (0.00134) | 39.8 | 7 |
| 1.43698 | 1.43741 | (0.00043) | 39.8 | 12 |
| 1.43695 | 1.43766 | (0.00071) | 39.8 | 17 |
| 1.43698 | 1.43796 | (0.00098) | 39.8 | 22 |
| 1.43698 | 1.43735 | (0.00037) | 39.8 | 27 |
| 1.43698 | 1.43761 | (0.00063) | 39.8 | 32 |
| 1.43698 | 1.43765 | (0.00067) | 39.8 | 37 |
| 1.43697 | 1.43767 | (0.00070) | 39.8 | 42 |
| 1.43698 | 1.43849 | (0.00151) | 39.8 | 47 |
| 1.43699 | 1.43779 | (0.00080) | 39.8 | 52 |
| Number | | 10 | 10 | 10 |
| Average | | 1.436999 | 1.437813 | (0.000814) |
| Standard Deviation | | 0.0000667 | 0.0004069 | 0.000367 |
| Coefficient of Variance | | 0.000046 | 0.000283 | 0.000255 |

Average % Difference = (0.057)

TABLE F-4

SAMPLING ACCURACY TESTS
ACCOUNTABILITY TANK

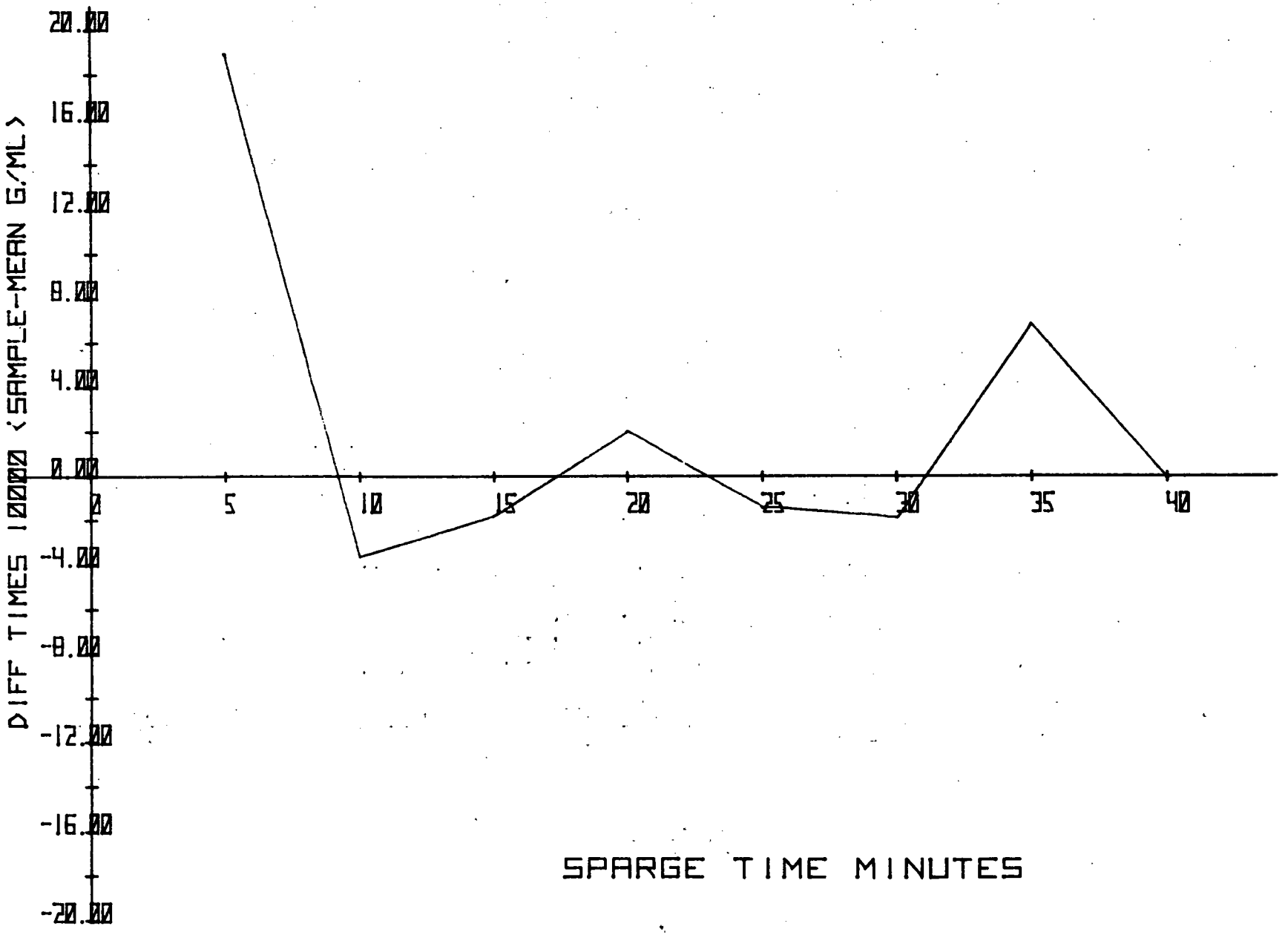
| Air Lift Sampling Data Density (g/ml) | | Dip Sample Data Density (g/ml) | | | Air Lift - Dip Density (g/ml) | Tank Temp | Sample Circulation |
|---|---|---|---|---|---|---|---|
| Original | | Original | Duplicate | Average | Difference | (°C) | Time (min) |
| 1.45074 | | 1.45348 | 1.45346 | 1.45347 | (0.002730) | 53 | 5 |
| 1.45085 | | 1.45235 | 1.45237 | 1.45236 | (0.001510) | 53 | 10 |
| 1.45085 | | 1.45137 | 1.45134 | 1.451355 | (0.000505) | 53 | 15 |
| 1.45086 | | 1.45190 | 1.45189 | 1.451895 | (0.001035) | 53 | 20 |
| 1.45091 | | 1.45145 | 1.45142 | 1.451435 | (0.000525) | 53 | 25 |
| 1.45092 | | 1.45187 | 1.45188 | 1.451875 | (0.000955) | 53 | 30 |
| 1.45094 | | 1.45157 | 1.45157 | 1.45157 | (0.000630) | 53 | 35 |
| 1.45095 | | 1.45175 | 1.45174 | 1.451745 | (0.000795) | 53 | 40 |
| 1.45095 | | 1.45141 | 1.45138 | 1.451395 | (0.000445) | 53 | 45 |
| 1.45097 | | 1.45480 | 1.45494 | 1.45487 | (0.003900) | 53 | 50 |
| Number | = 10 | 10 | 10 | 10 | | | |
| Average | = 1.450894 | 1.452195 | 1.452199 | 1.452197 | (0.001303) | | |
| Standard Deviation | = 0.0000667 | 0.0011106 | 0.001152 | 0.0011324 | 0.0011405 | | |
| Coeff. of Variance | = 0.000046 | 0.000765 | 0.000793 | 0.000780 | 0.000785 | | |

Average % Difference = (0.079)

TABLE F-5

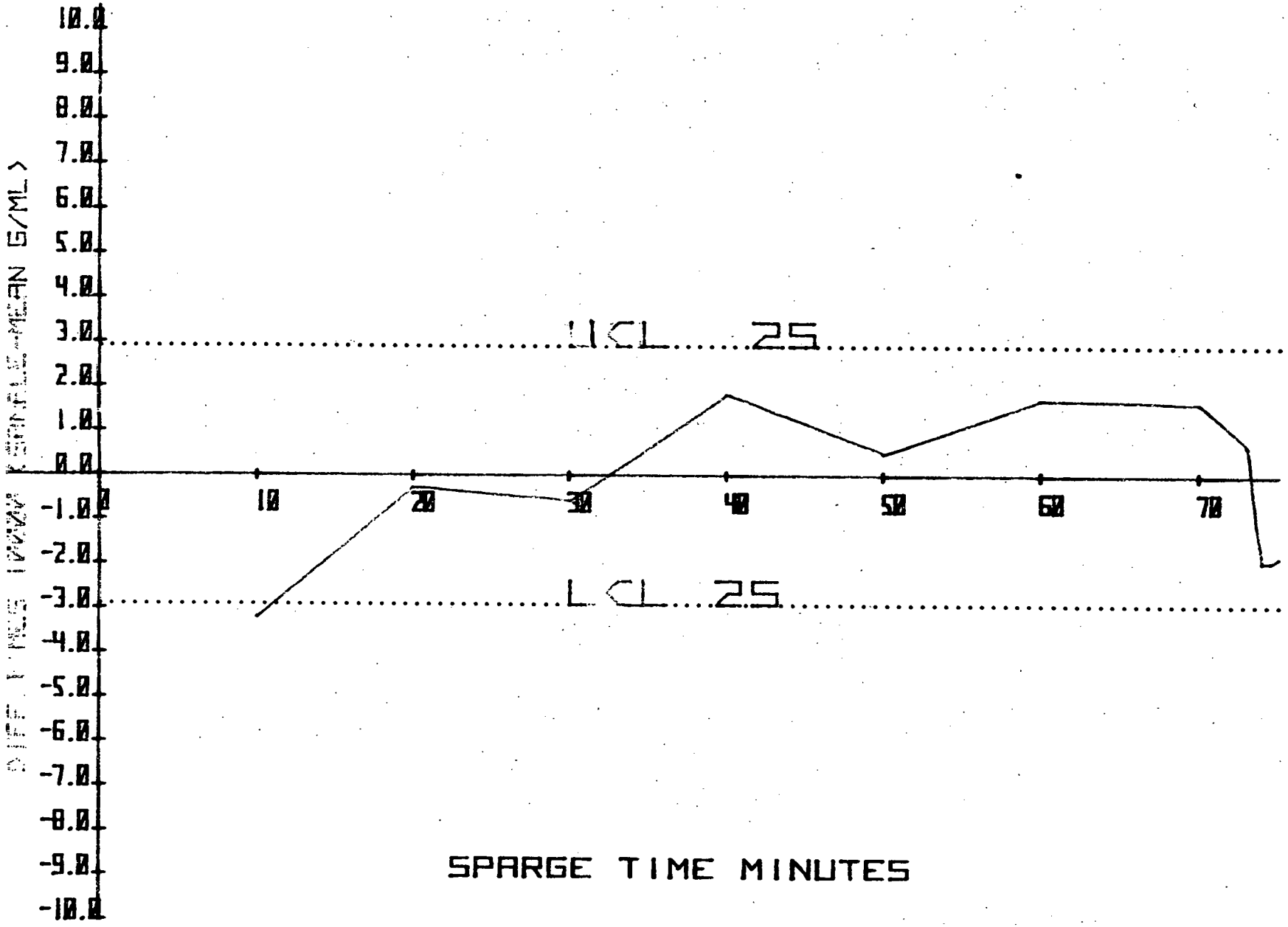
SAMPLING ACCURACY TESTS
ACCOUNTABILITY TANK

| Air Lift Sampling Data Density (g/ml) | | | Dip Sampling Data Density (g/ml) | | | Air Lift Dip Density (g/ml) Difference | Tank Temp. (°C) | Sample Circulation Time (min.) |
|---|---|---|---|---|---|---|---|---|
| Original | Duplicate | Average | Original | Duplicate | Average | | | |
| 1.52589 | 1.52594 | 1.525915 | 1.52616 | 1.52619 | 1.526175 | (0.000260) | 60 | 10 |
| 1.52604 | 1.52607 | 1.526055 | 1.52646 | 1.52648 | 1.52647 | (0.000415) | 60 | 15 |
| 1.52616 | 1.52608 | 1.52612 | 1.52660 | 1.52650 | 1.52655 | (0.000430) | 60 | 20 |
| 1.52610 | 1.52615 | 1.526125 | 1.52702 | 1.52702 | 1.52702 | (0.000895) | 60 | 25 |
| 1.52632 | 1.52656 | 1.52644 | 1.52684 | 1.52683 | 1.526835 | (0.000395) | 60 | 30 |
| | | 1.526131 | | | 1.526610 | <0.000479> | | |
| | | 0.000187 | | | 0.000328 | 0.000242 | | |
| | | Average % Difference (first five) = (0.031%) | | | | | | |
| 1.52604 | 1.52806 | 1.52705 | 1.52686 | 1.52688 | 1.52687 | 0.000180 | 59 | 65 |
| 1.52801 | 1.52802 | 1.528015 | 1.52674 | 1.52673 | 1.526735 | 0.001280 | 59 | 70 |
| 1.52802 | 1.52797 | 1.527995 | 1.52666 | 1.52664 | 1.52665 | 0.001345 | 59 | 75 |
| 1.52795 | 1.52796 | 1.527955 | 1.52691 | 1.52692 | 1.526915 | 0.001040 | 59 | 80 |
| 1.52805 | 1.52807 | 1.52806 | 1.52698 | 1.52699 | 1.526985 | 0.001075 | 59 | 85 |
| | | 1.527815 | | | 1.526831 | 0.000985 | | |
| | | 0.000430 | | | 0.000141 | 0.000468 | | |
| | | Average % Difference (last five) = 0.065% | | | | | | |




MIXING TEST DATA
URANIUM PRODUCT SAMPLE TANK

FIGURE F-1




MIXING TEST DATA
URANIUM PRODUCT OFF-SPECIFICATION TANK

FIGURE F-2

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX G

## VESSEL CALIBRATION ACTIVITIES

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

# 1.0 INTRODUCTION

Vessel calibration activities for FY 1979 included the "new" uranium product sample tank (24-D-204), uranium off-specification tank, and plutonium nitrate storage tanks in the plutonium product cell (PPC). Because of the piping changes associated with swapping functions for the two uranium tanks, calibrations were required to verify "new" heel measurements for the new off-specification tank and to provide a precision calibration for the new uranium product tank. Calibrations using the extremely accurate Ruska DDR-6000 precision pressure gage were needed for the plutonium product tanks.

The weigh-tank method of calibration was used. This calibration method consists of carefully adding a known quantity of calibration liquid to the tank and recording the response from tank instrumentation. Demineralized water was used for the calibrations.

The liquid level in the slab tanks is determined by measuring the differential pressure from the pneumatic dip tube/bubbler system. The primary differential pressure measurements were obtained from a Ruska DDR-6000 precision pressure transducer installed in parallel with the existing Taylor pressure transducers. The Ruska instrument provides a digital readout in 0.01 centimeter of water pressure at 4°C.

Differential pressure was recorded digitally from both the Ruska DDR-6000 attached across the level and reference probes and the Ruska DDR-6000 attached across the density and reference probes. (See Figure G-1 for the typical instrumentation used for tank calibrations.) The differences between these differential pressure measurements were used to determine effective probe separation and to detect instrument anomalies.

The incremental additions to the tanks were weighed on either a 50-kilogram or 350-kilogram scale with digital readout. The scale calibration was verified prior to each calibration pass. Both scales provided data of acceptable accuracy.

The temperature of the water in the tank was determined by a Type K thermocouple. For the plutonium tank, the thermocouple measured skin temperature at the bottom of the tank. Since the calibrations were carried out at ambient temperature, this method of assessing solution temperature was considered acceptable.

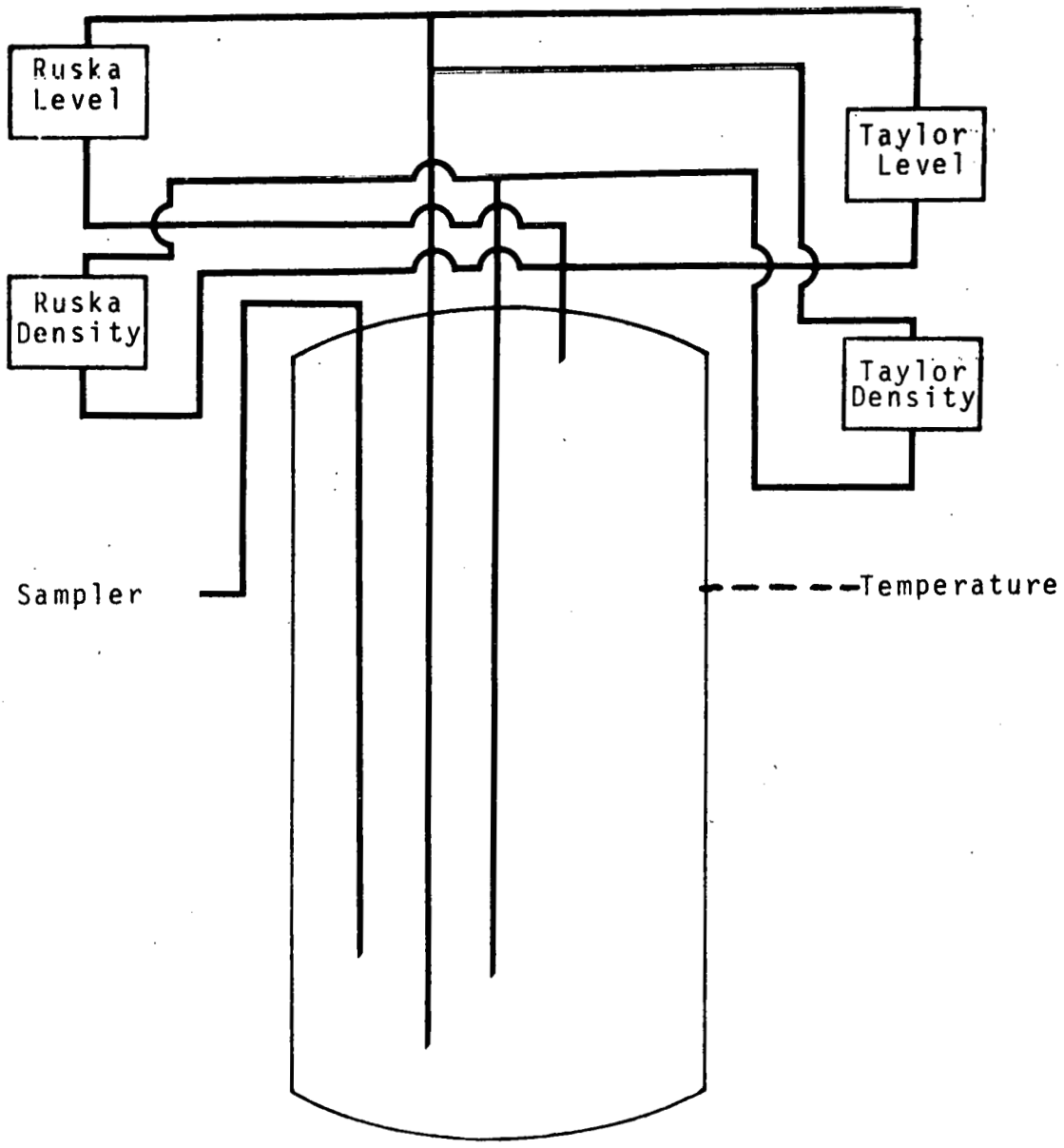
One test conducted during the calibration runs was to record pressure reading, sparge the solution in tank, allow reading to stablize, and record additional set of pressure readings. This test was designed as a check on the system stability. For two of the plutonium storage tanks, the repeat readings were erratic and calibration data were suspected. Because the acceptable calibration of all of the plutonium tanks was not essential for the FY 1979 integrated uranium run, the resolution of this

problem was deferred. Acceptable calibration data were obtained for one plutonium storage tank, 35-D-304.

Three calibration passes were run for each tank. The incremental additions were selected to provide a minimum of 20 to 25 data points for each pass. The raw calibration data were normalized to provide liquid level (height) above the bottom dip tube in centimeters and corresponding volume in liters. These data were plotted and a polynomial relationship was developed using the least-squares method of curve fitting.

## 2.0 DATA EVALUATION

Least-squares equations were developed and analysis of variance statistics obtained. The tanks were segmented into a sufficient number of polynomial equations to provide good fits over the entire tank. Relation error estimates for both the large uranium product sample tank (approximately 10,000 liters) and the small plutonium product storage tank (approximately 400 liters) were approximately the same, about 0.04% of full volume.




TYPICAL TANK CALIBRATION INSTRUMENTATION

FIGURE G-1

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX H

## EVALUATION OF ALTERNATE PRESSURE TRANSDUCERS

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
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## 1.0 INTRODUCTION

Several transmitters installed during the FY 1978 uranium run were tested in the instrument standards laboratory and reinstalled for the FY 1979 uranium run. These transmitters included Leeds and Northrup, Rosemount, Taylor, and Westinghouse pressure transmitters. In addition, units were received from Leslie and Gould for testing in the instrument standards laboratory. The results of these tests and transmitter performance during the FY 1979 uranium run are described in this appendix.

## 2.0 TEST RESULTS PRIOR TO FY 1979 INTEGRATED URANIUM RUN

The transmitter tests in the instrument standards laboratory prior to installation for the FY 1979 integrated uranium run were designed to evaluate linearity, temperature effects, and stability. A schematic of laboratory setup is provided in Figure H-1. Each transmitter was tested at 35°C prior to calibrating. This was an attempt to simulate the transmitter response under field conditions and with field calibration. These data are presented graphically in Figures H-2 through H-27.

The laboratory tests consisted of an initial linearity test with the transmitter at 35°C, cooling the transmitter to 25°C, setting zero and 100° of span, testing for linearity, raising transmitter temperature to 30°C and then 35°C, and testing for linearity at both temperatures. To ensure that thermal equilibrium was obtained, transmitters were maintained at designated temperature for approximately 24 hours prior to testing. The linearity test consisted of recording transmitter response from 0 to 100% span in 10% of span increments.

A review of these plots indicates that each transmitter has a unique response regardless of manufacturer; that transmitters with ranges 100 inches of water and above have better relative precision and accuracy; that field calibration can contribute significantly to transmitter accuracy; that temperature correction components vary widely in effectiveness; and that stability is good for most transmitters.

A Gould transmitter was received from the manufacture for test and evaluation. The standards laboratory tests on this transmitter with a range of 200 inches of water pressure are presented in Figure H-25. Based on this test data, the Gould transmitter does not represent an improvement over currently installed instrumentation.

A Leslie transmitter was received from the manufacturer for test and evaluation. The standards laboratory test on this transmitter with a range of 0 to 100 inches of water pressure are presented in Figures H-26 and H-27. Figure H-27 shows the effect of reducing the transmitter range from 100 to 40 inches of water pressure. The absolute error was reduced, but the transmitter was more sensitive to temperature and not

as linearity at zero. Based on these data, additional testing of Leslie transmitters are not warranted.

## 3.0 TRANSMITTER PERFORMANCE DURING FY 1979 INTEGRATED URANIUM RUN

The performance of process transmitters was satisfactory. A comparison of the responses from transmitters installed in parallel during the FY 1979 run provided a measurement of both the precision and stability of the two transmitters. For the accountability tank and the uranium product tank, Taylor instruments are in parallel with the very accurate and precise Ruska DDR-6000 precision pressure gage. This provided an opportunity to accurately monitor the performance of these instruments over an extended period of time. For the two waste measurement points, Taylor and Westinghouse transmitters were installed in parallel.

Over the time period of the FY 1979 run, some abrupt shifts did occur in transmitter response. However, the precision of process transmitter continued to be considerably better than the corresponding accurate values. Table H-1 provides a listing of comparisons between Ruska and Taylor levels for the input and product tank and between Westinghouse and Taylor levels for the two (2) liquid waste measurement points.

Note in Table H-1 that the standard deviations are generally smaller than differences. For the accountability tank (02003), no shifts were apparent, and the precision was better than 0.1% of full scale. Although at least one apparent shift occurred for the other instruments listed in Table H-1, the standard deviations expressed as a percent of full scale were not excessive. One reason the standard deviation values are small is the fact that the measurements were made at approximately the same pressure eliminating any nonlinearity in the transmitter.

These data indicate that an on-line one or two point calibration would be sufficient to eliminate most transmitter bias and provide very precise and accurate transmitter pressure measurements. A test using one or two known pressure sources manifolded to several transmitters for on-line test is planned for FY 1980.

## TABLE H-1

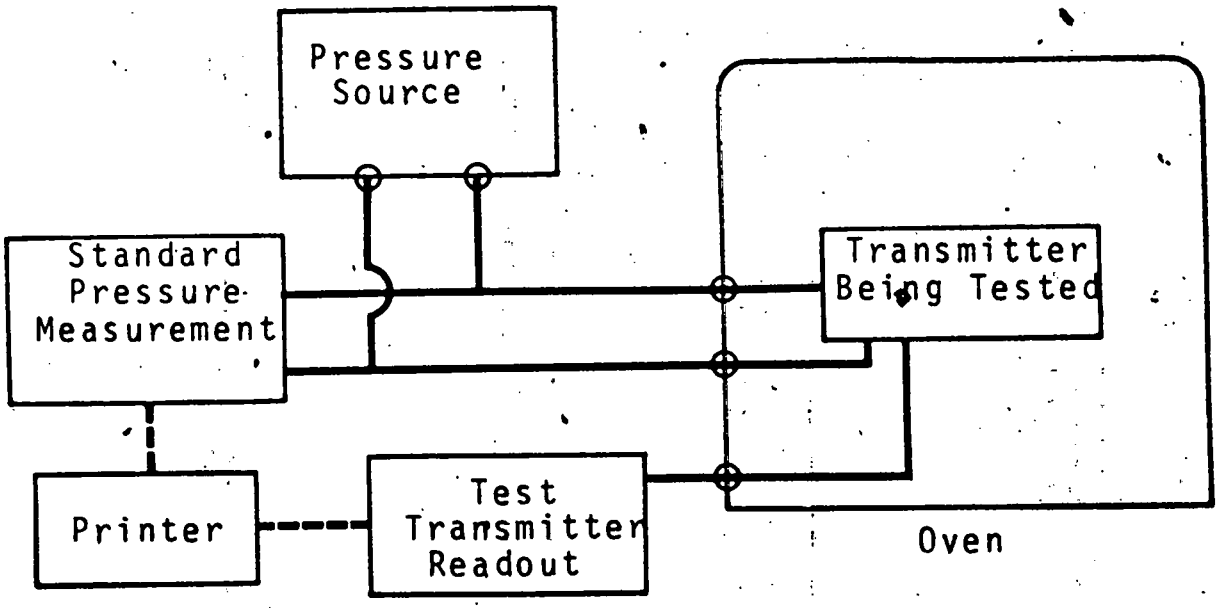
## LEVEL TRANSMITTER COMPARISONS FOR FY 1979 RUN

| Measurement Point Number | Level | Transmitter Range (cm) | Average Test (cm) | Number | Avg. Diff. | Standard Deviation(s) | Shifts | % Diff. | % S | % Full Scale Diff. | % Full Scale S |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | Upper | 546.1 | 341 | 149 | -5.01 | 0.45 | 0 | 1.47 | 0.13 | 0.92 | 0.08 |
| | Lower | -- | 71 | 148 | -2.07 | 0.26 | 0 | 2.92 | 0.37 | 0.38 | 0.07 |
| | Net | -- | 270 | | +2.94 | 0.52 | 0 | 1.09 | 0.19 | 0.54 | 0.10 |
| 2007 | Upper | 330 | 222 | 145 | 0.83 | 0.70 | 1 | 0.37 | 0.32 | 0.25 | 0.21 |
| | Lower | 330 | 71 | 147 | 0.20 | 0.80 | 2 | 0.28 | 1.13 | 0.06 | 0.24 |
| | Net | 330 | 151 | -- | 0.63 | 1.06 | | 0.42 | 0.70 | 0.19 | 0.32 |
| 2023 | Upper | 518.16 | 370 | 103 | -0.04 | 1.14 | 1-2 | (0.01) | 0.31 | 0.01 | 0.22 |
| | Lower | -- | 49 | 101 | -1.70 | 1.14 | 1-2 | (3.47) | 2.33 | 0.33 | 0.22 |
| | Net | -- | 321 | | 1.66 | 1.61 | 0 | 0.52 | 0.50 | 0.32 | 0.31 |
| *2028 | Upper | 181.10 | 140 | 111 | 1.77 | 0.60 | | 1.26 | 0.43 | 0.98 | 0.33 |
| | Upper | | 140 | 108 | -2.17 | 0.53 | | <1.55> | 0.38 | <1.20> | 0.29 |
| | Lower | -- | 23 | 93 | 1.18 | 0.60 | | 5.13 | 2.61 | 0.65 | 0.33 |
| | Lower | -- | 16 | 92 | -3.04 | 0.53 | | <19.0> | 2.79 | <1.68> | 0.29 |
| | Net-1 | -- | 117 | | 0.59 | 0.85 | | 0.50 | 0.73 | 0.33 | 0.47 |
| | Net-2 | -- | 124 | | 0.87 | 0.56 | | 0.70 | 0.45 | 0.48 | 0.31 |

*A substantial shift occurred and data were split into two groups.

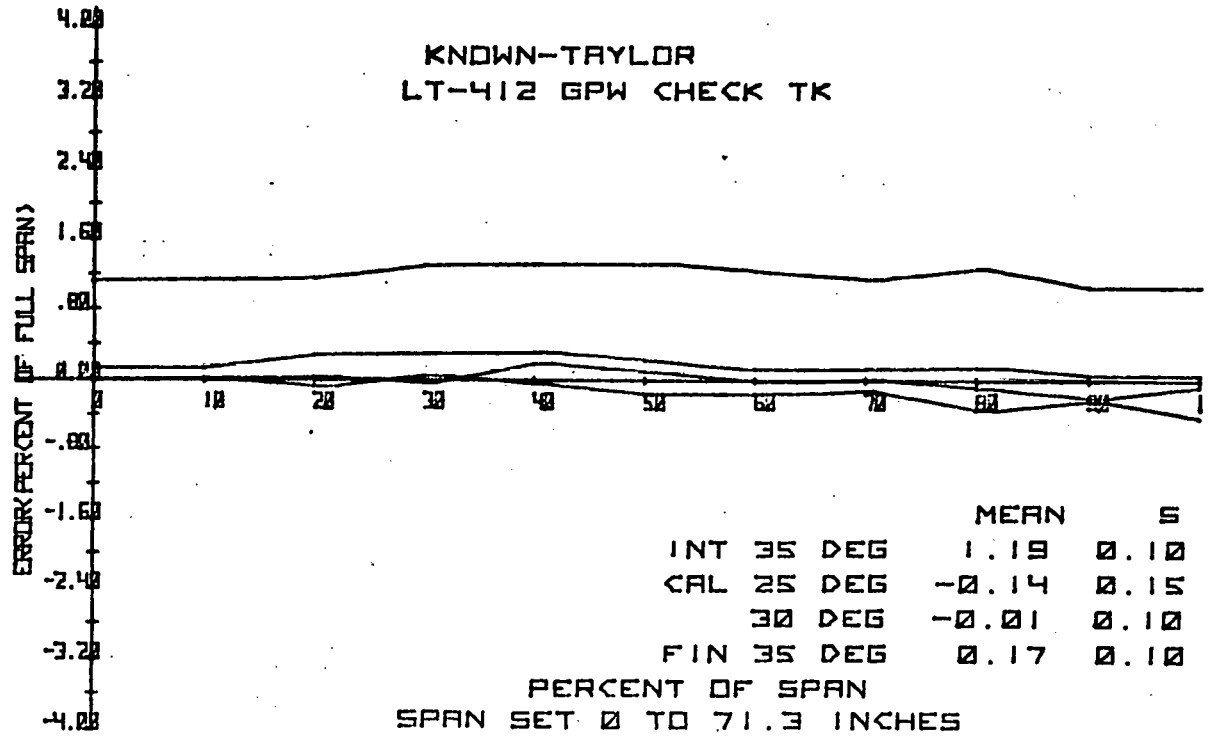
TABLE H-2

| LT Number | Manufacturer | Model No. | Range-Inches of Water | Figure |
|---|---|---|---|---|
| LT-412 | Taylor | | 0-71.3 | J-2 |
| LT-412-S | Westinghouse | 8-13-003 | 0-71.3 | J-2 |
| LT-419 | Taylor | | 0-204 | J-3 |
| LT-419-S | Westinghouse | 8-25-011 | 0-24 | J-3 |
| LT-129 | Taylor | | 0-285 | J-4 |
| LT-129-S-1 | Westinghouse | 8-25-013 | 0-285 | J-5 |
| LT-129-S-2 | Leeds & Northup | | 0-285 | J-6 |
| LT-130 | Taylor | | 0-285 | J-7 |
| LT-130-S-1 | Westinghouse | 8-2 | 0-285 | J-8 |
| LT-130-S-2 | Rosemount | | 0-285 | J-9 |
| LT-201-S | Westinghouse | 8-13-004 | 0-260 | J-10 |
| LT-235-S | Westinghouse | 8-25-009 | 0-130 | J-11&12 |
| LT-238-S | Westinghouse | 8-25-008 | 0-97 | J-13 |
| LT-465-S | Westinghouse | 8-25-010 | 0-145 | J-14 |
| LT-406-S | Westinghouse | 8-25-012 | 0-169 | J-15 |
| DT-416 | Taylor | | 8-14 | J-16 |
| DT-416-S | Westinghouse | 8-28-012 | 8-14 | J-16 |
| DT-430 | Taylor | | 10-15 | J-17 |
| DT-430-S | Westinghouse | 8-25-011 | 10-15 | J-17 |
| DT-168-S-1 | Westinghouse | 8-25-005 | 10-19 | J-18 |
| DT-168-S-2 | Leeds & Northup | 78-46505-2-1 | 10-19 | J-18 |
| DT-169-S-1 | Westinghouse | 8-25-001 | 10-19 | J-19 |
| DT-169-S-2 | Rosemount | 98922 | 10-19 | J-19 |
| DT-401-S | Westinghouse | 8-25-007 | 10-19 | J-20 |
| DT-410-S | Westinghouse | 8-25-002 | 7-12 | J-21 |
| DT-411-S | Westinghouse | 8-25-003 | 10-16 | J-22 |
| DT-269-S | Westinghouse | 8-25-004 | 10-19 | J-23 |
| DT-272-S | Westinghouse | 8-25-006 | 10-19 | J-24 |
| | Gould | | 0-200 | J-25 |
| | Leslie | | 0-100 | J-26 |
| | Leslie | | 10-50 | J-27 |




TRANSMITTER TEST SETUP

FIGURE H-1


KNOWN-TAYLOR
LT-412 GPW CHECK TK
ERROR(PERCENT OF FULL SPAN)
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
100
MEAN S
INT 35 DEG 1.19 0.10
CAL 25 DEG -0.14 0.15
30 DEG -0.01 0.10
FIN 35 DEG 0.17 0.10
PERCENT OF SPAN
SPAN SET 0 TO 71.3 INCHES

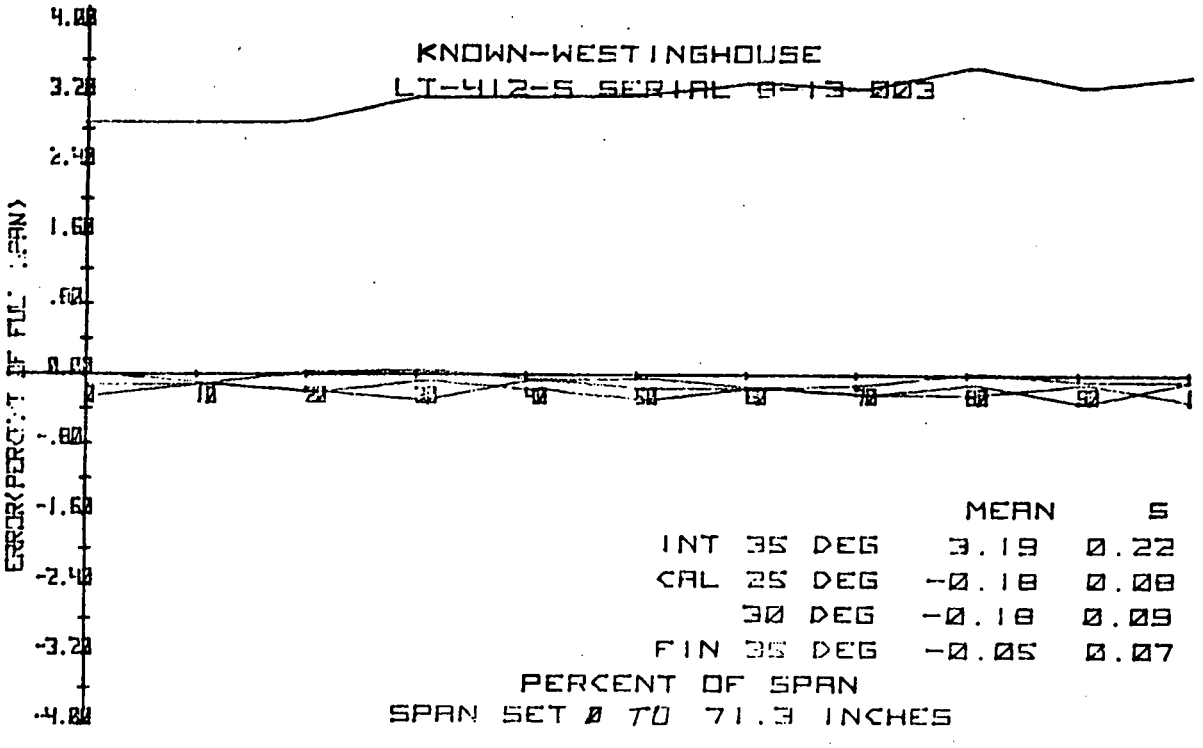
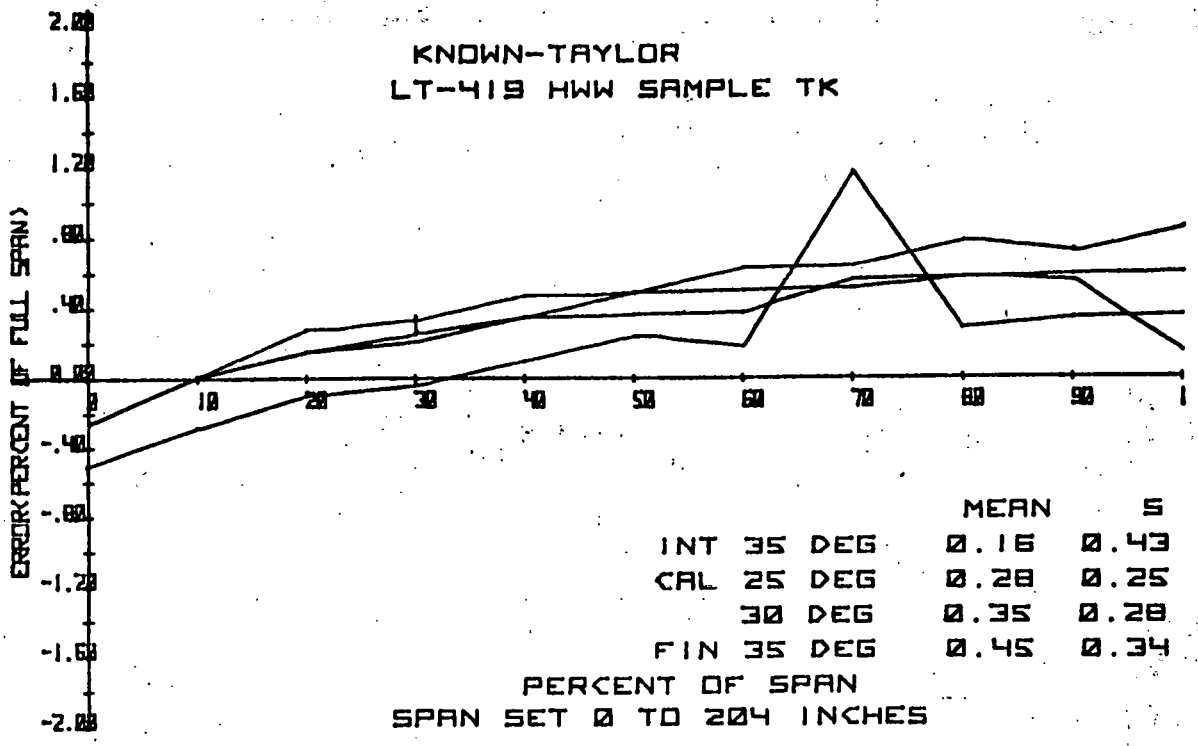

KNOWN-WESTINGHOUSE
LT-412-5 SERIAL B-13-003
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
100
MEAN S
INT 35 DEG 3.19 0.22
CAL 25 DEG -0.18 0.08
30 DEG -0.18 0.09
FIN 35 DEG -0.05 0.07
PERCENT OF SPAN
SPAN SET 0 TO 71.3 INCHES

FIGURE H-2


KNOWN-TAYLOR
LT-419 HWW SAMPLE TK
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 0.16 0.43
CAL 25 DEG 0.28 0.25
30 DEG 0.35 0.28
FIN 35 DEG 0.45 0.34
PERCENT OF SPAN
SPAN SET 0 TO 204 INCHES

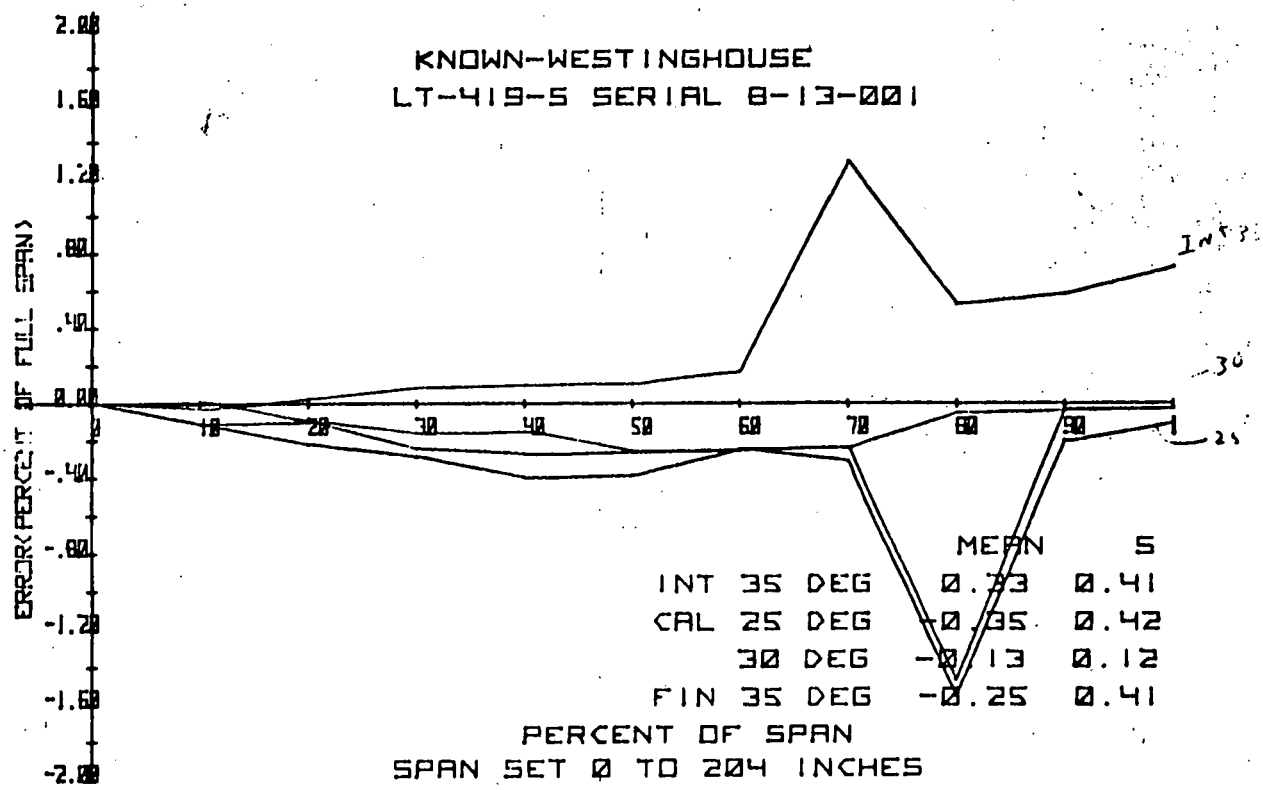

KNOWN-WESTINGHOUSE
LT-419-5 SERIAL 8-13-001
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 0.33 0.41
CAL 25 DEG -0.35 0.42
30 DEG -0.13 0.12
FIN 35 DEG -0.25 0.41
PERCENT OF SPAN
SPAN SET 0 TO 204 INCHES

FIGURE H-3

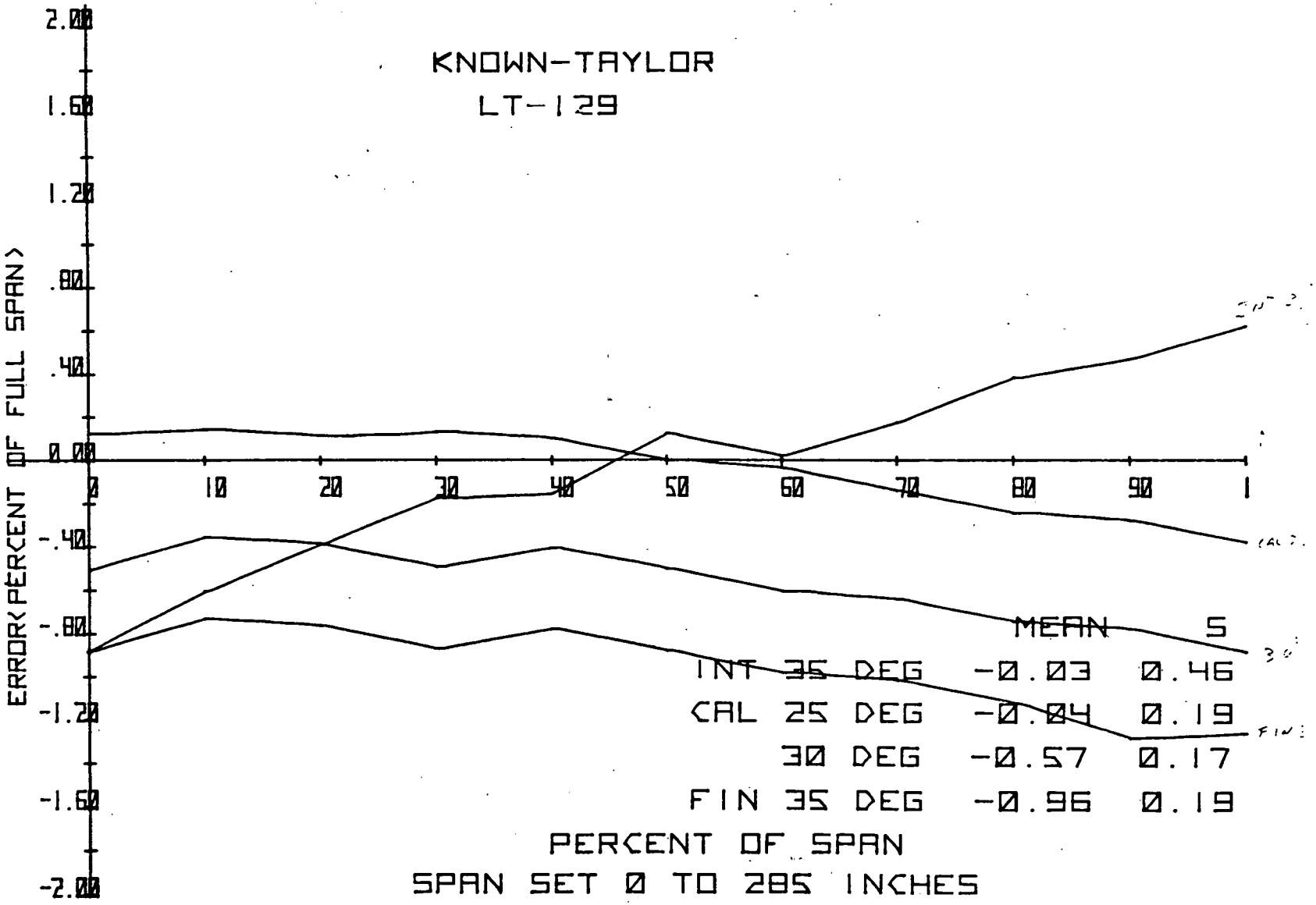

KNOWN-TAYLOR
LT-129
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG -0.03 0.46
CAL 25 DEG -0.04 0.19
30 DEG -0.57 0.17
FIN 35 DEG -0.96 0.19
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-4

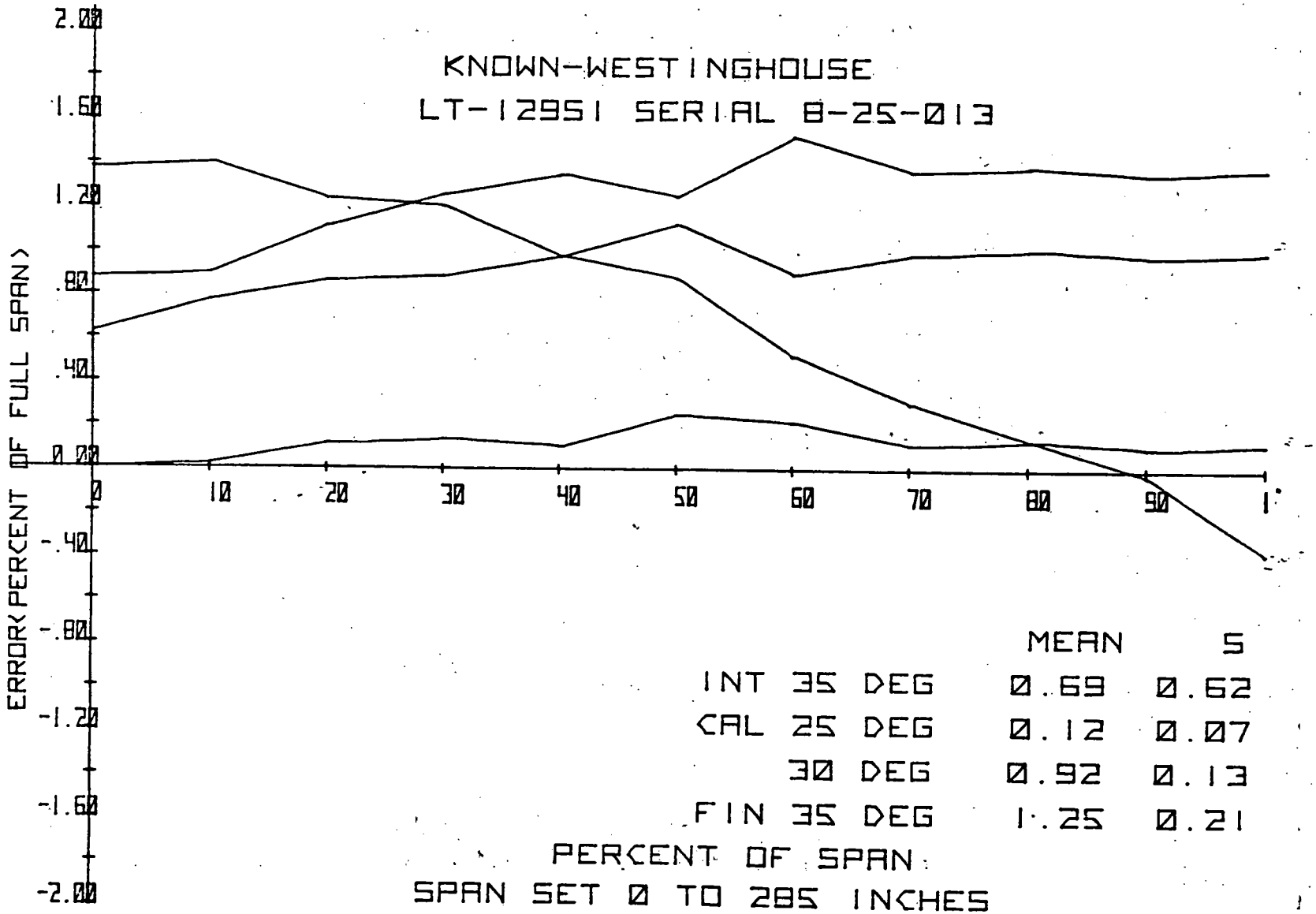

KNOWN-WESTINGHOUSE
LT-12951 SERIAL 8-25-013
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG 0.69 0.62
CAL 25 DEG 0.12 0.07
30 DEG 0.92 0.13
FIN 35 DEG 1.25 0.21
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-5

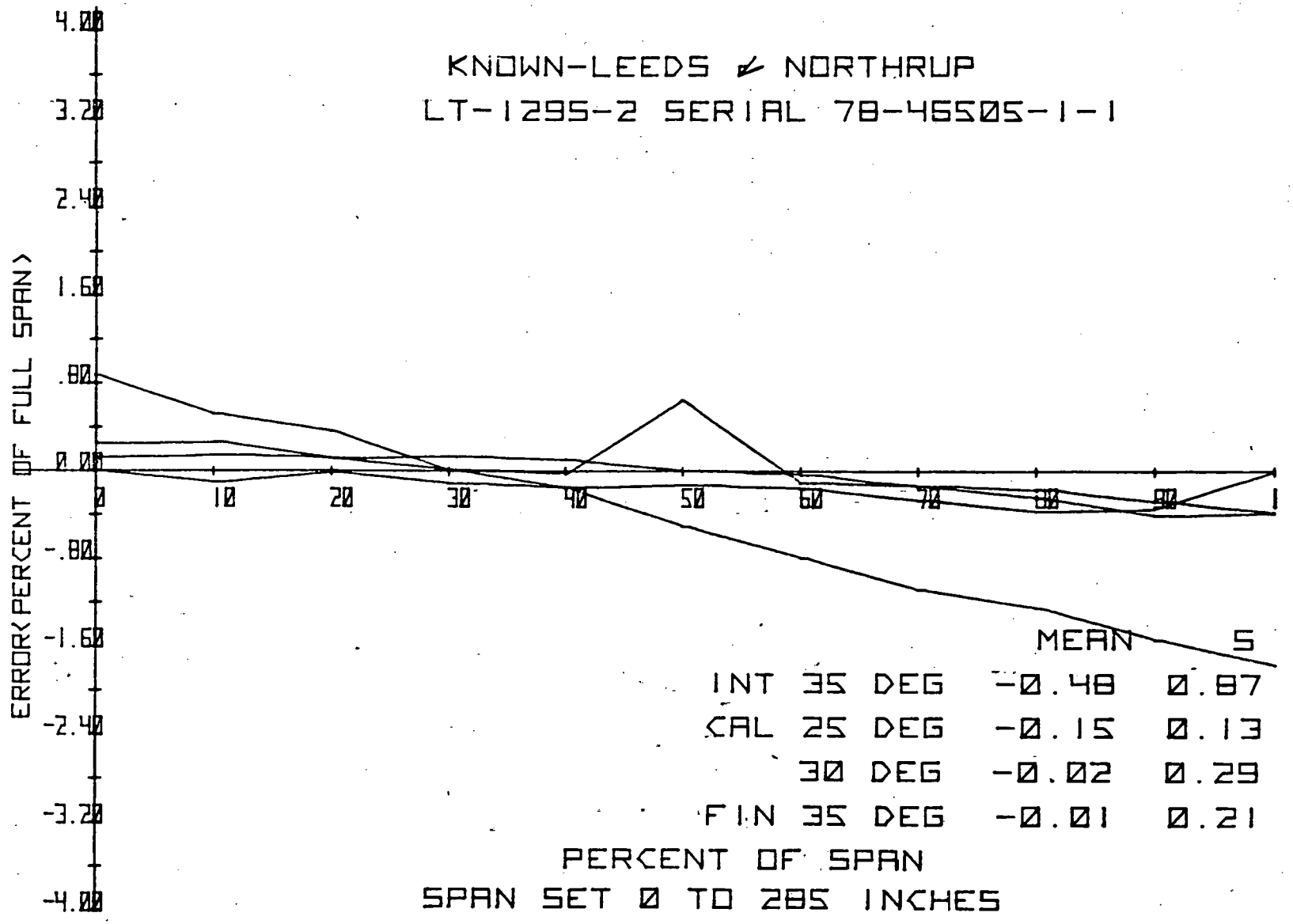

KNOWN-LEEDS ↙ NORTHRUP
LT-1295-2 SERIAL 78-46505-1-1
ERROR(PERCENT OF FULL SPAN)
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
100
MEAN S
INT 35 DEG -0.48 0.87
CAL 25 DEG -0.15 0.13
30 DEG -0.02 0.29
FIN 35 DEG -0.01 0.21
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-6

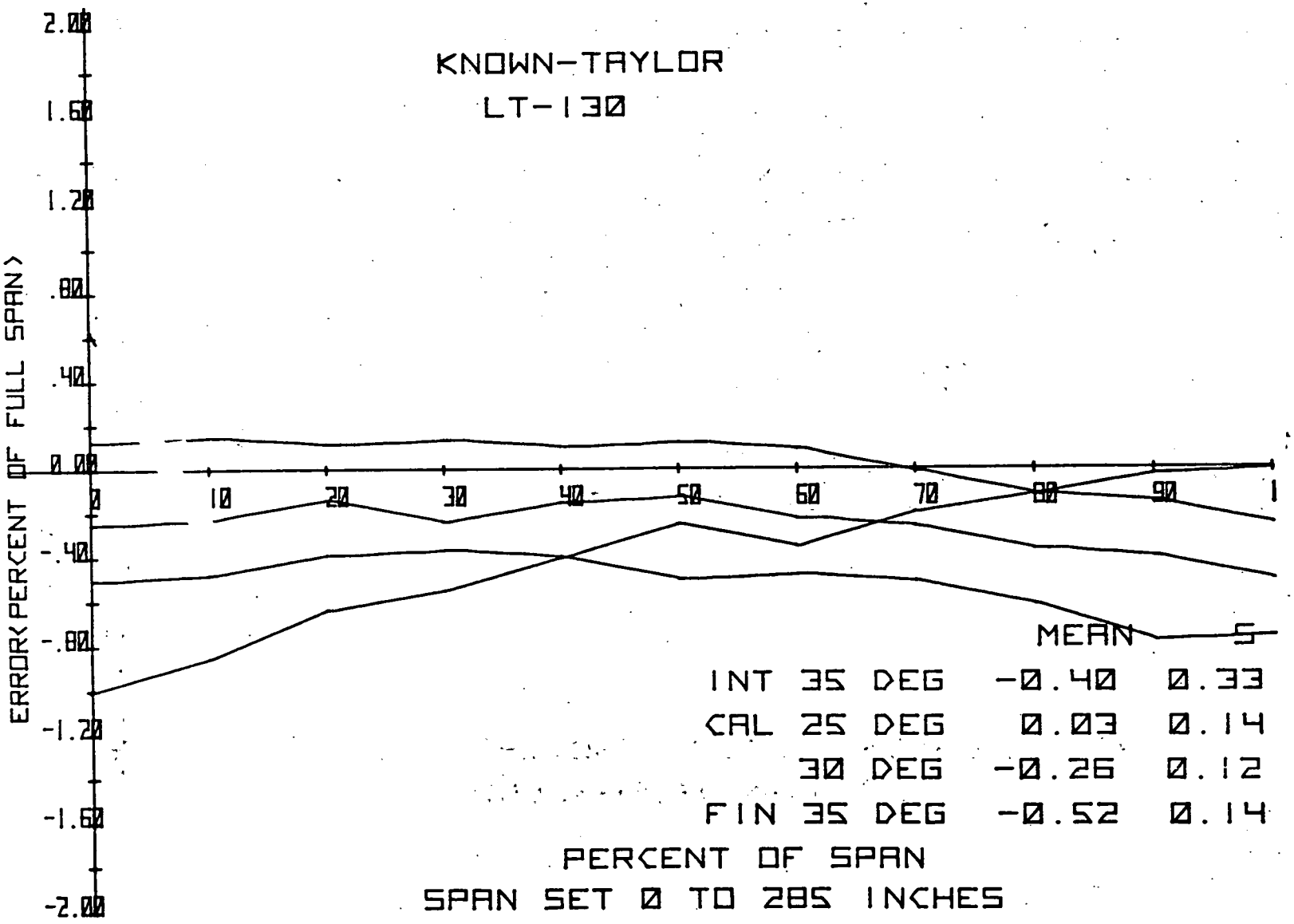

KNOWN-TAYLOR
LT-130
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG -0.40 0.33
CAL 25 DEG 0.03 0.14
30 DEG -0.26 0.12
FIN 35 DEG -0.52 0.14
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-7

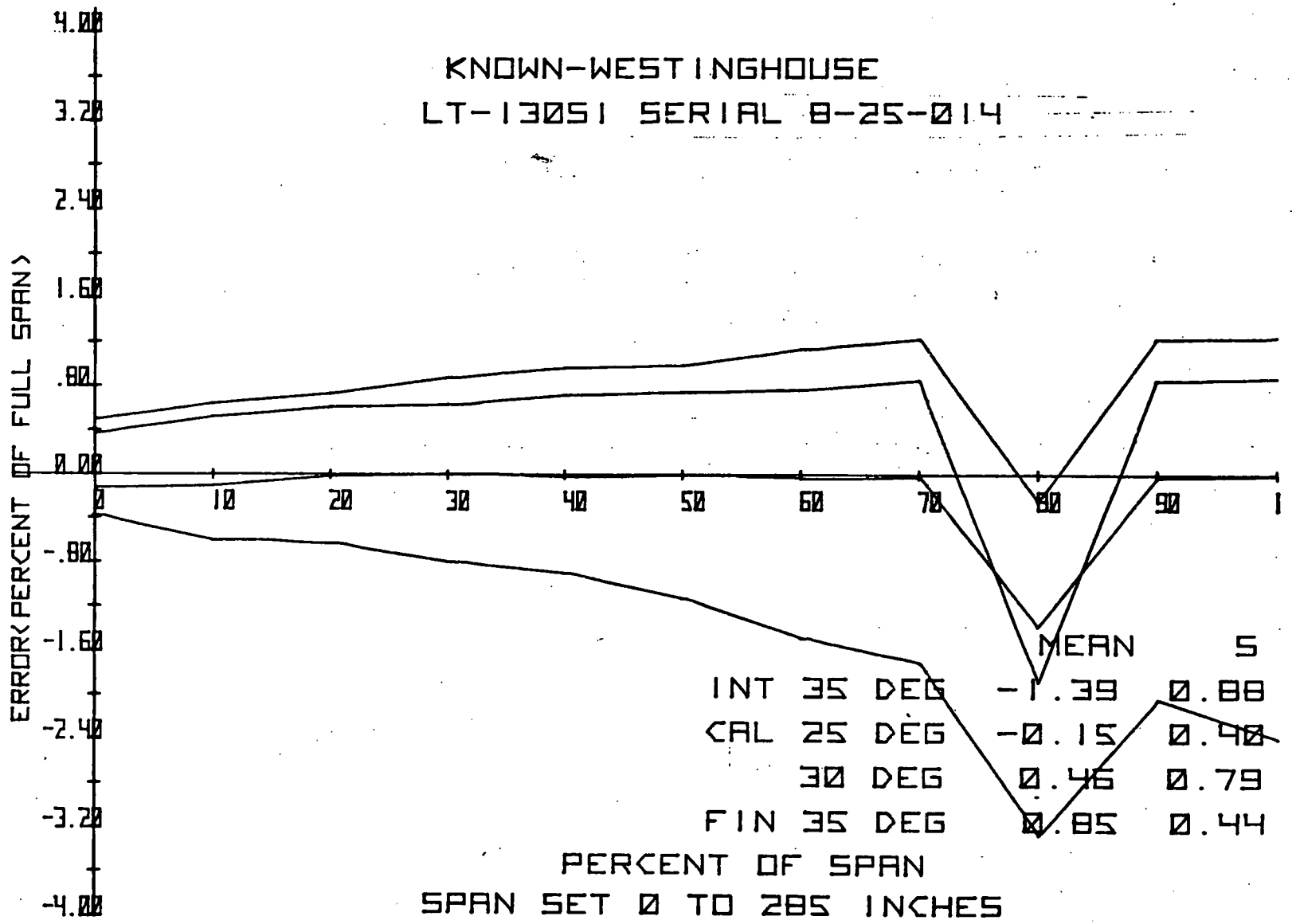

KNOWN-WESTINGHOUSE
LT-13051 SERIAL 8-25-014
ERROR(PERCENT OF FULL SPAN)
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG
-1.39
0.88
CAL 25 DEG
-0.15
0.40
30 DEG
0.46
0.79
FIN 35 DEG
0.85
0.44
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-8

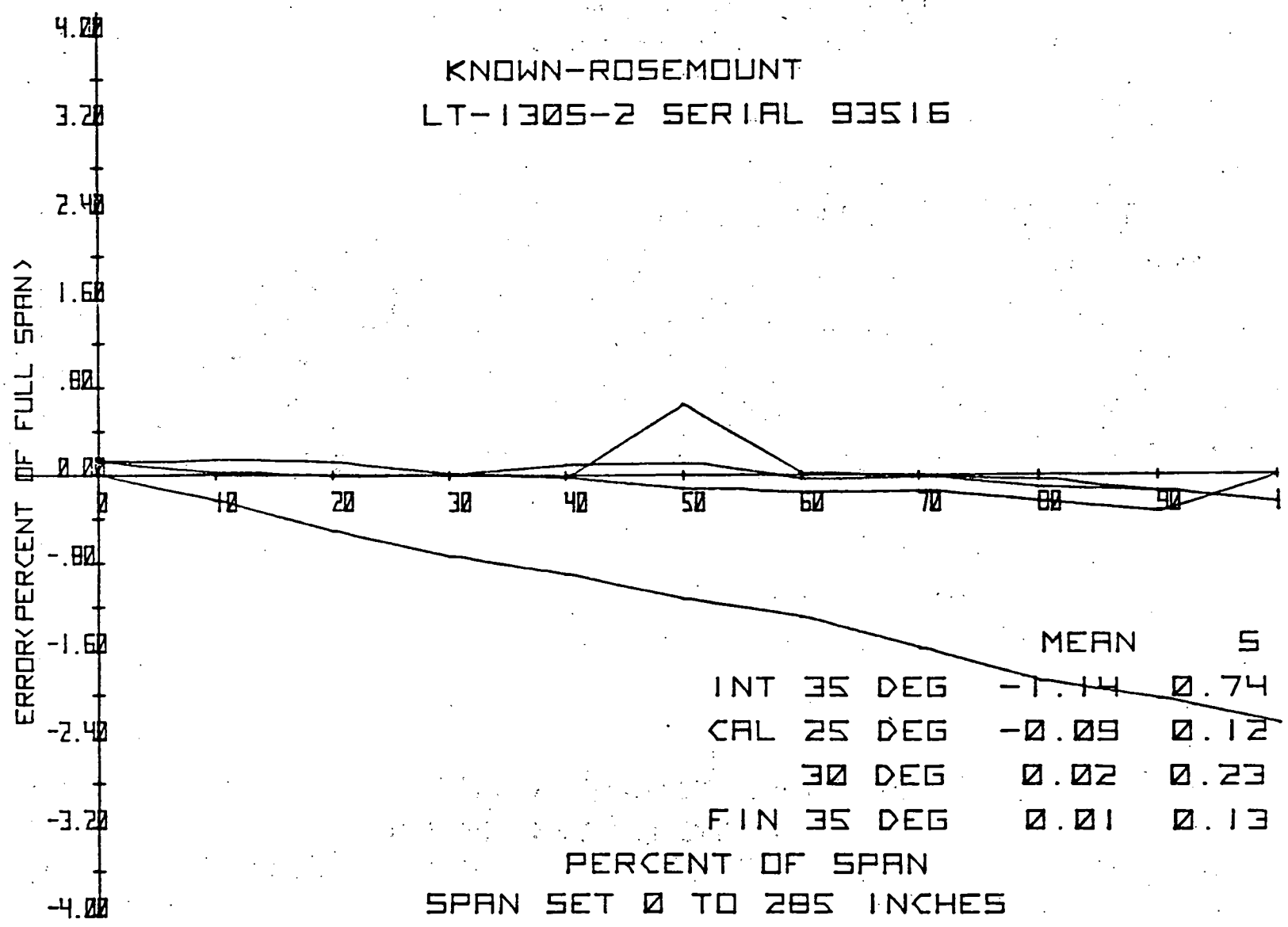

KNOWN-ROSEMOUNT
LT-1305-2 SERIAL 93516
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
ERROR(PERCENT OF FULL SPAN)
0
10
20
30
40
50
60
70
80
90
MEAN
S
INT 35 DEG -1.14 0.74
CAL 25 DEG -0.09 0.12
30 DEG 0.02 0.23
FIN 35 DEG 0.01 0.13
PERCENT OF SPAN
SPAN SET 0 TO 285 INCHES

FIGURE H-9

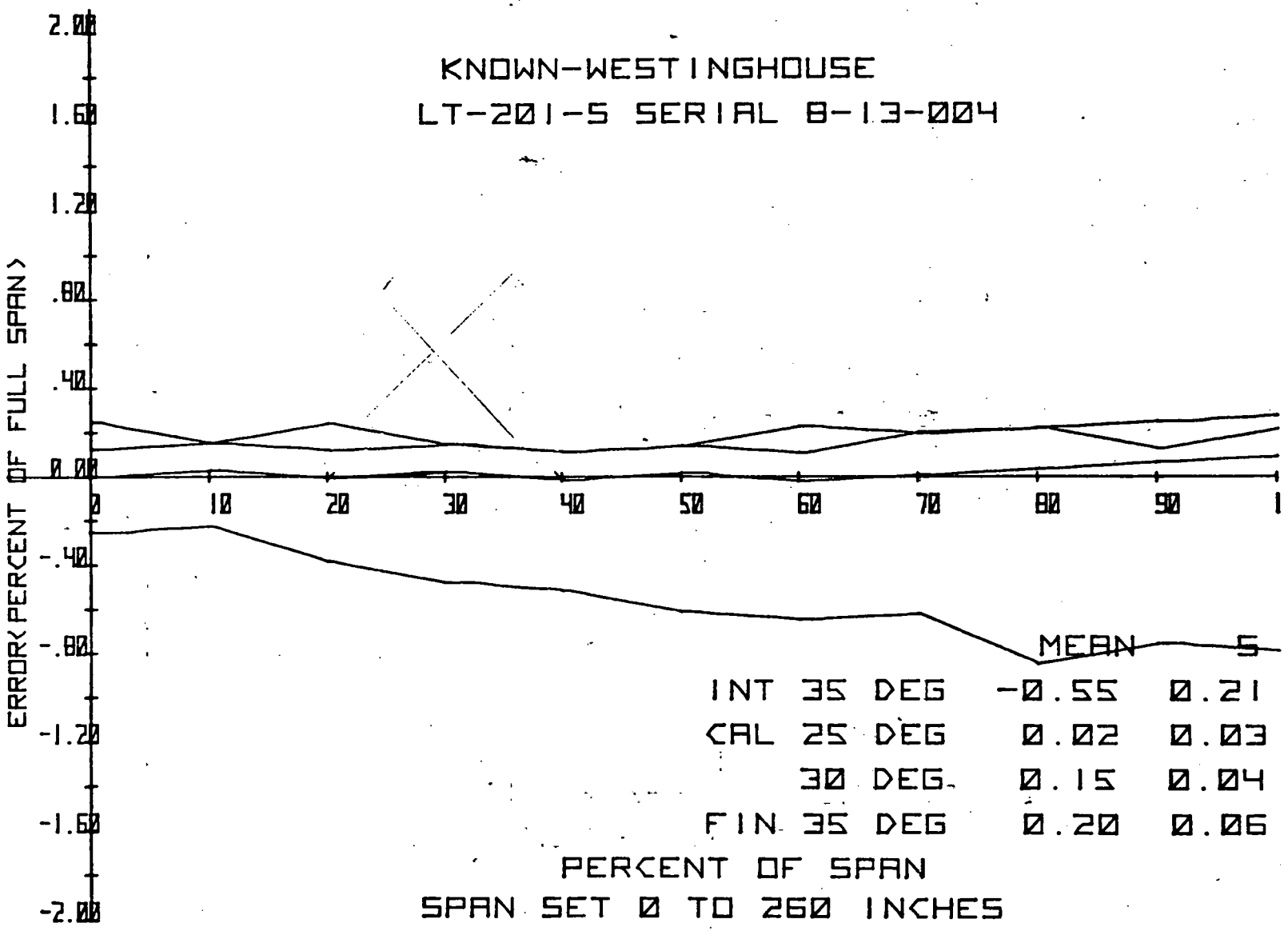

KNOWN-WESTINGHOUSE
LT-201-5 SERIAL 8-13-004
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
5
INT 35 DEG -0.55 0.21
CAL 25 DEG 0.02 0.03
30 DEG. 0.15 0.04
FIN 35 DEG 0.20 0.06
PERCENT OF SPAN
SPAN SET 0 TO 260 INCHES

FIGURE H-10

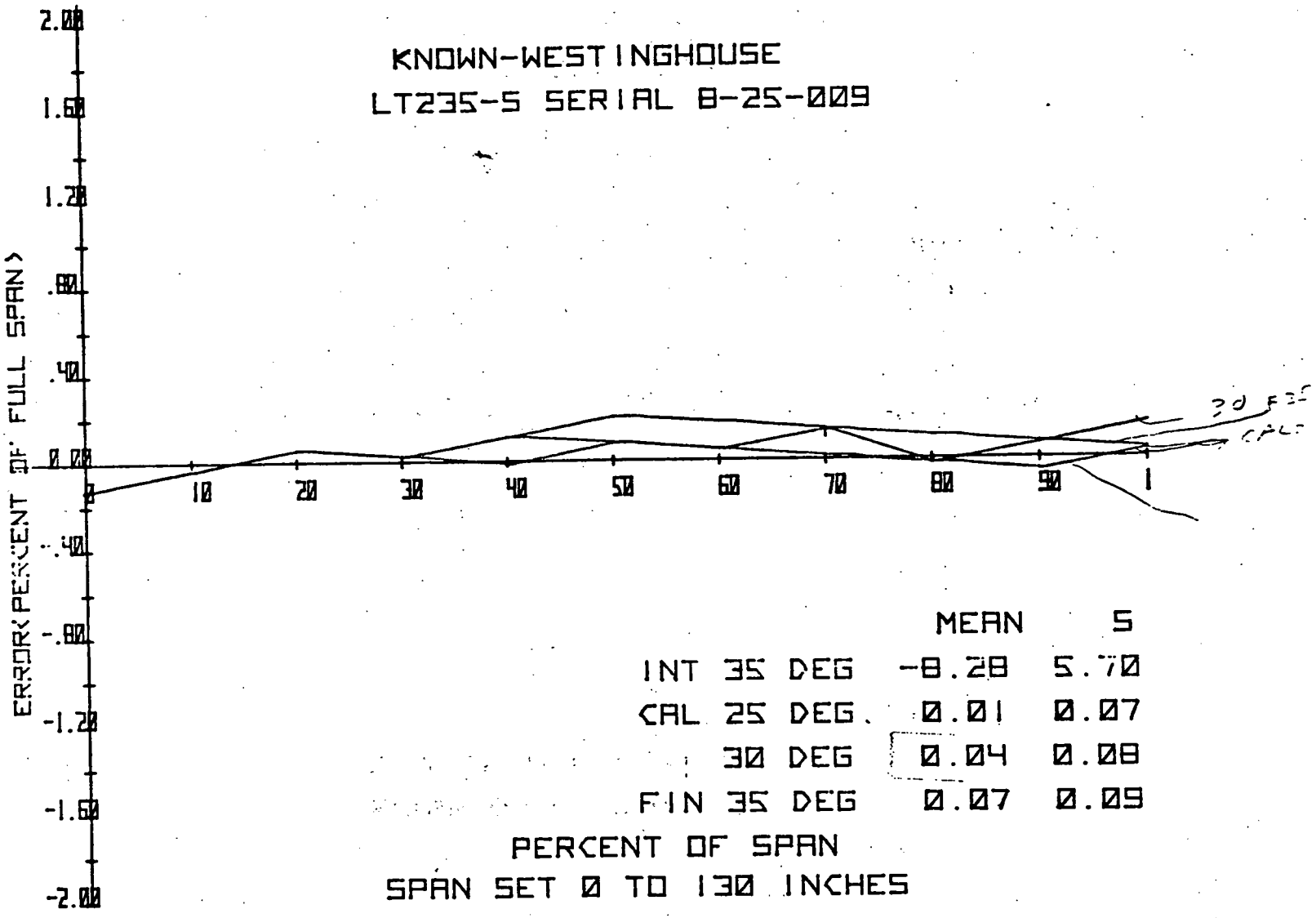

KNOWN-WESTINGHOUSE
LT235-5 SERIAL B-25-009
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN S
INT 35 DEG -0.28 5.70
CAL 25 DEG. 0.01 0.07
30 DEG 0.04 0.08
FIN 35 DEG 0.07 0.09
PERCENT OF SPAN
SPAN SET 0 TO 130 INCHES

FIGURE H-11

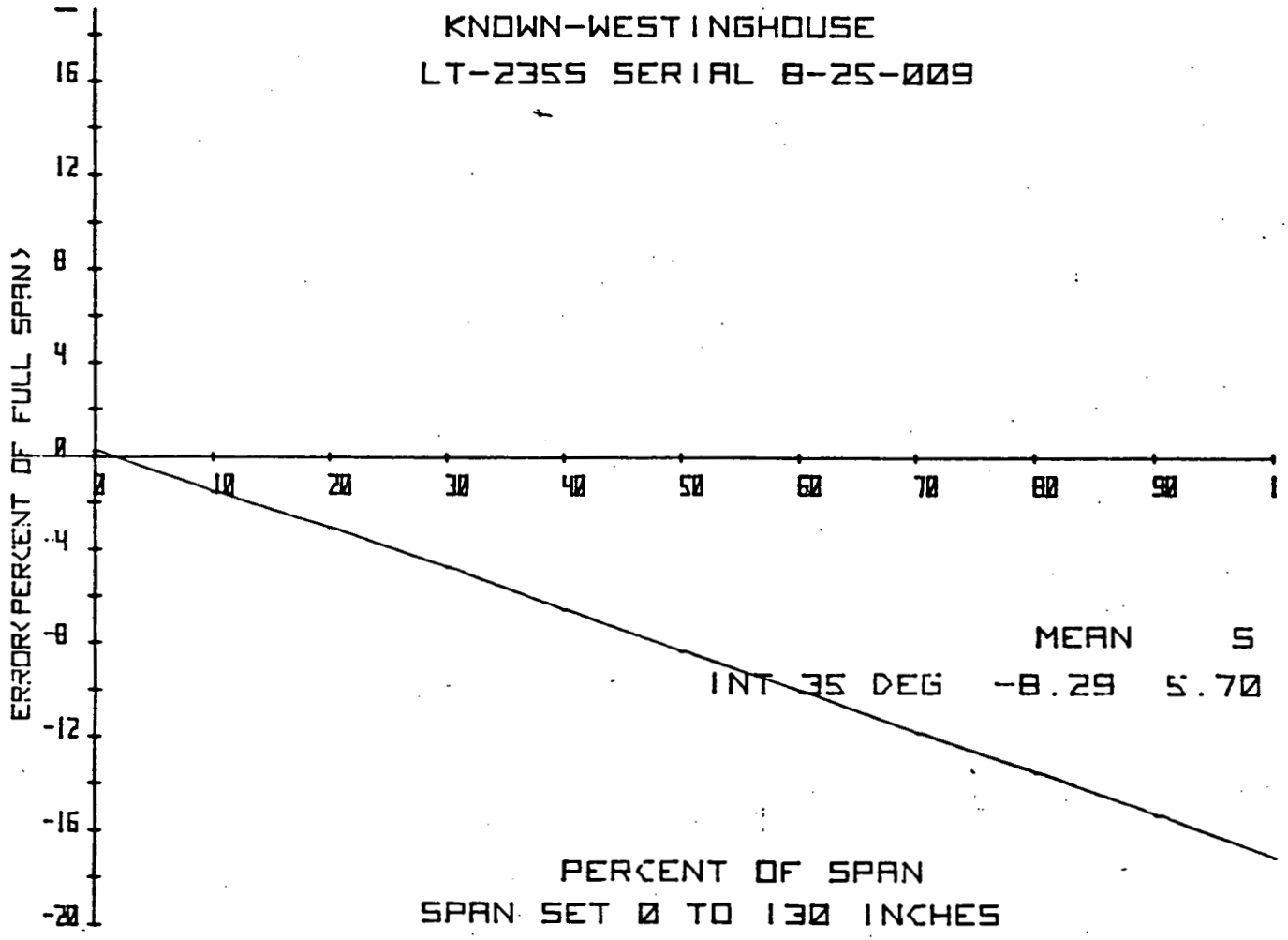

KNOWN-WESTINGHOUSE
LT-2355 SERIAL 8-25-009
ERROR(PERCENT OF FULL SPAN)
16
12
8
4
0
-4
-8
-12
-16
-20
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG
-8.29
5.70
PERCENT OF SPAN
SPAN SET 0 TO 130 INCHES

FIGURE H-12

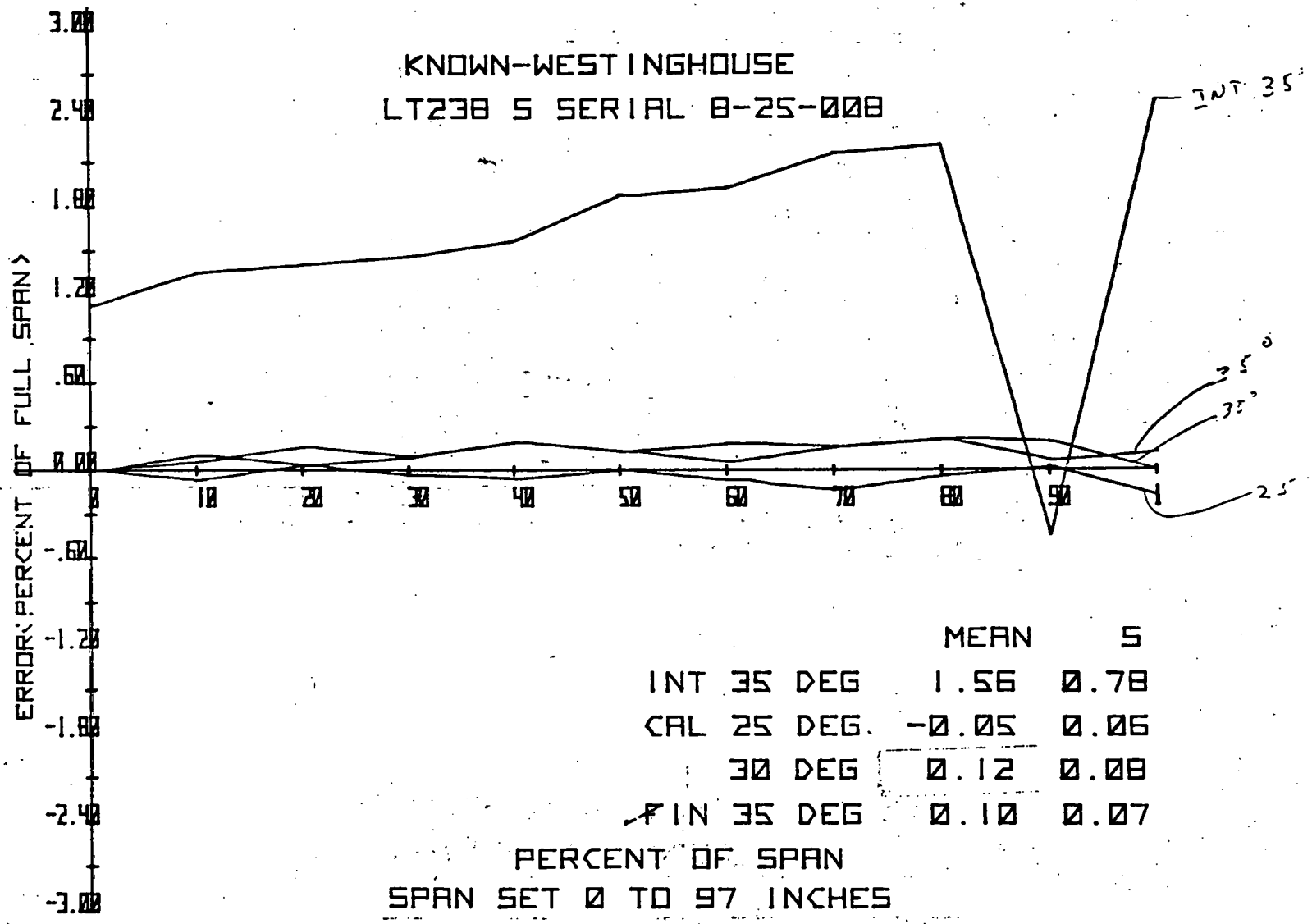
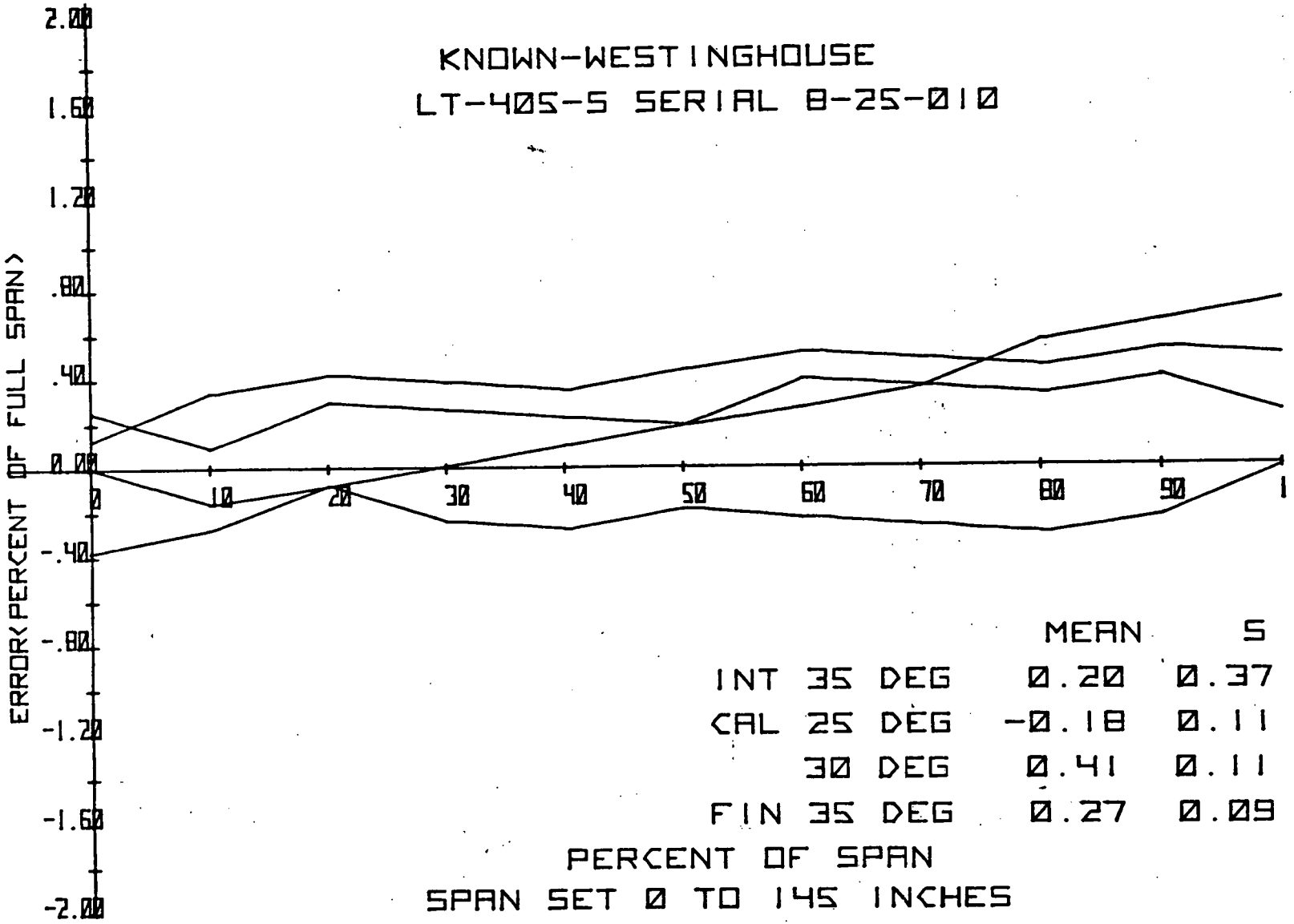

KNOWN-WESTINGHOUSE
LT238 S SERIAL 8-25-008
INT 35°
35°
35°
25°
ERROR (PERCENT OF FULL SPAN)
3.00
2.40
1.80
1.20
.60
0.00
-.60
-1.20
-1.80
-2.40
-3.00
0
10
20
30
40
50
60
70
80
90
100
MEAN S
INT 35 DEG 1.56 0.78
CAL 25 DEG. -0.05 0.06
30 DEG 0.12 0.08
FIN 35 DEG 0.10 0.07
PERCENT OF SPAN
SPAN SET 0 TO 97 INCHES

FIGURE H-13

FIGURE H-14


KNOWN-WESTINGHOUSE
LT-405-5 SERIAL 8-25-010
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN S
INT 35 DEG 0.20 0.37
CAL 25 DEG -0.18 0.11
30 DEG 0.41 0.11
FIN 35 DEG 0.27 0.09
PERCENT OF SPAN
SPAN SET 0 TO 145 INCHES

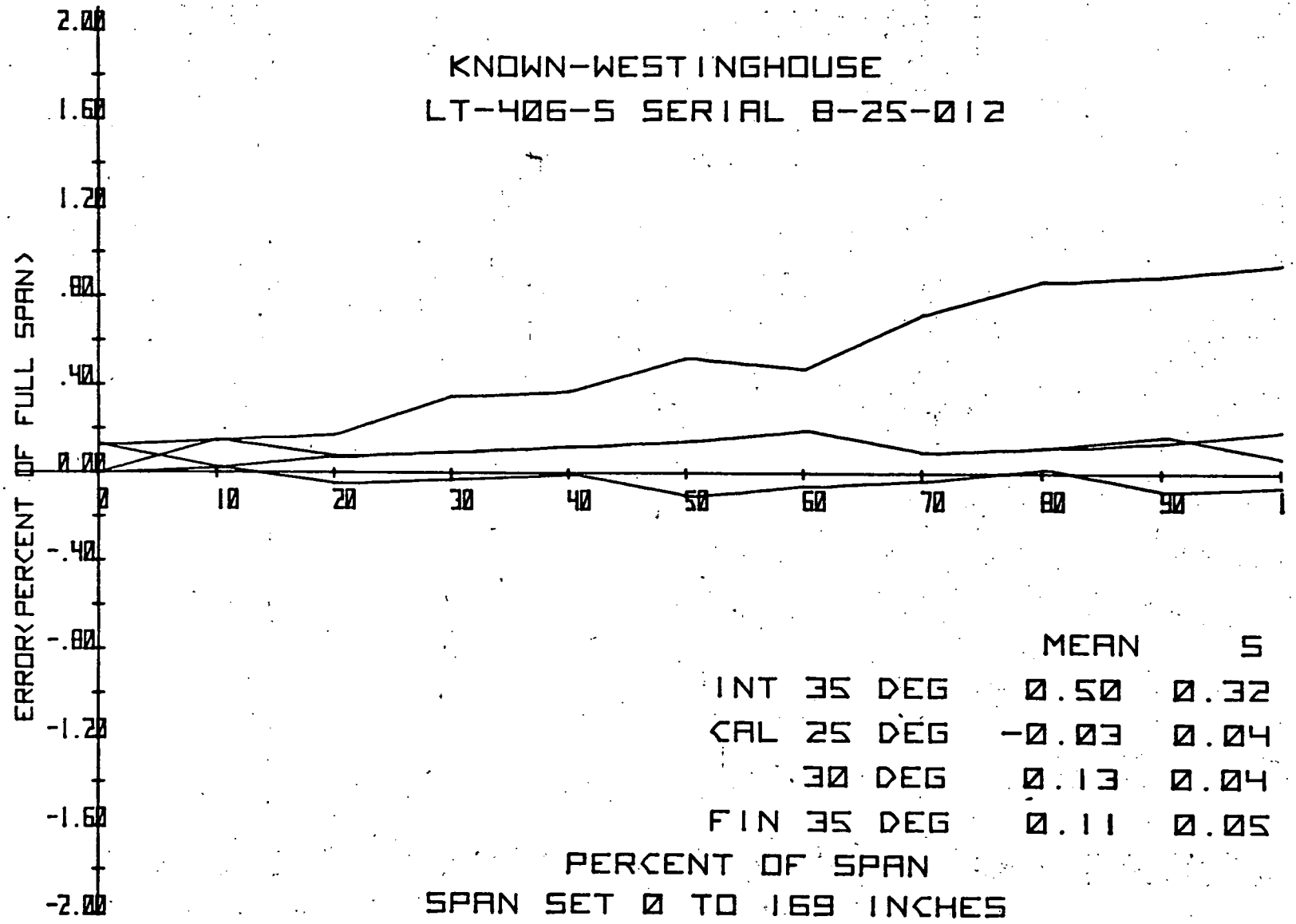

KNOWN-WESTINGHOUSE
LT-406-5 SERIAL 8-25-012
ERROR(PERCENT OF FULL SPAN)
2.00
1.60
1.20
.80
.40
0.00
-.40
-.80
-1.20
-1.60
-2.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG 0.50 0.32
CAL 25 DEG -0.03 0.04
30 DEG 0.13 0.04
FIN 35 DEG 0.11 0.05
PERCENT OF SPAN
SPAN SET 0 TO 169 INCHES

FIGURE H-15

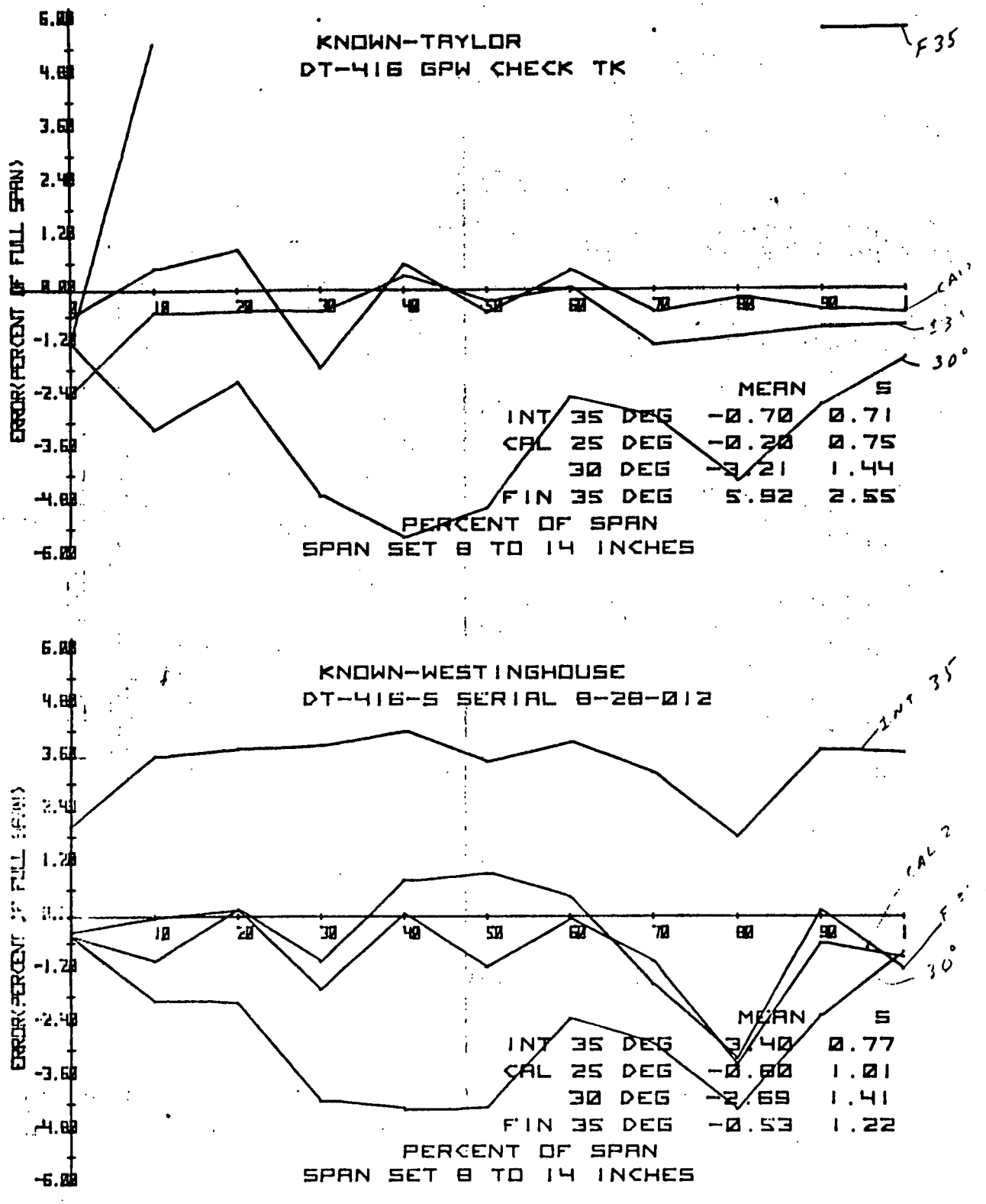
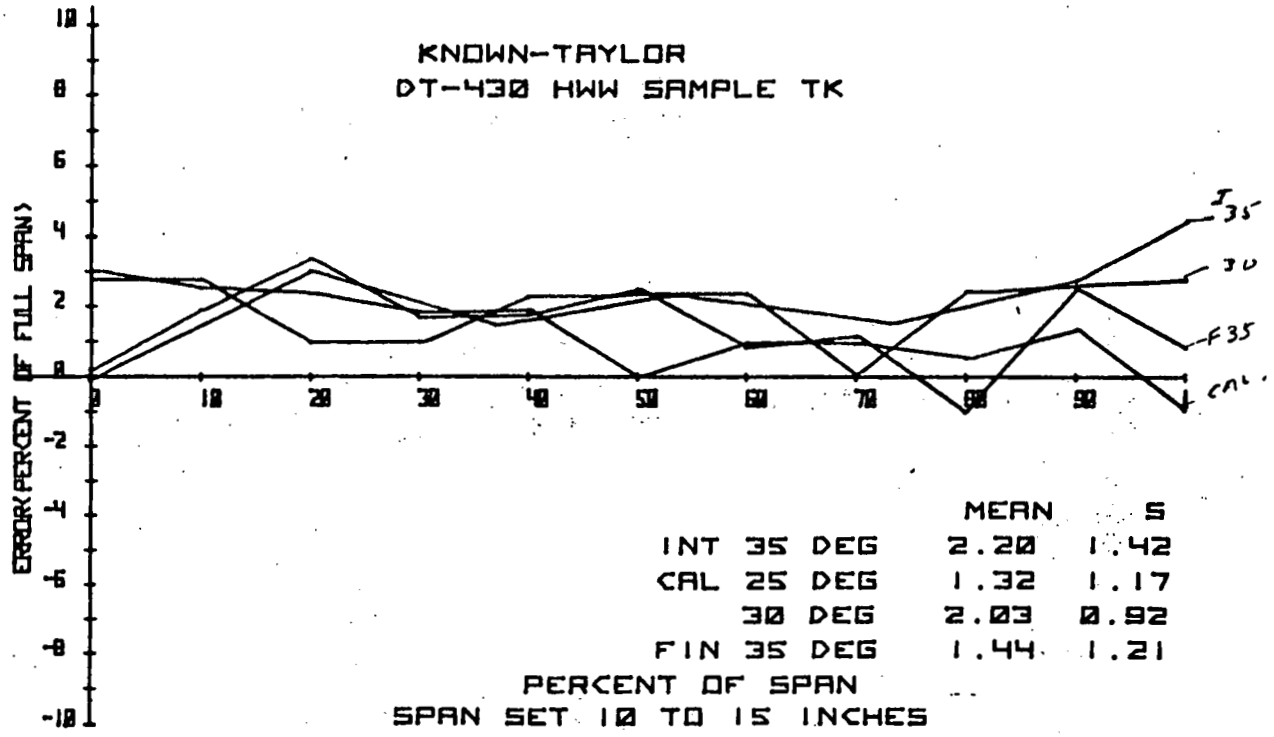

KNOWN-TAYLOR
DT-416 GPW CHECK TK
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG -0.70 0.71
CAL 25 DEG -0.20 0.75
30 DEG -3.21 1.44
FIN 35 DEG 5.92 2.55
PERCENT OF SPAN
SPAN SET 8 TO 14 INCHES
KNOWN-WESTINGHOUSE
DT-416-S SERIAL 8-28-012
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 3.40 0.77
CAL 25 DEG -0.80 1.01
30 DEG -2.69 1.41
FIN 35 DEG -0.53 1.22
PERCENT OF SPAN
SPAN SET 8 TO 14 INCHES

FIGURE H-16


KNOWN-TAYLOR
DT-430 HWW SAMPLE TK
ERROR(PERCENT OF FULL SPAN)
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
10
20
30
40
50
60
70
80
90
100
I 35
30
F35
CAL
MEAN S
INT 35 DEG 2.20 1.42
CAL 25 DEG 1.32 1.17
30 DEG 2.03 0.92
FIN 35 DEG 1.44 1.21
PERCENT OF SPAN
SPAN SET 10 TO 15 INCHES

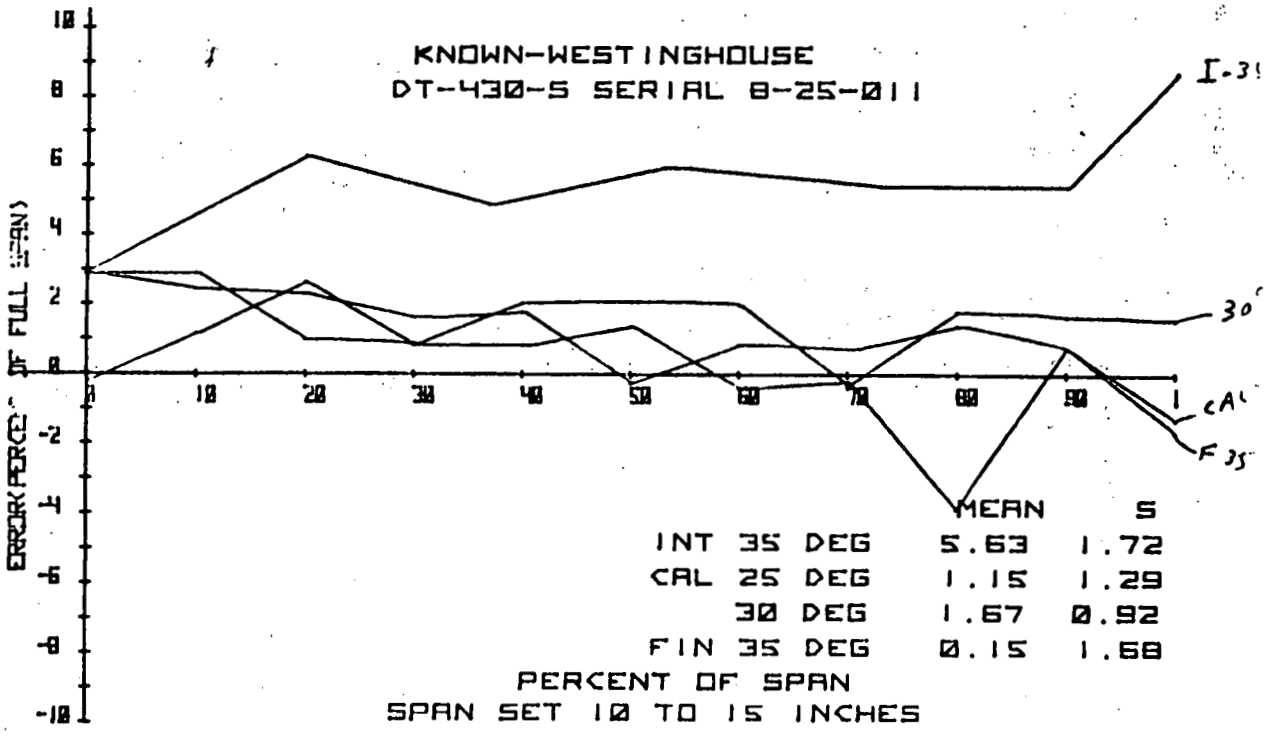
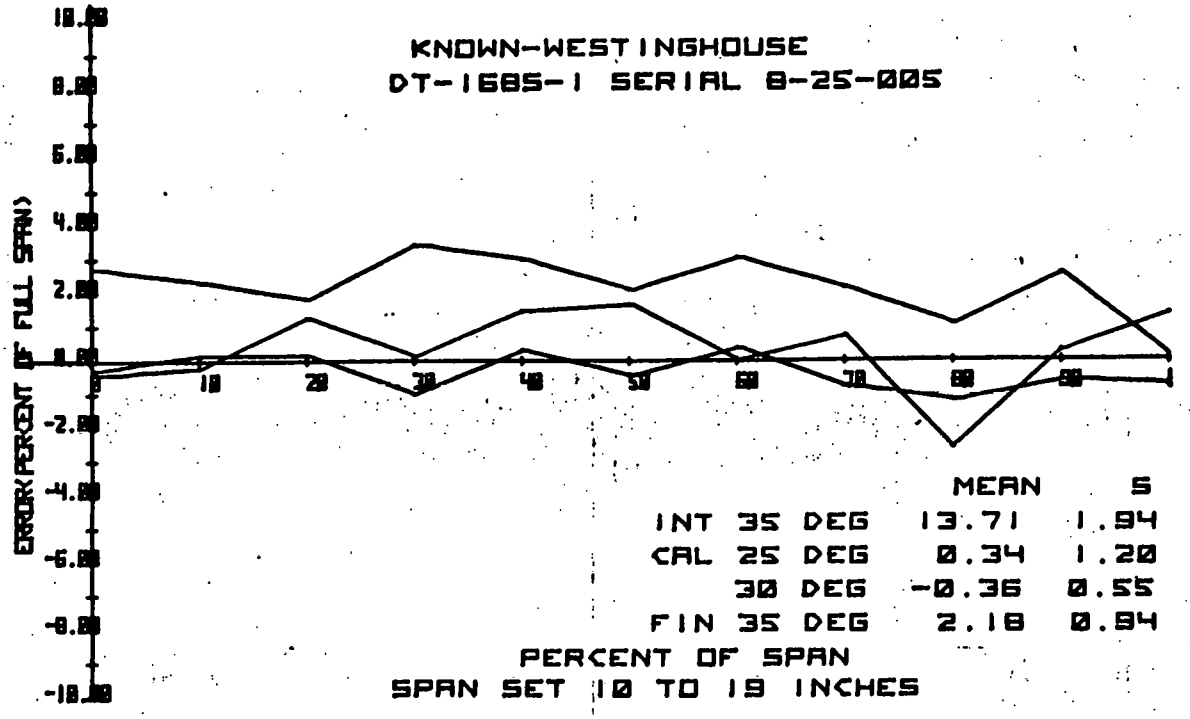

KNOWN-WESTINGHOUSE
DT-430-S SERIAL 8-25-011
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
10
20
30
40
50
60
70
80
90
100
I-35
30
CAL
F35
MEAN S
INT 35 DEG 5.63 1.72
CAL 25 DEG 1.15 1.29
30 DEG 1.67 0.92
FIN 35 DEG 0.15 1.68
PERCENT OF SPAN
SPAN SET 10 TO 15 INCHES

FIGURE H-17


KNOWN-WESTINGHOUSE
DT-1685-1 SERIAL 8-25-005
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 13.71 1.94
CAL 25 DEG 0.34 1.20
30 DEG -0.36 0.55
FIN 35 DEG 2.18 0.94
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

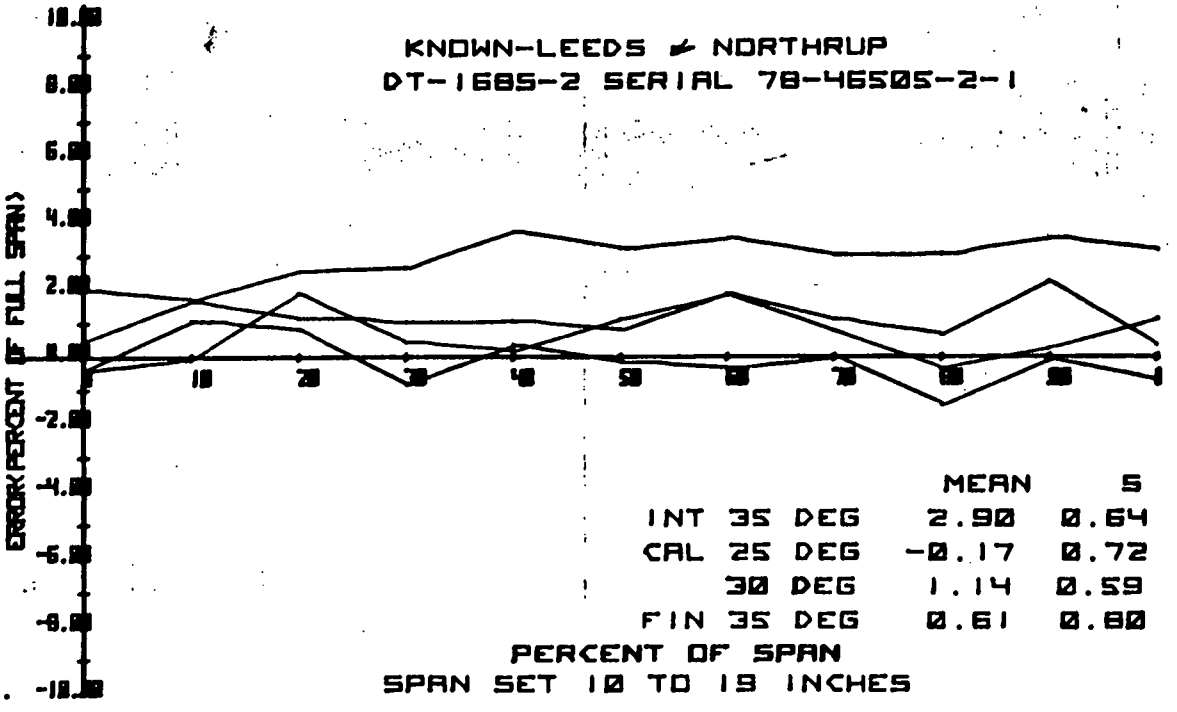
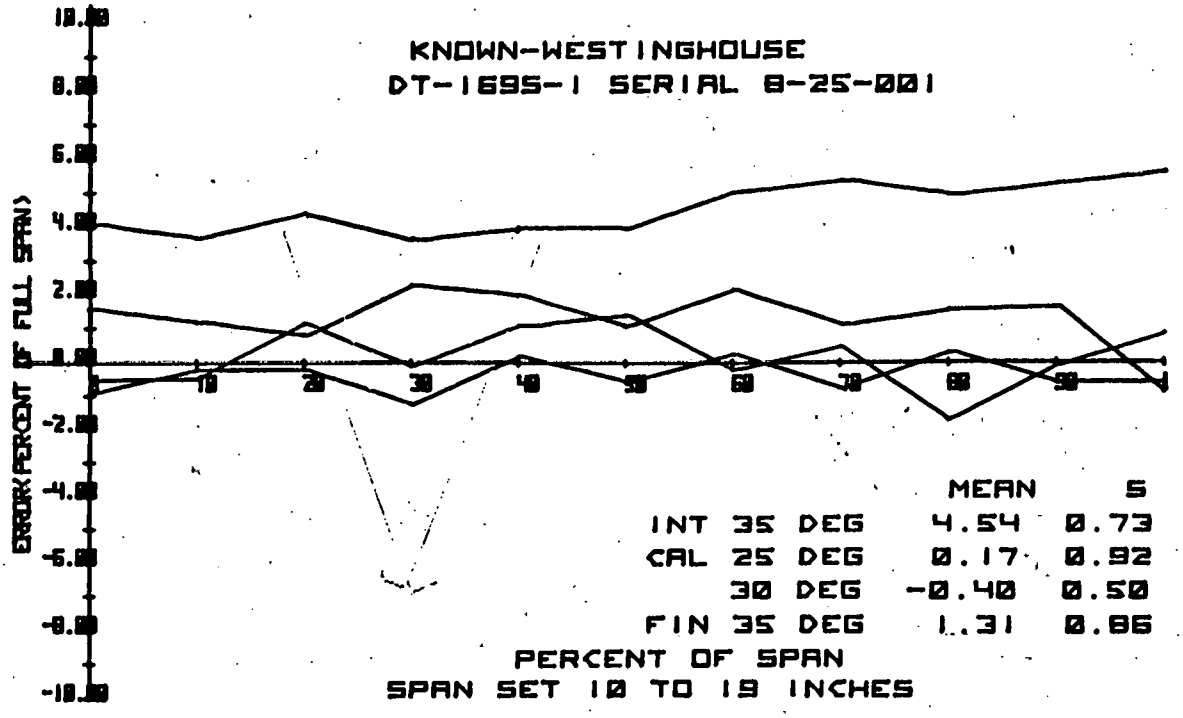

KNOWN-LEEDS & NORTHRUP
DT-1685-2 SERIAL 78-46505-2-1
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 2.90 0.64
CAL 25 DEG -0.17 0.72
30 DEG 1.14 0.59
FIN 35 DEG 0.61 0.80
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

FIGURE H-18


KNOWN-WESTINGHOUSE
DT-1695-1 SERIAL 8-25-001
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 4.54 0.73
CAL 25 DEG 0.17 0.92
30 DEG -0.40 0.50
FIN 35 DEG 1.31 0.86
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

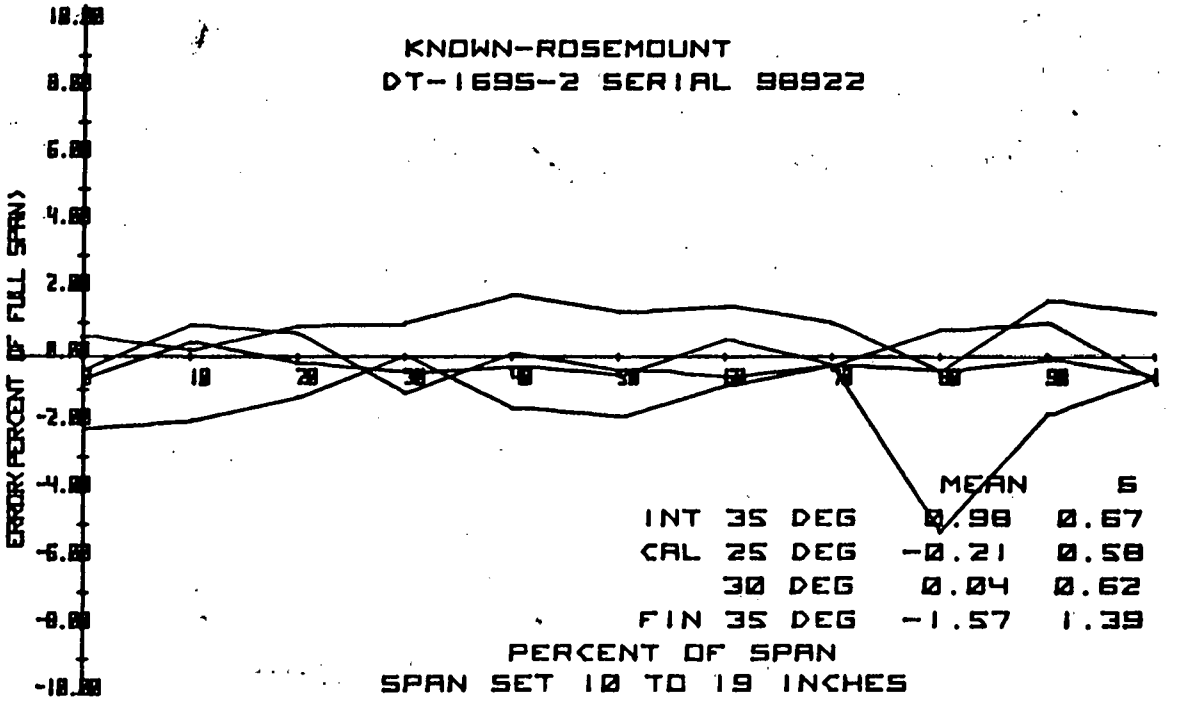

KNOWN-ROSEMOUNT
DT-1695-2 SERIAL 98922
ERROR(PERCENT OF FULL SPAN)
MEAN S
INT 35 DEG 0.98 0.67
CAL 25 DEG -0.21 0.58
30 DEG 0.04 0.62
FIN 35 DEG -1.57 1.39
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

FIGURE H-19

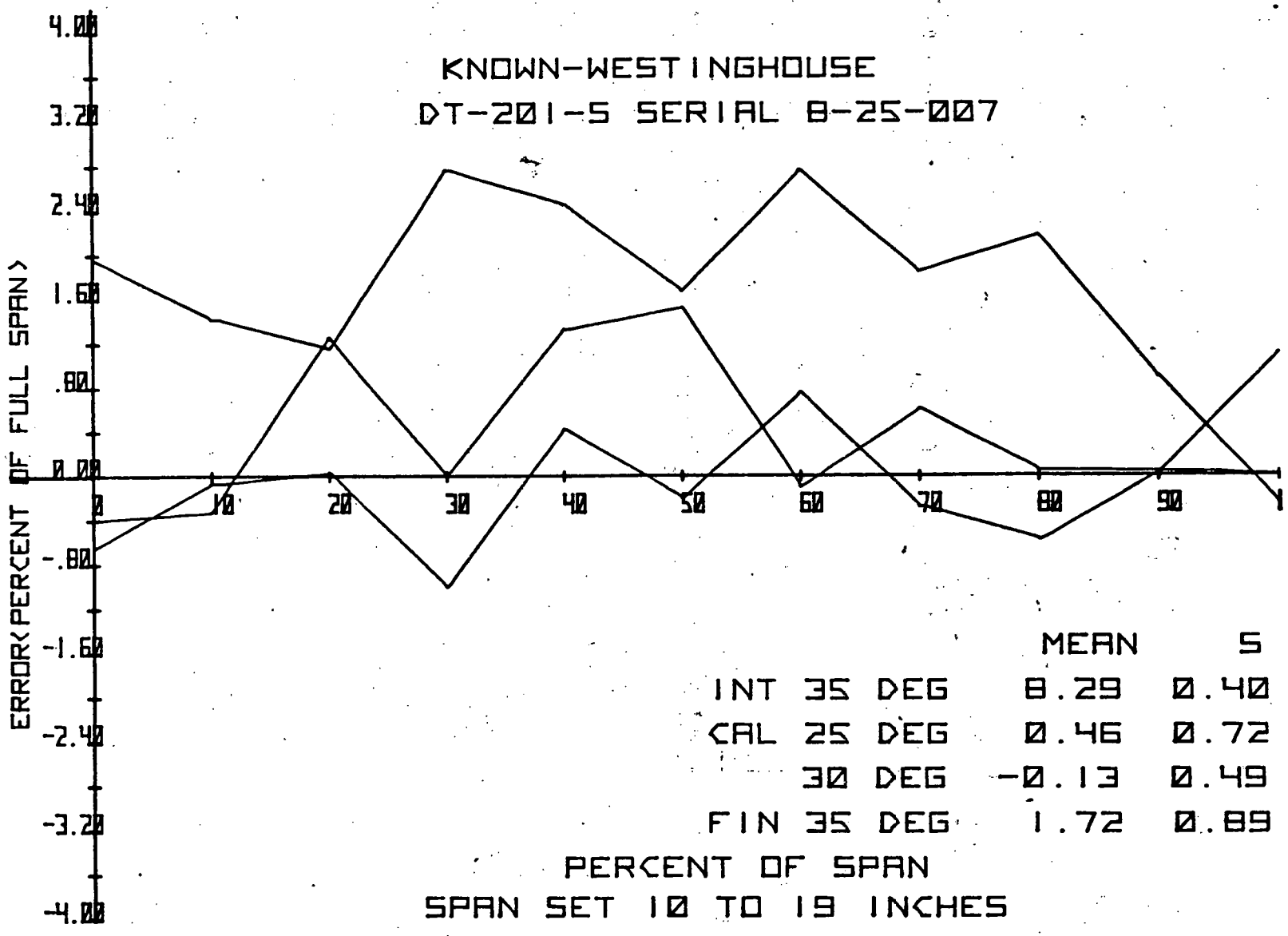

KNOWN-WESTINGHOUSE
DT-201-5 SERIAL 8-25-007
ERROR(PERCENT OF FULL SPAN)
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
100
MEAN S
INT 35 DEG 0.29 0.40
CAL 25 DEG 0.46 0.72
30 DEG -0.13 0.49
FIN 35 DEG 1.72 0.89
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

FIGURE H-20

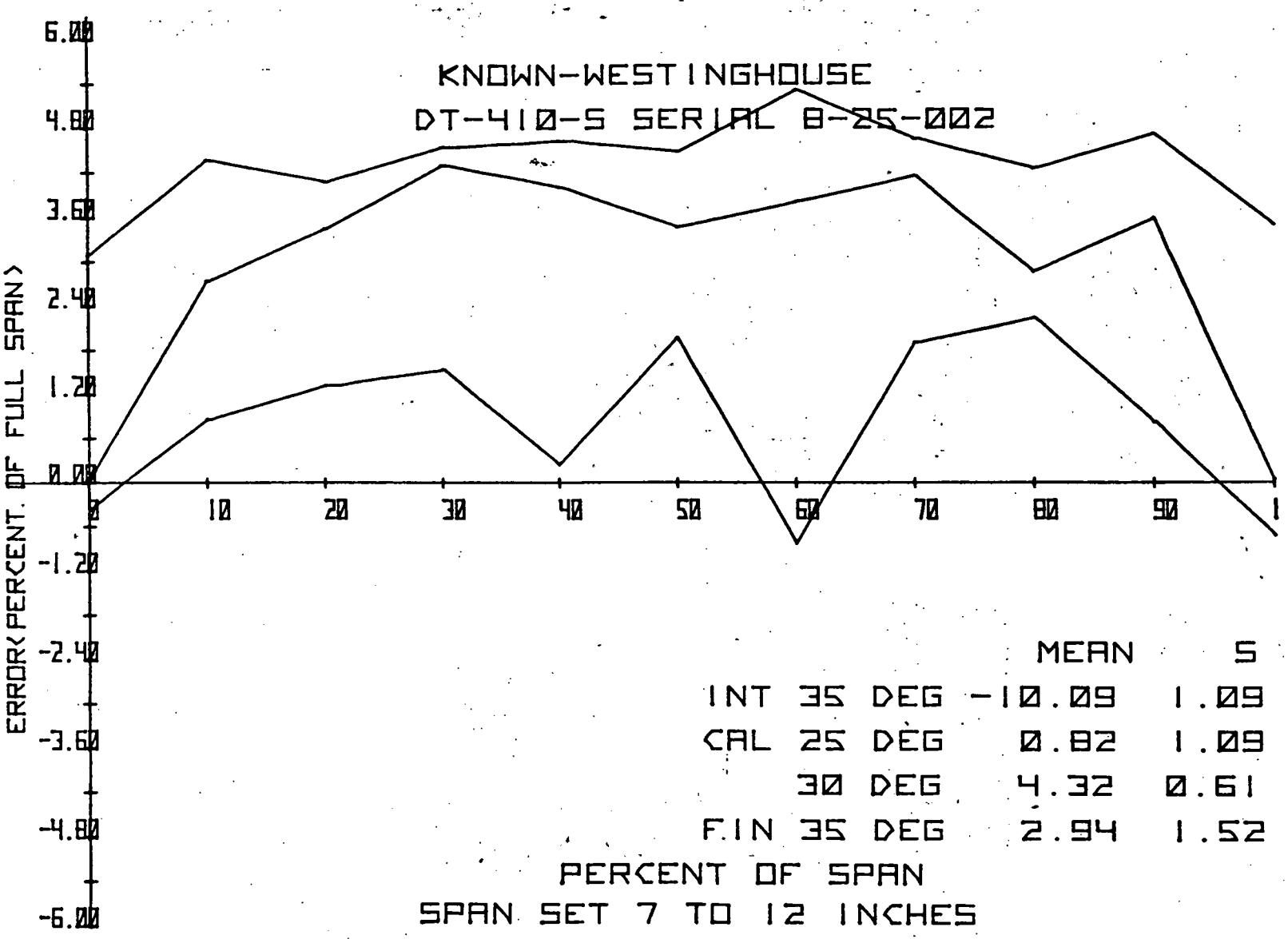

KNOWN-WESTINGHOUSE
DT-410-S SERIAL 8-25-002
ERROR(PERCENT. OF FULL SPAN)
6.00
4.80
3.60
2.40
1.20
0.00
-1.20
-2.40
-3.60
-4.80
-6.00
0
10
20
30
40
50
60
70
80
90
1
MEAN S
INT 35 DEG -10.09 1.09
CAL 25 DEG 0.82 1.09
30 DEG 4.32 0.61
FIN 35 DEG 2.94 1.52
PERCENT OF SPAN
SPAN SET 7 TO 12 INCHES

FIGURE H-21

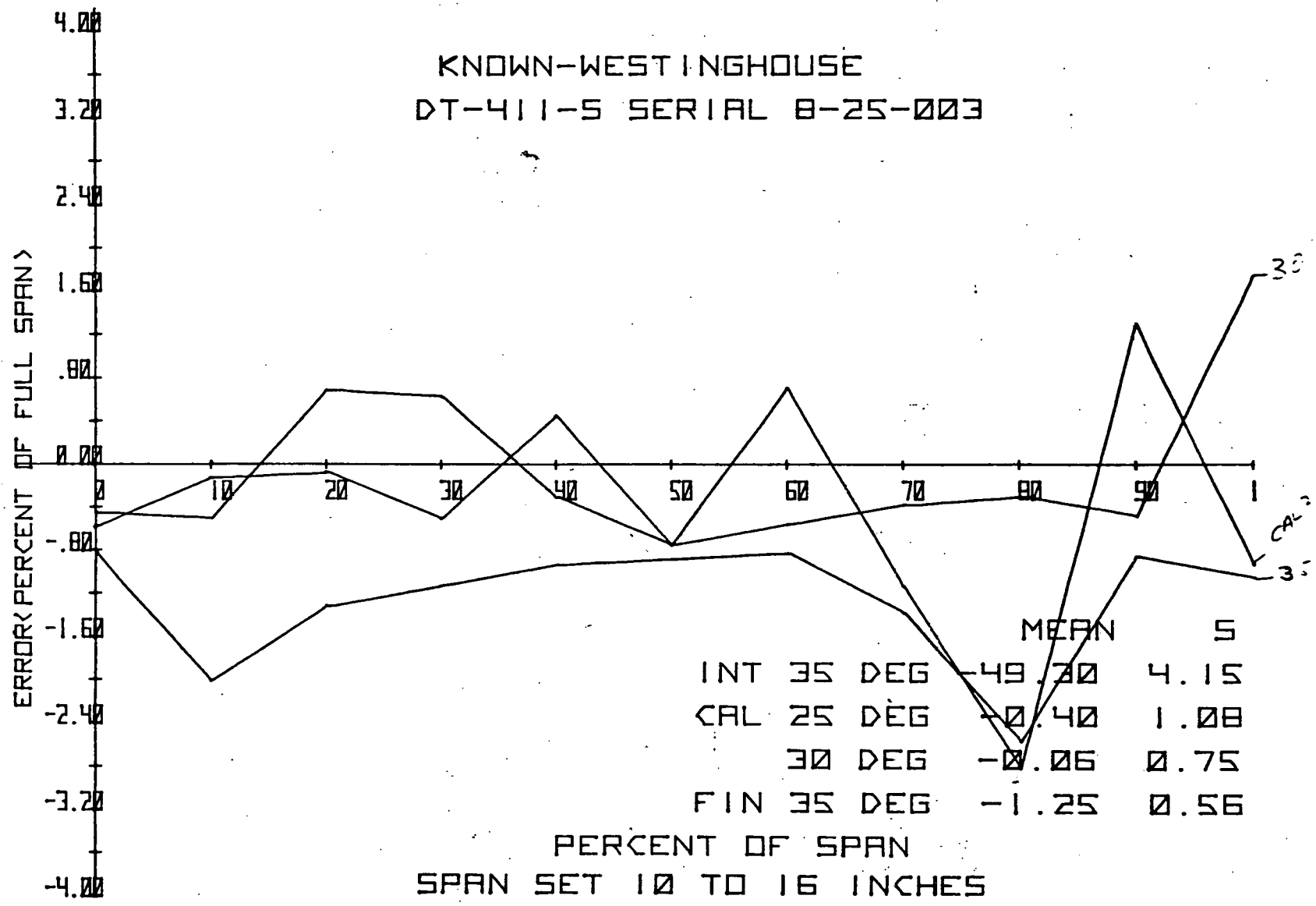

KNOWN-WESTINGHOUSE
DT-411-5 SERIAL 8-25-003
ERROR(PERCENT OF FULL SPAN)
4.00
3.20
2.40
1.60
.80
0.00
-.80
-1.60
-2.40
-3.20
-4.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 35 DEG -49.30 4.15
CAL 25 DEG -0.40 1.08
30 DEG -0.06 0.75
FIN 35 DEG -1.25 0.56
PERCENT OF SPAN
SPAN SET 10 TO 16 INCHES

FIGURE H-22

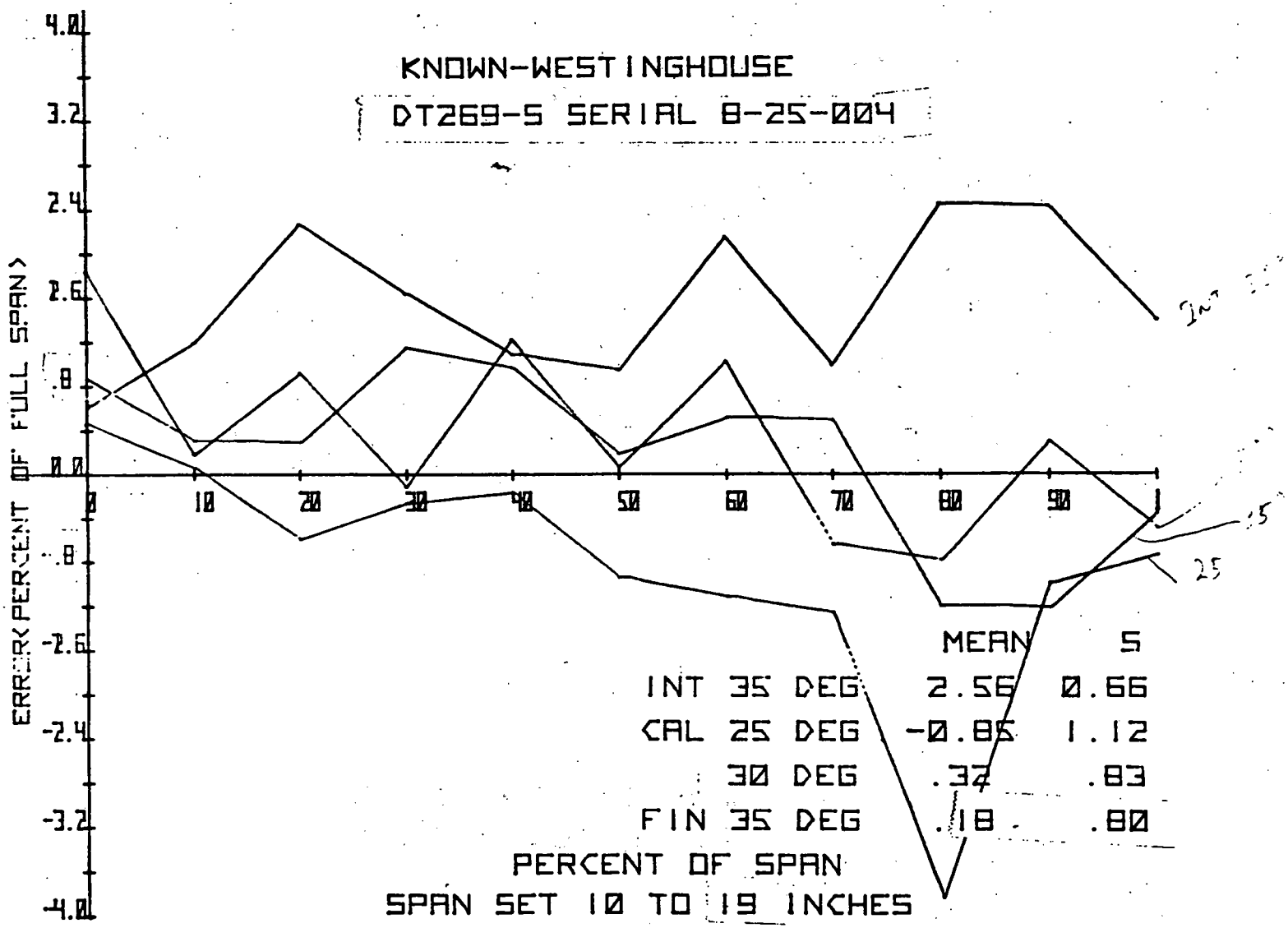

KNOWN-WESTINGHOUSE
DT269-5 SERIAL 8-25-004
ERROR PERCENT OF FULL SPAN
4.0
3.2
2.4
2.6
.8
0.0
.8
-2.6
-2.4
-3.2
-4.0
0
10
20
30
40
50
60
70
80
90
100
MEAN
S
INT 35 DEG
2.56
0.66
CAL 25 DEG
-0.85
1.12
30 DEG
.32
.83
FIN 35 DEG
.18
.80
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

FIGURE H-23

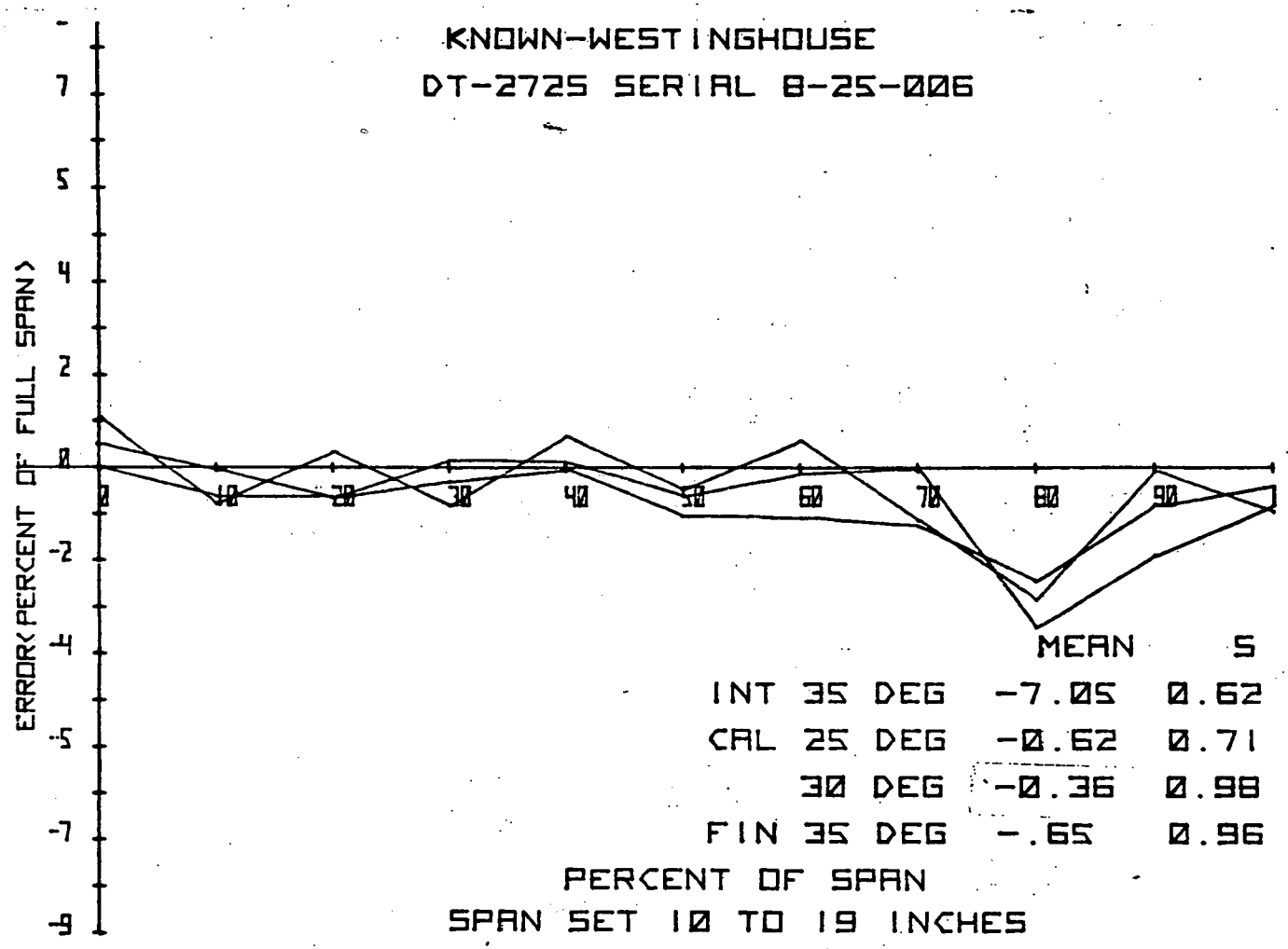
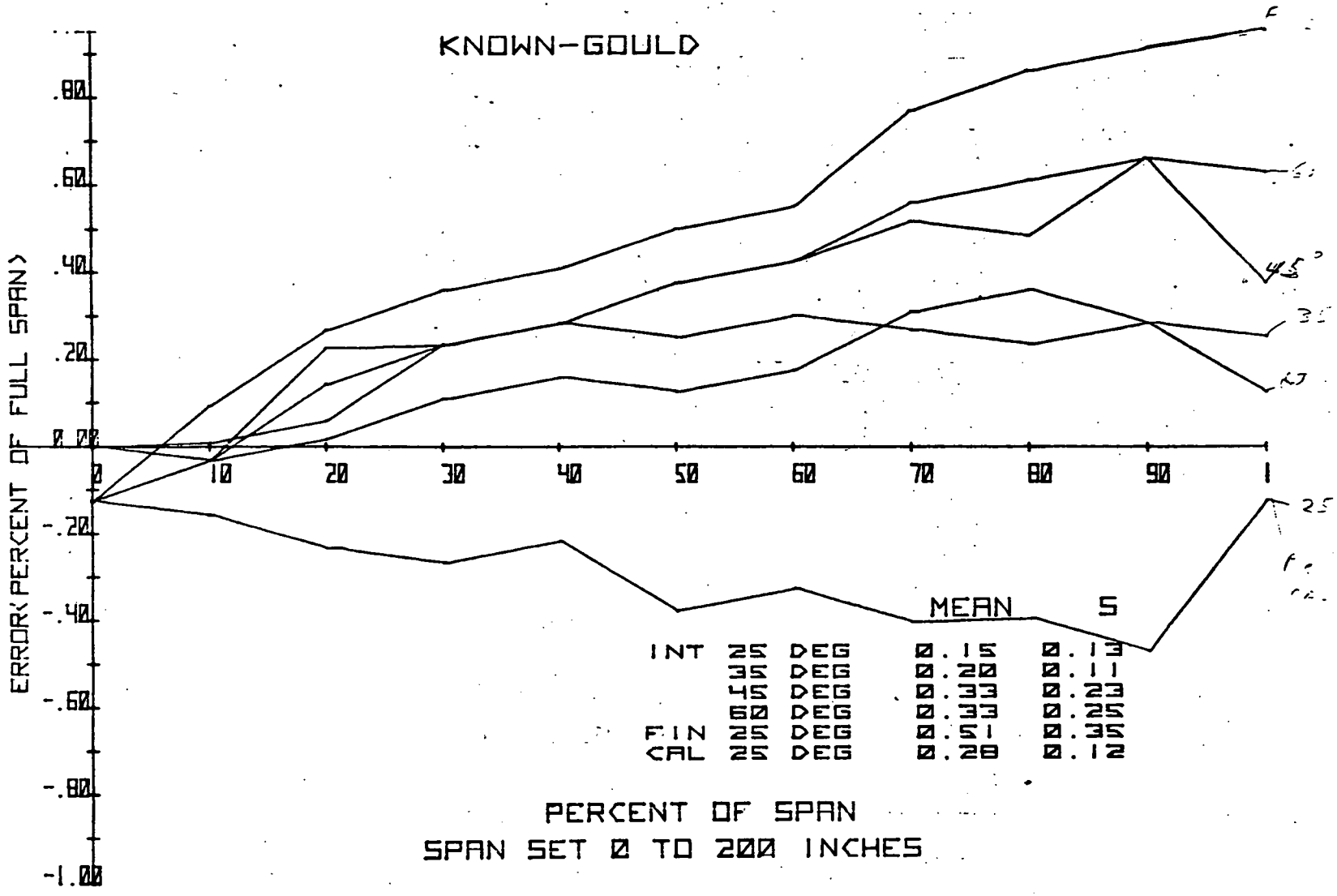

KNOWN-WESTINGHOUSE
DT-2725 SERIAL B-25-006
ERROR(PERCENT OF FULL SPAN)
7
5
4
2
0
-2
-5
-7
-9
0
10
20
30
40
50
60
70
80
90
MEAN S
INT 35 DEG -7.05 0.62
CAL 25 DEG -0.62 0.71
30 DEG -0.36 0.98
FIN 35 DEG -.65 0.96
PERCENT OF SPAN
SPAN SET 10 TO 19 INCHES

FIGURE H-24




J-25

FIGURE H-25

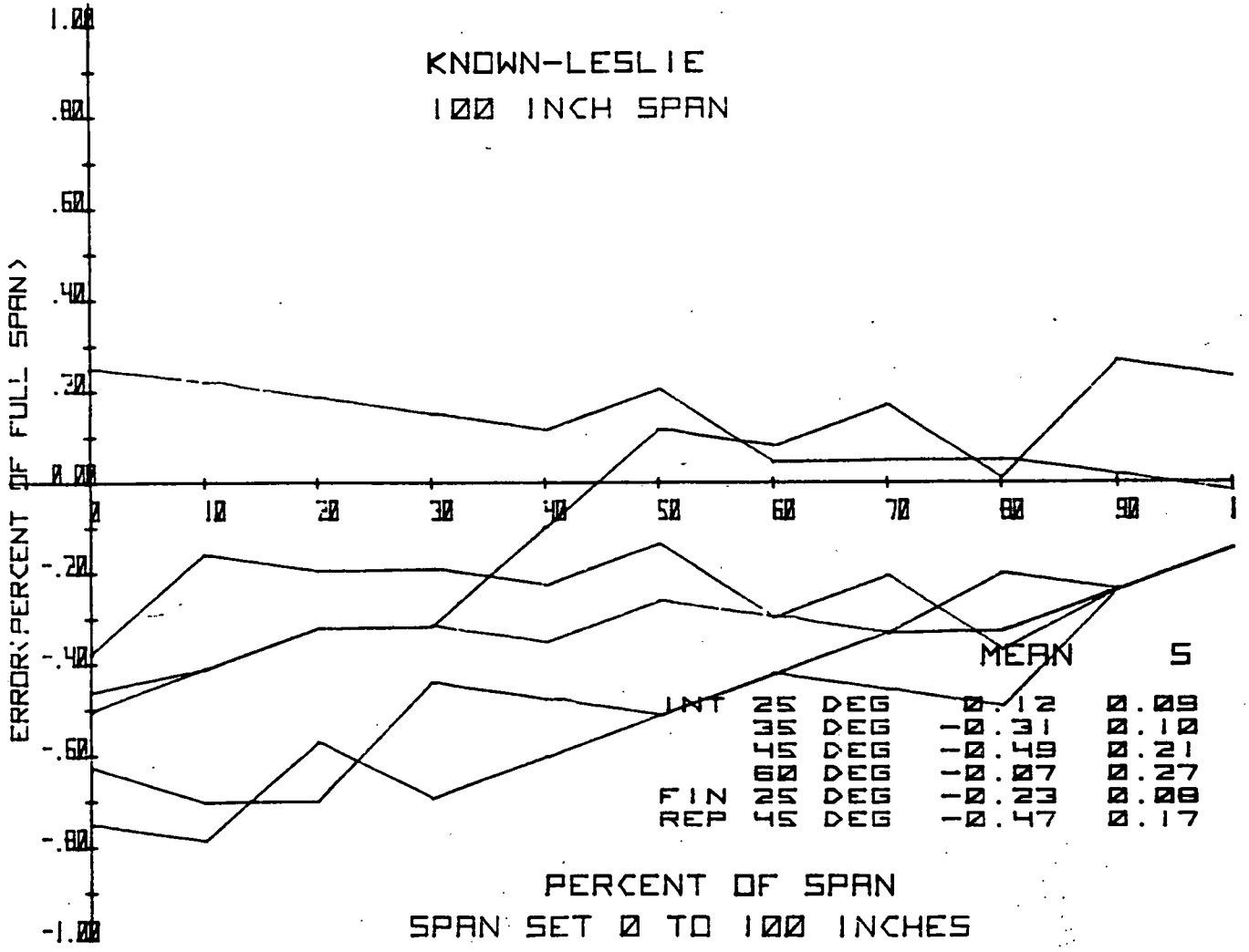

KNOWN-LESLIE
100 INCH SPAN
ERROR (PERCENT OF FULL SPAN)
1.00
.80
.60
.40
.20
0.00
-.20
-.40
-.60
-.80
-1.00
0
10
20
30
40
50
60
70
80
90
1
MEAN
S
INT 25 DEG -0.12 0.09
35 DEG -0.31 0.10
45 DEG -0.49 0.21
60 DEG -0.07 0.27
FIN 25 DEG -0.23 0.08
REP 45 DEG -0.47 0.17
PERCENT OF SPAN
SPAN SET 0 TO 100 INCHES

FIGURE H-26

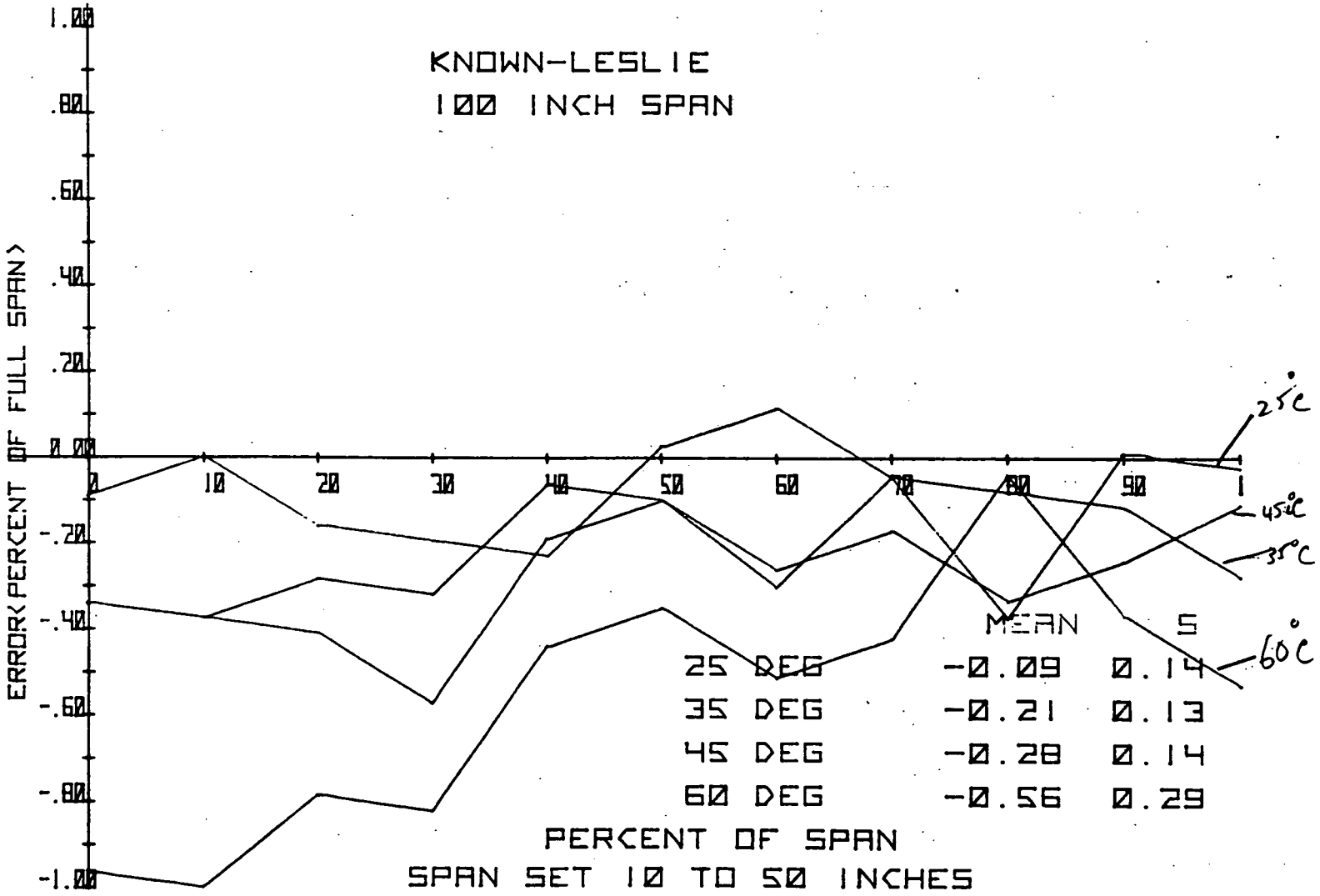

KNOWN-LESLIE
100 INCH SPAN
ERROR(PERCENT OF FULL SPAN)
1.00
.80
.60
.40
.20
0.00
-.20
-.40
-.60
-.80
-1.00
0
10
20
30
40
50
60
70
80
90
1
25°C
45°C
35°C
60°C
MEAN
S
25 DEG -0.09 0.14
35 DEG -0.21 0.13
45 DEG -0.28 0.14
60 DEG -0.56 0.29
PERCENT OF SPAN
SPAN SET 10 TO 50 INCHES

FIGURE H-27

REPORT NO. AGNS-35900-2.2-22

NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

APPENDIX I

# MICRO MOTION MASS FLOWMETER TEST

Richard J. Dabolt

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 19812

# MICRO MOTION MASS FLOWMETER TEST

Two mass flowmeters were installed and tested for process application during FY 1979. The accuracy of this type of flowmeter was tested in FY 1978 and proved satisfactory. The Micro Motion Model L50A was chosen for this year's run (calibrated from 0 to 100 pounds per minute).

A unit must be easy to install, dependable, and maintainable in order to be useful in a reprocessing facility. The mass flowmeters meet these qualifications; however, there are some items that require careful consideration during the design stages of systems utilizing them. The meters and their connecting piping must be supported in a manner that results in zero stress on the torque tube. Any external force on this tube will adversely affect its oscillating frequency and subsequently the accuracy of the meter.

Large quantities of air in the process stream have a disruptive effect on the meter. Although the air does not affect the accuracy of the meter, it does cause rapid fluctuations in the weight of the solution in the torque tube and a corresponding variance in the meter output. This causes the meter to indicate a wide band of flow, making it difficult to read. Therefore, these systems must be designed to minimize air entrainment in the process streams. Small amounts of air are allowable if the homogeneous character of the stream can be maintained.

Installation and maintenance requirements of the meters are acceptable. The power source and electronics package can be mounted separately from the pickup device. This provides easy access to them while allowing the components to contact with the process to be shielded.

The units tested proved to be reliable with only one breakdown in 3 months of operation. The transition point between the torque tube and connecting pipe is an interference fit which can allow leaks to develop. This was corrected by seal welding the joint.

Overall, the mass flowmeter offers a dependable method of accurate flow measurement for radioactive materials and is well suited for providing accountability data to an inprocess inventory system for special nuclear materials.

REPORT NO. AGNS-35900-2.2-22

NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

# APPENDIX J

# ALTERNATE LIQUID LEVEL MEASUREMENT SYSTEMS - FY 1979 DEVELOPMENT WORK

Hilton R. Tilley
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November 1979

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BARNWELL, SOUTH CAROLINA 29812

## 1.0 INTRODUCTION

The development of a liquid-level gauge using a radio frequence (RF) transmission line as a probe (per AGNS-1040-2.2-50, Appendix H) was continued during FY 1979. This gauge is designed to measure the liquid level in vessels containing electrically conducting liquids by sensing the length of an immersed RF transmission line progressively shorted by the liquid. Applications in a nuclear fuel reprocessing plant will be in aqueous streams of nitric acid concentrations of 0.1 N and greater.

## 2.0 TEST RESULTS

Tests with solutions of various nitric acid concentrations show that the gauge response is linear with acid concentrations above 0.1 N (see Figures J-1 and J-2). A test with .01 N nitric acid indicated that the solution conductivity was too low to effectively short the line and was acting more like a dielectric than a conductor. This suggests a possible use of a modified version of this device in an organic stream as a method of measuring solution dielectric constant, which in turn might vary with uranium or plutonium concentration.

During the course of laboratory tests, it was discovered that the small resistance variation in the center conductor pin of ordinary RF connectors gave small discontinuous jumps in the oscillator frequency. "UHF" and type "N" connectors were found to have this problem. When all connections were soldered, this effect disappeared.

As with any oscillator circuit, drift with temperature was noted. The drift was reduced by placing the circuit in a temperature-controlled oven, controlled to about ±2°F.

## 3.0 EQUIPMENT CHANGES

The original counter was replaced with a Racal-Dana frequency/period counter remotely controllable through an IEEE-488 I/O connection (see Figure J-3). The Racal-Dana is controlled with a PET computer equipped with 400 k bytes of storage on a dual mini-floppy disk system. Data printout is accomplished with an Anadex printer.

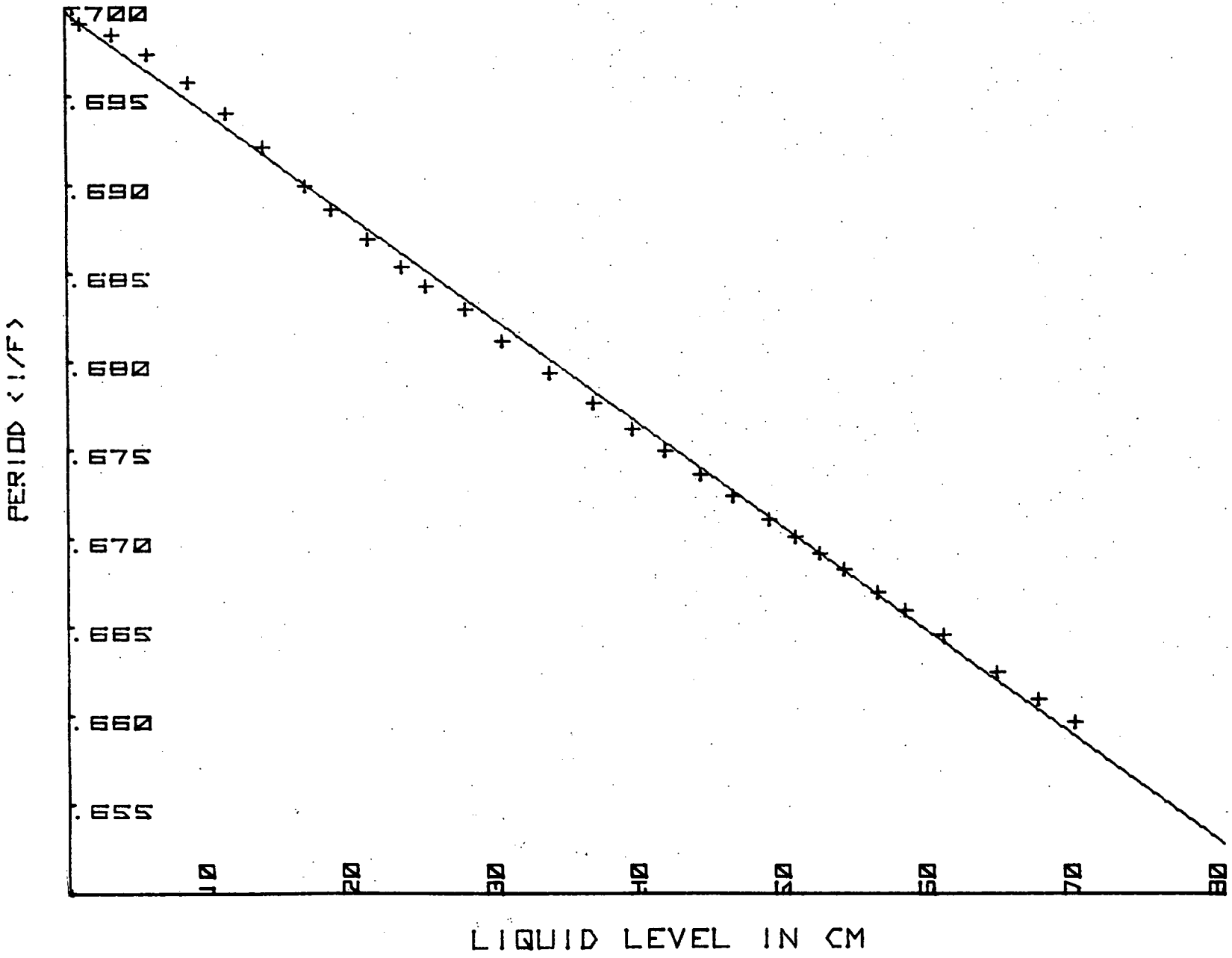
With the Racal-Dana programmed to output the period of the oscillator frequency to the PET computer, the data is normalized to indicate liquid level directly in any units desired. The computer also is programmable to analyze the data for linearity, drift, etc.

A test probe for laboratory tests of various solutions was constructed of two-inch SCH 40 304 stainless-steel pipe 40 inches long. The cell has provisions for attaching a sight glass for level measurement using a precision manometer scale.

## 4.0 FUTURE TESTS

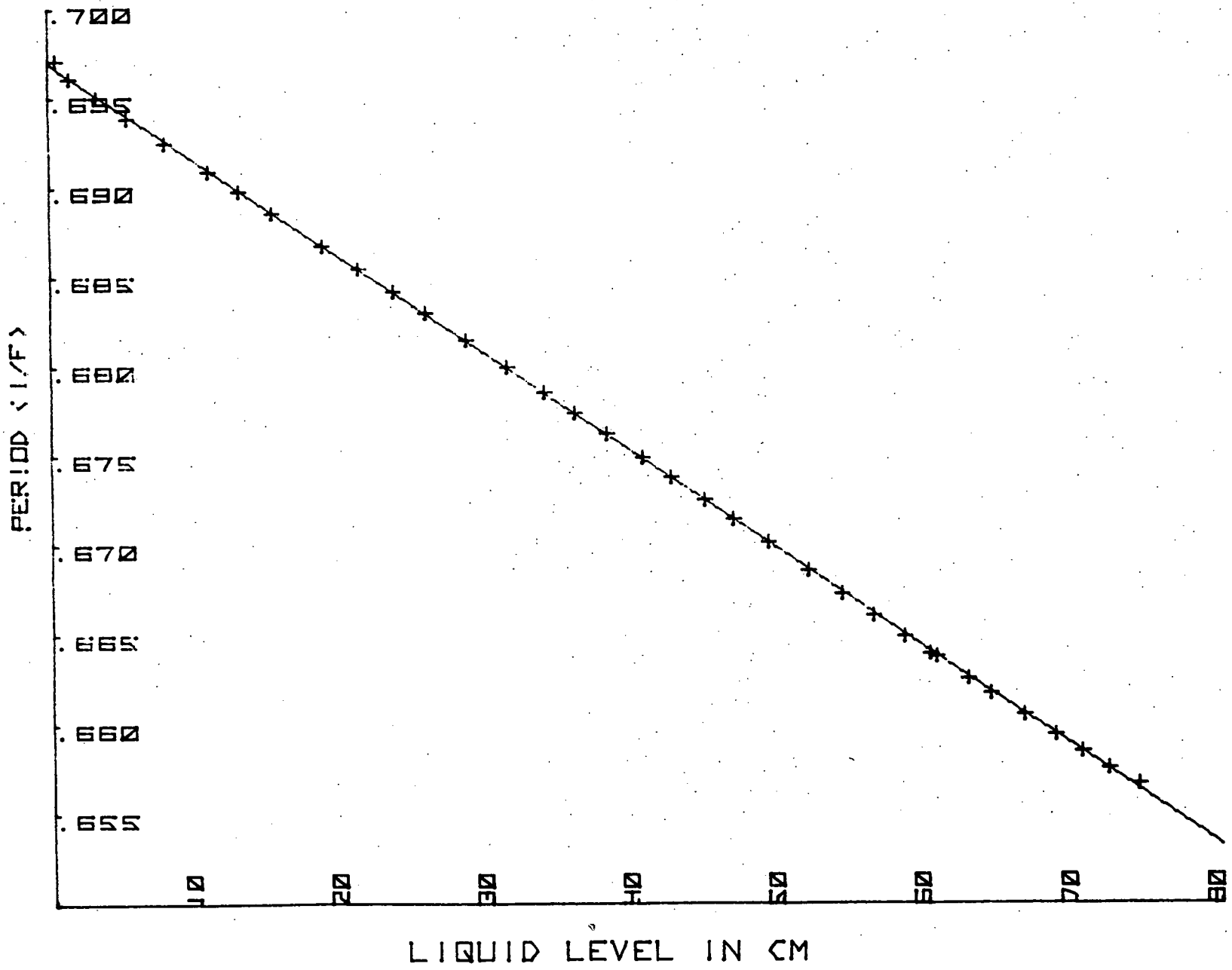
During FY 1980, tests will be made in a plant vessel. The vessel will have a Ruska quartz tube manometer on a bubbler tube for comparison.

Additional work will be done in the laboratory to further refine the circuit and to minimize any system drift and errors.



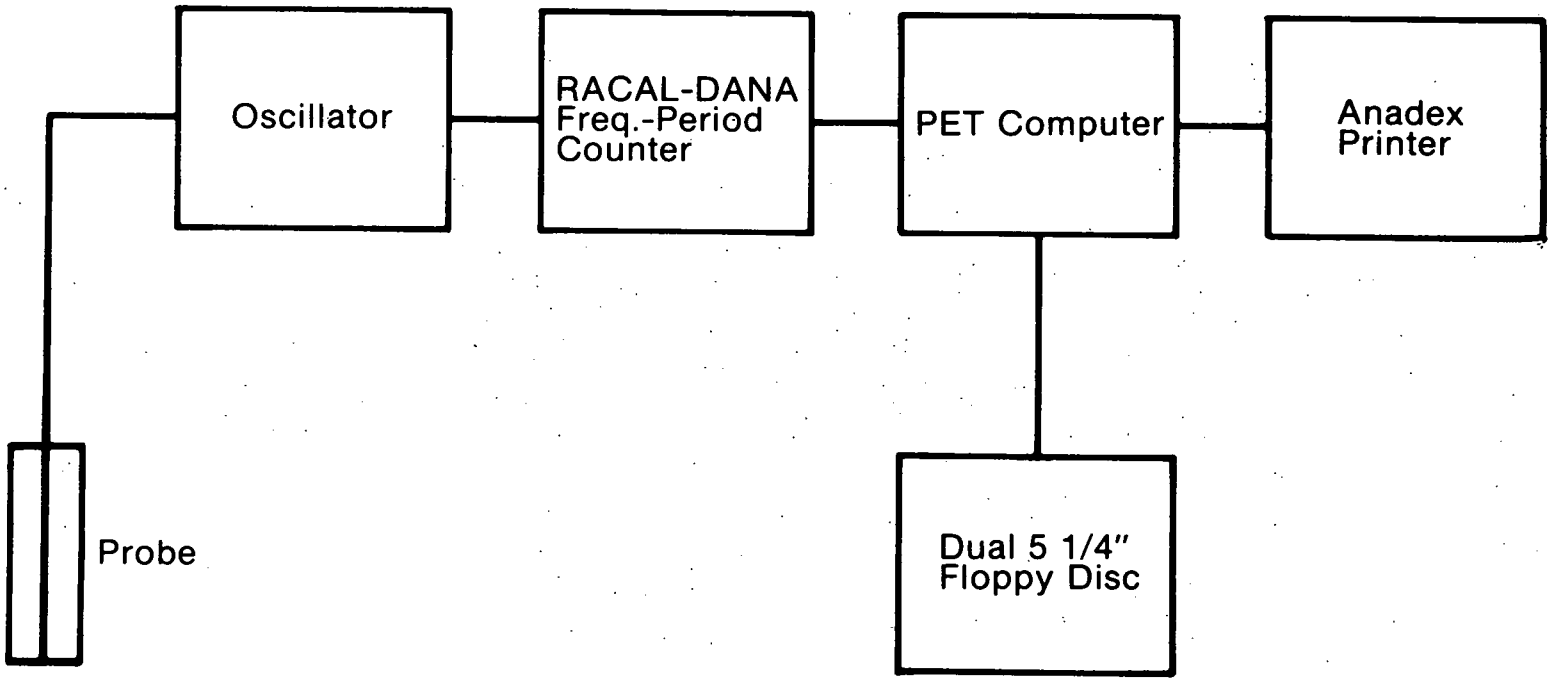

PERIOD VERSUS LEVEL WITH 0.1 N NITRIC

FIGURE J-1




PERIOD VERSUS LEVEL WITH 1.0 N NITRIC

FIGURE J-2




RF LIQUID LEVEL TEST SETUP

FIGURE J-3

REPORT NO. AGNS-35900-2.2-22

NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

APPENDIX K

# INSTRUMENT PURGE AIR HUMIDIFICATION TO REDUCE PROBE PLUGGAGE

Harry R. Kight

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 19812

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## 1.0 INTRODUCTION

Instrument probe pluggage has been a problem during integrated uranium runs. Pluggage generally occurs on tanks containing batches of uranium at 7250 grams/liter. Plugged probes are readily detected from strip chart readouts but are a nuisance and time consuming to clear during measurement sequences. However, the main problem is that partial plugs, which are not readily detectable, have significant effect on measurement accuracy.

The normal instrument air is dried to prevent buildups of condensation in air supply lines. Then, dry air is the major source of the plugging problem. The first effort to reduce pluggage was to use pulser air, which is not dry to the extent of instrument air. This resulted in a significantly reduced pluggage rate during FY 1978 runs. However, this did not totally eliminate the problem. Also, use of this "wetter" air on a routine basis could lead to a significant condensate problem.

During FY 1979, instrument air-line bubblers were tried as one effort to solve the pluggage problem. The bubblers could be installed on those tanks where high uranium concentrations resulted in continuing probe problems. They offer an additional advantage in that they could be installed at the probe penetration to eliminate condensate problems in instrument lines while supplying saturated air to the probes.

The bubblers were installed on May 20, 1979, and were left on through July 11, 1979. Each shift recorded whether an instrument (test) probe was plugged or not and made sure there was at least 20% water level in each bubbler.

## 2.0 INSTALLATION

The bubblers were first installed on the probe lines downstream of the instrument air connection (see Figure N-1). The regulator valve on the bubblers caused back pressure which, in turn, gave false level and density readings. This installation also allowed condensate to build up between the bubbler and the penetration valve, requiring the probes to be blown clear quite frequently.

The installation was modified so that the instrument air went directly to the bubbler and the bubbler discharge went directly to the penetration valve (see Figure N-2). Installing the bubblers in this manner did away with the back pressure problem, and because there are no "low points" between the penetration valve and the process vessel, condensate was no problem.

The bubblers used were Model 931S10, Type CP, Sight Feed Bubbler, made by The Meriam Instrument Company, Cleveland, Ohio.

## 3.0 TEST

After the bubblers were installed, readings were taken on each bubbler, and it was noted if a probe had to be blown (cleared). The bubbler $H_2O$ levels were maintained above 20%, and the purges were kept at 0.5 scfh. The test ran from May 20, 1979, to July 11, 1979.

## 4.0 URANIUM PRODUCT CATCH TANK

The uranium product, which has been concentrated to between 220 to 250 milligrams/gram, is received in the uranium product catch tank and is pumped, in batches, to the uranium product sample tank. Bubblers were installed on the purge lines of the uranium product catch tank and left the uranium product sample tank hooked up the normal way (see Figure N-3). The test was started on May 20, 1979, and ended on July 11, 1979. During this period, the uranium product catch tank did not get a plugged probe, but the uranium product sample tank had to have its probes cleared 48 times.

## 5.0 TEST RESULTS

### 5.1 HA Feed Tank

The uranium solution in the No. 1 and No. 2 FA tanks is between 220 to 250 milligrams/gram. After the acid molarity of the solution has been adjusted to 2.5 M, it is jetted through the centrifuge to the HA feed tank. Bubblers were installed on the HA feed tank, but left the No. 2 FAT with the normal probe arrangement. The HA feed tank had its probes blown clear once during the test period, and the No. 2 FAT had its probes blown clear 10 times.

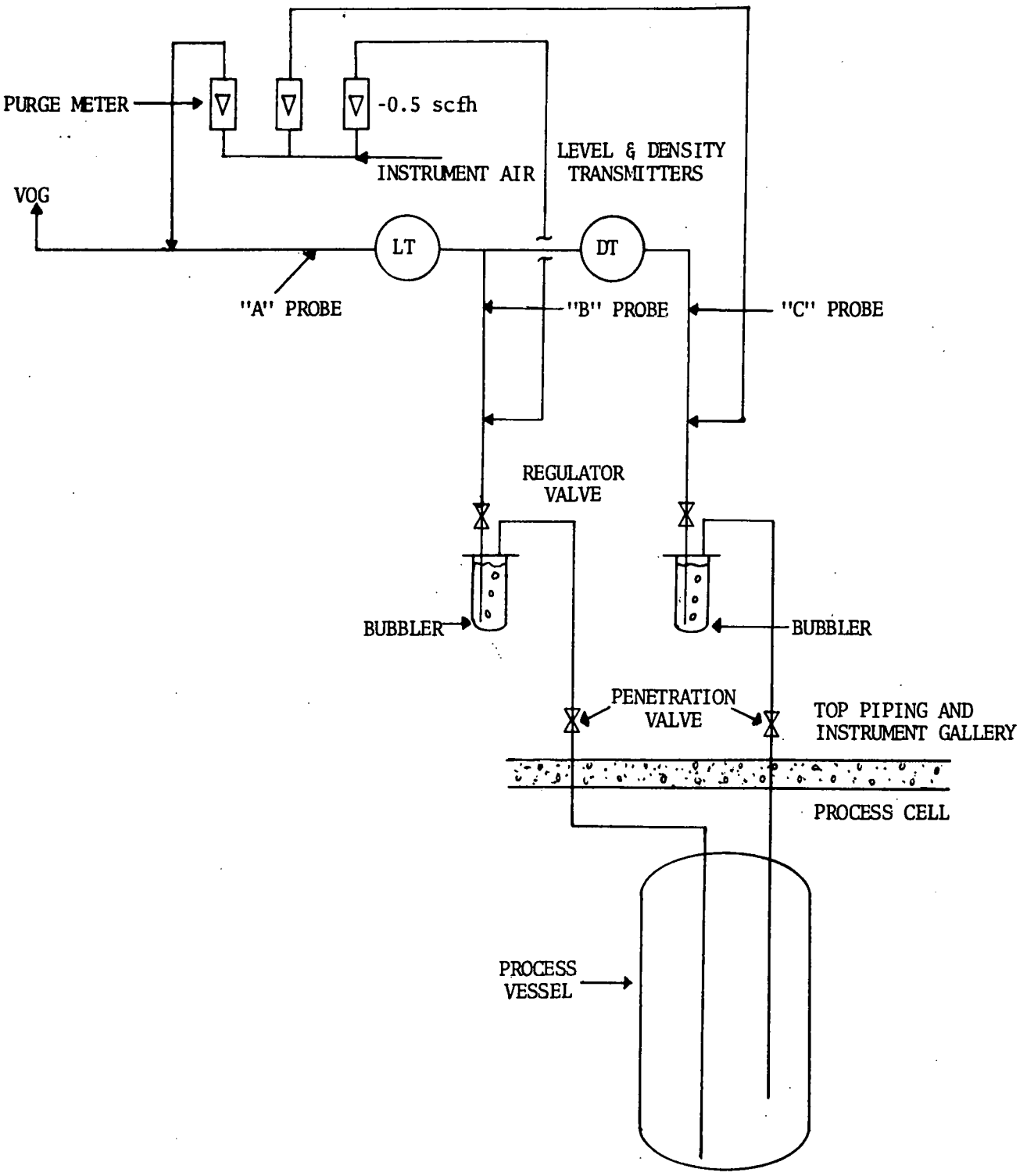
### 5.2 No. 1 FAT

A test comparison between the No. 1 and No. 2 FAT's was planned, but there was a problem with a bubbler on the No. 1 FAT and no useful data was collected. This particular bubbler has been removed and is under evaluation. It appears that a seal in the bubbler leaked, giving false indications of pluggage.

## 6.0 CONCLUSION

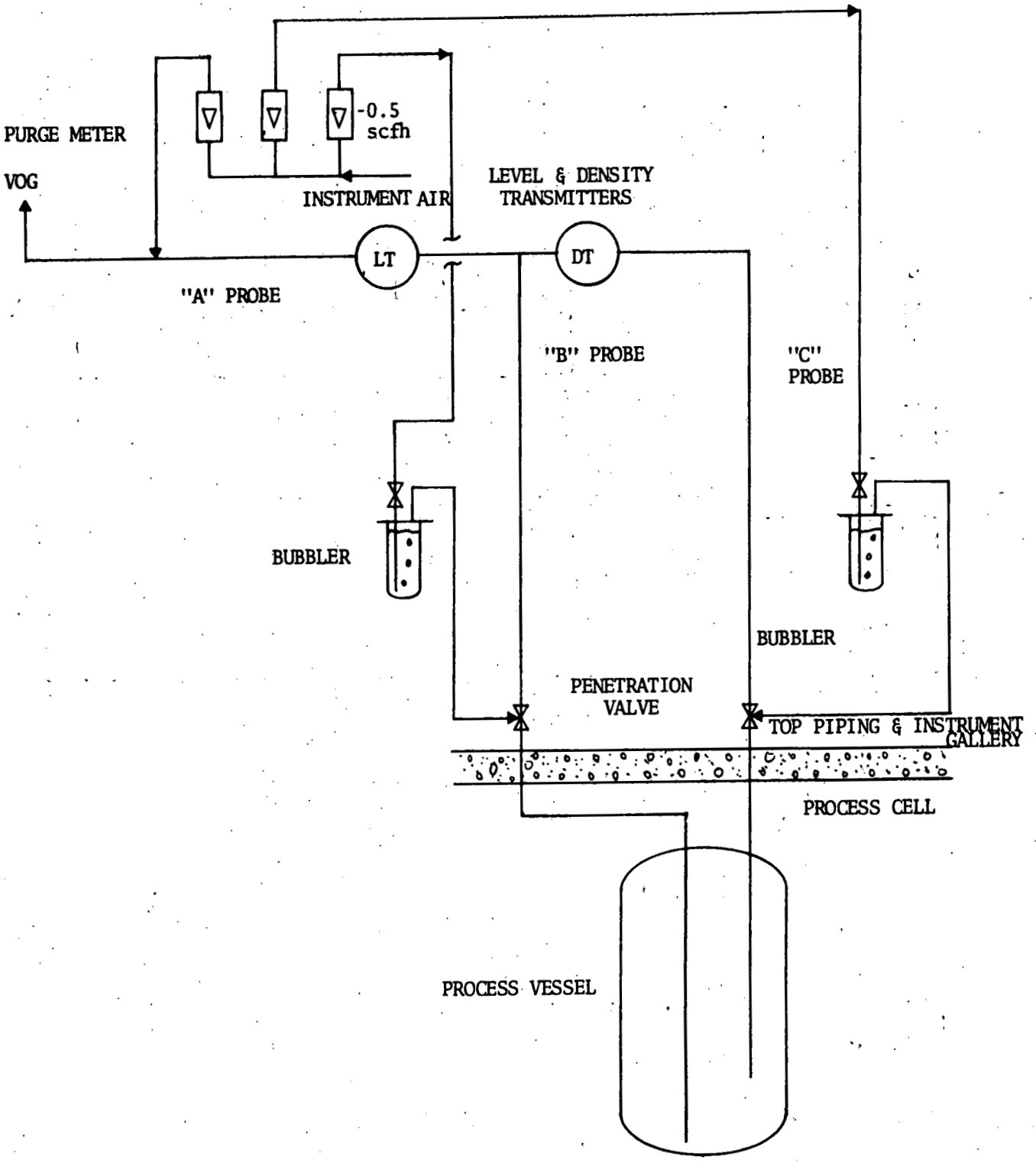
Plugged probes cause level and density transmitters to give false readings. When these false readings are used in calculations within a CNMCAS program, the output of the program is unusable until the probe is cleared and the program is rerun. These false readings not only slow down the CNMCAS, but also impede the operation of the Separations Plant.

Humidification of purge air on tanks containing high concentrations of uranium would greatly reduce or stop probe pluggage. It is believed it would improve measurement reliability to install a humidification system on the purge air to selected vessels in the Separations Facility.



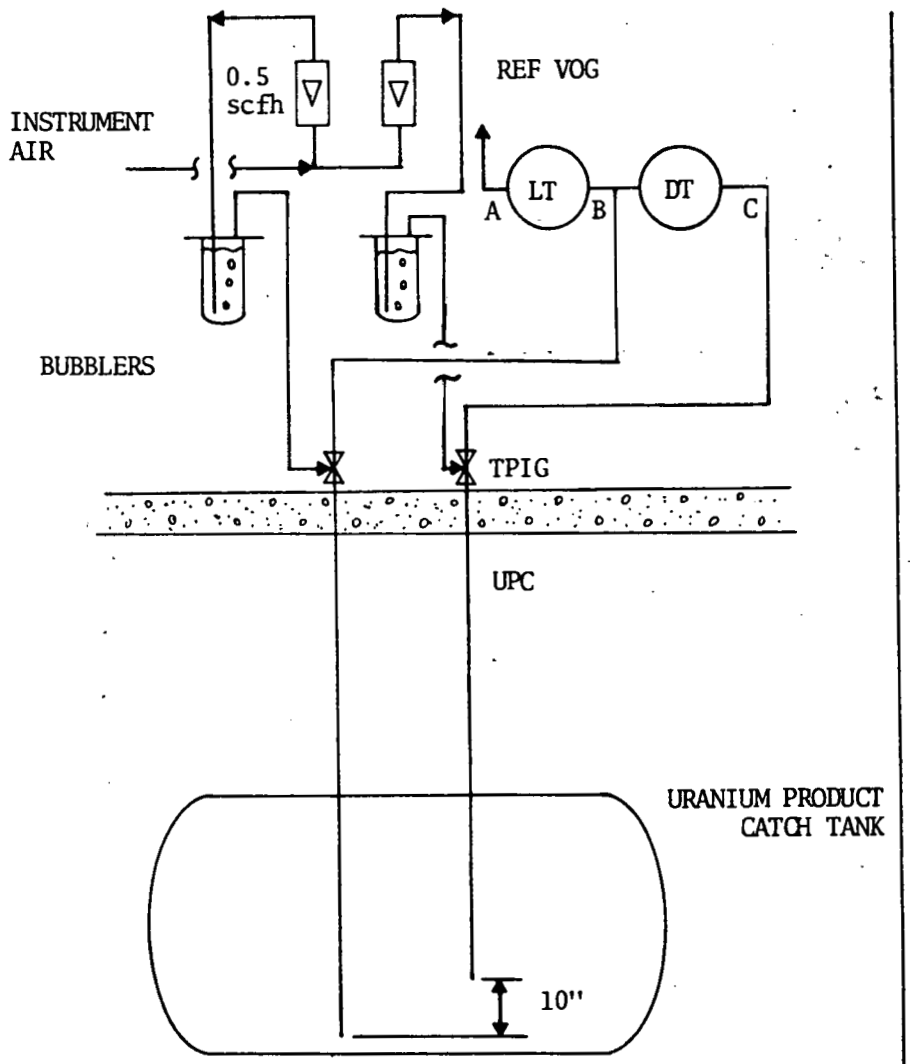

ORIGINAL TEST INSTALLATION

FIGURE K-1

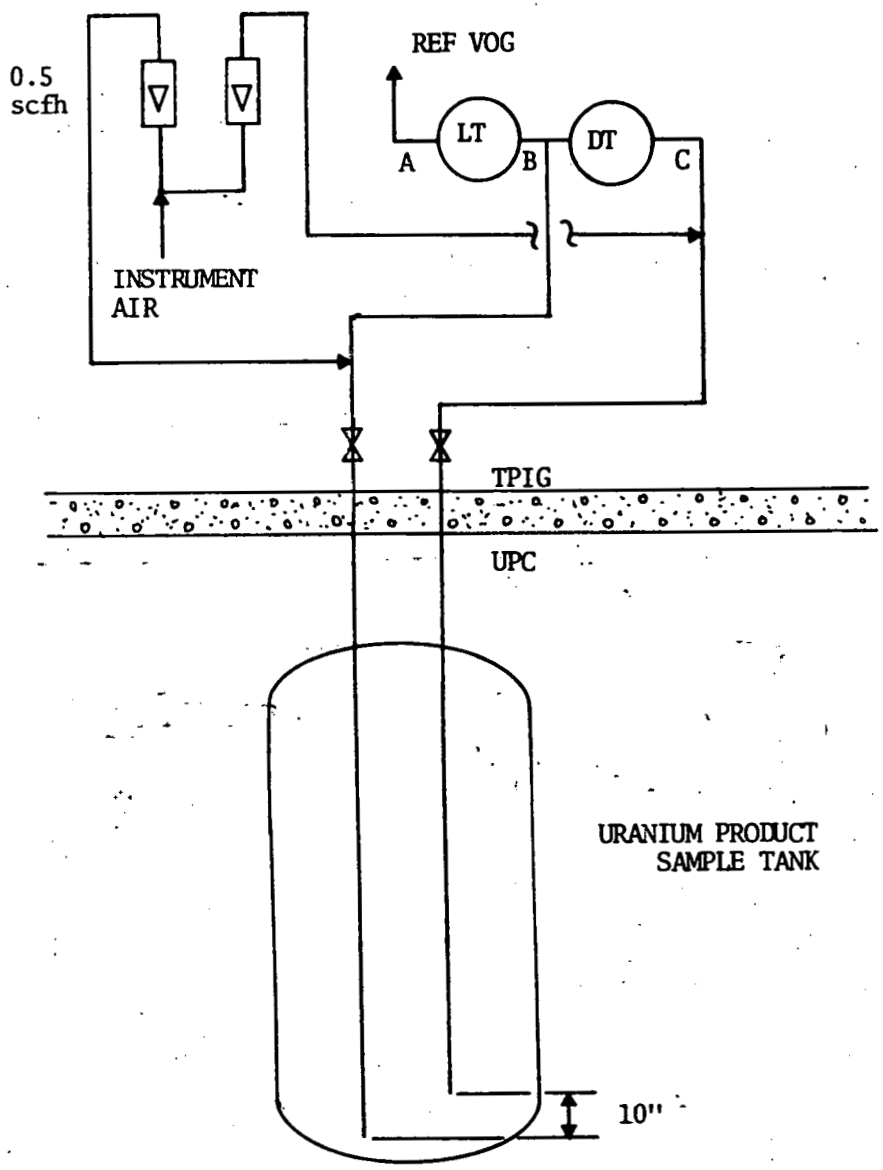



FINAL TEST INSTALLATION

FIGURE K-2




From 5/20/79 through 7/11/79 probes did not plug in 52 days.




From 5/20/79 through 7/11/79 probes plugged 48 times in 52 days.

FIGURE K-3

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX L

## FY 1979 MEASUREMENT AND COMPARISON DATA SUMMARIES

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

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FY 1979 CAMPAIGN SHUTDOWN PRIOR TO RUN
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 128 | 04/03/79 | 6204 | 8857.2 | 1859.39 |
| 129 | 04/04/79 | 6211 | 9195.4 | 2096.77 |
| 130 | 04/04/79 | 6219 | 9201.2 | 2105.61 |

| | | | |
|---|---|---|---|
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FY 1979 CAMPAIGN 1
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 131 | 04/07/79 | 5617 | 8413.8 | 1963.77 |
| 132 | 04/08/79 | 0 | 0 | 0 |
| 133 | 04/11/79 | 4749 | 6387 | 1064.43 |
| 134 | 04/13/79 | 5070 | 7183.4 | 1430.4 |
| 135 | 04/14/79 | 7224 | 11004.5 | 2590.49 |
| 136 | 04/15/79 | 3064 | 4930.4 | 1316.82 |
| 137 | 04/15/79 | 5556 | 8501.7 | 2337.39 |
| 138 | 04/15/79 | 3512 | 5852.2 | 1692.57 |
| 139 | 04/16/79 | 5740 | 9424.1 | 2758.55 |
| 140 | 04/17/79 | 4506 | 7408.1 | 2180.1 |
| 141 | 04/17/79 | 2650 | 4243.6 | 1132.26 |
| 142 | 04/18/79 | 4506 | 7219.4 | 1985.48 |
| 143 | 04/18/79 | 4773 | 7689 | 2159.96 |
| 144 | 04/19/79 | 4437 | 7117.5 | 2007.31 |
| 145 | 04/19/79 | 4627 | 7385.6 | 2080.61 |
| 146 | 04/19/79 | 4221 | 6711.2 | 1884.34 |
| 147 | 04/20/79 | 4236 | 6861.8 | 1942.41 |
| 148 | 04/20/79 | 4077 | 6597.9 | 1880.86 |
| 149 | 04/21/79 | 0 | 0 | 0 |
| 150 | 04/21/79 | 4108 | 6634.3 | 1864.22 |
| 151 | 04/21/79 | 4781 | 7781.6 | 2211.31 |
| 152 | 04/22/79 | 4124 | 6729.5 | 1939.02 |
| 153 | 04/22/79 | 4222 | 6845.8 | 1936.53 |
| 154 | 04/22/79 | 3828 | 6157.9 | 1720.67 |
| 155 | 04/23/79 | 3738 | 6121.1 | 1765.24 |
| 156 | 04/23/79 | 4038 | 6422.9 | 1728.78 |
| 157 | 04/23/79 | 4027 | 6446.9 | 1749.78 |
| 158 | 04/24/79 | 4148 | 6553.2 | 1755.87 |
| 159 | 04/24/79 | 3827 | 6092.1 | 1660.98 |
| 160 | 04/25/79 | 4295 | 6716.5 | 1785.35 |
| 161 | 04/25/79 | 4176 | 6675.9 | 1807.52 |
| 162 | 04/25/79 | 3808 | 6248.2 | 1743.66 |
| 163 | 04/26/79 | 4277 | 6808.7 | 1843.96 |
| 164 | 04/26/79 | 4748 | 7303.3 | 1874.3 |
| 165 | 04/27/79 | 3548 | 5607.4 | 1511.58 |
| 166 | 04/27/79 | 4315 | 6886.3 | 1905.21 |
| 167 | 04/27/79 | 3599 | 5809.4 | 1638.91 |
| 168 | 04/28/79 | 5298 | 8368.7 | 2266.91 |
| 169 | 04/28/79 | 2239 | 3361.8 | 788.81 |
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FY 1979 CAMPAIGN 1
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 171 | 04/29/79 | 4757 | 7382.6 | 1933.18 |
| 172 | 04/29/79 | 4238 | 6445 | 1636.9 |
| 173 | 04/30/79 | 5102 | 7613.8 | 1870.12 |
| 174 | 04/30/79 | 4065 | 6037.6 | 1470.27 |
| 175 | 04/30/79 | 3998 | 5953.8 | 1450.66 |
| 176 | 04/30/79 | 4979 | 7406 | 1788.98 |
| 177 | 05/01/79 | 4134 | 6147.1 | 1479.22 |
| 178 | 05/01/79 | 4351 | 6480.7 | 1579.17 |
| 179 | 05/01/79 | 5410 | 8077.9 | 1957.42 |
| 180 | 05/02/79 | 4626 | 6872.9 | 1666.7 |
| 181 | 05/02/79 | 4229 | 6174.2 | 1448.54 |
| 182 | 05/02/79 | 4606 | 6705 | 1561.97 |
| 183 | 05/03/79 | 4333 | 6429.5 | 1543.18 |
| 184 | 05/03/79 | 4030 | 6062.1 | 1512.33 |
| 185 | 05/04/79 | 4527 | 6785.1 | 1664.75 |
| 186 | 05/04/79 | 3700 | 5653.1 | 1419.39 |
| 187 | 05/04/79 | 4150 | 6290.4 | 1578.12 |
| 188 | 05/05/79 | 4433 | 6705.2 | 1684.73 |
| 189 | 05/05/79 | 5042 | 7571.4 | 1881.11 |
| 190 | 05/05/79 | 4610 | 6951.9 | 1721.3 |
| 191 | 05/05/79 | 4352 | 6502.5 | 1576.01 |
| 192 | 05/06/79 | 4933 | 7421.1 | 1814.02 |
| 193 | 05/06/79 | 3591 | 5445.3 | 1347.57 |
| 194 | 05/07/79 | 4913 | 7375.8 | 1810.91 |
| 195 | 05/07/79 | 5119 | 7685.2 | 1907.91 |
| 196 | 05/07/79 | 3265 | 4925 | 1236.26 |
| 197 | 05/08/79 | 4755 | 7109.8 | 1560.2 |
| 198 | 05/08/79 | 4955 | 7441.8 | 1832.93 |
| 199 | 05/08/79 | 3924 | 5920.4 | 1458.77 |
| 200 | 05/09/78 | 4982 | 7472.8 | 1842.06 |
| 201 | 05/09/79 | 2983 | 4474.3 | 1109.14 |
| 202 | 05/09/79 | 5293 | 7924.4 | 1951.57 |
| 203 | 05/10/79 | 4351 | 6503.7 | 1586.25 |
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FY 1979 CAMPAIGN 2
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 206 | 05/20/79 | 5371 | 7493.2 | 1326.96 |
| 207 | 05/21/79 | 5673 | 7987.3 | 1481.17 |
| 208 | 05/21/79 | 5832 | 8614.1 | 1960.26 |
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| 210 | 05/22/79 | 5034 | 7520 | 1814.02 |
| 211 | 05/22/79 | 3903 | 5851.8 | 1425.59 |
| 212 | 05/23/79 | 5096 | 7537.1 | 1797.46 |
| 213 | 05/23/79 | 4798 | 7050.9 | 1653.01 |
| 214 | 05/23/79 | 4392 | 6452.4 | 1509.85 |
| 215 | 05/24/79 | 3974 | 5915.7 | 1418.01 |
| 216 | 05/24/79 | 4192 | 6233.1 | 1512.66 |
| 217 | 05/25/79 | 4024 | 5994.8 | 1463.7 |
| 218 | 05/25/79 | 5042 | 7608.5 | 1844.68 |
| 219 | 05/25/79 | 5013 | 7560.2 | 1821.54 |
| 220 | 05/26/79 | 4103 | 6174.1 | 1475.81 |
| 221 | 05/26/79 | 4008 | 6028.8 | 1458.1 |
| 222 | 05/26/79 | 5696 | 8459.5 | 2006.95 |
| 223 | 05/27/79 | 4528 | 6712.2 | 1614.43 |
| 224 | 05/27/79 | 4283 | 6401 | 1571.45 |
| 225 | 05/27/79 | 5129 | 7591 | 1795.55 |
| 226 | 05/28/79 | 4410 | 6562.2 | 1547.82 |
| 227 | 05/28/79 | 4287 | 6376 | 1506.97 |
| 228 | 05/28/79 | 5200 | 7702.3 | 1798.66 |
| 229 | 05/29/79 | 4682 | 6989 | 1617.25 |
| 230 | 05/29/79 | 4019 | 6027.4 | 1406.84 |
| 231 | 05/30/79 | 4880 | 7330.2 | 1681.04 |
| 232 | 05/30/79 | 4161 | 6249.5 | 1486.41 |
| 233 | 05/30/79 | 5462 | 8163 | 1982.93 |
| 234 | 05/31/79 | 4524 | 6800.8 | 1595.76 |
| 235 | 06/01/79 | 4123 | 6218.8 | 1402.72 |
| 236 | 06/01/79 | 4755 | 7102.5 | 1667.32 |
| 237 | 06/02/79 | 4762 | 7006.1 | 1597.41 |
| 238 | 06/03/79 | 4772 | 7066.6 | 1668.1 |
| 239 | 06/03/79 | 4405 | 6497.7 | 1428.88 |
| 240 | 06/04/79 | 4561 | 6879.4 | 1594.95 |
| 241 | 06/04/79 | 4964 | 7427.9 | 1768.17 |
| 242 | 06/04/79 | 4778 | 7128.3 | 1709.66 |
| 243 | 06/05/79 | 5196 | 7787.4 | 1924.67 |
| 244 | 06/05/79 | 4314 | 6461.7 | 1566.79 |
| 245 | 06/06/79 | 4960 | 7420.4 | 1780.61 |
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FY 1979 CAMPAIGN 2
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 246 | 06/06/79 | 5136 | 7639.6 | 1805.01 |
| 247 | 06/06/79 | 4752 | 7066.2 | 1662.6 |
| 248 | 06/07/79 | 4899 | 7239 | 1698.64 |
| 249 | 06/07/79 | 5205 | 7624.5 | 1752.48 |
| 250 | 06/07/79 | 4611 | 6771 | 1593.46 |
| 251 | 06/08/79 | 5062 | 7498.4 | 1799.46 |
| 252 | 06/09/79 | 5115 | 7647.4 | 1869.09 |
| 253 | 06/09/79 | 5227 | 7820.1 | 1859.62 |
| 254 | 06/09/79 | 4673 | 6973.1 | 1632.1 |
| 255 | 06/10/79 | 4692 | 7058.8 | 1700.07 |
| 256 | 06/10/79 | 4807 | 7243.7 | 1743.53 |
| 257 | 06/10/79 | 4575 | 6873.3 | 1632.22 |
| 258 | 06/11/79 | 5033 | 7542.6 | 1766.72 |
| 259 | 06/11/79 | 4980 | 7463.9 | 1756.69 |
| 260 | 06/12/79 | 4861 | 7323.5 | 1737.15 |
| 261 | 06/12/79 | 4733 | 7103.8 | 1715.64 |
| 262 | 06/13/79 | 4327 | 6478.1 | 1548.18 |
| 263 | 06/13/79 | 5336 | 8006.8 | 1934.95 |
| 264 | 06/13/79 | 4941 | 7385.9 | 1793.21 |
| 265 | 06/14/79 | 5128 | 7707.2 | 1909.05 |
| 266 | 06/14/79 | 5060 | 7559 | 1850.12 |
| 267 | 06/15/79 | 4849 | 7280.7 | 1748.08 |
| 268 | 06/15/79 | 5199 | 7796 | 1856.18 |
| 269 | 06/16/79 | 5841 | 8637.5 | 2000.24 |
| 270 | 06/16/79 | 6564 | 9806.5 | 2330.12 |
| 271 | 06/19/79 | 636 | 792.4 | 4.93 |
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FY 1979 CAMPAIGN 3
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 272 | 06/22/79 | 4 | 2.8999 | .62 |
| 273 | 06/26/79 | 0 | 0 | -1.02 |
| 274 | 06/26/79 | 5187 | 7388.4 | 1443.22 |
| 275 | 06/26/79 | 6188 | 8991.8 | 1903.45 |
| 276 | 06/27/79 | 5686 | 8367.8 | 1909.04 |
| 277 | 06/27/79 | 4821 | 7138.2 | 1658.77 |
| 278 | 06/17/79 | 5106 | 7671.6 | 1820.72 |
| 279 | 06/28/79 | 4698 | 6984.9 | 1613.7 |
| 280 | 06/29/79 | 5606 | 8081.5 | 1638.52 |
| 281 | 06/29/79 | 3927 | 5649.4 | 1202.01 |
| 282 | 06/30/79 | 4897 | 7125 | 1535.45 |
| 283 | 06/30/79 | 6532 | 9528.6 | 2103.21 |
| 284 | 06/30/79 | 5459 | 7965.4 | 1771.19 |
| 285 | 06/30/79 | 4150 | 6077.5 | 1361.23 |
| 286 | 07/01/79 | 5014 | 7442.6 | 1729.64 |
| 287 | 07/01/79 | 5312 | 7883.5 | 1871.43 |
| 288 | 07/02/79 | 4692 | 6930.1 | 1642.26 |
| 289 | 07/02/79 | 5928 | 8737.5 | 2061.81 |
| 290 | 07/02/79 | 5364 | 7747.4 | 1739.17 |
| 291 | 07/02/79 | 5774 | 8410.7 | 1921.14 |
| 292 | 07/03/79 | 6602 | 9678.1 | 2200.24 |
| 293 | 07/05/79 | 5788 | 8456.1 | 1943.37 |
| 294 | 07/05/79 | 5204 | 7557.8 | 1699.8 |
| 295 | 07/06/79 | 5305 | 7688.8 | 1751.52 |
| 296 | 07/06/79 | 5365 | 7743.9 | 1737.13 |
| 297 | 07/06/79 | 5404 | 7880.2 | 1749.92 |
| 298 | 07/07/79 | 5478 | 8024 | 1846.78 |
| 299 | 07/07/79 | 4966 | 7292.5 | 1696.15 |
| 300 | 07/07/79 | 5872 | 8567 | 1967.7 |
| 301 | 07/08/79 | 5307 | 7768.5 | 1781.77 |
| 302 | 07/08/79 | 5104 | 7588.4 | 1788.06 |
| 303 | 07/08/79 | 5139 | 7736.4 | 1904.34 |
| 304 | 07/09/79 | 4815 | 7237 | 1771.58 |
| 305 | 07/09/79 | 4926 | 7420.2 | 1828.45 |
| 306 | 07/09/79 | 4762 | 7178.4 | 1762.61 |
| 307 | 07/10/79 | 4986 | 7496.8 | 1827.71 |
| 308 | 07/10/79 | 5008 | 7636.4 | 1900.32 |
| 309 | 07/10/79 | 5131 | 7802 | 1952.66 |
| 310 | 07/11/79 | 5095 | 7628.2 | 1913.37 |
| 311 | 07/12/79 | 2256 | 2243 | 9.77 |
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FY 1979 CAMPAIGN 3
ACCOUNTABILITY TANK BATCH INPUT SUMMARY
MEASUREMENT POINT 2-03
VESSEL 18-D-101

| BATCH NO. | DATE | LITERS | SOLUTION KGS. | URANIUN KGS. |
|---|---|---|---|---|
| 312 | 07/13/79 | 2001 | 2067.1 | .45 |
| 313 | 07/15/79 | 7629 | 7718 | .86 |
| 314 | 07/16/79 | 4911 | 4953.2 | .56 |
| 315 | 07/16/79 | 2651 | 2689.5 | .02 |

| | | | |
|---|---|---|---|
| PAGE TOTAL | 17192 | 17428 | 1.89 |
| CAMPAIGN TOTAL | 214050 | 306176 | 65960.7 |
| TOTAL THIS RUN | 844246 | .126079E 07 | 301445 |

31-Oct-79 03:49 PM

FY 1979 CAMPAIGN 1
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. |
|---|---|---|---|---|
| 2 | 04/11/79 | 3569 | 4797.4 | 794.3 |
| 3 | 04/12/79 | 5029 | 7146.1 | 1428.9 |
| 4 | 04/13/79 | 7271 | 11076.2 | 2603.1 |
| 5 | 04/14/79 | 3084 | 4961.4 | 1335.4 |
| 6 | 04/15/79 | 5168 | 8355.2 | 2303 |
| 7 | 04/15/79 | 3630 | 5954.2 | 1718.2 |
| 8 | 04/15/79 | 5717 | 9428 | 2761 |
| 9 | 04/16/79 | 4443 | 7311.7 | 2140.3 |
| 10 | 04/17/79 | 2654 | 4251.8 | 1134.4 |
| 11 | 04/18/79 | 4474 | 7216.5 | 1986 |
| 12 | 04/18/79 | 4770 | 7690.9 | 2169.2 |
| 13 | 04/19/79 | 4431 | 7124.1 | 2009.4 |
| 14 | 04/19/79 | 4609 | 7400.2 | 2079 |
| 15 | 04/19/79 | 4165 | 6697.5 | 1891.6 |
| 16 | 04/20/79 | 4238 | 6858.7 | 1946.8 |
| 17 | 04/20/79 | 4141 | 6703.4 | 1904.4 |
| 18 | 04/21/79 | 4218 | 6820.1 | 1918.3 |
| 19 | 04/21/79 | 4780 | 7785.4 | 2209.4 |
| 20 | 04/21/79 | 4186 | 6875.9 | 1989.2 |
| 21 | 04/22/79 | 4197 | 6810.9 | 1877.4 |
| 22 | 04/21/79 | 3915 | 6272.7 | 1751.6 |
| 23 | 04/22/79 | 3724 | 6121.3 | 1773.1 |
| 24 | 04/23/79 | 4003 | 6384.1 | 1719.7 |
| 25 | 04/23/79 | 4295 | 6894.4 | 1881.4 |
| 26 | 04/24/79 | 4128 | 6536.2 | 1749.8 |
| 27 | 04/24/79 | 3781 | 6032.2 | 1647.7 |
| 28 | 04/24/79 | 4272 | 6711.8 | 1781 |
| 29 | 04/25/79 | 4184 | 6677 | 1802.9 |
| 30 | 04/25/79 | 3803 | 6260.3 | 1751.5 |
| 31 | 04/25/79 | 4281 | 6793.4 | 1848.7 |
| 32 | 04/26/79 | 4697 | 7299.5 | 1884.4 |
| 33 | 04/27/79 | 3546 | 5621.9 | 1526.4 |
| 34 | 04/27/79 | 4327 | 6911 | 1917.7 |
| 35 | 04/27/79 | 3565 | 5771.6 | 1627.2 |
| 36 | 04/28/79 | 5270 | 8334.3 | 2263.4 |
| 37 | 04/28/79 | 4207 | 6618 | 1772.9 |
| 38 | 04/28/79 | 4748 | 7377.5 | 1935.6 |
| 39 | 04/29/79 | 4212 | 6420.7 | 1631.6 |
| 40 | 04/29/79 | 5096 | 7613 | 1869.6 |
| 41 | 04/30/79 | 4050 | 6028.9 | 1469.1 |
| TOTAL THIS PAGE | | 142760 | 273945 | 73804.6 |
| CAMPAIGN TOTAL | | 142760 | 273945 | 73804.6 |
| TOTAL THIS RUN | | 142760 | 273945 | 73804.6 |

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FY 1979 CAMPAIGN 1
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. |
|---|---|---|---|---|
| 42 | 04/30/79 | 4019 | 5955.4 | 1438.2 |
| 43 | 04/30/79 | 4975 | 7413.4 | 1789.8 |
| 44 | 05/01/79 | 4120 | 6142.4 | 1479.8 |
| 45 | 05/01/79 | 4342 | 6484.3 | 1582.8 |
| 46 | 05/01/79 | 5415 | 8083.9 | 1955.1 |
| 47 | 05/02/79 | 4611 | 6863 | 1666.3 |
| 48 | 05/02/79 | 4218 | 6166.3 | 1445.2 |
| 49 | 05/02/79 | 4661 | 6700.9 | 1505.5 |
| 50 | 05/03/79 | 4324 | 6434.1 | 1549.8 |
| 51 | 05/03/79 | 4023 | 6063.4 | 1513 |
| 52 | 05/03/79 | 4518 | 6786.9 | 1662 |
| 53 | 05/04/79 | 3681 | 5626 | 1415.7 |
| 54 | 05/04/79 | 4143 | 6292.9 | 1570.2 |
| 55 | 05/04/79 | 4420 | 6704 | 1687.9 |
| 56 | 05/05/79 | 5031 | 7568.5 | 1872.1 |
| 57 | 05/05/79 | 4601 | 6949.6 | 1721.7 |
| 58 | 05/05/79 | 4351 | 6510.3 | 1574.4 |
| 59 | 05/06/79 | 4915 | 7416.6 | 1808.2 |
| 60 | 05/06/79 | 3588 | 5447.7 | 1349.8 |
| 61 | 05/06/79 | 4925 | 7368.7 | 1811.5 |
| 62 | 05/07/79 | 5114 | 7693.6 | 1908.7 |
| 63 | 05/07/79 | 3260 | 4931.7 | 1240.3 |
| 64 | 05/07/79 | 4762 | 7110.8 | 1730.3 |
| 65 | 05/08/79 | 4962 | 7446.2 | 1835 |
| 66 | 05/08/79 | 3940 | 5943.2 | 1466 |
| 67 | 05/08/79 | 4994 | 7478.5 | 1844.6 |
| 68 | 05/09/79 | 2982 | 4472.6 | 1107.7 |
| 69 | 05/09/79 | 5290 | 7925.5 | 1951.5 |
| 70 | 05/09/79 | 4351 | 6509.6 | 1587.1 |
| 71 | 05/10/79 | 5049 | 7473.9 | 1826.5 |

| | | | |
|---|---|---|---|
| TOTAL THIS PAGE | 107070 | 199964 | 48896.7 |
| CAMPAIGN TOTAL | 249830 | 473909 | 122701 |
| TOTAL THIS RUN | 249830 | 473909 | 122701 |

31-Oct-79 03:52 PM

FY 1979 CAMPAIGN 2
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. |
|---|---|---|---|---|
| 72 | 05/12/79 | 5301 | 7417.8 | 1342.8 |
| 73 | 05/20/79 | 5731 | 7986.4 | 1484.3 |
| 74 | 05/21/79 | 5827 | 8619.8 | 1961.8 |
| 75 | 05/21/79 | 4749 | 7096.5 | 1701.5 |
| 76 | 05/22/79 | 5017 | 7510.8 | 1816.3 |
| 77 | 05/22/79 | 3921 | 5890.1 | 1437.2 |
| 78 | 05/22/79 | 5086 | 7536.7 | 1801.3 |
| 79 | 05/23/79 | 4796 | 7052.7 | 1658.6 |
| 80 | 05/23/79 | 4380 | 6447.5 | 1511.6 |
| 81 | 05/24/79 | 3963 | 5911.8 | 1420.7 |
| 82 | 05/24/79 | 4190 | 6236.6 | 1518.2 |
| 83 | 05/24/79 | 4019 | 5992.2 | 1464.9 |
| 84 | 05/25/79 | 5067 | 7646.7 | 1857.8 |
| 85 | 05/25/79 | 5013 | 7562 | 1821 |
| 86 | 05/25/79 | 4019 | 6051.4 | 1448.8 |
| 87 | 05/26/79 | 4050 | 6096.3 | 1474.3 |
| 88 | 05/26/79 | 5687 | 8457.1 | 2008.7 |
| 89 | 05/26/79 | 4523 | 6712.4 | 1619.6 |
| 90 | 05/27/79 | 4292 | 6402.4 | 1570.4 |
| 91 | 05/27/79 | 5124 | 7588.9 | 1794.8 |
| 92 | 05/27/79 | 4412 | 6562.4 | 1547.3 |
| 93 | 05/28/79 | 4286 | 6374.7 | 1556.9 |
| 94 | 05/28/79 | 5197 | 7702.1 | 1795.9 |
| 95 | 05/29/79 | 4689 | 7005 | 1619.4 |
| 96 | 05/29/79 | 4018 | 6028.5 | 1408.1 |
| 97 | 05/29/79 | 4837 | 7269.1 | 1669.2 |
| 98 | 05/30/79 | 4166 | 6260.7 | 1490.4 |
| 99 | 05/30/79 | 5447 | 8149 | 1979.6 |
| 100 | 05/31/79 | 4527 | 6811 | 1606.4 |
| 101 | 06/01/79 | 4120 | 6218 | 1403.7 |
| 102 | 06/01/79 | 4740 | 7095.3 | 1667.2 |
| 103 | 06/02/79 | 4758 | 7003.4 | 1590 |
| 104 | 06/02/79 | 4768 | 7065.2 | 1670.6 |
| 105 | 06/03/79 | 4403 | 6495.6 | 1428.2 |
| 106 | 06/04/79 | 4555 | 6878.4 | 1598.3 |
| 107 | 06/04/79 | 4957 | 7426.4 | 1771.3 |
| 108 | 06/04/79 | 4772 | 7125.3 | 1707.2 |
| 109 | 06/05/79 | 5193 | 7788.1 | 1924.9 |
| 110 | 06/05/79 | 4310 | 6461.3 | 1584.3 |
| 111 | 06/05/79 | 4962 | 7420.9 | 1780.9 |
| TOTAL THIS PAGE | | 144240 | 279357 | 65514.4 |
| CAMPAIGN TOTAL | | 144240 | 279357 | 65514.4 |
| TOTAL THIS RUN | | 450703 | 753266 | 188216 |

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FY 1979 CAMPAIGN 2
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. |
|---|---|---|---|---|
| 112 | 06/06/79 | 5128 | 7638.3 | 1806 |
| 113 | 06/06/79 | 4749 | 7068.3 | 1665.6 |
| 114 | 06/07/79 | 4888 | 7240.9 | 1704.7 |
| 115 | 06/07/79 | 5198 | 7611 | 1750.4 |
| 116 | 06/07/79 | 4611 | 6776.8 | 1596.7 |
| 117 | 06/08/79 | 5068 | 7492.8 | 1797.4 |
| 118 | 06/09/79 | 5110 | 7646.4 | 1865.9 |
| 119 | 06/09/79 | 5230 | 7834.4 | 1859.3 |
| 120 | 06/09/79 | 4671 | 6974.9 | 1633 |
| 121 | 06/10/79 | 4689 | 7061.1 | 1701.1 |
| 122 | 06/10/79 | 4805 | 7245 | 1744.2 |
| 123 | 06/10/79 | 4574 | 6876.2 | 1633.3 |
| 124 | 06/11/79 | 5036 | 7551 | 1765.7 |
| 125 | 06/11/79 | 4975 | 7466 | 1750.1 |
| 126 | 06/11/79 | 4874 | 7323.7 | 1739.9 |
| 127 | 06/12/79 | 4735 | 7110.5 | 1715 |
| 128 | 06/12/79 | 4328 | 6480.2 | 1547.3 |
| 129 | 06/13/79 | 5341 | 8009.4 | 1936.9 |
| 130 | 06/13/79 | 4939 | 7383.4 | 1794.3 |
| 131 | 06/14/79 | 5124 | 7705.3 | 1909 |
| 132 | 06/14/79 | 5068 | 7563.1 | 1853.5 |
| 133 | 06/14/79 | 4860 | 7280.1 | 1737.7 |
| 134 | 06/15/79 | 5207 | 7795.5 | 1849.1 |
| 135 | 06/15/79 | 0 | 0 | 0 |
| 136 | 06/16/79 | 5839 | 8624.6 | 1997.7 |
| 137 | 06/16/79 | 6556 | 9789.1 | 2333.5 |
| 138 | 06/17/79 | 0 | 0 | 0 |
| TOTAL THIS PAGE | | 96363 | 187548 | 44687.3 |
| CAMPAIGN TOTAL | | 240603 | 466905 | 110202 |
| TOTAL THIS RUN | | 547066 | 940814 | 232903 |

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FY 1979 CAMPAIGN 3
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. | |
|---|---|---|---|---|---|
| 139 | 06/19/79 | 0 | 0 | 0 | |
| 140 | 06/25/79 | 0 | 0 | 0 | |
| 141 | 06/26/79 | 5215 | 7433 | 1460.4 | |
| 142 | 06/26/79 | 6112 | 8899.4 | 1884.3 | |
| 143 | 06/26/79 | 5687 | 8367.3 | 1901.2 | |
| 144 | 06/27/79 | 4814 | 7142.2 | 1668.6 | |
| 145 | 06/27/79 | 5100 | 7675.2 | 1829.6 | |
| 146 | 06/28/79 | 4693 | 6984.5 | 1617.5 | |
| 147 | 06/28/79 | 5600 | 8080.4 | 1633 | |
| 148 | 06/29/79 | 3922 | 5650.7 | 1205.9 | |
| 149 | 06/29/79 | 4846 | 7125.1 | 1564.5 | |
| 150 | 06/30/79 | 6481 | 9518.1 | 2130.7 | |
| 151 | 06/30/79 | 5456 | 7967.1 | 1776.5 | |
| 152 | 06/30/79 | 4134 | 6060.8 | 1365.7 | |
| 153 | 07/01/79 | 5008 | 7445.4 | 1735.5 | |
| 154 | 07/01/79 | 5294 | 7879.6 | 1877.6 | |
| 155 | 07/01/79 | 4689 | 6930.4 | 1646.3 | |
| 156 | 07/02/79 | 5918 | 8733.1 | 2068 | |
| 157 | 07/02/79 | 5364 | 7751.3 | 1735.3 | |
| 158 | 07/02/79 | 5771 | 8409.8 | 1913.2 | |
| 159 | 07/03/79 | 6596 | 9672.6 | 2209.4 | |
| 160 | 07/03/79 | 5742 | 8435.7 | 1949.2 | |
| 161 | 07/05/79 | 5192 | 7542.9 | 1691.8 | |
| 162 | 07/05/79 | 5308 | 7688 | 1746.4 | |
| 163 | 07/06/79 | 5369 | 7745.5 | 1728.7 | |
| 164 | 07/06/79 | 5432 | 7931.6 | 1755.3 | |
| 165 | 07/07/79 | 5479 | 8032.4 | 1857.9 | |
| 166 | 07/07/79 | 4961 | 7287.4 | 1699.8 | |
| 167 | 07/07/79 | 5872 | 8566.6 | 1935.7 | |
| 168 | 07/07/79 | 5304 | 7773 | 1763.8 | |
| 169 | 07/08/79 | 5105 | 7585.1 | 1784.6 | |
| 170 | 07/08/79 | 5136 | 7733.9 | 1895.3 | |
| 171 | 07/08/79 | 4803 | 7227.4 | 1779 | |
| 172 | 07/09/79 | 4924 | 7411.6 | 1822.7 | |
| 173 | 07/09/79 | 4757 | 7177.6 | 1776.7 | |
| 174 | 07/09/79 | 4979 | 7495.1 | 1823.8 | |
| 175 | 07/10/79 | 5002 | 7632.7 | 1903.2 | |
| 176 | 07/10/79 | 5132 | 7805.9 | 1965.8 | |
| 177 | 07/10/79 | 5067 | 7689.7 | 1933.5 | |
| 178 | 07/11/79 | 4951 | 7408.6 | 1793.6 | * |
| TOTAL THIS PAGE | | 139191 | 293897 | 67830 | |
| CAMPAIGN TOTAL | | 139191 | 293897 | 67830 | |
| TOTAL THIS RUN | | 759129 | .123471E 07 | 300733 | |

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FY 1979 CAMPAIGN 3
U PROD SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-07
VESSEL 24-D-204

| BATCH 02-007- | DATE | LITERS | SOLUTION KGS. | URANIUM KGS. | |
|---|---|---|---|---|---|
| 179 | 07/11/79 | 5968 | 8772 | 2013.8 | * |
| 180 | 07/11/79 | 5057 | 7484.8 | 1702.7 | * |
| 181 | 07/13/79 | 4806 | 7232.2 | 1733.4 | * |
| 182 | 07/14/79 | 4323 | 6217.2 | 1238.7 | * |
| 183 | 07/15/79 | 5428 | 6942.6 | 666.1 | * |
| 184 | 07/20/79 | 5470 | 6534.2 | 247.8 | * |
| 185 | 07/22/79 | 5352 | 6062.4 | 143.7 | * |
| 186 | 07/23/79 | 1344 | 1481 | 13 | * |
| TOTAL THIS PAGE | | 28552 | 50726.4 | 7759.2 | |
| CAMPAIGN TOTAL | | 167743 | 344623 | 75589.2 | |
| TOTAL THIS RUN | | 787681 | .128544E 07 | 308492 | |

01-Nov-79 01:50 PM

FY 1979 CAMPAIGN PRIOR TO RUN
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 399 | 10/11/78 | 865 | 33.8 |
| 400 | 10/11/78 | 847 | 18.4 |
| 401 | 10/14/78 | 739 | 27.9 |
| 402 | 10/18/78 | 764 | 414.4 |
| 403 | 11/23/78 | 808 | 229.3 |
| 404 | 11/25/78 | 824 | 76 |
| 405 | 11/25/78 | 775 | 82.8 |
| 406 | 11/26/78 | 817 | 95.6 |
| 407 | 11/26/78 | 799 | 89 |
| 408 | 11/26/78 | 810 | 81.5 |
| 409 | 11/26/78 | 809 | 86.4 |
| 410 | 11/27/78 | 843 | 93.7 |
| 411 | 11/27/78 | 785 | 66.7 |
| 412 | 11/28/78 | 890 | 67.2 |
| 413 | 11/28/78 | 837 | 90.4 |
| 414 | 12/05/78 | 741 | 75.5 |
| 415 | 12/07/78 | 797 | 60.1 |
| 416 | 12/08/78 | 779 | 121.7 |
| 417 | 12/08/78 | 827 | 154.1 |
| 418 | 12/08/78 | 799 | 128 |
| 419 | 12/09/78 | 810 | 141.2 |
| 420 | 12/09/78 | 789 | 123.8 |
| 421 | 12/09/78 | 782 | 145.9 |
| 422 | 12/10/78 | 831 | 137.4 |
| 423 | 12/10/78 | 767 | 67.5 |
| 424 | 12/11/78 | 746 | 85.7 |
| 425 | 12/12/78 | 782 | 79.4 |
| 426 | 12/14/78 | 788 | 86.8 |
| 427 | 12/16/78 | 810 | 122.5 |
| 428 | 12/16/78 | 861 | 160.5 |
| 429 | 12/16/78 | 845 | 97.8 |
| 430 | 12/16/78 | 879 | 90.7 |
| 431 | 12/17/78 | 889 | 88.9 |
| 432 | 12/17/78 | 972 | 101.6 |
| 433 | 12/17/78 | 803 | 94.4 |
| 434 | 12/17/78 | 590 | 65.3 |
| 435 | 01/19/79 | RECYCLE | |
| 436 | 01/20/79 | RECYCLE | |
| 437 | 01/21/79 | RECYCLE | |
| 438 | 01/21/79 | RECYCLE | |
| TOTAL THIS PAGE | | 29099 | 3781.9 |
| TOTAL THIS CAMPAIGN | | 29099 | 3781.9 |
| TOTAL THIS RUN | | 29099 | 3781.9 |

01-Nov-79 01:50 PM

FY 1979 CAMPAIGN PRIOR TO RUN
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 439 | 01/21/79 | RECYCLE | |
| 440 | 01/21/79 | RECYCLE | |
| 441 | 01/21/79 | RECYCLE | |
| 442 | 01/22/79 | RECYCLE | |
| 443 | 01/22/79 | RECYCLE | |
| 444 | 01/26/79 | RECYCLE | |
| 445 | 02/09/78 | RECYCLE | |
| 446 | 03/22/79 | RECYCLE | |
| 447 | 03/23/79 | 847 | 677.6 |
| 448 | 03/25/79 | 0 | 0 |
| 449 | 03/26/79 | 756 | 2797.2 |
| 450 | 03/26/79 | 834 | 1584.6 |
| 451 | 03/27/79 | 793 | 660.4 |
| 452 | 03/27/79 | 773 | 446 |
| 453 | 03/27/79 | 815 | 570.5 |
| 454 | 03/27/79 | RECYCLE | |
| 455 | 03/28/79 | 802 | 483.7 |
| 456 | 03/29/79 | 808 | 492.9 |
| 457 | 03/29/79 | 845 | 539.1 |
| 458 | 03/30/79 | 843 | 385 |
| 459 | 03/30/79 | 816 | 503.5 |
| 460 | 03/30/79 | 832 | 665.6 |
| 461 | 03/30/79 | 731 | 146.2 |
| 462 | 03/31/79 | 767 | 79.8 |
| 463 | 03/31/79 | 796 | 768.2 |
| 464 | 03/31/78 | 807 | 290.5 |
| 465 | 04/01/79 | 773 | 464.6 |
| 466 | 04/01/79 | 788 | 549.2 |
| 467 | 04/01/79 | 721 | 535 |
| 468 | 04/01/79 | 775 | 253.4 |
| 469 | 04/01/79 | 819 | 573.3 |
| 470 | 04/01/79 | 669 | 3211.2 |
| 471 | 04/02/79 | RECYCLE | |
| 472 | 04/02/79 | 764 | 7716.4 |
| 473 | 04/03/79 | 828 | 662.4 |
| 474 | 04/03/79 | 718 | 287.2 |

| | | |
|---|---|---|
| TOTAL THIS PAGE | 19720 | 25343.5 |
| TOTAL THIS CAMPAIGN | 48819 | 29125.4 |
| TOTAL THIS RUN | 48819 | 29125.4 |

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FY 1979 CAMPAIGN 1
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 475 | 04/04/79 | 877 | 16926.1 |
| 476 | 04/07/79 | 748 | 1346.4 |
| 477 | 04/08/79 | RECYCLE | |
| 478 | 04/10/79 | 650 | 2145 |
| 479 | 04/10/79 | 478 | 91.3 |
| 480 | 04/11/79 | RECYCLE | |
| 481 | 04/12/79 | 290 | 261 |
| 482 | 04/12/79 | 618 | 4017 |
| 483 | 04/13/79 | 449 | 19127.4 |
| 484 | 04/14/79 | 575 | 5922.5 |
| 485 | 04/14/79 | 617 | 2838.2 |
| 486 | 04/14/79 | RECYCLE | |
| 487 | 04/15/79 | 400 | 2080 |
| 488 | 04/16/79 | 521 | 573.1 |
| 489 | 04/16/79 | 632 | 9037.6 |
| 490 | 04/17/79 | 769 | 1076.6 |
| 491 | 04/17/79 | 718 | 178.1 |
| 492 | 04/17/79 | 692 | 415.2 |
| 493 | 04/18/79 | 712 | 4912.8 |
| 494 | 04/19/79 | 684 | 2188.8 |
| 495 | 04/19/79 | 608 | 3100.8 |
| 496 | 04/20/79 | 868 | 1475.6 |
| 497 | 04/21/79 | 674 | 3370 |
| 498 | 04/22/79 | 689 | 482.3 |
| 499 | 04/22/79 | 681 | 6231.2 |
| 500 | 04/22/79 | 492 | 7330.8 |
| 501 | 04/23/79 | 734 | 1394.6 |
| 502 | 04/23/79 | RECYCLE | |
| 503 | 04/23/79 | RECYCLE | |
| 504 | 04/24/79 | 553 | 7576.1 |
| 505 | 04/24/79 | RECYCLE | |
| 506 | 04/25/79 | 502 | 2660.6 |
| 507 | 04/25/79 | 613 | 10972.7 |
| 508 | 04/25/79 | 616 | 15153.6 |
| 509 | 04/26/79 | 663 | 12132.9 |
| 510 | 04/26/79 | 655 | 6419 |
| 511 | 04/27/79 | 681 | 953.4 |
| 512 | 04/27/79 | 484 | 143.3 |
| 513 | 04/27/79 | 594 | 178.2 |
| 514 | 04/28/79 | 637 | 7580.3 |
| TOTAL THIS PAGE | | 21174 | 160293 |
| TOTAL THIS CAMPAIGN | | 21174 | 160293 |
| TOTAL THIS RUN | | 21174 | 160293 |

31-Oct-79 01:43 PM

FY 1979 CAMPAIGN 1
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 515 | 04/29/79 | 433 | 11604.4 |
| 516 | 04/29/79 | 581 | 13421.1 |
| 517 | 04/30/79 | 278 | 15526.3 |
| 518 | 04/30/79 | 640 | 1088 |
| 519 | 05/01/79 | 576 | 6134.4 |
| 520 | 05/02/79 | 283 | 2518.7 |
| 521 | 05/02/79 | 663 | 10906.4 |
| 522 | 05/02/79 | 472 | 151.5 |
| 523 | 05/03/79 | RECYCLE | |
| 524 | 05/03/79 | RECYCLE | |
| 525 | 05/04/79 | 466 | 3867.8 |
| 526 | 05/04/79 | 773 | 2550.9 |
| 527 | 05/06/79 | 660 | 26980.8 |
| 528 | 05/06/79 | 664 | 8100.8 |
| 529 | 05/06/79 | 665 | 864.5 |
| 530 | 05/07/79 | 434 | 607.6 |
| 531 | 05/08/79 | 689 | 413.4 |
| 532 | 05/08/79 | 732 | 171.7 |
| 533 | 05/08/79 | RECYCLE | |
| 534 | 05/09/79 | 733 | 8942.6 |
| 535 | 05/09/79 | 752 | 2256 |
| 536 | 05/09/79 | 702 | 456.4 |
| 537 | 05/09/79 | 778 | 150.2 |
| 538 | 05/10/79 | 656 | 557.6 |
| 539 | 05/10/79 | 486 | 388.8 |
| 540 | 05/10/79 | RECYCLE | |
| 541 | 05/10/79 | 613 | 3861.9 |
| 542 | 05/10/79 | 639 | 447.3 |
| 543 | 05/10/79 | RECYCLE | |
| 544 | 05/11/79 | 395 | 158 |
| 545 | 05/13/79 | RECYCLE | |
| 546 | 05/13/79 | RECYCLE | |
| 547 | 05/13/79 | 371 | 6318.6 |
| 548 | 05/14/79 | 767 | 9.2 |
| 549 | 05/14/79 | RECYCLE | |
| 550 | 05/15/79 | 289 | 809.2 |
| 551 | 05/15/79 | 417 | 458.7 |
| 552 | 05/15/79 | RECYCLE | |
| 553 | 05/15/79 | 613 | 3831.2 |
| 554 | 05/15/79 | 575 | 690 |
| TOTAL THIS PAGE | | 17795 | 134244 |
| TOTAL THIS CAMPAIGN | | 38969 | 294536 |
| TOTAL THIS RUN | | 30969 | 294536 |

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FY 1979 CAMPAIGN 1
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 555 | 05/15/79 | RECYCLE | |
| 556 | 05/15/79 | RECYCLE | |
| 557 | 05/16/79 | 578 | 118.2 |
| 558 | 05/16/79 | 851 | 3318.9 |
| 559 | 05/16/79 | 719 | 503.3 |
| 560 | 05/16/79 | 733 | 2492.2 |
| 561 | 05/17/79 | 698 | 1465.8 |
| 562 | 05/17/79 | 646 | 2002.6 |
| 563 | 05/18/79 | 458 | 379.4 |
| TOTAL THIS PAGE | | 4683 | 10280.4 |
| TOTAL THIS CAMPAIGN | | 43652 | 304817 |
| TOTAL THIS RUN | | 43652 | 304817 |

31-Oct-79 01:44 PM

FY 1979 CAMPAIGN 2
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 564 | 05/20/79 | 581 | 2411.1 |
| 565 | 05/21/79 | 615 | 1383.7 |
| 566 | 05/21/79 | 580 | 3480 |
| 567 | 05/22/79 | 310 | 744 |
| 568 | 05/23/79 | 547 | 4348.7 |
| 569 | 05/25/79 | 591 | 10490.2 |
| 570 | 05/25/79 | 590 | 1357 |
| 571 | 05/25/79 | 637 | 509.6 |
| 572 | 05/25/79 | 622 | 13030.9 |
| 573 | 05/25/79 | 562 | 2248 |
| 574 | 05/25/79 | 539 | 5713.4 |
| 575 | 05/26/79 | 569 | 1849.3 |
| 576 | 05/26/79 | 654 | 1569.6 |
| 577 | 05/27/79 | 569 | 1650.1 |
| 578 | 05/27/79 | 606 | 2484.6 |
| 579 | 05/27/79 | 599 | 12010 |
| 580 | 05/27/79 | 599 | 3653.9 |
| 581 | 05/28/79 | 591 | 4373.4 |
| 582 | 05/28/79 | 576 | 1612.8 |
| 583 | 05/28/79 | 625 | 1812.5 |
| 584 | 05/28/79 | 622 | 3358.8 |
| 585 | 05/28/79 | 603 | 3437.1 |
| 586 | 05/29/79 | 613 | 5639.6 |
| 587 | 05/29/79 | 634 | 3170 |
| 588 | 05/29/79 | 564 | 2425.2 |
| 589 | 05/29/79 | 379 | 2766.7 |
| 590 | 05/30/79 | 563 | 2083.1 |
| 591 | 05/30/79 | 620 | 8115.8 |
| 592 | 05/30/79 | 5 | 342 |
| 593 | 05/30/79 | RECYCLE | |
| 594 | 05/31/79 | 600 | 6450 |
| 595 | 05/31/79 | RECYCLE | |
| 596 | 05/31/79 | RECYCLE | |
| 597 | 06/01/79 | RECYCLE | |
| 598 | 06/01/79 | RECYCLE | |
| 599 | 06/02/79 | RECYCLE | |
| 600 | 06/02/79 | 620 | 13547 |
| 601 | 06/02/79 | RECYCLE | |
| 602 | 06/02/79 | 732 | 9040.2 |
| 603 | 06/03/79 | 554 | 9750.4 |
| TOTAL THIS PAGE | | 18671 | 146859 |
| TOTAL THIS CAMPAIGN | | 18671 | 146859 |
| TOTAL THIS RUN | | 62323 | 451676 |

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FY 1979 CAMPAIGN 2
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 604 | 06/03/79 | RECYCLE | |
| 605 | 06/03/79 | RECYCLE | |
| 606 | 06/04/79 | 402 | 221.1 |
| 607 | 06/04/79 | 575 | 2760 |
| 608 | 06/04/79 | 617 | 1295.7 |
| 609 | 06/04/79 | 640 | 2240 |
| 610 | 06/04/79 | 634 | 2187.3 |
| 611 | 06/05/79 | 634 | 2155.6 |
| 612 | 06/05/79 | 597 | 2388 |
| 613 | 06/05/79 | 226 | 531.1 |
| 614 | 06/05/79 | 625 | 2281.3 |
| 615 | 06/06/79 | 572 | 1487.2 |
| 616 | 06/06/79 | 580 | 1015 |
| 617 | 06/06/79 | 599 | 778.7 |
| 618 | 06/06/79 | 605 | 5929 |
| 619 | 06/07/79 | 630 | 281.3 |
| 620 | 06/07/79 | RECYCLE | |
| 621 | 06/07/79 | 569 | 512.1 |
| 622 | 06/07/79 | 574 | 660.1 |
| 623 | 06/08/79 | 595 | 714 |
| 624 | 06/08/79 | 530 | 715.5 |
| 625 | 06/08/79 | 624 | 561.6 |
| 626 | 06/08/79 | 623 | 467.3 |
| 627 | 06/08/79 | 613 | 1103.4 |
| 628 | 06/09/79 | RECYCLE | |
| 629 | 06/09/79 | RECYCLE | |
| 630 | 06/10/79 | 594 | 5524.2 |
| 631 | 06/11/79 | 597 | 2925.3 |
| 632 | 06/11/79 | 650 | 2535 |
| 633 | 06/11/79 | 666 | 2997 |
| 634 | 06/11/79 | 668 | 2571.8 |
| 635 | 06/11/79 | 611 | 1833 |
| 636 | 06/12/79 | 741 | 1778.4 |
| 637 | 06/12/79 | 665 | 2394 |
| 638 | 06/12/79 | 668 | 1068.8 |
| 639 | 06/13/79 | 202 | 2706.8 |
| 640 | 06/13/79 | RECYCLE | |
| 641 | 06/14/79 | 761 | 2587.4 |
| 642 | 06/14/79 | 768 | 460.8 |
| 643 | 06/14/79 | 709 | 38 |
| TOTAL THIS PAGE | | 20364 | 59705.8 |
| TOTAL THIS CAMPAIGN | | 39035 | 206564 |
| TOTAL THIS RUN | | 02687 | 511381 |

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FY 1979 CAMPAIGN 2
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 644 | 06/15/79 | 695 | 13.2 |
| 645 | 06/16/79 | 648 | 648 |
| 646 | 06/16/79 | 463 | 833.4 |
| 647 | 06/17/79 | 182 | 218.4 |
| 648 | 06/17/79 | 416 | 83.2 |
| 649 | 06/17/79 | 418 | 35.3 |
| 650 | 06/18/79 | 615 | 241.7 |
| 651 | 06/19/79 | RECYCLE | |
| 652 | 06/20/79 | 743 | 1188.8 |
| 653 | 06/20/79 | RECYCLE | |
| 654 | 06/20/79 | RECYCLE | |
| 655 | 06/21/79 | RECYCLE | |
| 656 | 06/21/79 | RECYCLE | |
| 657 | 06/21/79 | RECYCLE | |

| | | |
|---|---|---|
| TOTAL THIS PAGE | 4180 | 3262 |
| TOTAL THIS CAMPAIGN | 43215 | 209826 |
| TOTAL THIS RUN | 86867 | 514643 |

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FY 1979 CAMPAIGN 3
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 658 | 06/24/79 | 692 | 1522.4 |
| 659 | 06/25/79 | 449 | 516.4 |
| 660 | 06/26/79 | 222 | 277.5 |
| 661 | 06/27/79 | 553 | 13576.2 |
| 662 | 06/28/79 | 620 | 2945 |
| 663 | 06/29/79 | RECYCLE | |
| 664 | 06/29/79 | 739 | 665.1 |
| 665 | 06/30/79 | 616 | 2032.8 |
| 666 | 06/30/79 | 616 | 2063.6 |
| 667 | 06/30/79 | 550 | 2337.5 |
| 668 | 06/30/79 | 564 | 4624.8 |
| 669 | 06/30/79 | 648 | 2203.2 |
| 670 | 06/30/79 | 668 | 17201 |
| 671 | 07/01/79 | RECYCLE | |
| 672 | 07/01/79 | RECYCLE | |
| 673 | 07/03/79 | RECYCLE | |
| 674 | 07/03/79 | 273 | 11384.1 |
| 675 | 07/04/79 | 530 | 3074 |
| 676 | 07/04/79 | 424 | 2035.2 |
| 677 | 07/04/79 | 559 | 145.7 |
| 678 | 07/05/79 | RECYCLE | |
| 679 | 07/05/79 | RECYCLE | |
| 680 | 07/05/79 | RECYCLE | |
| 681 | 07/05/79 | 643 | 21058.3 |
| 682 | 07/05/79 | 605 | 17182 |
| 683 | 07/06/79 | 815 | 6601.5 |
| 684 | 07/06/79 | 689 | 9680.5 |
| 685 | 07/06/79 | 773 | 18629.3 |
| 686 | 07/06/79 | 568 | 3038.8 |
| 687 | 07/06/79 | 632 | 1801.2 |
| 688 | 07/07/79 | 632 | 1927.7 |
| 689 | 07/07/79 | 542 | 98.9 |
| 690 | 07/07/79 | RECYCLE | |
| 691 | 07/08/79 | 816 | 50.4 |
| 692 | 07/08/79 | 609 | 7612.5 |
| 693 | 07/09/79 | 588 | 4321.8 |
| 694 | 07/10/79 | 704 | 9433.6 |
| 695 | 07/10/79 | 463 | 1342.7 |
| 696 | 07/11/79 | 553 | 5917.1 |
| 697 | 07/12/79 | 567 | 8448.3 |
| TOTAL THIS PAGE | | 18922 | 183749 |
| TOTAL THIS CAMPAIGN | | 18922 | 183749 |
| TOTAL THIS RUN | | 105789 | 698393 |

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FY 1979 CAMPAIGN 3
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 698 | 07/13/79 | RECYCLE | |
| 699 | 07/14/79 | 747 | 4407.3 |
| 700 | 07/15/79 | RECYCLE | |
| 701 | 07/15/79 | 719 | 7693.3 |
| 702 | 07/16/79 | 703 | 1757.5 |
| 703 | 07/17/79 | 660 | 4884 |
| 704 | 07/17/79 | 759 | 10512.2 |
| 705 | 07/17/79 | 699 | 1013.6 |
| 706 | 07/18/79 | 521 | 7189.8 |
| 707 | 07/19/79 | 721 | 1442 |
| 708 | 07/20/79 | 693 | 178.4 |
| 709 | 07/29/79 | 675 | 5.5 |
| 710 | 07/20/79 | 631 | 10537.7 |
| 711 | 07/21/79 | 718 | 861.6 |
| 712 | 07/22/79 | 749 | 8688.4 |
| 713 | 07/22/79 | 692 | 14393.6 |
| 714 | 07/22/79 | 652 | 16495.6 |
| 715 | 07/22/79 | 658 | 14147 |
| 716 | 07/22/79 | 720 | 10296 |
| 717 | 07/22/79 | 664 | 4316 |
| 718 | 07/23/79 | 614 | 3377 |
| 719 | 07/23/79 | 570 | 3420 |
| 720 | 07/23/79 | 641 | 1858.9 |
| 721 | 07/23/79 | 408 | 183.6 |
| 722 | 07/23/79 | 666 | 2597.4 |
| 723 | 07/23/79 | 575 | 3565 |
| 724 | 07/24/79 | 622 | 4011.9 |
| 725 | 07/24/79 | 672 | 3897.6 |
| 726 | 07/24/79 | 595 | 3213 |
| 727 | 07/24/79 | 642 | 6869.4 |
| 728 | 07/24/79 | RECYCLE | |
| 729 | 07/24/79 | 702 | 4681 |
| 730 | 07/25/79 | 552 | 182.1 |
| 731 | 07/25/79 | 654 | 203.4 |
| 732 | 07/25/79 | 756 | 151.2 |
| 733 | 07/25/79 | 741 | 296.4 |
| 734 | 07/25/79 | 693 | 207.9 |
| 735 | 07/25/79 | 796 | 398 |
| 736 | 07/26/79 | 799 | 359.6 |
| 737 | 07/26/79 | 650 | 130 |
| TOTAL THIS PAGE | | 24729 | 158423 |
| TOTAL THIS CAMPAIGN | | 43651 | 342172 |
| TOTAL THIS RUN | | 130518 | 056815 |

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FY 1979 CAMPAIGN 3
GPW WASTE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-28
VESSEL 43-D-409

| BATCH 02-028- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 738 | 07/26/79 | 768 | 499.2 |
| 739 | 07/26/79 | 407 | 122.1 |
| 740 | 07/26/79 | 318 | 142.5 |

| | | |
|---|---|---|
| TOTAL THIS PAGE | 1493 | 763.8 |
| TOTAL THIS CAMPAIGN | 45144 | 342936 |
| TOTAL THIS RUN | 132011 | 857579 |

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FY 1979 CAMPAIGN 1
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 106 | 04/08/79 | 2684 | 235.1 |
| 107 | 04/09/79 | 2223 | 251.2 |
| 108 | 04/11/79 | 281 | 843 |
| 109 | 04/11/79 | RECYCLE | |
| 110 | 04/12/79 | RECYCLE | |
| 111 | 04/12/79 | 367 | 5908.7 |
| 112 | 04/13/79 | RECYCLE | |
| 113 | 04/14/79 | RECYCLE | |
| 114 | 04/14/79 | RECYCLE | |
| 115 | 04/15/79 | RECYCLE | |
| 116 | 04/15/79 | RECYCLE | |
| 117 | 04/17/79 | 1740 | 17052 |
| 118 | 04/17/79 | 2206 | 11802.1 |
| 119 | 04/18/79 | 2003 | 13720.6 |
| 120 | 04/18/79 | 1635 | 8338.5 |
| 121 | 04/19/79 | 1774 | 3725.4 |
| 122 | 04/19/79 | 2161 | 1944.9 |
| 123 | 04/20/79 | 1973 | 19927.3 |
| 124 | 04/20/79 | 2015 | 10276.5 |
| 125 | 04/20/79 | 2246 | 5839.6 |
| 126 | 04/21/79 | 2214 | 2656.8 |
| 127 | 04/21/79 | 2164 | 2164 |
| 128 | 04/21/79 | 1899 | 3038.4 |
| 129 | 04/22/79 | 1902 | 2662.8 |
| 130 | 04/22/79 | 2019 | 3129.4 |
| 131 | 04/22/79 | 2204 | 10579.2 |
| 132 | 04/23/79 | 2105 | 16208.5 |
| 133 | 04/23/79 | 1738 | 8516.2 |
| 134 | 04/24/79 | 1872 | 8611.2 |
| 135 | 04/25/79 | 2183 | 6549 |
| 136 | 04/26/79 | 1849 | 6286.6 |
| 137 | 04/27/79 | 2164 | 12984 |
| 138 | 04/28/79 | 2065 | 25089.8 |
| 139 | 04/29/79 | 2070 | 22770 |
| 140 | 04/30/79 | 1988 | 12723.2 |
| 141 | 04/30/79 | 2277 | 9904.9 |
| 142 | 05/01/79 | 2019 | 2019 |
| 143 | 05/01/79 | 1889 | 3778 |
| 144 | 05/01/79 | 2097 | 9436.5 |
| 145 | 05/03/79 | 2003 | 11016.5 |
| PAGE TOTAL | | 64029 | 279989 |
| CAMPAIGN TOTAL | | 64029 | 279989 |
| TOTAL THIS RUN | | 64029 | 279989 |

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FY 1979 CAMPAIGN 1
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 146 | 05/04/79 | 2181 | 20501.4 |
| 147 | 05/04/79 | 2136 | 13777.2 |
| 148 | 05/05/79 | 2046 | 20050.8 |
| 149 | 05/06/79 | 2059 | 12354 |
| 150 | 05/07/79 | 2067 | 19326.4 |
| 151 | 05/07/79 | 1971 | 19118.7 |
| 152 | 05/08/79 | 2164 | 13200.4 |
| 153 | 05/09/79 | 2317 | 8225.3 |
| 154 | 05/10/79 | RECYCLE | |
| 155 | 05/11/79 | 1250 | 6250 |
| 156 | 05/13/79 | 1573 | 2674.1 |
| 157 | 05/13/79 | 2453 | 1717.1 |
| 158 | 05/13/79 | 589 | 397.5 |

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|---|---|---|
| PAGE TOTAL | 22806 | 137593 |
| CAMPAIGN TOTAL | 86835 | 417582 |
| TOTAL THIS RUN | 86835 | 417582 |

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FY 1979 CAMPAIGN 2
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 159 | 05/21/79 | 2181 | 2399.1 |
| 160 | 05/21/79 | 2066 | 3202.3 |
| 161 | 05/22/79 | 2042 | 2450.4 |
| 162 | 05/22/79 | 1992 | 1494 |
| 163 | 05/22/79 | 2203 | 1101.5 |
| 164 | 05/23/79 | 2204 | 613.8 |
| 165 | 05/23/79 | 1872 | 454.8 |
| 166 | 05/23/79 | 2067 | 444.5 |
| 167 | 05/24/79 | 1748 | 580.3 |
| 168 | 05/24/79 | 1910 | 687.6 |
| 169 | 05/30/79 | 2311 | 416 |
| 170 | 06/01/79 | 2098 | 1049 |
| 171 | 06/02/79 | 2509 | 7903.3 |
| 172 | 06/03/79 | 2455 | 8960.7 |
| 173 | 06/04/79 | 2290 | 3206 |
| 174 | 06/05/79 | 2031 | 1320.1 |
| 175 | 06/06/79 | 2312 | 6358 |
| 176 | 06/06/79 | RECYCLE | |
| 177 | 06/07/79 | 2329 | 1630.3 |
| 178 | 06/07/79 | 2411 | 1023.5 |
| 179 | 06/08/79 | 2302 | 1065.8 |
| 180 | 06/08/79 | 2512 | 5400.8 |
| 181 | 06/09/79 | RECYCLE | |
| 182 | 60/97/ | RECYCLE | |
| 183 | 06/09/79 | RECYCLE | |
| 184 | 06/10/79 | RECYCLE | |
| 185 | 06/10/79 | RECYCLE | |
| 186 | 06/11/79 | RECYCLE | |
| 187 | 06/11/79 | 2235 | 6593.3 |
| 188 | 06/12/79 | RECYCLE | |
| 189 | 06/12/79 | RECYCLE | |
| 190 | 06/13/79 | 1583 | 4907.3 |
| 191 | 06/13/79 | 2307 | 4729.3 |
| 192 | 06/13/79 | 2384 | 5006.4 |
| 193 | 06/14/79 | 2038 | 3057 |
| 194 | 06/14/79 | 2035 | 5087.5 |
| 195 | 06/15/79 | RECYCLE | |
| 196 | 06/15/79 | 2629 | 8938.6 |
| 197 | 06/15/79 | RECYCLE | |
| 198 | 06/16/79 | 1835 | 1468 |
| PAGE TOTAL | | 62891 | 91549.2 |
| CAMPAIGN TOTAL | | 62891 | 91549.2 |
| TOTAL THIS RUN | | 149726 | 509131 |

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FY 1979 CAMPAIGN 2
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 199 | 06/16/79 | 2510 | 1506 |
| 200 | 06/16/79 | 2264 | 589.8 |
| 201 | 06/18/79 | 2216 | 322.4 |
| 202 | 06/18/79 | RECYCLE | |
| 203 | 06/18/79 | 1200 | 93 |
| 204 | 06/18/79 | 759 | 34 |

| | | |
|---|---|---|
| PAGE TOTAL | 8949 | 2545.2 |
| CAMPAIGN TOTAL | 71840 | 94094.4 |
| TOTAL THIS RUN | 158675 | 511676 |

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FY 1979 CAMPAIGN 2
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 205 | 06/25/79 | RECYCLE | |
| 206 | 06/25/79 | RECYCLE | |
| 207 | 06/26/79 | RECYCLE | |
| 208 | 06/27/79 | RECYCLE | |
| 209 | 06/27/79 | RECYCLE | |
| 210 | 06/28/79 | RECYCLE | |
| 211 | 06/28/79 | RECYCLE | |
| 212 | 06/29/79 | RECYCLE | |
| 213 | 06/29/79 | 2583 | 2583 |
| 214 | 06/29/79 | 2272 | 2044.8 |
| 215 | 06/30/79 | 2273 | 3864.1 |
| 216 | 06/30/79 | 2195 | 12182.2 |
| 217 | 07/01/79 | 2193 | 10745.7 |
| 218 | 07/01/79 | RECYCLE | |
| 219 | 07/01/79 | RECYCLE | |
| 220 | 07/02/79 | RECYCLE | |
| 221 | 07/02/79 | RECYCLE | |
| 222 | 07/03/79 | RECYCLE | |
| 223 | 07/03/79 | 340 | 2142 |
| 224 | 07/03/79 | 2254 | 11608.1 |
| 225 | 07/04/79 | 2093 | 6069.7 |
| 226 | 07/04/79 | RECYCLE | |
| 227 | 07/05/79 | 2272 | 2612.7 |
| 228 | 07/05/79 | 2472 | 1483.2 |
| 229 | 07/06/79 | 1885 | 3770 |
| 230 | 07/07/79 | 2307 | 4498.7 |
| 231 | 07/07/79 | 2363 | 3308.2 |
| 232 | 07/07/79 | 2321 | 6498.8 |
| 233 | 07/08/79 | 1852 | 9260 |
| 234 | 07/08/79 | 2040 | 13158.1 |
| 235 | 07/08/79 | 2239 | 11195 |
| 236 | 07/09/79 | 2090 | 7942 |
| 237 | 07/09/79 | 2380 | 10710 |
| 238 | 07/10/79 | 1977 | 6721.8 |
| 239 | 07/11/79 | 2160 | 7992 |
| 240 | 07/11/79 | 2281 | 2509.1 |
| 241 | 07/12/79 | 2005 | 1166.9 |
| 242 | 07/13/79 | 2141 | 963.4 |
| 243 | 07/14/79 | 1996 | 496 |
| 244 | 07/15/79 | 2418 | 483.6 |
| PAGE TOTAL | | 55402 | 146009 |
| CAMPAIGN TOTAL | | 55402 | 146009 |
| TOTAL THIS RUN | | 214077 | 657685 |

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FY 1979 CAMPAIGN 2
HWW SAMPLE TANK BATCH TRANSFER SUMMARY
MEASUREMENT POINT 2-23
VESSEL 41-D-405

| BATCH 02-023- | DATE | VOLUME (LITERS) | URANIUM (GRAMS) |
|---|---|---|---|
| 245 | 07/16/79 | 2126 | 229.6 |
| 246 | 07/16/79 | 2581 | 220.2 |
| 247 | 07/17/79 | 2403 | .7 |
| 248 | 07/18/79 | 2365 | 132.2 |
| 249 | 07/18/79 | 2309 | 133.4 |
| 250 | 07/19/79 | 2038 | 163.1 |
| 251 | 07/20/79 | 2092 | 217.6 |
| 252 | 07/20/79 | 1243 | 49.5 |
| 253 | 07/20/79 | 1227 | 23.6 |
| PAGE TOTAL | | 18384 | 1169.9 |
| CAMPAIGN TOTAL | | 73786 | 147179 |
| TOTAL THIS RUN | | 232461 | 658855 |

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SUMMARY OF PRODUCT TO INPUT MEASUREMENTS

| INPUT BATCH NO | INPUT KG SOL RECEIVED | INPUT KG U RECEIVED | PRODUCT-INPUT KG SOL | PRODUCT-INPUT KG U | PRODUCT KG SOL TRANS | PRODUCT KG U TRANS | PRODUCT BATCH NO |
|---|---|---|---|---|---|---|---|
| 133 | 6387 | 1064.43 | -1590 | -270.1 | 4797.4 | 794.3 | 2 |
| 134 | 7183.4 | 1430.4 | -37 | -1.5 | 7146.1 | 1428.9 | 3 |
| 135 | 11004.5 | 2590.49 | 72 | 12.6 | 11076.2 | 2603.1 | 4 |
| 136 | 4930.4 | 1316.82 | 31 | 18.6 | 4961.4 | 1335.4 | 5 |
| 137 | 8501.7 | 2337.39 | -146 | -34.4 | 8355.2 | 2303 | 6 |
| 138 | 5852.2 | 1692.57 | 102 | 25.6 | 5954.2 | 1718.2 | 7 |
| 139 | 9424.1 | 2758.55 | 4 | 2.4 | 9428 | 2761 | 8 |
| 140 | 7408.1 | 2180.1 | -96 | -39.8 | 7311.7 | 2140.3 | 9 |
| 141 | 4243.6 | 1132.26 | 8 | 2.1 | 4251.8 | 1134.4 | 10 |
| 142 | 7219.4 | 1985.48 | -3 | .5 | 7216.5 | 1986 | 11 |
| 143 | 7689 | 2159.96 | 2 | 9.2 | 7690.9 | 2169.2 | 12 |
| 144 | 7117.5 | 2007.31 | 7 | 2.1 | 7124.1 | 2009.4 | 13 |
| 145 | 7385.6 | 2080.61 | 15 | -1.6 | 7400.2 | 2079 | 14 |
| 146 | 6711.2 | 1884.34 | -14 | 7.3 | 6697.5 | 1891.6 | 15 |
| 147 | 6861.8 | 1942.41 | -3 | 4.4 | 6858.7 | 1946.8 | 16 |
| 148 | 6597.9 | 1880.86 | 105 | 23.5 | 6703.4 | 1904.4 | 17 |
| 150 | 6634.3 | 1864.22 | 186 | 54.1 | 6820.1 | 1918.3 | 18 |
| 151 | 7781.6 | 2211.31 | 4 | -1.9 | 7785.4 | 2209.4 | 19 |
| 152 | 6729.5 | 1939.02 | 146 | 50.2 | 6875.9 | 1989.2 | 20 |
| 153 | 6845.8 | 1936.53 | -35 | -59.1 | 6810.9 | 1877.4 | 21 |
| 154 | 6157.9 | 1720.67 | 115 | 30.9 | 6272.7 | 1751.6 | 22 |
| 155 | 6121.1 | 1765.24 | 0 | 7.9 | 6121.3 | 1773.1 | 23 |
| 156 | 6422.9 | 1728.78 | -39 | -9.1 | 6384.1 | 1719.7 | 24 |
| 157 | 6446.9 | 1749.78 | 448 | 131.6 | 6894.4 | 1881.4 | 25 |
| 158 | 6553.2 | 1755.87 | -17 | -6.1 | 6536.2 | 1749.8 | 26 |
| 159 | 6092.1 | 1660.98 | -60 | -13.3 | 6032.2 | 1647.7 | 27 |
| 160 | 6716.5 | 1785.35 | -5 | -4.3 | 6711.8 | 1781 | 28 |
| 161 | 6675.9 | 1807.52 | 1 | -4.6 | 6677 | 1802.9 | 29 |
| 162 | 6248.2 | 1743.66 | 12 | 7.8 | 6260.3 | 1751.5 | 30 |
| 163 | 6808.7 | 1843.96 | -15 | 4.7 | 6793.4 | 1848.7 | 31 |
| 164 | 7303.3 | 1874.3 | -4 | 10.1 | 7299.5 | 1884.4 | 32 |
| 165 | 5607.4 | 1511.58 | 14 | 14.8 | 5621.9 | 1526.4 | 33 |
| 166 | 6886.3 | 1905.21 | 25 | 12.5 | 6911 | 1917.7 | 34 |
| 167 | 5809.4 | 1638.91 | -38 | -11.7 | 5771.6 | 1627.2 | 35 |
| 168 | 8368.7 | 2266.91 | -34 | -3.5 | 8334.3 | 2263.4 | 36 |
| 170 | 6614.7 | 1788.13 | 3 | -15.2 | 6618 | 1772.9 | 37 |
| 171 | 7382.6 | 1933.18 | -5 | 2.4 | 7377.5 | 1935.6 | 38 |
| 172 | 6445 | 1636.9 | -24 | -5.3 | 6420.7 | 1631.6 | 39 |
| 173 | 7613.8 | 1870.12 | -1 | -.5 | 7613 | 1869.6 | 40 |
| 174 | 6037.6 | 1470.27 | -9 | -1.2 | 6028.9 | 1469.1 | 41 |
| 175 | 5953.8 | 1450.66 | 2 | -12.5 | 5955.4 | 1438.2 | 42 |
| 176 | 7406 | 1788.98 | 7 | .8 | 7413.4 | 1789.8 | 43 |
| 177 | 6147.1 | 1479.22 | -5 | .6 | 6142.4 | 1479.8 | 44 |
| 178 | 6480.7 | 1579.17 | 4 | 3.6 | 6484.3 | 1582.8 | 45 |
| 179 | 8077.9 | 1957.42 | 6 | -2.3 | 8083.9 | 1955.1 | 46 |

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SUMMARY OF PRODUCT TO INPUT MEASUREMENTS

| INPUT BATCH NO | INPUT KG SOL RECEIVED | INPUT KG U RECEIVED | PRODUCT-INPUT KG SOL | PRODUCT-INPUT KG U | PRODUCT KG SOL TRANS | PRODUCT KG U TRANS | PRODUCT BATCH NO |
|---|---|---|---|---|---|---|---|
| 180 | 6872.9 | 1666.7 | -10 | -.4 | 6863 | 1666.3 | 47 |
| 181 | 6174.2 | 1448.54 | -8 | -3.3 | 6166.3 | 1445.2 | 48 |
| 182 | 6705 | 1561.97 | -4 | -56.5 | 6700.9 | 1505.5 | 49 |
| 183 | 6429.5 | 1543.18 | 5 | 6.6 | 6434.1 | 1549.8 | 50 |
| 184 | 6062.1 | 1512.33 | 1 | .7 | 6063.4 | 1513 | 51 |
| 185 | 6785.1 | 1664.75 | 2 | -2.7 | 6786.9 | 1662 | 52 |
| 186 | 5653.1 | 1419.39 | -27 | -3.7 | 5626 | 1415.7 | 53 |
| 187 | 6290.4 | 1578.12 | 3 | -7.9 | 6292.9 | 1570.2 | 54 |
| 188 | 6705.2 | 1684.73 | -1 | 3.2 | 6704 | 1687.9 | 55 |
| 189 | 7571.4 | 1881.11 | -3 | -9 | 7568.5 | 1872.1 | 56 |
| 190 | 6951.9 | 1721.3 | -2 | .4 | 6949.6 | 1721.7 | 57 |
| 191 | 6502.5 | 1576.01 | 8 | -1.6 | 6510.3 | 1574.4 | 58 |
| 192 | 7421.1 | 1814.02 | -4 | -5.8 | 7416.6 | 1808.2 | 59 |
| 193 | 5445.3 | 1347.57 | 2 | 2.2 | 5447.7 | 1349.8 | 60 |
| 194 | 7375.8 | 1810.91 | -7 | .6 | 7368.7 | 1811.5 | 61 |
| 195 | 7685.2 | 1907.91 | 8 | .8 | 7693.6 | 1908.7 | 62 |
| 196 | 4925 | 1236.26 | 7 | 4 | 4931.7 | 1240.3 | 63 |
| 197 | 7109.8 | 1560.2 | 1 | 170.1 | 7110.8 | 1730.3 | 64 |
| 198 | 7441.8 | 1832.93 | 4 | 2.1 | 7446.2 | 1835 | 65 |
| 199 | 5920.4 | 1458.77 | 23 | 7.2 | 5943.2 | 1466 | 66 |
| 200 | 7472.8 | 1842.06 | 6 | 2.5 | 7478.5 | 1844.6 | 67 |
| 201 | 4474.3 | 1109.14 | -2 | -1.4 | 4472.6 | 1107.7 | 68 |
| 202 | 7924.4 | 1951.57 | 1 | -.1 | 7925.5 | 1951.5 | 69 |
| 203 | 6503.7 | 1586.25 | 6 | .8 | 6509.6 | 1587.1 | 70 |
| 205 | 7716.1 | 1823.8 | -242 | 2.7 | 7473.9 | 1826.5 | 71 |
| 206 | 7493.2 | 1326.96 | -75 | 15.8 | 7417.8 | 1342.8 | 72 |
| 207 | 7987.3 | 1481.17 | -1 | 3.1 | 7986.4 | 1484.3 | 73 |
| 208 | 8614.1 | 1960.26 | 6 | 1.5 | 8619.8 | 1961.8 | 74 |
| 209 | 7110 | 1700.7 | -13 | .8 | 7096.5 | 1701.5 | 75 |
| 210 | 7520 | 1814.02 | -9 | 2.3 | 7510.8 | 1816.3 | 76 |
| 211 | 5851.8 | 1425.59 | 38 | 11.6 | 5890.1 | 1437.2 | 77 |
| 212 | 7537.1 | 1797.46 | 0 | 3.8 | 7536.7 | 1801.3 | 78 |
| 213 | 7050.9 | 1653.01 | 2 | 5.6 | 7052.7 | 1658.6 | 79 |
| 214 | 6452.4 | 1509.85 | -5 | 1.8 | 6447.5 | 1511.6 | 80 |
| 215 | 5915.7 | 1418.01 | -4 | 2.7 | 5911.8 | 1420.7 | 81 |
| 216 | 6233.1 | 1512.66 | 4 | 5.5 | 6236.6 | 1518.2 | 82 |
| 217 | 5994.8 | 1463.7 | -3 | 1.2 | 5992.2 | 1464.9 | 83 |
| 218 | 7608.5 | 1844.68 | 38 | 13.1 | 7646.7 | 1857.8 | 84 |
| 219 | 7560.2 | 1821.54 | 2 | -.5 | 7562 | 1821 | 85 |
| 220 | 6174.1 | 1475.81 | -123 | -27 | 6051.4 | 1448.8 | 86 |
| 221 | 6028.8 | 1458.1 | 67 | 16.2 | 6096.3 | 1474.3 | 87 |
| 222 | 8459.5 | 2006.95 | -2 | 1.8 | 8457.1 | 2008.7 | 88 |
| 223 | 6712.2 | 1614.43 | 0 | 5.2 | 6712.4 | 1619.6 | 89 |
| 224 | 6401 | 1571.45 | 1 | -1 | 6402.4 | 1570.4 | 90 |
| 225 | 7591 | 1795.55 | -2 | -.7 | 7588.9 | 1794.8 | 91 |

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SUMMARY OF PRODUCT TO INPUT MEASUREMENTS

| INPUT BATCH NO | INPUT KG SOL RECEIVED | INPUT KG U RECEIVED | PRODUCT-INPUT KG SOL | PRODUCT-INPUT KG U | PRODUCT KG SOL TRANS | PRODUCT KG U TRANS | PRODUCT BATCH NO |
|---|---|---|---|---|---|---|---|
| 226 | 6562.2 | 1547.82 | 0 | -.5 | 6562.4 | 1547.3 | 92 |
| 227 | 6376 | 1506.97 | -1 | 49.9 | 6374.7 | 1556.9 | 93 |
| 228 | 7702.3 | 1798.66 | 0 | -2.8 | 7702.1 | 1795.9 | 94 |
| 229 | 6989 | 1617.25 | 16 | 2.2 | 7005 | 1619.4 | 95 |
| 230 | 6027.4 | 1406.84 | 1 | 1.3 | 6028.5 | 1408.1 | 96 |
| 231 | 7330.2 | 1681.04 | -61 | -11.8 | 7269.1 | 1669.2 | 97 |
| 232 | 6249.5 | 1486.41 | 11 | 4 | 6260.7 | 1490.4 | 98 |
| 233 | 8163 | 1982.93 | -14 | -3.3 | 8149 | 1979.6 | 99 |
| 234 | 6800.8 | 1595.76 | 10 | 10.6 | 6811 | 1606.4 | 100 |
| 235 | 6218.8 | 1402.72 | -1 | 1 | 6218 | 1403.7 | 101 |
| 236 | 7102.5 | 1667.32 | -7 | -.1 | 7095.3 | 1667.2 | 102 |
| 237 | 7006.1 | 1597.41 | -3 | -7.4 | 7003.4 | 1590 | 103 |
| 238 | 7066.6 | 1668.1 | -1 | 2.5 | 7065.2 | 1670.6 | 104 |
| 239 | 6497.7 | 1428.88 | -2 | -.7 | 6495.6 | 1428.2 | 105 |
| 240 | 6879.4 | 1594.95 | -1 | 3.4 | 6878.4 | 1598.3 | 106 |
| 241 | 7427.9 | 1768.17 | -1 | 3.1 | 7426.4 | 1771.3 | 107 |
| 242 | 7128.3 | 1709.66 | -3 | -2.5 | 7125.3 | 1707.2 | 108 |
| 243 | 7787.4 | 1924.67 | 1 | .2 | 7788.1 | 1924.9 | 109 |
| 244 | 6461.7 | 1566.79 | 0 | 17.5 | 6461.3 | 1584.3 | 110 |
| 245 | 7420.4 | 1780.61 | 0 | .3 | 7420.9 | 1780.9 | 111 |
| 246 | 7639.6 | 1805.01 | -1 | 1 | 7638.3 | 1806 | 112 |
| 247 | 7066.2 | 1662.6 | 2 | 3 | 7068.3 | 1665.6 | 113 |
| 248 | 7239 | 1698.64 | 2 | 6.1 | 7240.9 | 1704.7 | 114 |
| 249 | 7624.5 | 1752.48 | -13 | -2.1 | 7611 | 1750.4 | 115 |
| 250 | 6771 | 1593.46 | 6 | 3.2 | 6776.8 | 1596.7 | 116 |
| 251 | 7498.4 | 1799.46 | -6 | -2.1 | 7492.8 | 1797.4 | 117 |
| 252 | 7647.4 | 1869.09 | -1 | -3.2 | 7646.4 | 1865.9 | 118 |
| 253 | 7820.1 | 1859.62 | 14 | -.3 | 7834.4 | 1859.3 | 119 |
| 254 | 6973.1 | 1632.1 | 2 | .9 | 6974.9 | 1633 | 120 |
| 255 | 7058.8 | 1700.07 | 2 | 1 | 7061.1 | 1701.1 | 121 |
| 256 | 7243.7 | 1743.53 | 1 | .7 | 7245 | 1744.2 | 122 |
| 257 | 6873.3 | 1632.22 | 3 | 1.1 | 6876.2 | 1633.3 | 123 |
| 258 | 7542.6 | 1766.72 | 8 | -1 | 7551 | 1765.7 | 124 |
| 259 | 7463.9 | 1756.69 | 2 | -6.6 | 7466 | 1750.1 | 125 |
| 260 | 7323.5 | 1737.15 | 0 | 2.8 | 7323.7 | 1739.9 | 126 |
| 261 | 7103.8 | 1715.64 | 7 | -.6 | 7110.5 | 1715 | 127 |
| 262 | 6478.1 | 1548.18 | 2 | -.9 | 6480.2 | 1547.3 | 128 |
| 263 | 8006.8 | 1934.95 | 3 | 2 | 8009.4 | 1936.9 | 129 |
| 264 | 7385.9 | 1793.21 | -2 | 1.1 | 7383.4 | 1794.3 | 130 |
| 265 | 7707.2 | 1909.05 | -2 | -.1 | 7705.3 | 1909 | 131 |
| 266 | 7559 | 1850.12 | 4 | 3.4 | 7563.1 | 1853.5 | 132 |
| 267 | 7280.7 | 1748.08 | -1 | -10.4 | 7280.1 | 1737.7 | 133 |
| 268 | 7796 | 1856.18 | 0 | -7.1 | 7795.5 | 1849.1 | 134 |
| 269 | 8637.5 | 2000.24 | -13 | -2.5 | 8624.6 | 1997.7 | 136 |
| 270 | 9806.5 | 2330.12 | -17 | 3.4 | 9789.1 | 2333.5 | 137 |

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SUMMARY OF PRODUCT TO INPUT MEASUREMENTS

| INPUT BATCH NO | INPUT KG SOL RECEIVED | INPUT KG U RECEIVED | PRODUCT-INPUT KG SOL | PRODUCT-INPUT KG U | PRODUCT KG SOL TRANS | PRODUCT KG U TRANS | PRODUCT BATCH NO |
|---|---|---|---|---|---|---|---|
| 274 | 7388.4 | 1443.22 | 45 | 17.2 | 7433 | 1460.4 | 141 |
| 275 | 8991.8 | 1903.45 | -92 | -19.1 | 8899.4 | 1884.3 | 142 |
| 276 | 8367.8 | 1909.04 | 0 | -7.8 | 8367.3 | 1901.2 | 143 |
| 277 | 7138.2 | 1658.77 | 4 | 9.8 | 7142.2 | 1668.6 | 144 |
| 278 | 7671.6 | 1820.72 | 4 | 8.9 | 7675.2 | 1829.6 | 145 |
| 279 | 6984.9 | 1613.7 | 0 | 3.8 | 6984.5 | 1617.5 | 146 |
| 280 | 8081.5 | 1638.52 | -1 | -5.5 | 8080.4 | 1633 | 147 |
| 281 | 5649.4 | 1202.01 | 1 | 3.9 | 5650.7 | 1205.9 | 148 |
| 282 | 7125 | 1535.45 | 0 | 29.1 | 7125.1 | 1564.5 | 149 |
| 283 | 9528.6 | 2103.21 | -10 | 27.5 | 9518.1 | 2130.7 | 150 |
| 284 | 7965.4 | 1771.19 | 2 | 5.3 | 7967.1 | 1776.5 | 151 |
| 285 | 6077.5 | 1361.23 | -17 | 4.5 | 6060.8 | 1365.7 | 152 |
| 286 | 7442.6 | 1729.64 | 3 | 5.9 | 7445.4 | 1735.5 | 153 |
| 287 | 7883.5 | 1871.43 | -4 | 6.2 | 7879.6 | 1877.6 | 154 |
| 288 | 6930.1 | 1642.26 | 0 | 4 | 6930.4 | 1646.3 | 155 |
| 289 | 8737.5 | 2061.81 | -4 | 6.2 | 8733.1 | 2068 | 156 |
| 290 | 7747.4 | 1739.17 | 4 | -3.9 | 7751.3 | 1735.3 | 157 |
| 291 | 8410.7 | 1921.14 | -1 | -7.9 | 8409.8 | 1913.2 | 158 |
| 292 | 9678.1 | 2200.24 | -5 | 9.2 | 9672.6 | 2209.4 | 159 |
| 293 | 8456.1 | 1943.37 | -20 | 5.8 | 8435.7 | 1949.2 | 160 |
| 294 | 7557.8 | 1699.8 | -15 | -8 | 7542.9 | 1691.8 | 161 |
| 295 | 7688.8 | 1751.52 | -1 | -5.1 | 7688 | 1746.4 | 162 |
| 296 | 7743.9 | 1737.13 | 2 | -8.4 | 7745.5 | 1728.7 | 163 |
| 297 | 7880.2 | 1749.92 | 51 | 5.4 | 7931.6 | 1755.3 | 164 |
| 298 | 8024 | 1846.78 | 8 | 11.1 | 8032.4 | 1857.9 | 165 |
| 299 | 7292.5 | 1696.15 | -5 | 3.7 | 7287.4 | 1699.8 | 166 |
| 300 | 8567 | 1967.7 | 0 | -32 | 8566.6 | 1935.7 | 167 |
| 301 | 7768.5 | 1781.77 | 5 | -18 | 7773 | 1763.8 | 168 |
| 302 | 7588.4 | 1788.06 | -3 | -3.5 | 7585.1 | 1784.6 | 169 |
| 303 | 7736.4 | 1904.34 | -2 | -9 | 7733.9 | 1895.3 | 170 |
| 304 | 7237 | 1771.58 | -10 | 7.4 | 7227.4 | 1779 | 171 |
| 305 | 7420.2 | 1828.45 | -9 | -5.7 | 7411.6 | 1822.7 | 172 |
| 306 | 7178.4 | 1762.61 | -1 | 14.1 | 7177.6 | 1776.7 | 173 |
| 307 | 7496.8 | 1827.71 | -2 | -3.9 | 7495.1 | 1823.8 | 174 |
| 308 | 7636.4 | 1900.32 | -4 | 2.9 | 7632.7 | 1903.2 | 175 |
| 309 | 7802 | 1952.66 | 4 | 13.1 | 7805.9 | 1965.8 | 176 |
| 310 | 7628.2 | 1913.37 | 62 | 20.1 | 7689.7 | 1933.5 | 177 |

# ACCOUNTABILITY TANK
# DENSITY MEASUREMENT
# COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 2-1 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 128 | 1.3755 | 1.3901 | 1.3915 | -.016 | -.0014 | -1.15 | -.1 | .0146 | 04/03 |
| 129 | 1.4569 | 1.4768 | 1.4745 | -.0176 | .0023 | -1.19 | .16 | .0199 | 04/04 |
| 130 | 1.4633 | 1.4851 | 1.4793 | -.016 | .0058 | -1.08 | .39 | .0218 | 04/04 |
| 131 | 1.495 | 1.4954 | 1.4948 | .0002 | .0006 | .01 | .04 | .0004 | 04/07 |
| 132 | 1.4841 | 1.4911 | 1.4944 | -.0103 | -.0033 | -.69 | -.22 | .007 | 04/08 |
| 133 | 1.3501 | 1.3584 | 1.3582 | -.0081 | .0002 | -.6 | .01 | .0083 | 04/11 |
| 134 | 1.4044 | 1.4111 | 1.4098 | -.0054 | .0013 | -.38 | .09 | .0067 | 04/13 |
| 135 | 1.5131 | 1.5188 | 1.5164 | -.0033 | .0024 | -.22 | .16 | .0057 | 04/14 |
| 136 | 1.5719 | 1.5754 | 1.5775 | -.0056 | -.0021 | -.35 | -.13 | .0035 | 04/14 |
| 137 | 1.5964 | 1.5877 | 1.5335 | .0629 | .0542 | 4.1 | 3.53 | -.0087 | 04/15 |
| 138 | 1.5674 | 1.5739 | 1.6341 | -.0667 | -.0602 | -4.08 | -3.68 | .0065 | 04/15 |
| 139 | 1.6398 | 1.6471 | 1.6412 | -.0014 | .0059 | -.09 | .36 | .0073 | 04/16 |
| 140 | 1.6398 | 1.6448 | 1.6433 | -.0035 | .0015 | -.21 | .09 | .005 | 04/17 |
| 141 | 1.6127 | 1.6135 | 1.6173 | -.0046 | -.0038 | -.28 | -.23 | .0008 | 04/17 |
| 142 | 1.6081 | 1.6151 | 1.6041 | .004 | .011 | .25 | .69 | .007 | 04/18 |
| 143 | 1.6063 | 1.6095 | 1.6091 | -.0028 | .0004 | -.17 | .02 | .0032 | 04/18 |
| 144 | 1.6127 | 1.6055 | 1.6059 | .0068 | -.0004 | .42 | -.02 | -.0072 | 04/19 |
| 145 | 1.5946 | 1.6044 | 1.5996 | -.005 | .0048 | -.31 | .3 | .0098 | 04/19 |
| 146 | 1.6036 | 1.604 | 1.5928 | .0108 | .0112 | .68 | .7 | .0004 | 04/19 |
| 147 | 1.6036 | 1.6127 | 1.6101 | -.0065 | .0026 | -.4 | .16 | .0091 | 04/20 |
| 148 | 1.6109 | 1.6166 | 1.6153 | -.0044 | .0013 | -.27 | .08 | .0057 | 04/20 |
| 149 | 1.6154 | 1.615 | 1.6153 | .0001 | -.0003 | .01 | -.02 | -.0004 | 04/21 |
| 150 | 1.6127 | 1.617 | 1.6149 | -.0022 | .0021 | -.14 | .13 | .0043 | 04/21 |
| 151 | 1.6217 | 1.6289 | 1.6264 | -.0047 | .0025 | -.29 | .15 | .0072 | 04/21 |
| 152 | 1.6353 | 1.6701 | 1.6313 | .004 | .0388 | .25 | 2.38 | .0348 | 04/21 |
| 153 | 1.6217 | 1.6253 | 1.6236 | -.0019 | .0017 | -.12 | .1 | .0036 | 04/22 |
| 154 | 1.6036 | 1.6 | 1.6123 | -.0087 | -.0123 | -.54 | -.76 | -.0036 | 04/22 |
| 155 | 1.6263 | 1.6317 | 1.6304 | -.0041 | .0013 | -.25 | .08 | .0054 | 04/23 |
| 156 | 1.5946 | 1.596 | 1.5963 | -.0017 | -.0003 | -.11 | -.02 | .0014 | 04/23 |
| 157 | 1.5964 | 1.6036 | 1.6005 | -.0041 | .0031 | -.26 | .19 | .0072 | 04/23 |
| 158 | 1.5765 | 1.5822 | 1.5825 | -.006 | -.0003 | -.38 | -.02 | .0057 | 04/24 |
| 159 | 1.5873 | 1.5897 | 1.5906 | -.0033 | -.0009 | -.21 | -.06 | .0024 | 04/24 |
| 160 | 1.5629 | 1.3584 | 1.5663 | -.0034 | -.2079 | -.22 | -13.27 | -.2045 | 04/24 |
| 161 | 1.5946 | 1.5941 | 1.5942 | .0004 | -.0001 | .03 | -.01 | -.0005 | 04/25 |
| 162 | 1.5873 | 1.5945 | 1.6342 | -.0469 | -.0397 | -2.87 | -2.43 | .0072 | 04/25 |
| 163 | 1.5937 | 1.5988 | 1.5973 | -.0036 | .0015 | -.23 | .09 | .0051 | 04/25 |
| 164 | 1.5493 | 1.5584 | 1.5483 | .001 | .0101 | .06 | .65 | .0091 | 04/26 |
| 165 | 1.5629 | 1.5679 | 1.5691 | -.0062 | -.0012 | -.4 | -.08 | .005 | 04/27 |
| 166 | 1.5873 | 1.5996 | 1.5887 | -.0014 | .0109 | -.09 | .69 | .0123 | 04/27 |
| 167 | 1.5991 | 1.6067 | 1.6048 | -.0057 | .0019 | -.36 | .12 | .0076 | 04/27 |
| 168 | 1.5765 | 1.5818 | 1.5857 | -.0092 | -.0039 | -.58 | -.25 | .0053 | 04/28 |
| 169 | 1.5402 | 1.5465 | 1.5455 | -.0053 | .001 | -.34 | .06 | .0063 | 04/28 |
| 170 | 1.562 | 1.5675 | 1.5672 | -.0052 | .0003 | -.33 | .02 | .0055 | 04/28 |
| 171 | 1.5493 | 1.5525 | 1.5536 | -.0043 | -.0011 | -.28 | -.07 | .0032 | 04/29 |

# ACCOUNTABILITY TANK
# DENSITY MEASUREMENT
# COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 2-1 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 172 | 1.5221 | 1.5299 | 1.5272 | -.0051 | .0027 | -.33 | .18 | .0078 | 04/29 |
| 173 | 1.4995 | 1.5006 | 1.5006 | -.0011 | 0 | -.07 | 0 | .0011 | 04/29 |
| 174 | 1.4859 | 1.4931 | 1.4914 | -.0055 | .0017 | -.37 | .11 | .0072 | 04/30 |
| 175 | 1.4859 | 1.4903 | 1.4901 | -.0042 | .0002 | -.28 | .01 | .0044 | 04/30 |
| 176 | 1.4841 | 1.4859 | 1.4882 | -.0041 | -.0023 | -.28 | -.15 | .0018 | 04/30 |
| 177 | 1.4814 | 1.4863 | 1.4873 | -.0059 | -.001 | -.4 | -.07 | .0049 | 05/01 |
| 178 | 1.4859 | 1.4919 | 1.4891 | -.0032 | .0028 | -.21 | .19 | .006 | 05/01 |
| 179 | 1.4814 | 1.4899 | 1.4923 | -.0109 | -.0024 | -.73 | -.16 | .0085 | 05/01 |
| 180 | 1.4814 | 1.482 | 1.4873 | -.0059 | -.0053 | -.4 | -.36 | .0006 | 05/02 |
| 181 | 1.4678 | 1.4713 | 1.4686 | -.0008 | .0027 | -.05 | .18 | .0035 | 50/27 |
| 182 | 1.4542 | 1.4582 | 1.4583 | -.0041 | -.0001 | -.28 | -.01 | .004 | 05/02 |
| 183 | 1.4723 | 1.4796 | 1.4802 | -.0079 | -.0006 | -.53 | -.04 | .0073 | 05/03 |
| 184 | 1.495 | 1.5061 | 1.501 | -.006 | .0051 | -.4 | .34 | .0111 | 05/03 |
| 185 | 1.504 | 1.4986 | 1.499 | .005 | -.0004 | .33 | -.03 | -.0054 | 05/03 |
| 186 | 1.5221 | 1.522 | 1.5245 | -.0024 | -.0025 | -.16 | -.16 | -.0001 | 05/04 |
| 187 | 1.5176 | 1.5168 | 1.5167 | .0009 | .0001 | .06 | .01 | -.0008 | 05/04 |
| 188 | 1.5176 | 1.5129 | 1.5131 | .0045 | -.0002 | .3 | -.01 | -.0047 | 05/04 |
| 189 | 1.5058 | 1.5057 | 1.503 | .0028 | .0027 | .19 | .18 | -.0001 | 05/05 |
| 190 | 1.5067 | 1.5053 | 1.5062 | .0005 | -.0009 | .03 | -.06 | -.0014 | 05/05 |
| 191 | 1.4977 | 1.4994 | 1.4978 | -.0001 | .0016 | -.01 | .11 | .0017 | 05/05 |
| 192 | 1.5058 | 1.5034 | 1.5024 | .0034 | .001 | .23 | .07 | -.0024 | 05/06 |
| 193 | 1.5131 | 1.5113 | 1.5107 | .0024 | .0006 | .16 | .04 | -.0018 | 05/06 |
| 194 | 1.5058 | 1.5022 | 1.503 | .0028 | -.0008 | .19 | -.05 | -.0036 | 05/06 |
| 195 | 1.5022 | 1.501 | 1.5017 | .0005 | -.0007 | .03 | -.05 | -.0012 | 05/07 |
| 196 | 1.5086 | 1.5085 | 1.5062 | .0024 | .0023 | .16 | .15 | -.0001 | 05/07 |
| 197 | 1.5004 | 1.497 | 1.4961 | .0043 | .0009 | .29 | .06 | -.0034 | 05/08 |
| 198 | 1.504 | 1.5006 | 1.5014 | .0026 | -.0008 | .17 | -.05 | -.0034 | 05/08 |
| 199 | 1.5131 | 1.5046 | 1.5078 | .0053 | -.0032 | .35 | -.21 | -.0085 | 05/08 |
| 200 | 1.5049 | 1.4998 | 1.5004 | .0045 | -.0006 | .3 | -.04 | -.0051 | 05/09 |
| 201 | 1.504 | 1.4986 | 1.5001 | .0039 | -.0015 | .26 | -.1 | -.0054 | 05/09 |
| 202 | 1.4995 | 1.4998 | 1.4977 | .0018 | .0021 | .12 | .14 | .0003 | 05/09 |
| 203 | 1.4977 | 1.4947 | 1.4953 | .0024 | -.0006 | .16 | -.04 | -.003 | 05/09 |
| 204 | 1.4977 | 1.4939 | 1.4951 | .0026 | -.0012 | .17 | -.08 | -.0038 | 05/10 |
| 205 | 1.4787 | 1.4772 | 1.4783 | .0004 | -.0011 | .03 | -.07 | -.0015 | 05/14 |
| 206 | 1.4135 | 1.4123 | 1.4139 | -.0004 | -.0016 | -.03 | -.11 | -.0012 | 05/20 |
| 207 | 1.409 | 1.4083 | 1.4094 | -.0004 | -.0011 | -.03 | -.08 | -.0007 | 05/21 |
| 208 | 1.4606 | 1.463 | 1.4622 | -.0016 | .0008 | -.11 | .05 | .0024 | 05/21 |
| 209 | 1.4823 | 1.4836 | 1.4825 | -.0002 | .0011 | -.01 | .07 | .0013 | 05/21 |
| 210 | 1.4941 | 1.4919 | 1.4912 | .0029 | .0007 | .19 | .05 | -.0022 | 05/22 |
| 211 | 1.4968 | 1.4962 | 1.4964 | .0004 | -.0002 | .03 | -.01 | -.0006 | 05/22 |
| 212 | 1.4832 | 1.482 | 1.4813 | .0019 | .0007 | .13 | .05 | -.0012 | 05/23 |
| 213 | 1.4678 | 1.4705 | 1.4709 | -.0031 | -.0004 | -.21 | -.03 | .0027 | 05/23 |
| 214 | 1.4696 | 1.4701 | 1.4694 | .0002 | .0007 | .01 | .05 | .0005 | 05/23 |
| 215 | 1.4859 | 1.4863 | 1.4863 | -.0004 | 0 | -.03 | 0 | .0004 | 05/24 |
| 216 | 1.4904 | 1.4875 | 1.487 | .0034 | .0005 | .23 | .03 | -.0029 | 05/24 |

# ACCOUNTABILITY TANK
# DENSITY MEASUREMENT
# COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 2-1 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 217 | 1.4941 | 1.4907 | 1.4894 | .0047 | .0013 | .32 | .09 | -.0034 | 05/24 |
| 218 | 1.5086 | 1.5073 | 1.5073 | .0013 | 0 | .09 | 0 | -.0013 | 05/25 |
| 219 | 1.5131 | 1.5089 | 1.5081 | .005 | .0008 | .33 | .05 | -.0042 | 05/25 |
| 220 | 1.504 | 1.5034 | 1.5052 | -.0012 | -.0018 | -.08 | -.12 | -.0006 | 05/26 |
| 221 | 1.5058 | 1.5046 | 1.5043 | .0015 | .0003 | .1 | .02 | -.0012 | 05/26 |
| 222 | 1.4904 | 1.4875 | 1.4867 | .0037 | .0008 | .25 | .05 | -.0029 | 05/26 |
| 223 | 1.4904 | 1.4828 | 1.483 | .0074 | -.0002 | .5 | -.01 | -.0076 | 05/27 |
| 224 | 1.4932 | 1.4915 | 1.4931 | .0001 | -.0016 | .01 | -.11 | -.0017 | 05/27 |
| 225 | 1.4796 | 1.4812 | 1.4813 | -.0017 | -.0001 | -.11 | -.01 | .0016 | 05/27 |
| 226 | 1.4877 | 1.4867 | 1.4873 | .0004 | -.0006 | .03 | -.04 | -.001 | 05/28 |
| 227 | 1.4859 | 1.4883 | 1.4873 | -.0014 | .001 | -.09 | .07 | .0024 | 05/28 |
| 228 | 1.4832 | 1.4816 | 1.4817 | .0015 | -.0001 | .1 | -.01 | -.0016 | 05/28 |
| 229 | 1.4904 | 1.4899 | 1.4916 | -.0012 | -.0017 | -.08 | -.11 | -.0005 | 05/29 |
| 230 | 1.4995 | 1.497 | 1.4988 | .0007 | -.0018 | .05 | -.12 | -.0025 | 05/29 |
| 231 | 1.4995 | 1.5006 | 1.502 | -.0025 | -.0014 | -.17 | -.09 | .0011 | 05/29 |
| 232 | 1.504 | 1.4978 | 1.5018 | .0022 | -.004 | .15 | -.27 | -.0062 | 05/30 |
| 233 | 1.495 | 1.4883 | 1.4952 | -.0002 | -.0069 | -.01 | -.46 | -.0067 | 05/30 |
| 234 | 1.495 | 1.4923 | 1.5027 | -.0077 | -.0104 | -.51 | -.69 | -.0027 | 05/31 |
| 235 | 1.5086 | 1.5077 | 1.5076 | .001 | .0001 | .07 | .01 | -.0009 | 06/01 |
| 236 | 1.4995 | 1.4974 | 1.4951 | .0044 | .0023 | .29 | .15 | -.0021 | 06/01 |
| 237 | 1.4769 | 1.4756 | 1.4737 | .0032 | .0019 | .22 | .13 | -.0013 | 06/02 |
| 238 | 1.4823 | 1.4808 | 1.4801 | .0022 | .0007 | .15 | .05 | -.0015 | 06/02 |
| 239 | 1.4769 | 1.4764 | 1.4758 | .0011 | .0006 | .07 | .04 | -.0005 | 06/03 |
| 240 | 1.504 | 1.5053 | 1.505 | -.001 | .0003 | -.07 | .02 | .0013 | 06/03 |
| 241 | 1.495 | 1.4982 | 1.4971 | -.0021 | .0011 | -.14 | .07 | .0032 | 06/04 |
| 242 | 1.4986 | 1.4943 | 1.4926 | .006 | .0017 | .4 | .11 | -.0043 | 06/04 |
| 243 | 1.5031 | 1.4994 | 1.498 | .0051 | .0014 | .34 | .09 | -.0037 | 06/05 |
| 244 | 1.495 | 1.4978 | 1.4978 | -.0028 | 0 | -.19 | 0 | .0028 | 06/05 |
| 245 | 1.495 | 1.4958 | 1.496 | -.001 | -.0002 | -.07 | -.01 | .0008 | 06/06 |
| 246 | 1.4877 | 1.4883 | 1.4885 | -.0008 | -.0002 | -.05 | -.01 | .0006 | 06/06 |
| 247 | 1.4859 | 1.4855 | 1.4872 | -.0013 | -.0017 | -.09 | -.11 | -.0004 | 06/06 |
| 248 | 1.4769 | 1.4808 | 1.4786 | -.0017 | .0022 | -.11 | .15 | .0039 | 06/07 |
| 249 | 1.4633 | 1.4669 | 1.4663 | -.003 | .0006 | -.2 | .04 | .0036 | 06/07 |
| 250 | 1.4678 | 1.4685 | 1.4681 | -.0003 | .0004 | -.02 | .03 | .0007 | 06/07 |
| 251 | 1.4814 | 1.482 | 1.4799 | .0015 | .0021 | .1 | .14 | .0006 | 06/08 |
| 252 | 1.495 | 1.4939 | 1.4936 | .0014 | .0003 | .09 | .02 | -.0011 | 06/09 |
| 253 | 1.495 | 1.4943 | 1.4959 | -.0009 | -.0016 | -.06 | -.11 | -.0007 | 06/09 |
| 254 | 1.4904 | 1.4927 | 1.4926 | -.0022 | .0001 | -.15 | .01 | .0023 | 06/09 |
| 255 | 1.5076 | 1.5022 | 1.5031 | .0045 | -.0009 | .3 | -.06 | -.0054 | 06/10 |
| 256 | 1.504 | 1.5077 | 1.5065 | -.0025 | .0012 | -.17 | .08 | .0037 | 06/10 |
| 257 | 1.5086 | 1.5026 | 1.5026 | .006 | 0 | .4 | 0 | -.006 | 06/10 |
| 258 | 1.4968 | 1.4994 | 1.4992 | -.0024 | .0002 | -.16 | .01 | .0026 | 06/11 |
| 259 | 1.5022 | 1.4998 | 1.4988 | .0034 | .001 | .23 | .07 | -.0024 | 06/11 |
| 260 | 1.5058 | 1.5018 | 1.5059 | -.0001 | -.0041 | -.01 | -.27 | -.004 | 06/11 |
| 261 | 1.504 | 1.5038 | 1.5016 | .0024 | .0022 | .16 | .15 | -.0002 | 06/12 |

ACCOUNTABILITY TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 2-1 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 262 | 1.4995 | 1.4986 | 1.4977 | .0018 | .0009 | .12 | .06 | -.0009 | 06/12 |
| 263 | 1.504 | 1.5026 | 1.5004 | .0036 | .0022 | .24 | .15 | -.0014 | 06/13 |
| 264 | 1.4977 | 1.4986 | 1.4954 | .0023 | .0032 | .15 | .21 | .0009 | 06/13 |
| 265 | 1.5086 | 1.5073 | 1.5023 | .0063 | .005 | .42 | .33 | -.0013 | 06/14 |
| 266 | 1.504 | 1.4994 | 1.4945 | .0095 | .0049 | .64 | .33 | -.0046 | 06/14 |
| 267 | 1.504 | 1.5034 | 1.5008 | .0032 | .0026 | .21 | .17 | -.0006 | 06/14 |
| 268 | 1.504 | 1.5018 | 1.4998 | .0042 | .002 | .28 | .13 | -.0022 | 06/15 |
| 269 | 1.4968 | 1.4966 | 1.4825 | .0143 | .0141 | .96 | .95 | -.0002 | 06/16 |
| 270 | 1.5149 | 1.5172 | 1.4932 | .0217 | .024 | 1.45 | 1.61 | .0023 | 06/16 |
| 271 | 1.4669 | 1.4986 | 1.4646 | .0023 | .034 | .16 | 2.32 | .0317 | 06/19 |
| 272 | 1.4542 | 1.4614 | 1.4638 | -.0096 | -.0024 | -.66 | -.16 | .0072 | 06/22 |
| 273 | 1.4588 | 1.4618 | 1.4638 | -.005 | -.002 | -.34 | -.14 | .003 | 06/26 |
| 274 | 1.4225 | 1.4273 | 1.4279 | -.0054 | -.0006 | -.38 | -.04 | .0048 | 06/26 |
| 275 | 1.4497 | 1.4503 | 1.4508 | -.0011 | -.0005 | -.08 | -.03 | .0006 | 06/26 |
| 276 | 1.4678 | 1.4713 | 1.4691 | -.0013 | .0022 | -.09 | .15 | .0035 | 06/27 |
| 277 | 1.4769 | 1.48 | 1.4793 | -.0024 | .0007 | -.16 | .05 | .0031 | 06/27 |
| 278 | 1.495 | 1.4986 | 1.5007 | -.0057 | -.0021 | -.38 | -.14 | .0036 | 06/17 |
| 279 | 1.4859 | 1.4891 | 1.488 | -.0021 | .0011 | -.14 | .07 | .0032 | 06/28 |
| 280 | 1.4425 | 1.4463 | 1.4453 | -.0028 | .001 | -.19 | .07 | .0038 | 06/28 |
| 281 | 1.4343 | 1.4396 | 1.4396 | -.0053 | 0 | -.37 | 0 | .0053 | 06/29 |
| 282 | 1.4479 | 1.4543 | 1.4539 | -.006 | .0004 | -.41 | .03 | .0064 | 06/30 |
| 283 | 1.456 | 1.4586 | 1.4584 | -.0024 | .0002 | -.16 | .01 | .0026 | 06/30 |
| 284 | 1.4524 | 1.4594 | 1.4592 | -.0068 | .0002 | -.47 | .01 | .007 | 06/30 |
| 285 | 1.4588 | 1.4653 | 1.4638 | -.005 | .0015 | -.34 | .1 | .0065 | 06/30 |
| 286 | 1.4814 | 1.4848 | 1.4822 | -.0008 | .0026 | -.05 | .18 | .0034 | 07/01 |
| 287 | 1.4796 | 1.4859 | 1.4839 | -.0043 | .002 | -.29 | .13 | .0063 | 07/01 |
| 288 | 1.4714 | 1.4772 | 1.4774 | -.006 | -.0002 | -.41 | -.01 | .0058 | 07/01 |
| 289 | 1.4678 | 1.4733 | 1.4742 | -.0064 | -.0009 | -.43 | -.06 | .0055 | 07/02 |
| 290 | 1.4425 | 1.4475 | 1.4476 | -.0051 | -.0001 | -.35 | -.01 | .005 | 07/02 |
| 291 | 1.4551 | 1.4574 | 1.4558 | -.0007 | .0016 | -.05 | .11 | .0023 | 07/02 |
| 292 | 1.4606 | 1.4665 | 1.4651 | -.0045 | .0014 | -.31 | .1 | .0059 | 07/03 |
| 293 | 1.4588 | 1.463 | 1.4613 | -.0025 | .0017 | -.17 | .12 | .0042 | 07/05 |
| 294 | 1.4533 | 1.4547 | 1.4532 | .0001 | .0015 | .01 | .1 | .0014 | 07/05 |
| 295 | 1.4479 | 1.4507 | 1.4497 | -.0018 | .001 | -.12 | .07 | .0028 | 07/05 |
| 296 | 1.4379 | 1.4448 | 1.4439 | -.006 | .0009 | -.42 | .06 | .0069 | 07/06 |
| 297 | 1.4542 | 1.4582 | 1.4573 | -.0031 | .0009 | -.21 | .06 | .004 | 07/06 |
| 298 | 1.4578 | 1.4661 | 1.4642 | -.0064 | .0019 | -.44 | .13 | .0083 | 07/07 |
| 299 | 1.4588 | 1.4685 | 1.4681 | -.0093 | .0004 | -.63 | .03 | .0097 | 07/07 |
| 300 | 1.4551 | 1.4586 | 1.4597 | -.0046 | -.0011 | -.32 | -.08 | .0035 | 07/07 |
| 301 | 1.4588 | 1.4646 | 1.4633 | -.0045 | .0013 | -.31 | .09 | .0058 | 07/07 |
| 302 | 1.4787 | 1.4836 | 1.4846 | -.0059 | -.001 | -.4 | -.07 | .0049 | 07/08 |
| 303 | 1.495 | 1.5038 | 1.5036 | -.0086 | .0002 | -.57 | .01 | .0088 | 07/08 |
| 304 | 1.4542 | 1.505 | 1.5031 | -.0489 | .0019 | -3.25 | .13 | .0508 | 07/08 |
| 305 | 1.4968 | 1.5081 | 1.5062 | -.0094 | .0019 | -.62 | .13 | .0113 | 07/09 |
| 306 | 1.5031 | 1.5081 | 1.5074 | -.0043 | .0007 | -.29 | .05 | .005 | 07/09 |

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ACCOUNTABILITY TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 2-1 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 307 | 1.4995 | 1.505 | 1.5041 | -.0046 | .0009 | -.31 | .06 | .0055 | 07/09 |
| 308 | 1.5167 | 1.5232 | 1.5233 | -.0066 | -.0001 | -.43 | -.01 | .0065 | 07/10 |
| 309 | 1.5131 | 1.5204 | 1.5209 | -.0078 | -.0005 | -.51 | -.03 | .0073 | 07/10 |
| 310 | 1.5013 | 1.5042 | 1.5003 | .001 | .0039 | .07 | .26 | .0029 | 07/10 |
| 311 | 1.0893 | 1.1018 | 1.1007 | -.0114 | .0011 | -1.04 | .1 | .0125 | 07/12 |
| 312 | 1.0241 | 1.0293 | 1.0334 | -.0093 | -.0041 | -.9 | -.4 | .0052 | 07/13 |
| 313 | 1.0169 | 1.0131 | 1.0129 | .004 | .0002 | .39 | .02 | -.0038 | 07/14 |
| 314 | 1.006 | 1.0075 | 1.0089 | -.0029 | -.0014 | -.29 | -.14 | .0015 | 07/16 |
| 315 | 1.0106 | 1.0087 | 1.0138 | -.0032 | -.0051 | -.32 | -.5 | -.0019 | 07/16 |

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U PRODUCT SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.3396 | 1.3408 | 1.3435 | -.0039 | -.0027 | -.29 | -.2 | -.0012 | 04/11 |
| 3 | 1.4189 | 1.4193 | 1.4203 | -.0014 | -.001 | -.1 | -.07 | -.0004 | 04/12 |
| 4 | 1.5284 | 1.5346 | 1.5235 | .0049 | .0111 | .32 | .73 | -.0062 | 04/13 |
| 5 | 1.5712 | 1.5559 | 1.6084 | -.0372 | -.0525 | -2.31 | -3.26 | .0153 | 04/14 |
| 6 | 1.5785 | 1.4974 | 1.6161 | -.0376 | -.1187 | -2.33 | -7.34 | .0811 | 04/15 |
| 7 | 1.6104 | 1.6235 | 1.638 | -.0276 | -.0145 | -1.68 | -.89 | -.0131 | 04/15 |
| 8 | 1.6515 | 1.6536 | 1.6489 | .0026 | .0047 | .16 | .29 | -.0021 | 04/15 |
| 9 | 1.6424 | 1.6508 | 1.6454 | -.003 | .0054 | -.18 | .33 | -.0084 | 04/16 |
| 10 | 1.6013 | 1.6111 | 1.601 | .0003 | .0101 | .02 | .63 | -.0098 | 04/17 |
| 11 | 1.6132 | 1.6163 | 1.6121 | .0011 | .0042 | .07 | .26 | -.0031 | 04/18 |
| 12 | 1.6059 | 1.6147 | 1.6109 | -.005 | .0038 | -.31 | .24 | -.0088 | 04/18 |
| 13 | 1.6059 | 1.6107 | 1.6066 | -.0007 | .0041 | -.04 | .26 | -.0048 | 04/19 |
| 14 | 1.5603 | 1.6107 | 1.6047 | -.0444 | .006 | -2.77 | .37 | -.0504 | 04/19 |
| 15 | 1.7189 | 1.6388 | 1.6073 | .1116 | .0315 | 6.94 | 1.96 | .0801 | 04/19 |
| 16 | 1.6515 | 1.6564 | 1.6175 | .034 | .0389 | 2.1 | 2.4 | -.0049 | 04/20 |
| 17 | 1.7062 | 1.8318 | 1.6178 | .0884 | .214 | 5.46 | 13.23 | -.1256 | 04/20 |
| 18 | 1.5794 | 1.6215 | 1.6169 | -.0375 | .0046 | -2.32 | .28 | -.0421 | 04/21 |
| 19 | 1.542 | 1.5278 | 1.6284 | -.0864 | -.1006 | -5.31 | -6.18 | .0142 | 04/21 |
| 20 | 1.5466 | 1.5551 | 1.6425 | -.0959 | -.0874 | -5.84 | -5.32 | -.0085 | 04/21 |
| 21 | 1.6241 | 1.6656 | 1.6218 | .0023 | .0438 | .14 | 2.7 | -.0415 | 04/22 |
| 22 | 1.6424 | 1.644 | 1.6017 | .0407 | .0423 | 2.54 | 2.64 | -.0016 | 04/21 |
| 23 | 1.6378 | 1.6468 | 1.6429 | -.0051 | .0039 | -.31 | .24 | -.009 | 04/22 |
| 24 | 1.574 | 1.6115 | 1.5933 | -.0193 | .0182 | -1.21 | 1.14 | -.0375 | 04/23 |
| 25 | 1.5329 | 1.5491 | 1.6039 | -.071 | -.0548 | -4.43 | -3.42 | -.0162 | 04/23 |
| 26 | 1.5876 | 1.5855 | 1.5819 | .0057 | .0036 | .36 | .23 | .0021 | 04/24 |
| 27 | 1.6287 | 1.6436 | 1.5941 | .0346 | .0495 | 2.17 | 3.11 | -.0149 | 04/24 |
| 28 | 1.5785 | 1.5763 | 1.5702 | .0083 | .0061 | .53 | .39 | .0022 | 04/24 |
| 29 | 1.5876 | 1.6051 | 1.5951 | -.0075 | .01 | -.47 | .63 | -.0175 | 04/25 |
| 30 | 1.5603 | 1.5607 | 1.6441 | -.0838 | -.0834 | -5.1 | -5.07 | -.0004 | 04/25 |
| 31 | 1.6095 | 1.5891 | 1.5858 | .0237 | .0033 | 1.49 | .21 | .0204 | 04/25 |
| 32 | 1.5603 | 1.5559 | 1.5529 | .0074 | .003 | .48 | .19 | .0044 | 04/26 |
| 33 | 1.5876 | 1.5851 | 1.5848 | .0028 | .0003 | .18 | .02 | .0025 | 04/27 |
| 34 | 1.6013 | 1.5987 | 1.5961 | .0052 | .0026 | .33 | .16 | .0026 | 04/27 |
| 35 | 1.6196 | 1.6151 | 1.6163 | .0033 | -.0012 | .2 | -.07 | .0045 | 04/27 |
| 36 | 1.5922 | 1.5839 | 1.5805 | .0117 | .0034 | .74 | .22 | .0083 | 04/28 |
| 37 | 1.5831 | 1.5751 | 1.5723 | .0108 | .0028 | .69 | .18 | .008 | 04/28 |
| 38 | 1.5603 | 1.5539 | 1.5531 | .0072 | .0008 | .46 | .05 | .0064 | 04/28 |
| 39 | 1.5329 | 1.5106 | 1.5226 | .0103 | -.012 | .68 | -.79 | .0223 | 04/29 |
| 40 | 1.501 | 1.4946 | 1.4933 | .0077 | .0013 | .52 | .09 | .0064 | 04/29 |
| 41 | 1.5147 | 1.4818 | 1.487 | .0277 | -.0052 | 1.86 | -.35 | .0329 | 04/30 |
| 42 | 1.501 | 1.4958 | 1.4817 | .0193 | .0141 | 1.3 | .95 | .0052 | 04/30 |
| 43 | 1.4873 | 1.4802 | 1.4895 | -.0022 | -.0093 | -.15 | -.62 | .0071 | 04/30 |
| 44 | 1.4828 | 1.4722 | 1.489 | -.0062 | -.0168 | -.42 | -1.13 | .0106 | 05/01 |
| 45 | 1.501 | 1.475 | 1.4923 | .0087 | -.0173 | .58 | -1.16 | .026 | 05/01 |

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U PRODUCT SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 46 | 1.501 | 1.493 | 1.4923 | .0087 | .0007 | .58 | .05 | .008 | 05/01 |
| 47 | 1.4965 | 1.4882 | 1.4876 | .0089 | .0006 | .6 | .04 | .0083 | 05/02 |
| 48 | 1.4782 | 1.4678 | 1.4609 | .0173 | .0069 | 1.18 | .47 | .0104 | 05/02 |
| 49 | 1.4417 | 1.4353 | 1.4369 | .0048 | -.0016 | .33 | -.11 | .0064 | 05/02 |
| 50 | 1.4828 | 1.4706 | 1.487 | -.0042 | -.0164 | -.28 | -1.1 | .0122 | 05/03 |
| 51 | 1.5101 | 1.5194 | 1.5063 | .0038 | .0131 | .25 | .87 | -.0093 | 05/03 |
| 52 | 1.5147 | 1.5026 | 1.5016 | .0131 | .001 | .87 | .07 | .0121 | 05/03 |
| 53 | 1.542 | 1.5318 | 1.5274 | .0146 | .0044 | .96 | .29 | .0102 | 05/04 |
| 54 | 1.5238 | 1.5214 | 1.5184 | .0054 | .003 | .36 | .2 | .0024 | 05/04 |
| 55 | 1.5284 | 1.5198 | 1.5154 | .013 | .0044 | .86 | .29 | .0086 | 05/04 |
| 56 | 1.5147 | 1.507 | 1.5033 | .0114 | .0037 | .76 | .25 | .0077 | 05/05 |
| 57 | 1.5138 | 1.5074 | 1.5094 | .0044 | -.002 | .29 | -.13 | .0064 | 05/05 |
| 58 | 1.4965 | 1.4886 | 1.4955 | .001 | -.0069 | .07 | -.46 | .0079 | 05/05 |
| 59 | 1.5183 | 1.5118 | 1.5067 | .0116 | .0051 | .77 | .34 | .0065 | 05/06 |
| 60 | 1.5329 | 1.5186 | 1.5175 | .0154 | .0011 | 1.01 | .07 | .0143 | 05/06 |
| 61 | 1.4591 | 1.4449 | 1.4957 | -.0366 | -.0508 | -2.45 | -3.4 | .0142 | 05/06 |
| 62 | 1.5174 | 1.5094 | 1.5036 | .0138 | .0058 | .92 | .39 | .008 | 05/07 |
| 63 | 1.5256 | 1.515 | 1.5127 | .0129 | .0023 | .85 | .15 | .0106 | 05/07 |
| 64 | 1.501 | 1.4962 | 1.4932 | .0078 | .003 | .52 | .2 | .0048 | 05/07 |
| 65 | 1.4983 | 1.4906 | 1.4992 | -.0009 | -.0086 | -.06 | -.57 | .0077 | 05/08 |
| 66 | 1.4919 | 1.4626 | 1.5062 | -.0143 | -.0436 | -.95 | -2.89 | .0293 | 05/08 |
| 67 | 1.5147 | 1.505 | 1.4963 | .0184 | .0087 | 1.23 | .58 | .0097 | 05/08 |
| 68 | 1.5101 | 1.5042 | 1.4995 | .0106 | .0047 | .71 | .31 | .0059 | 05/09 |
| 69 | 1.5147 | 1.5002 | 1.4976 | .0171 | .0026 | 1.14 | .17 | .0145 | 05/09 |
| 70 | 1.5056 | 1.4998 | 1.4952 | .0104 | .0046 | .7 | .31 | .0058 | 05/09 |
| 71 | 1.5056 | 1.497 | 1.483 | .0226 | .014 | 1.52 | .94 | .0086 | 05/10 |
| 72 | 1.4071 | 1.3981 | 1.3991 | .008 | -.001 | .57 | -.07 | .009 | 05/12 |
| 73 | 1.4189 | 1.4065 | 1.3968 | .0221 | .0097 | 1.58 | .69 | .0124 | 05/20 |
| 74 | 1.4873 | 1.483 | 1.4789 | .0084 | .0041 | .57 | .28 | .0043 | 05/21 |
| 75 | 1.5083 | 1.4998 | 1.4935 | .0148 | .0063 | .99 | .42 | .0085 | 05/21 |
| 76 | 1.5366 | 1.527 | 1.4944 | .0422 | .0326 | 2.82 | 2.18 | .0096 | 05/22 |
| 77 | 1.5329 | 1.5254 | 1.5017 | .0312 | .0237 | 2.08 | 1.58 | .0075 | 05/22 |
| 78 | 1.4417 | 1.4345 | 1.4809 | -.0392 | -.0464 | -2.65 | -3.13 | .0072 | 05/22 |
| 79 | 1.4828 | 1.475 | 1.4711 | .0117 | .0039 | .8 | .27 | .0078 | 05/23 |
| 80 | 1.4828 | 1.4742 | 1.4713 | .0115 | .0029 | .78 | .2 | .0086 | 05/23 |
| 81 | 1.4965 | 1.487 | 1.4912 | .0053 | -.0042 | .36 | -.28 | .0095 | 05/24 |
| 82 | 1.4965 | 1.4922 | 1.4887 | .0078 | .0035 | .52 | .24 | .0043 | 05/24 |
| 83 | 1.5028 | 1.4926 | 1.4902 | .0126 | .0024 | .85 | .16 | .0102 | 05/24 |
| 84 | 1.5238 | 1.5162 | 1.5086 | .0152 | .0076 | 1.01 | .5 | .0076 | 05/25 |
| 85 | 1.5229 | 1.513 | 1.5078 | .0151 | .0052 | 1 | .34 | .0099 | 05/25 |
| 86 | 1.5101 | 1.5038 | 1.5042 | .0059 | -.0004 | .39 | -.03 | .0063 | 05/25 |
| 87 | 1.5147 | 1.5062 | 1.5045 | .0102 | .0017 | .68 | .11 | .0085 | 05/26 |
| 88 | 1.4992 | 1.4914 | 1.4867 | .0125 | .0047 | .84 | .32 | .0078 | 05/26 |
| 89 | 1.4965 | 1.4878 | 1.4831 | .0134 | .0047 | .9 | .32 | .0087 | 05/26 |
| 90 | 1.5056 | 1.4974 | 1.4916 | .014 | .0058 | .94 | .39 | .0082 | 05/27 |

U PRODUCT SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 91 | 1.4919 | 1.467 | 1.4803 | .0116 | -.0133 | .78 | -.9 | .0249 | 05/27 |
| 92 | 1.5056 | 1.4934 | 1.4868 | .0188 | .0066 | 1.26 | .44 | .0122 | 05/27 |
| 93 | 1.4965 | 1.4902 | 1.4868 | .0097 | .0034 | .65 | .23 | .0063 | 05/28 |
| 94 | 1.4937 | 1.4874 | 1.4816 | .0121 | .0058 | .82 | .39 | .0063 | 05/28 |
| 95 | 1.5101 | 1.515 | 1.4928 | .0173 | .0222 | 1.16 | 1.49 | -.0049 | 05/29 |
| 96 | 1.5101 | 1.5034 | 1.4994 | .0107 | .004 | .71 | .27 | .0067 | 05/29 |
| 97 | 1.5767 | 1.5691 | 1.5022 | .0745 | .0669 | 4.96 | 4.45 | .0076 | 05/29 |
| 98 | 1.5147 | 1.505 | 1.502 | .0127 | .003 | .85 | .2 | .0097 | 05/30 |
| 99 | 1.5147 | 1.5038 | 1.4954 | .0193 | .0084 | 1.29 | .56 | .0109 | 05/30 |
| 100 | 1.5192 | 1.5086 | 1.504 | .0152 | .0046 | 1.01 | .31 | .0106 | 05/31 |
| 101 | 1.5147 | 1.5066 | 1.5083 | .0064 | -.0017 | .42 | -.11 | .0081 | 06/01 |
| 102 | 1.5047 | 1.497 | 1.4963 | .0084 | .0007 | .56 | .05 | .0077 | 06/01 |
| 103 | 1.4873 | 1.4786 | 1.4715 | .0158 | .0071 | 1.07 | .48 | .0087 | 06/02 |
| 104 | 1.4965 | 1.487 | 1.4813 | .0152 | .0057 | 1.03 | .38 | .0095 | 06/02 |
| 105 | 1.4873 | 1.4802 | 1.475 | .0123 | .0052 | .83 | .35 | .0071 | 06/03 |
| 106 | 1.522 | 1.5118 | 1.5093 | .0127 | .0025 | .84 | .17 | .0102 | 06/04 |
| 107 | 1.5047 | 1.4998 | 1.4975 | .0072 | .0023 | .48 | .15 | .0049 | 06/04 |
| 108 | 1.4828 | 1.4786 | 1.4924 | -.0096 | -.0138 | -.64 | -.92 | .0042 | 06/04 |
| 109 | 1.5147 | 1.505 | 1.4994 | .0153 | .0056 | 1.02 | .37 | .0097 | 06/05 |
| 110 | 1.5147 | 1.503 | 1.4984 | .0163 | .0046 | 1.09 | .31 | .0117 | 06/05 |
| 111 | 1.5065 | 1.501 | 1.4949 | .0116 | .0061 | .78 | .41 | .0055 | 06/05 |
| 112 | 1.5037 | 1.4942 | 1.489 | .0147 | .0052 | .99 | .35 | .0095 | 06/06 |
| 113 | 1.501 | 1.4902 | 1.4873 | .0137 | .0029 | .92 | .19 | .0108 | 06/06 |
| 114 | 1.4965 | 1.4854 | 1.4809 | .0156 | .0045 | 1.05 | .3 | .0111 | 06/07 |
| 115 | 1.4873 | 1.4786 | 1.4639 | .0234 | .0147 | 1.6 | 1 | .0087 | 06/07 |
| 116 | 1.4828 | 1.4754 | 1.4693 | .0135 | .0061 | .92 | .42 | .0074 | 06/07 |
| 117 | 1.4965 | 1.4882 | 1.4778 | .0187 | .0104 | 1.27 | .7 | .0083 | 06/08 |
| 118 | 1.5083 | 1.5022 | 1.4956 | .0127 | .0066 | .85 | .44 | .0061 | 06/09 |
| 119 | 1.4983 | 1.491 | 1.4971 | .0012 | -.0061 | .08 | -.41 | .0073 | 06/09 |
| 120 | 1.5037 | 1.497 | 1.4925 | .0112 | .0045 | .75 | .3 | .0067 | 06/09 |
| 121 | 1.5147 | 1.5094 | 1.5048 | .0099 | .0046 | .66 | .31 | .0053 | 06/10 |
| 122 | 1.5147 | 1.5126 | 1.5071 | .0076 | .0055 | .5 | .36 | .0021 | 06/10 |
| 123 | 1.5147 | 1.507 | 1.5028 | .0119 | .0042 | .79 | .28 | .0077 | 06/10 |
| 124 | 1.4691 | 1.4638 | 1.4987 | -.0296 | -.0349 | -1.98 | -2.33 | .0053 | 06/11 |
| 125 | 1.5074 | 1.5054 | 1.5 | .0074 | .0054 | .49 | .36 | .002 | 06/11 |
| 126 | 1.5147 | 1.5062 | 1.5019 | .0128 | .0043 | .85 | .29 | .0085 | 06/11 |
| 127 | 1.5147 | 1.5046 | 1.5011 | .0136 | .0035 | .91 | .23 | .0101 | 06/12 |
| 128 | 1.5101 | 1.5014 | 1.4965 | .0136 | .0049 | .91 | .33 | .0087 | 06/12 |
| 129 | 1.5284 | 1.5206 | 1.4992 | .0292 | .0214 | 1.95 | 1.43 | .0078 | 06/13 |
| 130 | 1.5056 | 1.5014 | 1.4944 | .0112 | .007 | .75 | .47 | .0042 | 06/13 |
| 131 | 1.5147 | 1.5086 | 1.5029 | .0118 | .0057 | .79 | .38 | .0061 | 06/14 |
| 132 | 1.5056 | 1.4998 | 1.4921 | .0135 | .0077 | .9 | .52 | .0058 | 06/14 |
| 133 | 1.5147 | 1.5102 | 1.4976 | .0171 | .0126 | 1.14 | .84 | .0045 | 06/14 |
| 134 | 1.5056 | 1.5018 | 1.497 | .0086 | .0048 | .57 | .32 | .0038 | 06/15 |
| 135 | 1.4901 | 1.4798 | 1.4815 | .0086 | -.0017 | .58 | -.11 | .0103 | 06/15 |

U PRODUCT SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 136 | 1.4901 | 1.4834 | 1.4766 | .0135 | .0068 | .91 | .46 | .0067 | 06/16 |
| 137 | 1.5074 | 1.5002 | 1.4929 | .0145 | .0073 | .97 | .49 | .0072 | 06/16 |
| 138 | 1.4873 | 1.4794 | 1.4666 | .0207 | .0128 | 1.41 | .87 | .0079 | 06/17 |
| 139 | 1.4509 | 1.4401 | 1.4404 | .0105 | -.0003 | .73 | -.02 | .0108 | 06/19 |
| 140 | 1.4509 | 1.4489 | 1.4448 | .0061 | .0041 | .42 | .28 | .002 | 06/25 |
| 141 | 1.4308 | 1.4289 | 1.4245 | .0063 | .0044 | .44 | .31 | .0019 | 06/26 |
| 142 | 1.4618 | 1.4602 | 1.4555 | .0063 | .0047 | .43 | .32 | .0016 | 06/26 |
| 143 | 1.4782 | 1.4746 | 1.4706 | .0076 | .004 | .52 | .27 | .0036 | 06/26 |
| 144 | 1.4919 | 1.489 | 1.4829 | .009 | .0061 | .61 | .41 | .0029 | 06/27 |
| 145 | 1.5147 | 1.5114 | 1.5042 | .0105 | .0072 | .7 | .48 | .0033 | 06/27 |
| 146 | 1.4983 | 1.4918 | 1.4884 | .0099 | .0034 | .67 | .23 | .0065 | 06/28 |
| 147 | 1.4481 | 1.4461 | 1.4423 | .0058 | .0038 | .4 | .26 | .002 | 06/28 |
| 148 | 1.4509 | 1.4565 | 1.4398 | .0111 | .0167 | .77 | 1.16 | -.0056 | 06/29 |
| 149 | 1.4673 | 1.4614 | 1.4687 | -.0014 | -.0073 | -.1 | -.5 | .0059 | 06/29 |
| 150 | 1.4709 | 1.465 | 1.468 | .0029 | -.003 | .2 | -.2 | .0059 | 06/30 |
| 151 | 1.4691 | 1.4654 | 1.4593 | .0098 | .0061 | .67 | .42 | .0037 | 06/30 |
| 152 | 1.4782 | 1.4686 | 1.4644 | .0138 | .0042 | .94 | .29 | .0096 | 06/30 |
| 153 | 1.4965 | 1.4918 | 1.4867 | .0098 | .0051 | .66 | .34 | .0047 | 07/01 |
| 154 | 1.4937 | 1.4886 | 1.4877 | .006 | .0009 | .4 | .06 | .0051 | 07/01 |
| 155 | 1.4873 | 1.4818 | 1.4773 | .01 | .0045 | .68 | .3 | .0055 | 07/01 |
| 156 | 1.4855 | 1.481 | 1.475 | .0105 | .006 | .71 | .41 | .0045 | 07/02 |
| 157 | 1.4554 | 1.4497 | 1.4443 | .0111 | .0054 | .77 | .37 | .0057 | 07/02 |
| 158 | 1.4655 | 1.4577 | 1.4567 | .0088 | .001 | .6 | .07 | .0078 | 07/02 |
| 159 | 1.4746 | 1.4722 | 1.4661 | .0085 | .0061 | .58 | .42 | .0024 | 07/03 |
| 160 | 1.4764 | 1.4738 | 1.4678 | .0086 | .006 | .59 | .41 | .0026 | 07/03 |
| 161 | 1.4627 | 1.4594 | 1.4527 | .01 | .0067 | .69 | .46 | .0033 | 07/05 |
| 162 | 1.46 | 1.4573 | 1.448 | .012 | .0093 | .83 | .64 | .0027 | 07/05 |
| 163 | 1.4518 | 1.4529 | 1.4423 | .0095 | .0106 | .66 | .73 | -.0011 | 07/06 |
| 164 | 1.5047 | 1.5002 | 1.4596 | .0451 | .0406 | 3.09 | 2.78 | .0045 | 07/06 |
| 165 | 1.4782 | 1.469 | 1.4653 | .0129 | .0037 | .88 | .25 | .0092 | 07/07 |
| 166 | 1.4764 | 1.4694 | 1.4683 | .0081 | .0011 | .55 | .07 | .007 | 07/07 |
| 167 | 1.4691 | 1.4614 | 1.4583 | .0108 | .0031 | .74 | .21 | .0077 | 07/07 |
| 168 | 1.4709 | 1.4714 | 1.465 | .0059 | .0064 | .4 | .44 | -.0005 | 07/07 |
| 169 | 1.4937 | 1.4946 | 1.4852 | .0085 | .0094 | .57 | .63 | -.0009 | 07/08 |
| 170 | 1.5147 | 1.5122 | 1.5052 | .0095 | .007 | .63 | .47 | .0025 | 07/08 |
| 171 | 1.5147 | 1.5146 | 1.5039 | .0108 | .0107 | .72 | .71 | .0001 | 07/08 |
| 172 | 1.5147 | 1.5006 | 1.5048 | .0099 | -.0042 | .66 | -.28 | .0141 | 07/09 |
| 173 | 1.5156 | 1.5134 | 1.5082 | .0074 | .0052 | .49 | .34 | .0022 | 07/09 |
| 174 | 1.5147 | 1.509 | 1.5047 | .01 | .0043 | .66 | .29 | .0057 | 07/09 |
| 175 | 1.5466 | 1.5318 | 1.5254 | .0212 | .0064 | 1.39 | .42 | .0148 | 07/10 |
| 176 | 1.5329 | 1.5282 | 1.5203 | .0126 | .0079 | .83 | .52 | .0047 | 07/10 |
| 177 | 1.5238 | 1.5238 | 1.5176 | .0062 | .0062 | .41 | .41 | 0 | 07/10 |
| 178 | 1.5056 | 1.503 | 1.4956 | .01 | .0074 | .67 | .49 | .0026 | 07/11 |
| 179 | 1.4791 | 1.475 | 1.4691 | .01 | .0059 | .68 | .4 | .0041 | 07/11 |
| 180 | 1.4901 | 1.4858 | 1.4786 | .0115 | .0072 | .78 | .49 | .0043 | 07/11 |

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U PRODUCT SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | RUSKA DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 181 | 1.5174 | 1.513 | 1.5043 | .0131 | .0087 | .87 | .58 | .0044 | 07/13 |
| 182 | 1.4135 | 1.4397 | 1.4376 | -.0241 | .0021 | -1.68 | .15 | -.0262 | 07/14 |
| 183 | 1.2867 | 1.2807 | 1.2786 | .0081 | .0021 | .63 | .16 | .006 | 07/15 |
| 184 | 1.2047 | 1.1962 | 1.1959 | .0088 | .0003 | .74 | .03 | .0085 | 07/20 |
| 185 | 1.1408 | 1.1354 | 1.1328 | .008 | .0026 | .71 | .23 | .0054 | 07/22 |
| 186 | 1.1071 | 1.1029 | 1.1017 | .0054 | .0012 | .49 | .11 | .0042 | 07/23 |

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GPW CHECK TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 475 | 1.1144 | 1.1616 | 1.017 | .0974 | .1446 | 9.57 | 14.21 | -.0473 | 04/04 |
| 476 | 1.0778 | 1.1309 | 1.0738 | .004 | .0571 | .37 | 5.31 | -.0531 | 04/07 |
| 477 | 1.0498 | 1.1004 | 1.0462 | .0036 | .0542 | .34 | 5.18 | -.0507 | 04/08 |
| 478 | 1.2014 | 1.2581 | 1.1989 | .0025 | .0592 | .2 | 4.93 | -.0567 | 04/10 |
| 479 | 1.1606 | 1.2634 | 1.1588 | .0018 | .1046 | .15 | 9.02 | -.1029 | 04/10 |
| 480 | NO SAMPLE | | | | | | | | |
| 481 | 1.1247 | 1.1448 | 1.1117 | .013 | .0331 | 1.16 | 2.97 | -.0201 | 04/12 |
| 482 | 1.2981 | 1.3245 | 1.2022 | .0959 | .1223 | 7.97 | 10.17 | -.0265 | 04/12 |
| 483 | 1.1764 | 1.1966 | 1.1684 | .008 | .0282 | .68 | 2.41 | -.0203 | 04/13 |
| 484 | 1.2981 | 1.3894 | 1.2581 | .04 | .1313 | 3.17 | 10.43 | -.0913 | 04/14 |
| 485 | 1.219 | 1.2555 | 1.1537 | .0653 | .1018 | 5.66 | 8.82 | -.0365 | 04/14 |
| 486 | 1.2567 | 1.2774 | 1.2235 | .0332 | .0539 | 2.71 | 4.4 | -.0207 | 04/14 |
| 487 | 1.1582 | 1.1773 | 1.1191 | .0391 | .0582 | 3.49 | 5.2 | -.0191 | 04/15 |
| 488 | 1.1521 | 1.1757 | 1.1403 | .0118 | .0354 | 1.03 | 3.1 | -.0236 | 04/16 |
| 489 | 1.3115 | 1.3264 | 1.2761 | .0354 | .0503 | 2.77 | 3.94 | -.0149 | 04/16 |
| 490 | 1.1551 | 1.1697 | 1.124 | .0311 | .0457 | 2.76 | 4.06 | -.0147 | 04/17 |
| 491 | 1.1582 | 1.1742 | 1.1323 | .0259 | .0419 | 2.28 | 3.7 | -.016 | 04/17 |
| 492 | 1.1265 | 1.1379 | 1.0991 | .0274 | .0388 | 2.49 | 3.53 | -.0114 | 04/17 |
| 493 | 1.146 | 1.172 | 1.1277 | .0183 | .0443 | 1.62 | 3.92 | -.026 | 04/18 |
| 494 | 1.1454 | 1.1606 | 1.1411 | .0043 | .0195 | .37 | 1.7 | -.0153 | 04/19 |
| 495 | 1.1271 | 1.1488 | 1.1295 | -.0024 | .0193 | -.22 | 1.7 | -.0218 | 04/19 |
| 496 | 1.0851 | 1.1049 | 1.0858 | -.0007 | .0191 | -.07 | 1.75 | -.0199 | 04/20 |
| 497 | 1.2592 | 1.2948 | 1.183 | .0762 | .1118 | 6.44 | 9.45 | -.0357 | 04/21 |
| 498 | 1.1703 | 1.2067 | 1.138 | .0323 | .0687 | 2.83 | 6.03 | -.0364 | 04/22 |
| 499 | 1.2494 | 1.2698 | 1.2246 | .0248 | .0452 | 2.02 | 3.69 | -.0205 | 04/22 |
| 500 | 1.2373 | 1.2652 | 1.2209 | .0164 | .0443 | 1.34 | 3.62 | -.0279 | 04/22 |
| 501 | 1.0973 | 1.1318 | 1.0945 | .0028 | .0373 | .25 | 3.4 | -.0345 | 04/23 |
| 502 | NO SAMPLE | | | | | | | | |
| 503 | 1.2434 | 1.2775 | 1.2399 | .0035 | .0376 | .28 | 3.03 | -.0342 | 04/23 |
| 504 | 1.2312 | 1.2658 | 1.2245 | .0067 | .0413 | .54 | 3.37 | -.0347 | 04/24 |
| 505 | NO SAMPLE | | | | | | | | |
| 506 | 1.3529 | 1.3884 | 1.2014 | .1515 | .187 | 12.61 | 15.56 | -.0356 | 04/25 |
| 507 | 1.286 | 1.3258 | 1.2687 | .0173 | .0571 | 1.36 | 4.5 | -.0399 | 04/25 |
| 508 | 1.3225 | 1.3588 | 1.3176 | .0049 | .0412 | .37 | 3.12 | -.0364 | 04/25 |
| 509 | 1.2707 | 1.3094 | 1.2759 | -.0052 | .0335 | -.41 | 2.62 | -.0388 | 04/26 |
| 510 | 1.2008 | 1.2406 | 1.2047 | -.0039 | .0359 | -.33 | 2.97 | -.0399 | 04/26 |
| 511 | 1.1855 | 1.2213 | 1.1907 | -.0052 | .0306 | -.44 | 2.56 | -.0358 | 04/27 |
| 512 | 1.1673 | 1.2061 | 1.1672 | .0001 | .0389 | 0 | 3.33 | -.0388 | 04/27 |
| 513 | 1.2008 | 1.2336 | 1.1981 | .0027 | .0355 | .22 | 2.96 | -.0329 | 04/27 |
| 514 | 1.219 | 1.2482 | 1.2166 | .0024 | .0316 | .19 | 2.59 | -.0293 | 04/28 |
| 515 | 1.286 | 1.3272 | 1.2932 | -.0072 | .034 | -.56 | 2.62 | -.0413 | 04/29 |
| 516 | 1.2677 | 1.301 | 1.2654 | .0023 | .0356 | .18 | 2.81 | -.0334 | 04/29 |
| 517 | 1.2768 | 1.3061 | 1.2074 | .0694 | .0987 | 5.74 | 8.17 | -.0293 | 04/30 |
| 518 | 1.1642 | 1.1945 | 1.1633 | .0009 | .0312 | .07 | 2.68 | -.0304 | 04/30 |

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GPW CHECK TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 519 | 1.219 | 1.2544 | 1.2188 | .0002 | .0356 | .01 | 2.92 | -.0355 | 05/01 |
| 520 | 1.216 | 1.2472 | 1.2147 | .0013 | .0325 | .1 | 2.67 | -.0313 | 05/02 |
| 521 | 1.2981 | 1.3263 | 1.293 | .0051 | .0333 | .39 | 2.57 | -.0283 | 05/02 |
| 522 | 1.2111 | 1.2411 | 1.2125 | -.0014 | .0286 | -.12 | 2.35 | -.03 | 05/02 |
| 523 | .93 | .9469 | .8283 | .1017 | .1186 | 12.27 | 14.31 | -.0169 | 05/03 |
| 524 | 1.2434 | 1.2722 | 1.2124 | .031 | .0598 | 2.55 | 4.93 | -.0288 | 05/03 |
| 525 | 1.286 | 1.3131 | 1.2582 | .0278 | .0549 | 2.2 | 4.36 | -.0271 | 05/04 |
| 526 | 1.2038 | 1.2323 | 1.1993 | .0045 | .033 | .37 | 2.75 | -.0286 | 05/04 |
| 527 | 1.2598 | 1.2747 | 1.2409 | .0189 | .0338 | 1.52 | 2.72 | -.015 | 05/06 |
| 528 | 1.2008 | 1.2151 | 1.1954 | .0054 | .0197 | .45 | 1.64 | -.0144 | 05/06 |
| 529 | 1.1886 | 1.2022 | 1.1841 | .0045 | .0181 | .38 | 1.52 | -.0136 | 05/06 |
| 530 | 1.2239 | 1.2376 | 1.2168 | .0071 | .0208 | .58 | 1.7 | -.0138 | 05/07 |
| 531 | 1.1916 | 1.2065 | 1.192 | -.0004 | .0145 | -.04 | 1.21 | -.015 | 05/08 |
| 532 | 1.1764 | 1.1944 | 1.1799 | -.0035 | .0145 | -.3 | 1.22 | -.018 | 05/08 |
| 533 | 1.1947 | 1.2014 | 1.1864 | .0083 | .015 | .69 | 1.26 | -.0068 | 05/08 |
| 534 | 1.2373 | 1.2281 | 1.2221 | .0152 | .006 | 1.24 | .49 | .0091 | 05/09 |
| 535 | 1.1308 | 1.1332 | 1.1183 | .0125 | .0149 | 1.11 | 1.33 | -.0024 | 05/09 |
| 536 | 1.1338 | 1.1366 | 1.1223 | .0115 | .0143 | 1.02 | 1.27 | -.0029 | 05/09 |
| 537 | 1.0851 | 1.0897 | 1.0818 | .0033 | .0079 | .3 | .73 | -.0047 | 05/09 |
| 538 | 1.0967 | 1.0976 | 1.0843 | .0124 | .0133 | 1.14 | 1.22 | -.001 | 05/10 |
| 539 | 1.0973 | 1.0987 | 1.0889 | .0084 | .0098 | .77 | .89 | -.0014 | 05/10 |
| 540 | 1.0194 | 1.0203 | 1.0889 | -.0695 | -.0686 | -6.39 | -6.3 | -.001 | 05/10 |
| 541 | 1.2251 | 1.172 | 1.2154 | .0097 | -.0434 | .79 | -3.58 | .0531 | 05/10 |
| 542 | 1.0486 | 1.2318 | 1.0421 | .0065 | .1897 | .62 | 18.2 | -.1832 | 05/10 |
| 543 | 1.0091 | 1.0131 | 1.0421 | -.033 | -.029 | -3.17 | -2.79 | -.004 | 05/10 |
| 544 | 1.1277 | 1.1296 | 1.1177 | .01 | .0119 | .89 | 1.06 | -.0019 | 05/11 |
| 545 | 1.3194 | 1.321 | 1.3044 | .015 | .0166 | 1.14 | 1.27 | -.0017 | 05/13 |
| 546 | 1.2993 | 1.3041 | 1.2895 | .0098 | .0146 | .75 | 1.13 | -.0048 | 05/13 |
| 547 | 1.003 | 0 | 1.0031 | -.0001 | 0 | -.01 | 0 | -.0048 | 05/13 |
| 548 | 1.1247 | 1.1242 | 1.1119 | .0128 | .0123 | 1.15 | 1.1 | .0004 | 05/14 |
| 549 | 1.359 | 1.3603 | 1.3081 | .0509 | .0522 | 3.89 | 3.99 | -.0013 | 05/14 |
| 550 | 1.219 | 1.2175 | 1.2021 | .0169 | .0154 | 1.4 | 1.28 | .0015 | 05/15 |
| 551 | 1.2129 | 1.2168 | 1.2033 | .0096 | .0135 | .79 | 1.12 | -.0039 | 05/15 |
| 552 | 1.0334 | 0 | 1.0335 | -.0001 | 0 | -.01 | 0 | -.0039 | 05/15 |
| 553 | 1.2434 | 1.242 | 1.2326 | .0108 | .0094 | .87 | .76 | .0013 | 05/15 |
| 554 | 1.2494 | 1.2612 | 1.2369 | .0125 | .0243 | 1.01 | 1.96 | -.0119 | 05/15 |
| 555 | .9543 | .9649 | .8596 | .0947 | .1053 | 11.01 | 12.24 | -.0107 | 05/15 |
| 556 | 1.0121 | 1.0276 | 1.0285 | -.0164 | -.0009 | -1.6 | -.09 | -.0156 | 05/15 |
| 557 | 1.2002 | 1.2158 | 1.1922 | .008 | .0236 | .67 | 1.97 | -.0157 | 05/16 |
| 558 | 1.0425 | 1.0587 | 1.0412 | .0013 | .0175 | .12 | 1.68 | -.0163 | 05/16 |
| 559 | 1.1153 | 1.1303 | 1.1144 | .0009 | .0159 | .08 | 1.42 | -.015 | 05/16 |
| 560 | 1.0365 | 1.0492 | 1.0386 | -.0021 | .0106 | -.21 | 1.02 | -.0127 | 05/16 |
| 561 | 1.076 | 1.0923 | 1.0812 | -.0052 | .0111 | -.49 | 1.02 | -.0163 | 05/17 |
| 562 | 1.0419 | 1.0564 | 1.0446 | -.0027 | .0118 | -.26 | 1.12 | -.0146 | 05/17 |
| 563 | .9987 | 1.0195 | 1.0072 | -.0085 | .0123 | -.85 | 1.22 | -.0208 | 05/18 |

# GPW CHECK TANK
# DENSITY MEASUREMENT
# COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 564 | 1.1734 | 1.1924 | 1.1729 | .0005 | .0195 | .04 | 1.66 | -.0191 | 05/20 |
| 565 | 1.0973 | 1.2546 | 1.2363 | -.139 | .0183 | -11.25 | 1.48 | -.1574 | 05/21 |
| 566 | 1.2701 | 1.2884 | 1.2677 | .0024 | .0207 | .18 | 1.63 | -.0184 | 05/21 |
| 567 | 1.2616 | 1.2785 | 1.2579 | .0037 | .0206 | .29 | 1.63 | -.017 | 05/22 |
| 568 | 1.2555 | 1.2749 | 1.2545 | .001 | .0204 | .07 | 1.62 | -.0194 | 05/23 |
| 569 | 1.2342 | 1.2539 | 1.2353 | -.0011 | .0186 | -.09 | 1.5 | -.0198 | 05/25 |
| 570 | 1.2464 | 1.2572 | 1.2475 | -.0011 | .0097 | -.09 | .77 | -.0108 | 05/25 |
| 571 | 1.2494 | 1.2664 | 1.2518 | -.0024 | .0146 | -.2 | 1.16 | -.017 | 05/25 |
| 572 | 1.2251 | 1.241 | 1.2245 | .0006 | .0165 | .04 | 1.34 | -.016 | 05/25 |
| 573 | 1.2525 | 1.2655 | 1.2491 | .0034 | .0164 | .27 | 1.31 | -.0131 | 05/25 |
| 574 | 1.2555 | 1.2691 | 1.2501 | .0054 | .019 | .43 | 1.51 | -.0137 | 05/25 |
| 575 | 1.2494 | 1.2619 | 1.2453 | .0041 | .0166 | .32 | 1.33 | -.0126 | 05/26 |
| 576 | 1.2494 | 1.267 | 1.257 | -.0076 | .01 | -.61 | .79 | -.0176 | 05/26 |
| 577 | 1.2555 | 1.2696 | 1.2653 | -.0098 | .0043 | -.78 | .33 | -.0142 | 05/27 |
| 578 | 1.2586 | 1.2688 | 1.2633 | -.0047 | .0055 | -.38 | .43 | -.0103 | 05/27 |
| 579 | 1.2367 | 1.2479 | 1.2411 | -.0044 | .0068 | -.36 | .54 | -.0112 | 05/27 |
| 580 | 1.2555 | 1.2711 | 1.2636 | -.0081 | .0075 | -.65 | .59 | -.0157 | 05/27 |
| 581 | 1.2616 | 1.2709 | 1.2632 | -.0016 | .0077 | -.13 | .6 | -.0093 | 05/28 |
| 582 | 1.2525 | 1.261 | 1.2634 | -.0109 | -.0024 | -.87 | -.19 | -.0085 | 05/28 |
| 583 | 1.2586 | 1.2684 | 1.2645 | -.0059 | .0039 | -.47 | .3 | -.0099 | 05/28 |
| 584 | 1.2555 | 1.2689 | 1.2639 | -.0084 | .005 | -.67 | .39 | -.0135 | 05/28 |
| 585 | 1.2616 | 1.2788 | 1.2664 | -.0048 | .0124 | -.38 | .97 | -.0172 | 05/28 |
| 586 | 1.2068 | 1.2214 | 1.2089 | -.0021 | .0125 | -.18 | 1.03 | -.0147 | 05/29 |
| 587 | 1.2555 | 1.2704 | 1.2541 | .0014 | .0163 | .11 | 1.29 | -.015 | 05/29 |
| 588 | 1.2586 | 1.2779 | 1.2609 | -.0023 | .017 | -.19 | 1.34 | -.0193 | 05/29 |
| 589 | 1.2446 | 1.2586 | 1.2486 | -.004 | .01 | -.33 | .8 | -.014 | 05/29 |
| 590 | 1.2677 | 1.2822 | 1.2674 | .0003 | .0148 | .02 | 1.16 | -.0146 | 05/30 |
| 591 | 1.2799 | 1.2926 | 1.2774 | .0025 | .0152 | .19 | 1.18 | -.0127 | 05/30 |
| 592 | 1.3286 | 1.3385 | 1.3184 | .0102 | .0201 | .77 | 1.52 | -.0099 | 05/30 |
| 593 | 1.3286 | 1.3335 | 1.3184 | .0102 | .0151 | .77 | 1.14 | -.0049 | 05/30 |
| 594 | 1.2251 | 1.2337 | 1.2193 | .0058 | .0144 | .47 | 1.18 | -.0086 | 05/31 |
| 595 | 1.2975 | 1.3083 | 1.2888 | .0087 | .0195 | .67 | 1.51 | -.0108 | 05/31 |
| 596 | 1.2403 | 1.2525 | 1.238 | .0023 | .0145 | .18 | 1.17 | -.0122 | 05/31 |
| 597 | 1.286 | 1.2906 | 1.2752 | .0108 | .0154 | .84 | 1.2 | -.0047 | 06/01 |
| 598 | 1.2951 | 1.3073 | 1.2917 | .0034 | .0156 | .26 | 1.2 | -.0123 | 06/01 |
| 599 | 1.3012 | 1.312 | 1.2993 | .0019 | .0127 | .14 | .97 | -.0108 | 06/02 |
| 600 | 1.2494 | 1.2546 | 1.2445 | .0049 | .0101 | .39 | .81 | -.0053 | 06/02 |
| 601 | 1.3164 | 1.3231 | 1.3048 | .0116 | .0183 | .88 | 1.4 | -.0068 | 06/02 |
| 602 | 1.1855 | 1.1953 | 1.1909 | -.0054 | .0044 | -.46 | .36 | -.0098 | 06/02 |
| 603 | 1.3438 | 1.3784 | 1.3553 | -.0115 | .0231 | -.85 | 1.7 | -.0347 | 06/03 |
| 604 | 1.3377 | 1.3462 | 1.3261 | .0116 | .0201 | .87 | 1.51 | -.0085 | 06/03 |
| 605 | NO SAMPLE | | | | | | | | |
| 606 | 1.1247 | 1.1353 | 1.1207 | .004 | .0146 | .35 | 1.3 | -.0106 | 06/04 |
| 607 | 1.3359 | 1.3066 | 1.3223 | .0136 | -.0157 | 1.02 | -1.19 | .0292 | 06/04 |
| 608 | 1.1898 | 1.1632 | 1.1029 | .0069 | .0197 | .58 | -1.67 | .0265 | 06/04 |

GPW CHECK TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 609 | 1.2543 | 1.2422 | 1.2496 | .0047 | -.0074 | .37 | -.6 | .012 | 06/04 |
| 610 | 1.2513 | 1.2386 | 1.2457 | .0056 | -.0071 | .44 | -.57 | .0126 | 06/04 |
| 611 | 1.2373 | 1.2268 | 1.2345 | .0028 | -.0077 | .22 | -.63 | .0105 | 06/05 |
| 612 | 1.2415 | 1.2298 | 1.2409 | .0006 | -.0111 | .04 | -.9 | .0117 | 06/05 |
| 613 | 1.1995 | 1.1761 | 1.1922 | .0073 | -.0161 | .61 | -1.36 | .0233 | 06/05 |
| 614 | 1.2689 | 1.2523 | 1.2712 | -.0023 | -.0189 | -.19 | -1.49 | .0166 | 06/05 |
| 615 | 1.2847 | 1.2711 | 1.2784 | .0063 | -.0073 | .49 | -.58 | .0135 | 06/06 |
| 616 | 1.2707 | 1.2558 | 1.2646 | .0061 | -.0088 | .48 | -.7 | .0148 | 06/06 |
| 617 | 1.2525 | 1.2398 | 1.2499 | .0026 | -.0101 | .2 | -.81 | .0127 | 06/06 |
| 618 | 1.1703 | 1.1641 | 1.1707 | -.0004 | -.0066 | -.04 | -.57 | .0062 | 06/06 |
| 619 | 1.2008 | 1.189 | 1.2015 | -.0007 | -.0125 | -.06 | -1.05 | .0117 | 06/07 |
| 620 | .8843 | 0 | .8605 | .0238 | 0 | 2.76 | 0 | .0117 | 06/07 |
| 621 | 1.2829 | 1.2656 | 1.2738 | .0091 | -.0082 | .71 | -.65 | .0173 | 06/07 |
| 622 | 1.286 | 1.2699 | 1.2793 | .0067 | -.0094 | .52 | -.74 | .0161 | 06/07 |
| 623 | 1.2787 | 1.2633 | 1.2741 | .0046 | -.0108 | .36 | -.85 | .0153 | 06/08 |
| 624 | 1.2762 | 1.2615 | 1.2686 | .0076 | -.0071 | .59 | -.56 | .0147 | 06/08 |
| 625 | 1.2993 | 1.2706 | 1.2798 | .0195 | -.0092 | 1.52 | -.72 | .0286 | 06/08 |
| 626 | 1.2981 | 1.2703 | 1.2921 | .006 | -.0218 | .46 | -1.69 | .0277 | 06/08 |
| 627 | 1.2981 | 1.2787 | 1.2912 | .0069 | -.0125 | .53 | -.97 | .0193 | 06/08 |
| 628 | 1.2835 | 1.2724 | 1.2806 | .0029 | -.0082 | .22 | -.65 | .0111 | 06/09 |
| 629 | 1.2434 | 1.2087 | 1.2359 | .0075 | -.0272 | .6 | -2.21 | .0347 | 06/09 |
| 630 | 1.2616 | 1.2448 | 1.2554 | .0062 | -.0106 | .49 | -.85 | .0168 | 06/10 |
| 631 | 1.1922 | 1.1741 | 1.1827 | .0095 | -.0086 | .8 | -.73 | .0181 | 06/11 |
| 632 | 1.2008 | 1.1811 | 1.1912 | .0096 | -.0101 | .8 | -.85 | .0196 | 06/11 |
| 633 | 1.2677 | 1.2414 | 1.25 | .0177 | -.0086 | 1.41 | -.69 | .0262 | 06/11 |
| 634 | 1.2555 | 1.2387 | 1.2468 | .0087 | -.0081 | .69 | -.65 | .0167 | 06/11 |
| 635 | 1.2251 | 1.2057 | 1.2142 | .0109 | -.0085 | .89 | -.71 | .0193 | 06/11 |
| 636 | 1.1503 | 1.1388 | 1.1478 | .0025 | -.009 | .21 | -.79 | .0114 | 06/12 |
| 637 | 1.286 | 1.276 | 1.2832 | .0028 | -.0072 | .21 | -.57 | .0099 | 06/12 |
| 638 | 1.1716 | 1.1641 | 1.1734 | -.0018 | -.0093 | -.16 | -.8 | .0075 | 06/12 |
| 639 | 1.1947 | 1.1732 | 1.1866 | .0081 | -.0134 | .68 | -1.13 | .0214 | 06/13 |
| 640 | 1.2981 | 1.2794 | 1.2849 | .0132 | -.0055 | 1.02 | -.43 | .0186 | 06/13 |
| 641 | 1.1399 | 1.1226 | 1.1413 | -.0014 | -.0187 | -.13 | -1.64 | .0173 | 06/14 |
| 642 | 1.0973 | 1.0786 | 1.0962 | .0011 | -.0176 | .1 | -1.61 | .0186 | 06/14 |
| 643 | 1.1034 | 1.084 | 1.1047 | -.0013 | -.0207 | -.12 | -1.88 | .0193 | 06/14 |
| 644 | 1.0967 | 1.0755 | 1.0967 | 0 | -.0212 | 0 | -1.94 | .0212 | 06/15 |
| 645 | 1.1186 | 1.099 | 1.1204 | -.0018 | -.0214 | -.17 | -1.92 | .0196 | 06/16 |
| 646 | 1.2172 | 1.1956 | 1.2163 | .0009 | -.0207 | .07 | -1.71 | .0216 | 06/16 |
| 647 | 1.1892 | 1.1695 | 1.1905 | -.0013 | -.021 | -.11 | -1.77 | .0197 | 06/17 |
| 648 | 1.1886 | 1.1692 | 1.1921 | -.0035 | -.0229 | -.3 | -1.93 | .0193 | 06/17 |
| 649 | 1.1825 | 1.1615 | 1.1829 | -.0004 | -.0214 | -.04 | -1.81 | .021 | 06/17 |
| 650 | 1.1855 | 1.1688 | 1.1894 | -.0039 | -.0206 | -.33 | -1.74 | .0167 | 06/18 |
| 651 | 1.1612 | 1.1422 | 1.1622 | -.001 | -.02 | -.09 | -1.73 | .0189 | 06/19 |
| 652 | 1.1825 | 1.1583 | 1.1776 | .0049 | -.0193 | .41 | -1.64 | .0242 | 06/20 |
| 653 | 1.2525 | 1.2286 | 1.2358 | .0167 | -.0072 | 1.35 | -.59 | .0239 | 06/20 |

GPW CHECK TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 654 | 1.1612 | 1.1369 | 1.1183 | .0429 | .0186 | 3.83 | 1.66 | .0242 | 06/20 |
| 655 | 1.2738 | 1.2604 | 1.2441 | .0297 | .0163 | 2.38 | 1.31 | .0133 | 06/21 |
| 656 | 1.2677 | 1.2378 | 1.2213 | .0464 | .0165 | 3.79 | 1.35 | .0298 | 06/21 |
| 657 | 1.1186 | 1.0983 | 1.0965 | .0221 | .0018 | 2.01 | .16 | .0203 | 06/21 |
| 658 | 1.0638 | 1.0363 | 1.0172 | .0466 | .0191 | 4.58 | 1.87 | .0275 | 06/24 |
| 659 | 1.129 | 1.1049 | 1.1226 | .0064 | -.0177 | .57 | -1.58 | .024 | 06/25 |
| 660 | 1.1703 | 1.1449 | 1.1608 | .0095 | -.0159 | .81 | -1.37 | .0254 | 06/26 |
| 661 | 1.2008 | 1.1773 | 1.2021 | -.0013 | -.0248 | -.11 | -2.07 | .0234 | 06/27 |
| 662 | 1.303 | 1.2761 | 1.2941 | .0089 | -.018 | .68 | -1.4 | .0268 | 06/28 |
| 663 | NO SAMPLE | | | | | | | | |
| 664 | 1.146 | 1.1222 | 1.14 | .006 | -.0178 | .52 | -1.57 | .0238 | 06/29 |
| 665 | 1.2586 | 1.2373 | 1.2523 | .0063 | -.015 | .5 | -1.2 | .0212 | 06/30 |
| 666 | 1.2586 | 1.2373 | 1.2523 | .0063 | -.015 | .5 | -1.2 | .0212 | 06/30 |
| 667 | 1.2799 | 1.2574 | 1.2754 | .0045 | -.018 | .35 | -1.42 | .0225 | 06/30 |
| 668 | 1.2373 | 1.2164 | 1.2322 | .0051 | -.0158 | .41 | -1.29 | .0209 | 06/30 |
| 669 | 1.2361 | 1.2119 | 1.2283 | .0078 | -.0164 | .63 | -1.34 | .0241 | 06/30 |
| 670 | 1.3103 | 1.2667 | 1.2869 | .0234 | -.0202 | 1.81 | -1.57 | .0435 | 06/30 |
| 671 | 1.2616 | 1.2384 | 1.2489 | .0127 | -.0105 | 1.01 | -.85 | .0232 | 07/01 |
| 672 | 1.23 | 1.2398 | 1.2151 | .0149 | .0247 | 1.22 | 2.03 | -.0098 | 07/01 |
| 673 | 1.1947 | 1.1764 | 1.1905 | .0042 | -.0141 | .35 | -1.19 | .0183 | 07/03 |
| 674 | 1.2129 | 1.1612 | 1.0856 | .1273 | .0756 | 11.72 | 6.96 | .0517 | 07/03 |
| 675 | 1.1277 | 1.0876 | 1.1052 | .0225 | -.0176 | 2.03 | -1.6 | .04 | 07/04 |
| 676 | 1.0943 | 1.0554 | 1.0804 | .0139 | -.025 | 1.28 | -2.32 | .0389 | 07/04 |
| 677 | 1.073 | 1.0388 | 1.0638 | .0092 | -.025 | .86 | -2.36 | .0342 | 07/04 |
| 678 | 1.1977 | 1.1566 | 1.1812 | .0165 | -.0246 | 1.39 | -2.09 | .0411 | 07/05 |
| 679 | 1.2263 | 1.1932 | 1.1923 | .034 | .0009 | 2.85 | .07 | .033 | 07/05 |
| 680 | 1.1886 | 1.1413 | 1.1419 | .0467 | -.0006 | 4.08 | -.06 | .0472 | 07/05 |
| 681 | 1.1582 | 1.1263 | 1.1357 | .0225 | -.0094 | 1.98 | -.83 | .0319 | 07/05 |
| 682 | 1.1521 | 1.1125 | 1.1119 | .0402 | .0006 | 3.61 | .05 | .0396 | 07/05 |
| 683 | 1.073 | 1.0371 | 1.0304 | .0426 | .0067 | 4.13 | .65 | .0358 | 07/06 |
| 684 | 1.1004 | 1.0615 | 1.0812 | .0192 | -.0197 | 1.77 | -1.83 | .0389 | 07/06 |
| 685 | 1.146 | 1.1199 | 1.1158 | .0302 | .0041 | 2.7 | .36 | .0261 | 07/06 |
| 686 | 1.2829 | 1.2593 | 1.2805 | .0024 | -.0212 | .18 | -1.66 | .0235 | 07/06 |
| 687 | 1.2397 | 1.2143 | 1.2371 | .0026 | -.0228 | .21 | -1.85 | .0253 | 07/06 |
| 688 | 1.2525 | 1.2258 | 1.2476 | .0049 | -.0218 | .39 | -1.75 | .0267 | 07/07 |
| 689 | 1.1898 | 1.1591 | 1.1823 | .0075 | -.0232 | .63 | -1.97 | .0307 | 07/07 |
| 690 | 1.073 | 1.0514 | 1.0769 | -.0039 | -.0255 | -.37 | -2.37 | .0216 | 07/07 |
| 691 | 1.0352 | 1.0087 | 1.0367 | -.0015 | -.028 | -.15 | -2.71 | .0264 | 07/08 |
| 692 | 1.2342 | 1.2086 | 1.2158 | .0184 | -.0072 | 1.51 | -.6 | .0255 | 07/08 |
| 693 | 1.1247 | 1.0929 | 1.1091 | .0156 | -.0162 | 1.4 | -1.47 | .0318 | 07/09 |
| 694 | 1.2251 | 1.1876 | 1.1918 | .0333 | -.0042 | 2.79 | -.36 | .0375 | 07/10 |
| 695 | 1.2129 | 1.1737 | 1.1893 | .0236 | -.0156 | 1.98 | -1.32 | .0392 | 07/10 |
| 696 | 1.216 | 1.1802 | 1.1944 | .0216 | -.0142 | 1.8 | -1.19 | .0357 | 07/11 |
| 697 | 1.2434 | 1.1892 | 1.2037 | .0397 | -.0145 | 3.29 | -1.21 | .0541 | 07/12 |
| 698 | 1.0791 | 1.0444 | 1.0613 | .0178 | -.0169 | 1.67 | -1.6 | .0346 | 07/13 |

GPW CHECK TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 699 | 1.0882 | 1.0362 | 1.0576 | .0306 | -.0214 | 2.89 | -2.03 | .052 | 07/14 |
| 700 | 1.1886 | 1.1412 | 1.1637 | .0249 | -.0225 | 2.13 | -1.94 | .0473 | 07/15 |
| 701 | 1.1886 | 1.1369 | 1.1603 | .0283 | -.0234 | 2.43 | -2.02 | .0516 | 07/15 |
| 702 | 1.0547 | 1.0198 | 1.0463 | .0084 | -.0265 | .8 | -2.54 | .0348 | 07/16 |
| 703 | 1.1247 | 1.0731 | 1.1075 | .0172 | -.0344 | 1.55 | -3.11 | .0515 | 07/17 |
| 704 | 1.1338 | 1.0754 | 1.1194 | .0144 | -.044 | 1.28 | -3.94 | .0583 | 07/17 |
| 705 | 1.0864 | 1.0318 | 1.0737 | .0127 | -.0419 | 1.18 | -3.91 | .0545 | 07/17 |
| 706 | 1.1886 | 1.1377 | 1.1724 | .0162 | -.0347 | 1.38 | -2.96 | .0508 | 07/18 |
| 707 | 1.0517 | 1.0111 | 1.051 | .0007 | -.0399 | .06 | -3.8 | .0405 | 07/19 |
| 708 | 1.0851 | 1.0408 | 1.0816 | .0035 | -.0408 | .32 | -3.78 | .0442 | 07/20 |
| 709 | 1.143 | 1.0895 | 1.1323 | .0107 | -.0428 | .94 | -3.78 | .0535 | 07/29 |
| 710 | 1.2269 | 1.1875 | 1.2191 | .0078 | -.0316 | .63 | -2.6 | .0393 | 07/20 |
| 711 | 1.1521 | 1.1103 | 1.1447 | .0074 | -.0344 | .64 | -3.01 | .0418 | 07/21 |
| 712 | 1.146 | 1.101 | 1.1376 | .0084 | -.0366 | .73 | -3.22 | .045 | 07/22 |
| 713 | 1.1886 | 1.1492 | 1.1853 | .0033 | -.0361 | .27 | -3.05 | .0393 | 07/22 |
| 714 | 1.2434 | 1.2118 | 1.2438 | -.0004 | -.032 | -.04 | -2.58 | .0315 | 07/22 |
| 715 | 1.2221 | 1.1845 | 1.2231 | -.001 | -.0386 | -.09 | -3.16 | .0376 | 07/22 |
| 716 | 1.1703 | 1.1403 | 1.1744 | -.0041 | -.0341 | -.35 | -2.91 | .03 | 07/22 |
| 717 | 1.1472 | 1.117 | 1.1559 | -.0087 | -.0389 | -.76 | -3.37 | .0301 | 07/22 |
| 718 | 1.1947 | 1.1612 | 1.1963 | -.0016 | -.0351 | -.14 | -2.94 | .0335 | 07/23 |
| 719 | 1.2129 | 1.1818 | 1.2184 | -.0055 | -.0366 | -.46 | -3.01 | .0311 | 07/23 |
| 720 | 1.1612 | 1.1262 | 1.1605 | .0007 | -.0343 | .06 | -2.96 | .0349 | 07/23 |
| 721 | 1.2032 | 1.1623 | 1.1973 | .0059 | -.035 | .49 | -2.93 | .0408 | 07/23 |
| 722 | 1.1722 | 1.144 | 1.179 | -.0068 | -.035 | -.58 | -2.97 | .0282 | 07/23 |
| 723 | 1.1874 | 1.1524 | 1.1855 | .0019 | -.0331 | .16 | -2.8 | .0349 | 07/23 |
| 724 | 1.1764 | 1.1434 | 1.1808 | -.0044 | -.0374 | -.38 | -3.17 | .0329 | 07/24 |
| 725 | 1.1509 | 1.1172 | 1.1564 | -.0055 | -.0392 | -.48 | -3.39 | .0336 | 07/24 |
| 726 | 1.146 | 1.1125 | 1.1516 | -.0056 | -.0391 | -.49 | -3.4 | .0335 | 07/24 |
| 727 | 1.2367 | 1.2036 | 1.2396 | -.0029 | -.036 | -.24 | -2.91 | .033 | 07/24 |
| 728 | 1.0547 | 0 | 1.0687 | -.014 | 0 | -1.32 | 0 | .033 | 07/24 |
| 729 | 1.0541 | 1.0214 | 1.0687 | -.0146 | -.0473 | -1.37 | -4.43 | .0326 | 07/24 |
| 730 | 1.0237 | .9982 | 1.0687 | -.045 | -.0705 | -4.22 | -6.6 | .0254 | 07/25 |
| 731 | 1.0097 | .9869 | 1.0206 | -.0109 | -.0337 | -1.07 | -3.31 | .0228 | 07/25 |
| 732 | 1.0212 | .9979 | 1.0324 | -.0112 | -.0345 | -1.09 | -3.35 | .0233 | 07/25 |
| 733 | 1.0194 | .999 | 1.0336 | -.0142 | -.0346 | -1.38 | -3.35 | .0203 | 07/25 |
| 734 | 1.1107 | 1.0867 | 1.1208 | -.0101 | -.0341 | -.91 | -3.05 | .024 | 07/25 |
| 735 | 1.0365 | .993 | 1.0374 | -.0009 | -.0444 | -.09 | -4.28 | .0435 | 07/25 |
| 736 | 1.0359 | .9978 | 1.0331 | .0028 | -.0353 | .27 | -3.42 | .038 | 07/26 |
| 737 | 1.0486 | 1.01 | 1.0379 | .0107 | -.0279 | 1.03 | -2.69 | .0386 | 07/26 |
| 738 | 1.0474 | .9933 | 1.037 | .0104 | -.0437 | 1 | -4.22 | .054 | 07/26 |
| 739 | 1.1764 | 1.1232 | 1.1558 | .0206 | -.0326 | 1.78 | -2.83 | .0531 | 07/26 |
| 740 | 1.0498 | .9993 | 1.0373 | .0125 | -.038 | 1.2 | -3.67 | .0504 | 07/26 |

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HWW SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 106 | 1.0526 | 1.1334 | 1.0379 | .0147 | .0955 | 1.42 | 9.2 | -.0808 | 04/08 |
| 107 | 1.0526 | 1.1103 | 1.0108 | .0418 | .0995 | 4.14 | 9.84 | -.0577 | 04/09 |
| 108 | 1.1078 | 1.1915 | 1.0877 | .0201 | .1038 | 1.85 | 9.54 | -.0837 | 04/11 |
| 109 | 1.1078 | 1.1911 | 1.0877 | .0201 | .1034 | 1.85 | 9.51 | -.0833 | 04/11 |
| 110 | 1.2368 | 1.313 | 1.197 | .0398 | .116 | 3.32 | 9.69 | -.0762 | 04/12 |
| 111 | 1.3052 | 1.3816 | 1.2589 | .0463 | .1227 | 3.68 | 9.75 | -.0764 | 04/12 |
| 112 | 1.3684 | 1.3746 | 1.2616 | .1068 | .113 | 8.47 | 8.96 | -.0062 | 04/13 |
| 113 | 1.3263 | 1.4076 | 1.2793 | .047 | .1283 | 3.67 | 10.03 | -.0813 | 04/14 |
| 114 | 1.3263 | 1.4089 | 1.3011 | .0252 | .1078 | 1.94 | 8.29 | -.0826 | 04/14 |
| 115 | 1.3263 | 1.3504 | 1.281 | .0453 | .0694 | 3.54 | 5.42 | -.0241 | 04/15 |
| 116 | 1.321 | 1.4026 | 1.2866 | .0344 | .116 | 2.67 | 9.02 | -.0816 | 04/15 |
| 117 | 1.2631 | 1.3414 | 1.2292 | .0339 | .1122 | 2.76 | 9.13 | -.0783 | 04/17 |
| 118 | 1.2736 | 1.3574 | 1.2445 | .0291 | .1129 | 2.34 | 9.07 | -.0838 | 04/17 |
| 119 | 1.2999 | 1.3791 | 1.2624 | .0375 | .1167 | 2.97 | 9.24 | -.0792 | 04/18 |
| 120 | 1.3078 | 1.3921 | 1.2744 | .0334 | .1177 | 2.62 | 9.24 | -.0843 | 04/18 |
| 121 | 1.2894 | 1.3755 | 1.2609 | .0285 | .1146 | 2.26 | 9.09 | -.0861 | 04/19 |
| 122 | 1.2684 | 1.3522 | 1.223 | .0454 | .1292 | 3.71 | 10.56 | -.0838 | 04/19 |
| 123 | 1.2999 | 1.3854 | 1.2633 | .0366 | .1221 | 2.9 | 9.67 | -.0855 | 04/20 |
| 124 | 1.3052 | 1.3975 | 1.2783 | .0269 | .1192 | 2.1 | 9.32 | -.0923 | 04/20 |
| 125 | 1.2947 | 1.3727 | 1.2614 | .0333 | .1113 | 2.64 | 8.82 | -.078 | 04/20 |
| 126 | 1.2842 | 1.368 | 1.2554 | .0288 | .1126 | 2.29 | 8.97 | -.0838 | 04/21 |
| 127 | 1.3052 | 1.3869 | 1.2675 | .0377 | .1194 | 2.97 | 9.42 | -.0817 | 04/21 |
| 128 | 1.2973 | 1.3722 | 1.2663 | .031 | .1059 | 2.45 | 8.36 | -.0749 | 04/21 |
| 129 | 1.2736 | 1.3785 | 1.2649 | .0087 | .1136 | .69 | 8.98 | -.1049 | 04/22 |
| 130 | 1.3026 | 1.3866 | 1.2645 | .0381 | .1221 | 3.01 | 9.66 | -.084 | 04/22 |
| 131 | 1.2831 | 1.3516 | 1.2495 | .0336 | .1021 | 2.69 | 8.17 | -.0685 | 04/22 |
| 132 | 1.2842 | 1.3475 | 1.2544 | .0298 | .0931 | 2.38 | 7.42 | -.0633 | 04/23 |
| 133 | 1.2921 | 1.3611 | 1.2596 | .0325 | .1015 | 2.58 | 8.06 | -.069 | 04/23 |
| 134 | 1.2973 | 1.3547 | 1.264 | .0333 | .0907 | 2.63 | 7.18 | -.0574 | 04/24 |
| 135 | 1.2947 | 1.3604 | 1.2856 | .0091 | .0748 | .71 | 5.82 | -.0657 | 04/25 |
| 136 | 1.2842 | 1.3455 | 1.2518 | .0324 | .0937 | 2.59 | 7.49 | -.0613 | 04/26 |
| 137 | 1.2947 | 1.3571 | 1.2562 | .0385 | .1009 | 3.06 | 8.03 | -.0624 | 04/27 |
| 138 | 1.3052 | 1.3677 | 1.2723 | .0329 | .0954 | 2.59 | 7.5 | -.0625 | 04/28 |
| 139 | 1.3026 | 1.3812 | 1.2728 | .0298 | .1084 | 2.34 | 8.52 | -.0786 | 04/29 |
| 140 | 1.3131 | 1.3907 | 1.276 | .0371 | .1147 | 2.91 | 8.99 | -.0776 | 04/30 |
| 141 | 1.2999 | 1.3844 | 1.2742 | .0257 | .1102 | 2.02 | 8.65 | -.0845 | 04/30 |
| 142 | 1.271 | 1.3445 | 1.2473 | .0237 | .0972 | 1.9 | 7.79 | -.0735 | 05/01 |
| 143 | 1.2789 | 1.3668 | 1.255 | .0239 | .1118 | 1.9 | 8.91 | -.0879 | 05/01 |
| 144 | 1.2684 | 1.3574 | 1.2418 | .0266 | .1156 | 2.14 | 9.31 | -.089 | 05/01 |
| 145 | 1.2499 | 1.3369 | 1.2275 | .0224 | .1094 | 1.82 | 8.91 | -.087 | 05/03 |
| 146 | 1.2657 | 1.3572 | 1.2354 | .0303 | .1218 | 2.45 | 9.86 | -.0915 | 05/04 |
| 147 | 1.2526 | 1.3475 | 1.2301 | .0225 | .1174 | 1.83 | 9.54 | -.0949 | 05/04 |
| 148 | 1.2684 | 1.3597 | 1.2446 | .0238 | .1151 | 1.91 | 9.25 | -.0913 | 05/05 |
| 149 | 1.2526 | 1.3434 | 1.2267 | .0259 | .1167 | 2.11 | 9.51 | -.0908 | 05/06 |

# HWW SAMPLE TANK
# DENSITY MEASUREMENT
# COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 150 | 1.2578 | 1.3447 | 1.2332 | .0246 | .1115 | 1.99 | 9.04 | -.0869 | 05/07 |
| 151 | 1.2578 | 1.3438 | 1.232 | .0258 | .1118 | 2.09 | 9.07 | -.086 | 05/07 |
| 152 | 1.2526 | 1.3412 | 1.2233 | .0293 | .1179 | 2.4 | 9.64 | -.0886 | 05/08 |
| 153 | 1.2184 | 1.3373 | 1.2217 | -.0033 | .1156 | -.27 | 9.46 | -.1189 | 05/09 |
| 154 | 1.2473 | 1.3395 | 1.2155 | .0318 | .124 | 2.62 | 10.2 | -.0922 | 05/10 |
| 155 | 1.2499 | 1.3345 | 1.2211 | .0288 | .1134 | 2.36 | 9.29 | -.0846 | 05/11 |
| 156 | 1.1973 | 1.2908 | 1.176 | .0213 | .1148 | 1.81 | 9.76 | -.0935 | 05/13 |
| 157 | 1.0552 | 1.1447 | 1.0389 | .0163 | .1058 | 1.57 | 10.18 | -.0895 | 05/13 |
| 158 | 1.0526 | 1.1024 | .9998 | .0528 | .1026 | 5.28 | 10.26 | -.0498 | 05/13 |
| 159 | 1.1473 | 1.2282 | 1.1456 | .0017 | .0826 | .15 | 7.21 | -.0809 | 05/21 |
| 160 | 1.2184 | 1.3037 | 1.2212 | -.0028 | .0825 | -.23 | 6.76 | -.0853 | 05/21 |
| 161 | 1.2421 | 1.3272 | 1.2462 | -.0041 | .081 | -.33 | 6.5 | -.0851 | 05/22 |
| 162 | 1.2342 | 1.3113 | 1.2462 | -.012 | .0651 | -.96 | 5.22 | -.0771 | 05/22 |
| 163 | 1.241 | 1.2407 | 1.2413 | -.0003 | -.0006 | -.02 | -.05 | .0003 | 05/22 |
| 164 | 1.2721 | 1.2732 | 1.2309 | .0412 | .0423 | 3.35 | 3.44 | -.0011 | 05/23 |
| 165 | 1.2789 | 1.2802 | 1.2389 | .04 | .0413 | 3.23 | 3.33 | -.0013 | 05/23 |
| 166 | 1.2789 | 1.2853 | 1.2426 | .0363 | .0427 | 2.92 | 3.44 | -.0064 | 05/23 |
| 167 | 1.2921 | 1.2915 | 1.2503 | .0418 | .0412 | 3.34 | 3.3 | .0006 | 05/24 |
| 168 | 1.2815 | 1.2802 | 1.2407 | .0408 | .0395 | 3.29 | 3.18 | .0013 | 05/24 |
| 169 | 1.1657 | 1.1649 | 1.1352 | .0305 | .0297 | 2.69 | 2.62 | .0008 | 05/30 |
| 170 | 1.1815 | 1.1818 | 1.1424 | .0391 | .0394 | 3.42 | 3.45 | -.0003 | 06/01 |
| 171 | 1.1921 | 1.1887 | 1.1548 | .0373 | .0339 | 3.23 | 2.94 | .0034 | 06/02 |
| 172 | 1.2263 | 1.2218 | 1.1832 | .0431 | .0386 | 3.64 | 3.26 | .0045 | 06/03 |
| 173 | 1.2394 | 1.2393 | 1.2001 | .0393 | .0392 | 3.27 | 3.27 | .0001 | 06/04 |
| 174 | 1.2263 | 1.2287 | 1.1837 | .0426 | .045 | 3.6 | 3.8 | -.0024 | 06/05 |
| 175 | 1.2578 | 1.2606 | 1.213 | .0448 | .0476 | 3.69 | 3.92 | -.0028 | 06/06 |
| 176 | 1.2684 | 1.3067 | 1.2274 | .041 | .0793 | 3.34 | 6.46 | -.0383 | 06/06 |
| 177 | 1.271 | 1.3168 | 1.2287 | .0423 | .0881 | 3.44 | 7.17 | -.0458 | 06/07 |
| 178 | 1.2631 | 1.3093 | 1.2225 | .0406 | .0868 | 3.32 | 7.1 | -.0462 | 06/07 |
| 179 | 1.2315 | 1.2733 | 1.1923 | .0392 | .081 | 3.29 | 6.79 | -.0418 | 06/08 |
| 180 | 1.1868 | 1.2301 | 1.1467 | .0401 | .0834 | 3.5 | 7.27 | -.0433 | 06/08 |
| 181 | 1.2289 | 1.2755 | 1.1938 | .0351 | .0817 | 2.94 | 6.84 | -.0466 | 06/09 |
| 182 | 1.2631 | 1.3089 | 1.2269 | .0362 | .082 | 2.95 | 6.68 | -.0458 | 60/97 |
| 183 | 1.271 | 1.3209 | 1.2394 | .0316 | .0815 | 2.55 | 6.58 | -.0499 | 06/09 |
| 184 | 1.2736 | 1.3167 | 1.2298 | .0438 | .0869 | 3.56 | 7.07 | -.0431 | 06/10 |
| 185 | 1.2657 | 1.3038 | 1.2294 | .0363 | .0744 | 2.95 | 6.05 | -.0381 | 06/10 |
| 186 | 1.2578 | 1.3025 | 1.2204 | .0374 | .0821 | 3.06 | 6.73 | -.0447 | 06/11 |
| 187 | 1.2631 | 1.3086 | 1.2242 | .0389 | .0844 | 3.18 | 6.89 | -.0455 | 06/11 |
| 188 | 1.2499 | 1.2966 | 1.2202 | .0297 | .0764 | 2.43 | 6.26 | -.0467 | 06/12 |
| 189 | 1.2684 | 1.3058 | 1.2331 | .0353 | .0727 | 2.86 | 5.9 | -.0374 | 06/12 |
| 190 | 1.2973 | 1.3443 | 1.2552 | .0421 | .0891 | 3.35 | 7.1 | -.047 | 06/13 |
| 191 | 1.2921 | 1.335 | 1.2553 | .0368 | .0797 | 2.93 | 6.35 | -.0429 | 06/13 |
| 192 | 1.2947 | 1.3408 | 1.2541 | .0406 | .0867 | 3.24 | 6.91 | -.0461 | 06/13 |
| 193 | 1.2763 | 1.3175 | 1.2588 | .0175 | .0587 | 1.39 | 4.66 | -.0412 | 06/14 |
| 194 | 1.2921 | 1.3495 | 1.2597 | .0324 | .0898 | 2.57 | 7.13 | -.0574 | 06/14 |

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HWW SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 195 | 1.2789 | 1.344 | 1.2533 | .0256 | .0907 | 2.04 | 7.24 | -.0651 | 06/15 |
| 196 | 1.2789 | 1.339 | 1.2502 | .0287 | .0888 | 2.3 | 7.1 | -.0601 | 06/15 |
| 197 | 1.2815 | 1.3455 | 1.2519 | .0296 | .0936 | 2.36 | 7.48 | -.064 | 06/15 |
| 198 | 1.2868 | 1.3456 | 1.2589 | .0279 | .0867 | 2.22 | 6.89 | -.0588 | 06/16 |
| 199 | 1.2984 | 1.3605 | 1.2691 | .0293 | .0914 | 2.31 | 7.2 | -.0621 | 06/16 |
| 200 | 1.3368 | 1.3891 | 1.3042 | .0326 | .0849 | 2.5 | 6.51 | -.0523 | 06/16 |
| 201 | 1.2447 | 1.2374 | 1.2145 | .0302 | .0229 | 2.49 | 1.89 | .0073 | 06/18 |
| 202 | 1.121 | 1.1235 | 1.0984 | .0226 | .0251 | 2.06 | 2.29 | -.0025 | 06/18 |
| 203 | 1.1236 | 1.1228 | 1.0961 | .0275 | .0267 | 2.51 | 2.44 | .0008 | 06/18 |
| 204 | 1.0721 | 1.0658 | 1.0409 | .0312 | .0249 | 3 | 2.39 | .0063 | 06/18 |
| 205 | 1.1578 | 1.1774 | 1.1262 | .0316 | .0512 | 2.81 | 4.55 | -.0196 | 06/25 |
| 206 | 1.2631 | 1.3262 | 1.2104 | .0527 | .1158 | 4.35 | 9.57 | -.0631 | 06/25 |
| 207 | 1.3315 | 1.3927 | 1.29 | .0415 | .1027 | 3.22 | 7.96 | -.0612 | 06/26 |
| 208 | 1.321 | 1.384 | 1.2863 | .0347 | .0977 | 2.7 | 7.6 | -.063 | 06/27 |
| 209 | 1.3263 | 1.3952 | 1.29 | .0363 | .1052 | 2.81 | 8.16 | -.0689 | 06/27 |
| 210 | 1.2736 | 1.3415 | 1.2446 | .029 | .0969 | 2.33 | 7.79 | -.0679 | 06/28 |
| 211 | 1.2236 | 1.2868 | 1.191 | .0326 | .0958 | 2.74 | 8.04 | -.0632 | 06/28 |
| 212 | 1.2468 | 1.3033 | 1.2117 | .0351 | .0916 | 2.9 | 7.56 | -.0565 | 06/29 |
| 213 | 1.2289 | 1.2972 | 1.1975 | .0314 | .0997 | 2.62 | 8.33 | -.0683 | 06/29 |
| 214 | 1.2631 | 1.3259 | 1.2278 | .0353 | .0981 | 2.88 | 7.99 | -.0628 | 06/29 |
| 215 | 1.2499 | 1.3132 | 1.2113 | .0386 | .1019 | 3.19 | 8.41 | -.0633 | 06/30 |
| 216 | 1.2878 | 1.2837 | 1.2441 | .0437 | .0396 | 3.51 | 3.18 | .0041 | 06/30 |
| 217 | 1.2894 | 1.2863 | 1.2501 | .0393 | .0362 | 3.14 | 2.9 | .0031 | 07/01 |
| 218 | 1.3026 | 1.3036 | 1.2604 | .0422 | .0432 | 3.35 | 3.43 | -.001 | 07/01 |
| 219 | 1.3184 | 1.3156 | 1.275 | .0434 | .0406 | 3.4 | 3.18 | .0028 | 07/01 |
| 220 | 1.321 | 1.3907 | 1.2801 | .0409 | .1106 | 3.2 | 8.64 | -.0697 | 07/02 |
| 221 | 1.3368 | 1.4009 | 1.2924 | .0444 | .1085 | 3.44 | 8.4 | -.0641 | 07/02 |
| 222 | 1.321 | 1.387 | 1.2802 | .0408 | .1068 | 3.19 | 8.34 | -.066 | 07/03 |
| 223 | 1.3236 | 1.3882 | 1.2793 | .0443 | .1089 | 3.46 | 8.51 | -.0646 | 07/03 |
| 224 | 1.3147 | 1.3726 | 1.2739 | .0408 | .0987 | 3.2 | 7.75 | -.0579 | 07/03 |
| 225 | 1.3473 | 1.4102 | 1.3047 | .0426 | .1055 | 3.27 | 8.09 | -.0629 | 07/04 |
| 226 | 1.3147 | 1.3803 | 1.2747 | .04 | .1056 | 3.14 | 8.28 | -.0656 | 07/04 |
| 227 | 1.2499 | 1.3079 | 1.2139 | .036 | .094 | 2.97 | 7.74 | -.058 | 07/05 |
| 228 | 1.2463 | 1.3001 | 1.2027 | .0436 | .0974 | 3.63 | 8.1 | -.0538 | 07/05 |
| 229 | 1.271 | 1.3426 | 1.2376 | .0334 | .105 | 2.7 | 8.48 | -.0716 | 07/06 |
| 230 | 1.2789 | 1.3403 | 1.2391 | .0398 | .1012 | 3.21 | 8.17 | -.0614 | 07/07 |
| 231 | 1.2763 | 1.3356 | 1.2363 | .04 | .0993 | 3.24 | 8.03 | -.0593 | 07/07 |
| 232 | 1.2999 | 1.3612 | 1.2613 | .0386 | .0999 | 3.06 | 7.92 | -.0613 | 07/07 |
| 233 | 1.2894 | 1.3504 | 1.2497 | .0397 | .1007 | 3.18 | 8.06 | -.061 | 07/08 |
| 234 | 1.2684 | 1.3381 | 1.2385 | .0299 | .0996 | 2.41 | 8.04 | -.0697 | 07/08 |
| 235 | 1.271 | 1.3398 | 1.2395 | .0315 | .1003 | 2.54 | 8.09 | -.0688 | 07/08 |
| 236 | 1.2578 | 1.3245 | 1.2228 | .035 | .1017 | 2.86 | 8.32 | -.0667 | 07/09 |
| 237 | 1.2763 | 1.3312 | 1.2382 | .0381 | .093 | 3.08 | 7.51 | -.0549 | 07/09 |
| 238 | 1.2973 | 1.3596 | 1.2607 | .0366 | .0989 | 2.9 | 7.84 | -.0623 | 07/10 |
| 239 | 1.3052 | 1.3682 | 1.2674 | .0378 | .1008 | 2.98 | 7.95 | -.063 | 07/11 |

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HWW SAMPLE TANK
DENSITY MEASUREMENT
COMPARISONS

| BATCH NO | TAYLOR DENS (1) | WESTI DENS (2) | LAB DENS (3) | 1-3 G/ML | 2-3 G/ML | 1-3/3 % | 2-3/3 % | 1-2 G/ML | DATE |
|---|---|---|---|---|---|---|---|---|---|
| 240 | 1.2973 | 1.3041 | 1.267 | .0303 | .0371 | 2.39 | 2.93 | -.0068 | 07/11 |
| 241 | 1.3447 | 1.3993 | 1.3092 | .0355 | .0901 | 2.71 | 6.88 | -.0546 | 07/12 |
| 242 | 1.2868 | 1.3515 | 1.2545 | .0323 | .097 | 2.57 | 7.73 | -.0647 | 07/13 |
| 243 | 1.2842 | 1.3379 | 1.2443 | .0399 | .0936 | 3.21 | 7.52 | -.0537 | 07/14 |
| 244 | 1.2473 | 1.3093 | 1.2159 | .0314 | .0934 | 2.58 | 7.68 | -.062 | 07/15 |
| 245 | 1.2131 | 1.2711 | 1.1787 | .0344 | .0924 | 2.92 | 7.84 | -.058 | 07/16 |
| 246 | 1.2031 | 1.2621 | 1.172 | .0311 | .0901 | 2.65 | 7.69 | -.059 | 07/16 |
| 247 | 1.1921 | 1.2555 | 1.1565 | .0356 | .099 | 3.08 | 8.56 | -.0634 | 07/17 |
| 248 | 1.2026 | 1.1971 | 1.1667 | .0359 | .0304 | 3.08 | 2.61 | .0055 | 07/18 |
| 249 | 1.1631 | 1.1602 | 1.1352 | .0279 | .025 | 2.46 | 2.2 | .0029 | 07/18 |
| 250 | 1.1605 | 1.2228 | 1.1246 | .0359 | .0982 | 3.19 | 8.73 | -.0623 | 07/19 |
| 251 | 1.1973 | 1.255 | 1.1611 | .0362 | .0939 | 3.12 | 8.09 | -.0577 | 07/20 |
| 252 | 1.1315 | 1.1876 | 1.1015 | .03 | .0861 | 2.72 | 7.82 | -.0561 | 07/20 |
| 253 | 1.1157 | 1.1769 | 1.0877 | .028 | .0892 | 2.57 | 8.2 | -.0612 | 07/20 |

INPUT ACCOUNTABILITY TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 128 | 04/03 | 416.2 | 416.2 | 417.8 | -1.6 | -1.6 | 0 | 37.7 | 41 | -3.3 |
| 129 | 04/04 | 407.5 | 407.4 | 409.6 | -2.1 | -2.2 | .1 | 49.6 | 49.1 | .5 |
| 130 | 04/04 | 418.8 | 418.6 | 420.5 | -1.7 | -1.9 | .2 | 68.9 | 69.9 | -1 |
| 131 | 04/07 | 406.5 | 406.5 | 409.6 | -3.1 | -3.1 | 0 | 219.6 | 220.1 | -.5 |
| 132 | 04/08 | 219.6 | 219.7 | 220.1 | -.5 | -.4 | -.1 | 42.8 | 43.7 | -.9 |
| 133 | 04/11 | 298 | 298 | 297.6 | .4 | .4 | 0 | 50.3 | 49.7 | .6 |
| 134 | 04/13 | 338.9 | 338.9 | 341.3 | -2.4 | -2.4 | 0 | 39.2 | 41 | -1.8 |
| 135 | 04/14 | 481.7 | 481.7 | 483.3 | -1.6 | -1.6 | 0 | 108.7 | 108.7 | 0 |
| 136 | 04/15 | 306.9 | 307 | 308.5 | -1.6 | -1.5 | -.1 | 42.6 | 43.7 | -1.1 |
| 137 | 04/15 | 383.5 | 382.1 | 385.5 | -2 | -3.4 | 1.4 | 83.7 | 84.6 | -.9 |
| 138 | 04/15 | 319.3 | 320.9 | 322.2 | -2.9 | -1.3 | -1.6 | 45.7 | 49.1 | -3.4 |
| 139 | 04/16 | 424 | 423.8 | 426 | -2 | -2.2 | .2 | 115.5 | 115.8 | -.3 |
| 140 | 04/17 | 412.4 | 412.4 | 415 | -2.6 | -2.6 | 0 | 123 | 122.9 | .1 |
| 141 | 04/17 | 292.8 | 292.9 | 294.9 | -2.1 | -2 | -.1 | 57.8 | 62.8 | -5 |
| 142 | 04/18 | 347.4 | 347.1 | 347.3 | .1 | -.2 | .3 | 92.9 | 92.8 | .1 |
| 143 | 04/18 | 401.2 | 401.2 | 404.1 | -2.9 | -2.9 | 0 | 179.4 | 207.5 | -28.1 |
| 144 | 04/19 | 464.5 | 464.5 | 464.2 | .3 | .3 | 0 | 170.3 | 169.3 | 1 |
| 145 | 04/19 | 466.2 | 466.1 | 469.6 | -3.4 | -3.5 | .1 | 158.5 | 158.9 | -.4 |
| 146 | 04/19 | 427.3 | 427 | 428.7 | -1.4 | -1.7 | .3 | 164.8 | 166.6 | -1.8 |
| 147 | 04/20 | 439.9 | 439.8 | 442.3 | -2.4 | -2.5 | .1 | 163.2 | 163.8 | -.6 |
| 148 | 04/20 | 427.6 | 427.6 | 430.3 | -2.7 | -2.7 | 0 | 176.5 | 178 | -1.5 |
| 149 | 04/21 | 176.5 | 176.5 | 178 | -1.5 | -1.5 | 0 | 46.1 | 47 | -.9 |
| 150 | 04/21 | 312.6 | 312.5 | 314 | -1.4 | -1.5 | .1 | 45.4 | 46.4 | -1 |
| 151 | 04/21 | 358 | 357.9 | 360.4 | -2.4 | -2.5 | .1 | 46.6 | 49.1 | -2.5 |
| 152 | 04/22 | 316.9 | 315.9 | 316.7 | .2 | -.8 | 1 | 96.2 | 96.7 | -.5 |
| 153 | 04/22 | 370.6 | 370.5 | 371.3 | -.7 | -.8 | .1 | 103 | 103.8 | -.8 |
| 154 | 04/22 | 349.7 | 350 | 350.6 | -.9 | -.6 | -.3 | 111.1 | 112 | -.9 |
| 155 | 04/23 | 356.6 | 356.6 | 358.8 | -2.2 | -2.2 | 0 | 60.7 | 61.2 | -.5 |
| 156 | 04/23 | 318.2 | 318.2 | 316.7 | 1.5 | 1.5 | 0 | 52.2 | 54.6 | -2.4 |
| 157 | 04/23 | 311 | 311 | 313.5 | -2.5 | -2.5 | 0 | 58.9 | 61.7 | -2.8 |
| 158 | 04/24 | 321.7 | 321.7 | 322.2 | -.5 | -.5 | 0 | 50.7 | 51.9 | -1.2 |
| 159 | 04/24 | 295.4 | 295.4 | 296 | -.6 | -.6 | 0 | 45.8 | 46.4 | -.6 |
| 160 | 04/25 | 315.3 | 320.5 | 316.7 | -1.4 | 3.8 | -5.2 | 54.5 | 54.6 | -.1 |
| 161 | 04/25 | 322.8 | 322.8 | 322.2 | .6 | .6 | 0 | 53.9 | 54.6 | -.7 |
| 162 | 04/25 | 305.1 | 306.1 | 305.8 | -.7 | .3 | -1 | 55.3 | 54.6 | .7 |
| 163 | 04/26 | 328.2 | 328.2 | 328.8 | -.6 | -.6 | 0 | 79.7 | 79.2 | .5 |
| 164 | 04/26 | 372.1 | 371.8 | 371.3 | .8 | .5 | .3 | 130.2 | 131.1 | -.9 |
| 165 | 04/27 | 355.1 | 355.1 | 355 | .1 | .1 | 0 | 112 | 110.9 | 1.1 |
| 166 | 04/27 | 388.1 | 387.9 | 390.5 | -2.4 | -2.6 | .2 | 143.6 | 145.3 | -1.7 |
| 167 | 04/27 | 376.6 | 376.5 | 376.8 | -.2 | -.3 | .1 | 121.1 | 120.1 | 1 |
| 168 | 04/28 | 456.2 | 456.3 | 458.7 | -2.5 | -2.4 | -.1 | 168.5 | 174.8 | -6.3 |
| 169 | 04/28 | 302.8 | 302.8 | 302.5 | .3 | .3 | 0 | 71.9 | 72.1 | -.2 |
| 170 | 04/28 | 337.4 | 337.4 | 338.6 | -1.2 | -1.2 | 0 | 53.6 | 54.6 | -1 |
| 171 | 04/29 | 349.7 | 349.7 | 352.2 | -2.5 | -2.5 | 0 | 78.4 | 84.6 | -6.2 |

# INPUT ACCOUNTABILITY TANK
## LEVEL MEASUREMENT
## COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | AFTER SAMPLE BACKUP LEVEL (2) | AFTER SAMPLE TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | AFTER TRANSFER TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 172 | 04/29 | 336.5 | 336.5 | 336.4 | .1 | .1 | 0 | 113.4 | 114.7 | -1.3 |
| 173 | 04/30 | 418.2 | 418.2 | 393.2 | 25 | 25 | 0 | 174.7 | 177.5 | -2.8 |
| 174 | 04/30 | 416.5 | 416.4 | 417.8 | -1.3 | -1.4 | .1 | 164.4 | 163.8 | .6 |
| 175 | 04/30 | 403 | 403 | 404.1 | -1.1 | -1.1 | 0 | 124.8 | 125.6 | -.8 |
| 176 | 04/30 | 421.5 | 421.6 | 422.1 | -.6 | -.5 | -.1 | 140.6 | 142 | -1.4 |
| 177 | 05/01 | 386.9 | 386.9 | 387.7 | -.8 | -.8 | 0 | 111.6 | 112 | -.4 |
| 178 | 05/01 | 371.3 | 371.3 | 371.3 | 0 | 0 | 0 | 99.6 | 98.3 | 1.3 |
| 179 | 05/01 | 423.4 | 423.5 | 423.2 | .2 | .3 | -.1 | 130 | 131.1 | -1.1 |
| 180 | 05/02 | 405.4 | 405.5 | 404.1 | 1.3 | 1.4 | -.1 | 130.9 | 131.1 | -.2 |
| 181 | 05/02 | 378.1 | 378 | 376.8 | 1.3 | 1.2 | .1 | 78.4 | 80.3 | -1.9 |
| 182 | 05/02 | 347.1 | 347.1 | 349.5 | -2.4 | -2.4 | 0 | 51.5 | 54.6 | -3.1 |
| 183 | 05/03 | 309.7 | 309.8 | 311.3 | -1.6 | -1.5 | -.1 | 48.2 | 49.1 | -.9 |
| 184 | 05/03 | 291.8 | 291.7 | 293.3 | -1.5 | -1.6 | .1 | 42.1 | 44.2 | -2.1 |
| 185 | 05/04 | 314.5 | 314.5 | 316.7 | -2.2 | -2.2 | 0 | 40.6 | 42.6 | -2 |
| 186 | 05/04 | 268 | 268.1 | 270.3 | -2.3 | -2.2 | -.1 | 42.6 | 45.3 | -2.7 |
| 187 | 05/04 | 295.2 | 295.2 | 294.9 | .3 | .3 | 0 | 40.8 | 43.1 | -2.3 |
| 188 | 05/05 | 310.1 | 310.1 | 314 | -3.9 | -3.9 | 0 | 58.5 | 60.1 | -1.6 |
| 189 | 05/05 | 362.1 | 362.1 | 362.1 | 0 | 0 | 0 | 143.2 | 143.6 | -.4 |
| 190 | 05/05 | 421.8 | 421.8 | 421.6 | .2 | .2 | 0 | 135 | 137.1 | -2.1 |
| 191 | 05/05 | 395.4 | 395.4 | 396.5 | -1.1 | -1.1 | 0 | 143.6 | 144.7 | -1.1 |
| 192 | 05/06 | 441 | 440.9 | 442.3 | -1.3 | -1.4 | .1 | 161.2 | 163.8 | -2.6 |
| 193 | 05/06 | 379.4 | 379.4 | 381.2 | -1.8 | -1.8 | 0 | 88.7 | 89 | -.3 |
| 194 | 05/07 | 384.3 | 384.3 | 385.5 | -1.2 | -1.2 | 0 | 98.9 | 99.9 | -1 |
| 195 | 05/07 | 406.9 | 406.9 | 406.8 | .1 | .1 | 0 | 113.6 | 114.7 | -1.1 |
| 196 | 05/07 | 311 | 310.9 | 311.3 | -.3 | -.4 | .1 | 43.2 | 46.4 | -3.2 |
| 197 | 05/08 | 328.5 | 328.5 | 330.9 | -2.4 | -2.4 | 0 | 41.2 | 44.8 | -3.6 |
| 198 | 05/08 | 340 | 340.1 | 343.5 | -3.5 | -3.4 | -.1 | 60.8 | 62.8 | -2 |
| 199 | 05/08 | 298.4 | 298.5 | 300.4 | -2 | -1.9 | -.1 | 40.7 | 43.7 | -3 |
| 200 | 05/09 | 340.7 | 340.7 | 343 | -2.3 | -2.3 | 0 | 247.4 | 250.1 | -2.7 |
| 201 | 05/09 | 426.7 | 426.8 | 483.3 | -56.6 | -56.5 | -.1 | 100.8 | 101 | -.2 |
| 202 | 05/09 | 418.4 | 418.3 | 420.5 | -2.1 | -2.2 | .1 | 78.2 | 79.2 | -1 |
| 203 | 05/10 | 338.9 | 338.9 | 340.2 | -1.3 | -1.3 | 0 | 145.1 | 152.9 | -7.8 |
| 204 | 05/10 | 145.1 | 145.2 | 152.9 | -7.8 | -7.7 | -.1 | 40.3 | 43.7 | -3.4 |
| 205 | 05/14 | 349.9 | 350 | 353.9 | -4 | -3.9 | -.1 | 103.3 | 103.8 | -.5 |
| 206 | 05/20 | 403 | 403 | 405.8 | -2.8 | -2.8 | 0 | 114.2 | 115.8 | -1.6 |
| 207 | 05/21 | 434.2 | 434.3 | 436.9 | -2.7 | -2.6 | -.1 | 107.9 | 109.2 | -1.3 |
| 208 | 05/21 | 453.6 | 453.5 | 456 | -2.4 | -2.5 | .1 | 126.3 | 127.8 | -1.5 |
| 209 | 05/21 | 411.4 | 411.4 | 413.9 | -2.5 | -2.5 | 0 | 122.9 | 125.6 | -2.7 |
| 210 | 05/22 | 424.3 | 424.3 | 426 | -1.7 | -1.7 | 0 | 133.5 | 136.5 | -3 |
| 211 | 05/22 | 368.1 | 368.1 | 370.3 | -2.2 | -2.2 | 0 | 65.8 | 68.3 | -2.5 |
| 212 | 05/23 | 367.9 | 367.9 | 371.3 | -3.4 | -3.4 | 0 | 52 | 54.6 | -2.6 |
| 213 | 05/23 | 334.9 | 334.9 | 338.6 | -3.7 | -3.7 | 0 | 50.6 | 53.5 | -2.9 |
| 214 | 05/23 | 309.6 | 309.5 | 311.3 | -1.7 | -1.8 | .1 | 48.8 | 50.2 | -1.4 |
| 215 | 05/24 | 286.4 | 286.4 | 289.4 | -3 | -3 | 0 | 50.8 | 54.1 | -3.3 |
| 216 | 05/24 | 300.9 | 300.9 | 300.9 | 0 | 0 | 0 | 80.8 | 81.9 | -1.1 |

# INPUT ACCOUNTABILITY TANK
# LEVEL MEASUREMENT
# COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 217 | 05/25 | 321.2 | 321.1 | 322.7 | -1.5 | -1.6 | .1 | 42.5 | 47 | -4.5 |
| 218 | 05/25 | 348.1 | 348.1 | 349.5 | -1.4 | -1.4 | 0 | 41 | 45.3 | -4.3 |
| 219 | 05/25 | 344.5 | 344.5 | 346.8 | -2.3 | -2.3 | 0 | 51.9 | 54.6 | -2.7 |
| 220 | 05/26 | 299.7 | 299.8 | 300.4 | -.7 | -.6 | -.1 | 47.3 | 49.1 | -1.8 |
| 221 | 05/26 | 289.3 | 289.3 | 292.7 | -3.4 | -3.4 | 0 | 45 | 49.1 | -4.1 |
| 222 | 05/26 | 384.3 | 384.3 | 387.7 | -3.4 | -3.4 | 0 | 68.9 | 71 | -2.1 |
| 223 | 05/27 | 338.1 | 338.1 | 341.3 | -3.2 | -3.2 | 0 | 51.3 | 54.6 | -3.3 |
| 224 | 05/27 | 308.3 | 308.3 | 311.3 | -3 | -3 | 0 | 45.6 | 48.1 | -2.5 |
| 225 | 05/27 | 350.1 | 350.1 | 352.2 | -2.1 | -2.1 | 0 | 42.5 | 45.3 | -2.8 |
| 226 | 05/28 | 306.1 | 306.1 | 308.5 | -2.4 | -2.4 | 0 | 48.2 | 49.1 | -.9 |
| 227 | 05/28 | 304.2 | 304.1 | 305.8 | -1.6 | -1.7 | .1 | 45.6 | 47 | -1.4 |
| 228 | 05/28 | 354.7 | 354.7 | 356.1 | -1.4 | -1.4 | 0 | 48.7 | 51.9 | -3.2 |
| 229 | 05/29 | 329.3 | 329.3 | 330.4 | -1.1 | -1.1 | 0 | 46.8 | 49.1 | -2.3 |
| 230 | 05/29 | 288.9 | 288.9 | 292.2 | -3.3 | -3.3 | 0 | 40.6 | 44.8 | -4.2 |
| 231 | 05/30 | 334.9 | 334.9 | 338.6 | -3.7 | -3.7 | 0 | 43.4 | 49.1 | -5.7 |
| 232 | 05/30 | 294.4 | 294.5 | 294.9 | -.5 | -.4 | -.1 | 47.5 | 50.2 | -2.7 |
| 233 | 05/30 | 375 | 375.2 | 376.8 | -1.8 | -1.6 | -.2 | 42.9 | 44.2 | -1.3 |
| 234 | 05/31 | 316 | 316.3 | 318.9 | -2.9 | -2.6 | -.3 | 45.4 | 46.4 | -1 |
| 235 | 06/01 | 295.1 | 295.1 | 297.6 | -2.5 | -2.5 | 0 | 42.5 | 48.1 | -5.6 |
| 236 | 06/01 | 327.6 | 327.5 | 333.1 | -5.5 | -5.6 | .1 | 46.4 | 49.1 | -2.7 |
| 237 | 06/02 | 327.4 | 327.3 | 329.3 | -1.9 | -2 | .1 | 47.5 | 49.1 | -1.6 |
| 238 | 06/03 | 331.1 | 331.1 | 333.1 | -2 | -2 | 0 | 45.3 | 49.1 | -3.8 |
| 239 | 06/03 | 306.1 | 306.1 | 306.9 | -.8 | -.8 | 0 | 45.5 | 48.6 | -3.1 |
| 240 | 06/04 | 321.9 | 321.9 | 325.5 | -3.6 | -3.6 | 0 | 43.3 | 48.1 | -4.8 |
| 241 | 06/04 | 341.4 | 341.4 | 341.3 | .1 | .1 | 0 | 48.6 | 49.1 | -.5 |
| 242 | 06/04 | 334.6 | 334.5 | 338.6 | -4 | -4.1 | .1 | 46.6 | 49.1 | -2.5 |
| 243 | 06/05 | 359.1 | 359.1 | 360.4 | -1.3 | -1.3 | 0 | 48.8 | 49.1 | -.3 |
| 244 | 06/05 | 308.2 | 308.2 | 311.3 | -3.1 | -3.1 | 0 | 47.4 | 48.6 | -1.2 |
| 245 | 06/06 | 345.2 | 345.2 | 346.8 | -1.6 | -1.6 | 0 | 50.3 | 50.2 | .1 |
| 246 | 06/06 | 356.8 | 356.8 | 355 | 1.8 | 1.8 | 0 | 56.2 | 54.1 | 2.1 |
| 247 | 06/06 | 339.7 | 339.7 | 339.7 | 0 | 0 | 0 | 49.4 | 49.1 | .3 |
| 248 | 06/07 | 339.8 | 339.7 | 341.3 | -1.5 | -1.6 | .1 | 49.8 | 50.8 | -1 |
| 249 | 06/07 | 355.6 | 355.6 | 355 | .6 | .6 | 0 | 45.3 | 46.4 | -1.1 |
| 250 | 06/07 | 317.1 | 317.1 | 319.5 | -2.4 | -2.4 | 0 | 46.1 | 49.1 | -3 |
| 251 | 06/08 | 347.2 | 347.1 | 349.5 | -2.3 | -2.4 | .1 | 50.2 | 54.6 | -4.4 |
| 252 | 06/09 | 357.2 | 357.2 | 360.4 | -3.2 | -3.2 | 0 | 51.7 | 54.6 | -2.9 |
| 253 | 06/09 | 365.5 | 365.5 | 367 | -1.5 | -1.5 | 0 | 49.6 | 51.9 | -2.3 |
| 254 | 06/09 | 329.4 | 329.4 | 332 | -2.6 | -2.6 | 0 | 47.6 | 49.1 | -1.5 |
| 255 | 06/10 | 331 | 331 | 333.1 | -2.1 | -2.1 | 0 | 42.7 | 48.1 | -5.4 |
| 256 | 06/10 | 333.5 | 333.5 | 334.8 | -1.3 | -1.3 | 0 | 50.4 | 54.6 | -4.2 |
| 257 | 06/10 | 326.2 | 326.2 | 324.9 | 1.3 | 1.3 | 0 | 42.4 | 48.1 | -5.7 |
| 258 | 06/11 | 345.1 | 345.1 | 349.5 | -4.4 | -4.4 | 0 | 46.1 | 48.1 | -2 |
| 259 | 06/11 | 345.6 | 345.6 | 349.5 | -3.9 | -3.9 | 0 | 43 | 48.1 | -5.1 |
| 260 | 06/12 | 337.1 | 337.2 | 338.6 | -1.5 | -1.4 | -.1 | 46.1 | 47.5 | -1.4 |
| 261 | 06/12 | 331.2 | 331.2 | 333.1 | -1.9 | -1.9 | 0 | 42.5 | 47.5 | -5 |

INPUT ACCOUNTABILITY TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 262 | 06/13 | 302.6 | 302.6 | 305.8 | -3.2 | -3.2 | 0 | 41.5 | 46.4 | -4.9 |
| 263 | 06/13 | 362.9 | 362.8 | 365.9 | -3 | -3.1 | .1 | 43.4 | 48.6 | -5.2 |
| 264 | 06/13 | 339.8 | 339.7 | 342.4 | -2.6 | -2.7 | .1 | 49 | 51.3 | -2.3 |
| 265 | 06/14 | 358.3 | 358.2 | 360.4 | -2.1 | -2.2 | .1 | 43.2 | 46.4 | -3.2 |
| 266 | 06/14 | 346.6 | 346.4 | 349.5 | -2.9 | -3.1 | .2 | 49.3 | 50.8 | -1.5 |
| 267 | 06/15 | 341.5 | 341.5 | 344 | -2.5 | -2.5 | 0 | 49.7 | 50.8 | -1.1 |
| 268 | 06/15 | 362.5 | 362.4 | 365.9 | -3.4 | -3.5 | .1 | 87.2 | 90.1 | -2.9 |
| 269 | 06/16 | 433.2 | 432.9 | 436.9 | -3.7 | -4 | .3 | 45.6 | 49.1 | -3.5 |
| 270 | 06/16 | 439.1 | 438.5 | 442.3 | -3.2 | -3.8 | .6 | 297.4 | 302 | -4.6 |
| 271 | 06/19 | 328.8 | 328 | 331.5 | -2.7 | -3.5 | .8 | 328.8 | 331.5 | -2.7 |
| 272 | 06/22 | 329 | 329 | 330.4 | -1.4 | -1.4 | 0 | 201.1 | 202.1 | -1 |
| 273 | 06/26 | 201.1 | 201.1 | 202.1 | -1 | -1 | 0 | 42.2 | 46.4 | -4.2 |
| 274 | 06/26 | 338.5 | 338.5 | 338.6 | -.1 | -.1 | 0 | 47.6 | 49.1 | -1.5 |
| 275 | 06/26 | 408.5 | 408.5 | 409.6 | -1.1 | -1.1 | 0 | 59.4 | 62.8 | -3.4 |
| 276 | 06/27 | 395.1 | 395.1 | 398.7 | -3.6 | -3.6 | 0 | 49.4 | 51.9 | -2.5 |
| 277 | 06/27 | 336 | 336 | 338.6 | -2.6 | -2.6 | 0 | 40.1 | 43.7 | -3.6 |
| 278 | 06/17 | 348.3 | 348.3 | 350.1 | -1.8 | -1.8 | 0 | 42.2 | 44.2 | -2 |
| 279 | 06/28 | 322.5 | 322.5 | 326.6 | -4.1 | -4.1 | 0 | 42.9 | 43.7 | -.8 |
| 280 | 06/29 | 366.8 | 366.8 | 371.3 | -4.5 | -4.5 | 0 | 48.9 | 49.1 | -.2 |
| 281 | 06/29 | 275.6 | 275.6 | 276.9 | -1.3 | -1.3 | 0 | 39.4 | 42 | -2.6 |
| 282 | 06/30 | 325.6 | 325.6 | 327.7 | -2.1 | -2.1 | 0 | 49.9 | 51.3 | -1.4 |
| 283 | 06/30 | 432.2 | 432.2 | 435.8 | -3.6 | -3.6 | 0 | 50.3 | 54.1 | -3.8 |
| 284 | 06/30 | 369.9 | 369.9 | 371.3 | -1.4 | -1.4 | 0 | 42.6 | 45.3 | -2.7 |
| 285 | 06/30 | 286.7 | 286.7 | 288.3 | -1.6 | -1.6 | 0 | 48.7 | 50.2 | -1.5 |
| 286 | 07/01 | 347.6 | 347.5 | 349.5 | -1.9 | -2 | .1 | 49.7 | 51.9 | -2.2 |
| 287 | 07/01 | 366.1 | 366 | 367 | -.9 | -1 | .1 | 41.1 | 42.6 | -1.5 |
| 288 | 07/02 | 319.3 | 319.3 | 321.7 | -2.4 | -2.4 | 0 | 46.9 | 49.1 | -2.2 |
| 289 | 07/02 | 397.4 | 397.4 | 398.7 | -1.3 | -1.3 | 0 | 51.4 | 53 | -1.6 |
| 290 | 07/02 | 362 | 362 | 365.3 | -3.3 | -3.3 | 0 | 47.4 | 49.1 | -1.7 |
| 291 | 07/02 | 384.9 | 384.9 | 387.7 | -2.8 | -2.8 | 0 | 47.2 | 49.7 | -2.5 |
| 292 | 07/03 | 435.5 | 435.5 | 437.4 | -1.9 | -1.9 | 0 | 51.1 | 54.6 | -3.5 |
| 293 | 07/05 | 390.3 | 390.3 | 392.1 | -1.8 | -1.8 | 0 | 49.8 | 51.3 | -1.5 |
| 294 | 07/05 | 352.9 | 352.9 | 355 | -2.1 | -2.1 | 0 | 42 | 43.7 | -1.7 |
| 295 | 07/06 | 350.6 | 350.5 | 353.3 | -2.7 | -2.8 | .1 | 49.5 | 50.8 | -1.3 |
| 296 | 07/06 | 360.2 | 360.1 | 360.4 | -.2 | -.3 | .1 | 38.7 | 39.3 | -.6 |
| 297 | 07/06 | 355.2 | 355.2 | 356.1 | -.9 | -.9 | 0 | 41 | 43.7 | -2.7 |
| 298 | 07/07 | 363.2 | 363.1 | 361.5 | 1.7 | 1.6 | .1 | 39.8 | 41.5 | -1.7 |
| 299 | 07/07 | 332.6 | 332.6 | 333.1 | -.5 | -.5 | 0 | 41.3 | 44.2 | -2.9 |
| 300 | 07/07 | 385.1 | 385.1 | 387.7 | -2.6 | -2.6 | 0 | 51.1 | 51.9 | -.8 |
| 301 | 07/08 | 362.8 | 362.7 | 363.2 | -.4 | -.5 | .1 | 42.3 | 44.8 | -2.5 |
| 302 | 07/08 | 347.1 | 347.1 | 349.5 | -2.4 | -2.4 | 0 | 42.3 | 43.7 | -1.4 |
| 303 | 07/08 | 353.1 | 353 | 355 | -1.9 | -2 | .1 | 42.2 | 44.8 | -2.6 |
| 304 | 07/09 | 332.8 | 332.7 | 327.7 | 5.1 | 5 | .1 | 50 | 50.8 | -.8 |
| 305 | 07/09 | 347.8 | 347.8 | 349.5 | -1.7 | -1.7 | 0 | 42.6 | 44.2 | -1.6 |
| 306 | 07/09 | 330.8 | 330.8 | 332 | -1.2 | -1.2 | 0 | 49.1 | 49.1 | 0 |

# INPUT ACCOUNTABILITY TANK
# LEVEL MEASUREMENT
# COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 307 | 07/10 | 349.9 | 349.9 | 352.2 | -2.3 | -2.3 | 0 | 42.1 | 44.8 | -2.7 |
| 308 | 07/10 | 348.9 | 348.9 | 349.5 | -.6 | -.6 | 0 | 46.4 | 46.4 | 0 |
| 309 | 07/10 | 359.5 | 359.5 | 360.4 | -.9 | -.9 | 0 | 60.9 | 62.8 | -1.9 |
| 310 | 07/11 | 366.7 | 366.6 | 369.7 | -3 | -3.1 | .1 | 50.6 | 53 | -2.4 |
| 311 | 07/12 | 137 | 136.9 | 136.5 | .5 | .4 | .1 | 2.1 | 4.4 | -2.3 |
| 312 | 07/13 | 93.6 | 93.7 | 95.6 | -2 | -1.9 | -.1 | 28.7 | 32.8 | -4.1 |
| 313 | 07/15 | 338.1 | 338.1 | 339.7 | -1.6 | -1.6 | 0 | 27.3 | 28.9 | -1.6 |
| 314 | 07/16 | 226.1 | 226.1 | 226.6 | -.5 | -.5 | 0 | 28.2 | 28.9 | -.7 |
| 315 | 07/16 | 136.4 | 136.5 | 137.1 | -.7 | -.6 | -.1 | 24 | 26.2 | -2.2 |

31-Oct-79 02:33 PM

U PRODUCT SAMPLE TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 04/11 | 221.2 | 221.3 | 221.2 | 0 | .1 | -.1 | 117.5 | 119.2 | -1.7 |
| 3 | 04/12 | 266.4 | 266.4 | 263.5 | 2.9 | 2.9 | 0 | 111.6 | 107.6 | 4 |
| 4 | 04/13 | 268.3 | 268 | 264.2 | 4.1 | 3.8 | .3 | 23.5 | 18.8 | 4.7 |
| 5 | 04/14 | 224.4 | 225.7 | 217.3 | 7.1 | 8.4 | -1.3 | 117 | 122.2 | -5.2 |
| 6 | 04/15 | 235.5 | 238.5 | 231.1 | 4.4 | 7.4 | -3 | 54.2 | 49.5 | 4.7 |
| 7 | 04/15 | 228.6 | 229 | 224.5 | 4.1 | 4.5 | -.4 | 99.7 | 95.8 | 3.9 |
| 8 | 04/15 | 238.1 | 238 | 234.4 | 3.7 | 3.6 | .1 | 30.2 | 26.4 | 3.8 |
| 9 | 04/16 | 188.7 | 188.5 | 184.6 | 4.1 | 3.9 | .2 | 24.5 | 20.8 | 3.7 |
| 10 | 04/17 | 159.7 | 159.4 | 155.2 | 4.5 | 4.2 | .3 | 67.4 | 62.7 | 4.7 |
| 11 | 04/18 | 221.7 | 221.6 | 217.9 | 3.8 | 3.7 | .1 | 65.2 | 61.1 | 4.1 |
| 12 | 04/18 | 231.9 | 231.8 | 227.8 | 4.1 | 4 | .1 | 65.1 | 60.4 | 4.7 |
| 13 | 04/19 | 230.8 | 230.7 | 227.8 | 3 | 2.9 | .1 | 76.5 | 72.6 | 3.9 |
| 14 | 04/19 | 225.5 | 225.4 | 221.2 | 4.3 | 4.2 | .1 | 65.1 | 60.8 | 4.3 |
| 15 | 04/19 | 210.4 | 209.6 | 206.7 | 3.7 | 2.9 | .8 | 65.1 | 61.1 | 4 |
| 16 | 04/20 | 213.9 | 212.9 | 209.7 | 4.2 | 3.2 | 1 | 65.1 | 59.4 | 5.7 |
| 17 | 04/20 | 208.6 | 203.2 | 204.7 | 3.9 | -1.5 | 5.4 | 63.1 | 58.8 | 4.3 |
| 18 | 04/21 | 209 | 208.9 | 205.1 | 3.9 | 3.8 | .1 | 61.1 | 61.1 | 0 |
| 19 | 04/21 | 233.8 | 236.3 | 229.5 | 4.3 | 6.8 | -2.5 | 65.1 | 59.4 | 5.7 |
| 20 | 04/21 | 210.6 | 212.8 | 206.4 | 4.2 | 6.4 | -2.2 | 61.5 | 57.8 | 3.7 |
| 21 | 04/22 | 211.7 | 210.6 | 205.7 | 6 | 4.9 | 1.1 | 63.9 | 59.4 | 4.5 |
| 22 | 04/21 | 200.3 | 199.2 | 194.8 | 5.5 | 4.4 | 1.1 | 64.2 | 59.4 | 4.8 |
| 23 | 04/22 | 197.1 | 197 | 191.5 | 5.6 | 5.5 | .1 | 64.4 | 59.4 | 5 |
| 24 | 04/23 | 203.9 | 203.4 | 199.8 | 4.1 | 3.6 | .5 | 65.5 | 62.1 | 3.4 |
| 25 | 04/23 | 200.8 | 202.2 | 195.8 | 5 | 6.4 | -1.4 | 51 | 46.2 | 4.8 |
| 26 | 04/24 | 207.2 | 207.2 | 202.7 | 4.5 | 4.5 | 0 | 65.4 | 61.4 | 4 |
| 27 | 04/24 | 197.3 | 196 | 191.5 | 5.8 | 4.5 | 1.3 | 66.4 | 62.7 | 3.7 |
| 28 | 04/24 | 210.9 | 210.8 | 206.4 | 4.5 | 4.4 | .1 | 65.3 | 60.8 | 4.5 |
| 29 | 04/25 | 210.8 | 210.5 | 205.1 | 5.7 | 5.4 | .3 | 65.9 | 61.1 | 4.8 |
| 30 | 04/25 | 201.2 | 203.3 | 198.1 | 3.1 | 5.2 | -2.1 | 65.4 | 61.1 | 4.3 |
| 31 | 04/25 | 212.4 | 212.4 | 208 | 4.4 | 4.4 | 0 | 65.2 | 60.1 | 5.1 |
| 32 | 04/26 | 223.4 | 223.3 | 219.3 | 4.1 | 4 | .1 | 65.2 | 61.1 | 4.1 |
| 33 | 04/27 | 187 | 187 | 181.6 | 5.4 | 5.4 | 0 | 65 | 61.1 | 3.9 |
| 34 | 04/27 | 215 | 214.9 | 209.7 | 5.3 | 5.2 | .1 | 65.2 | 59.8 | 5.4 |
| 35 | 04/27 | 223 | 223 | 217.9 | 5.1 | 5.1 | 0 | 97.9 | 92.5 | 5.4 |
| 36 | 04/28 | 246 | 245.9 | 242.7 | 3.3 | 3.2 | .1 | 65.3 | 59.4 | 5.9 |
| 37 | 04/28 | 209 | 209 | 205.7 | 3.3 | 3.3 | 0 | 65.4 | 61.1 | 4.3 |
| 38 | 04/28 | 225.4 | 225.4 | 221.2 | 4.2 | 4.2 | 0 | 65.4 | 60.1 | 5.3 |
| 39 | 04/29 | 204.7 | 205 | 201.4 | 3.3 | 3.6 | -.3 | 65.4 | 55.5 | 9.9 |
| 40 | 04/29 | 230.1 | 230.1 | 225.2 | 4.9 | 4.9 | 0 | 65.2 | 60.8 | 4.4 |
| 41 | 04/30 | 214.4 | 214.5 | 211.3 | 3.1 | 3.2 | -.1 | 83.9 | 79.2 | 4.7 |
| 42 | 04/30 | 194.2 | 193.9 | 189.2 | 5 | 4.7 | .3 | 65.1 | 59.4 | 5.7 |
| 43 | 04/30 | 225.8 | 226 | 221.2 | 4.6 | 4.8 | -.2 | 65.2 | 61.7 | 3.5 |
| 44 | 05/01 | 198.4 | 198.9 | 194.8 | 3.6 | 4.1 | -.5 | 65.2 | 61.1 | 4.1 |
| 45 | 05/01 | 205.8 | 206.2 | 201.4 | 4.4 | 4.8 | -.4 | 65.3 | 59.4 | 5.9 |

# U PRODUCT SAMPLE TANK
## LEVEL MEASUREMENT
## COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | AFTER SAMPLE BACKUP LEVEL (2) | AFTER SAMPLE TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | AFTER TRANSFER TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 05/01 | 240.5 | 240.5 | 236.1 | 4.4 | 4.4 | 0 | 65.5 | 61.7 | 3.8 |
| 47 | 05/02 | 214 | 213.9 | 209.7 | 4.3 | 4.2 | .1 | 65.2 | 61.1 | 4.1 |
| 48 | 05/02 | 198.6 | 198.5 | 194.8 | 3.8 | 3.7 | .1 | 65 | 61.1 | 3.9 |
| 49 | 05/02 | 210.2 | 210.2 | 204.7 | 5.5 | 5.5 | 0 | 65 | 60.1 | 4.9 |
| 50 | 05/03 | 204.6 | 205 | 201.4 | 3.2 | 3.6 | -.4 | 65.1 | 61.1 | 4 |
| 51 | 05/03 | 196.6 | 196.3 | 191.5 | 5.1 | 4.8 | .3 | 65.1 | 59.4 | 5.7 |
| 52 | 05/03 | 212.4 | 212.4 | 208 | 4.4 | 4.4 | 0 | 65.2 | 61.4 | 3.8 |
| 53 | 05/04 | 187.1 | 187 | 181.6 | 5.5 | 5.4 | .1 | 65.1 | 61.1 | 4 |
| 54 | 05/04 | 201.6 | 201.5 | 198.1 | 3.5 | 3.4 | .1 | 65.2 | 59.4 | 5.8 |
| 55 | 05/04 | 210.6 | 210.4 | 207 | 3.6 | 3.4 | .2 | 65.2 | 44.6 | 20.6 |
| 56 | 05/05 | 229.3 | 229.2 | 226.2 | 3.1 | 3 | .1 | 65.2 | 62.1 | 3.1 |
| 57 | 05/05 | 215.9 | 215.9 | 227.8 | -11.9 | -11.9 | 0 | 65.2 | 61.7 | 3.5 |
| 58 | 05/05 | 205.9 | 206 | 202.1 | 3.8 | 3.9 | -.1 | 64.8 | 61.4 | 3.4 |
| 59 | 05/06 | 225.8 | 225.6 | 221.2 | 4.6 | 4.4 | .2 | 65 | 61.4 | 3.6 |
| 60 | 05/06 | 183.2 | 183.2 | 179.6 | 3.6 | 3.6 | 0 | 65.1 | 62.4 | 2.7 |
| 61 | 05/06 | 224.6 | 225.9 | 221.2 | 3.4 | 4.7 | -1.3 | 65 | 61.4 | 3.6 |
| 62 | 05/07 | 231.6 | 231.5 | 227.8 | 3.8 | 3.7 | .1 | 65 | 62.4 | 2.6 |
| 63 | 05/07 | 172 | 172 | 168.4 | 3.6 | 3.6 | 0 | 65.1 | 62.7 | 2.4 |
| 64 | 05/07 | 219.2 | 219.1 | 214.6 | 4.6 | 4.5 | .1 | 65.1 | 61.7 | 3.4 |
| 65 | 05/08 | 226.4 | 226.6 | 223.2 | 3.2 | 3.4 | -.2 | 65.1 | 59.4 | 5.7 |
| 66 | 05/08 | 193.5 | 194.6 | 188.9 | 4.6 | 5.7 | -1.1 | 64.5 | 61.1 | 3.4 |
| 67 | 05/08 | 227 | 226.8 | 224.2 | 2.8 | 2.6 | .2 | 65 | 29.4 | 35.6 |
| 68 | 05/09 | 227.7 | 227.6 | 224.5 | 3.2 | 3.1 | .1 | 130.9 | 128.4 | 2.5 |
| 69 | 05/09 | 236.8 | 236.7 | 292.2 | -55.4 | -55.5 | .1 | 65 | 62.7 | 2.3 |
| 70 | 05/09 | 206 | 205.9 | 203.1 | 2.9 | 2.8 | .1 | 65 | 61.7 | 3.3 |
| 71 | 05/10 | 226.8 | 226.5 | 224.5 | 2.3 | 2 | .3 | 64.9 | 62.4 | 2.5 |
| 72 | 05/12 | 225.4 | 225.4 | 222.9 | 2.5 | 2.5 | 0 | 64.7 | 62.1 | 2.6 |
| 73 | 05/20 | 243.8 | 243.5 | 241.4 | 2.4 | 2.1 | .3 | 70.9 | 69.3 | 1.6 |
| 74 | 05/21 | 253.2 | 253.1 | 249.3 | 3.9 | 3.8 | .1 | 66.5 | 62.7 | 3.8 |
| 75 | 05/21 | 219.2 | 219.1 | 214.6 | 4.6 | 4.5 | .1 | 65.4 | 62.7 | 2.7 |
| 76 | 05/22 | 227.9 | 227.1 | 223.9 | 4 | 3.2 | .8 | 65.1 | 61.7 | 3.4 |
| 77 | 05/22 | 193 | 192.4 | 188.2 | 4.8 | 4.2 | .6 | 65.3 | 62.7 | 2.6 |
| 78 | 05/22 | 228.8 | 230 | 224.5 | 4.3 | 5.5 | -1.2 | 65.5 | 62.7 | 2.8 |
| 79 | 05/23 | 218.2 | 218.1 | 214.6 | 3.6 | 3.5 | .1 | 65.4 | 59.4 | 6 |
| 80 | 05/23 | 205.3 | 205.2 | 201.4 | 3.9 | 3.8 | .1 | 65.5 | 62.7 | 2.8 |
| 81 | 05/24 | 193.7 | 193.8 | 189.2 | 4.5 | 4.6 | -.1 | 65.5 | 62.7 | 2.8 |
| 82 | 05/24 | 200.5 | 200.5 | 196.5 | 4 | 4 | 0 | 65.4 | 62.1 | 3.3 |
| 83 | 05/24 | 195.3 | 195.3 | 191.5 | 3.8 | 3.8 | 0 | 65.4 | 62.7 | 2.7 |
| 84 | 05/25 | 231.1 | 230.9 | 227.5 | 3.6 | 3.4 | .2 | 65.4 | 62.4 | 3 |
| 85 | 05/25 | 229.3 | 229.1 | 224.5 | 4.8 | 4.6 | .2 | 65.5 | 62.7 | 2.8 |
| 86 | 05/25 | 199.1 | 199.1 | 194.8 | 4.3 | 4.3 | 0 | 67.9 | 64.4 | 3.5 |
| 87 | 05/26 | 197.7 | 197.6 | 194.2 | 3.5 | 3.4 | .1 | 65.5 | 62.7 | 2.8 |
| 88 | 05/26 | 248.8 | 248.6 | 244.3 | 4.5 | 4.3 | .2 | 65.5 | 79.2 | -13.7 |
| 89 | 05/26 | 211 | 210.9 | 207.7 | 3.3 | 3.2 | .1 | 65.5 | 62.7 | 2.8 |
| 90 | 05/27 | 204.3 | 204.1 | 201.4 | 2.9 | 2.7 | .2 | 65.5 | 62.7 | 2.8 |

U PRODUCT SAMPLE TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 91 | 05/27 | 229.7 | 230.1 | 225.2 | 4.5 | 4.9 | -.4 | 65.4 | 62.7 | 2.7 |
| 92 | 05/27 | 207.6 | 207.4 | 204.7 | 2.9 | 2.7 | .2 | 65.4 | 62.7 | 2.7 |
| 93 | 05/28 | 203.7 | 203.6 | 198.8 | 4.9 | 4.8 | .1 | 65.5 | 62.1 | 3.4 |
| 94 | 05/28 | 232.4 | 232.3 | 228.8 | 3.6 | 3.5 | .1 | 65.5 | 63.4 | 2.1 |
| 95 | 05/29 | 217.4 | 216.9 | 213 | 4.4 | 3.9 | .5 | 65.5 | 62.7 | 2.8 |
| 96 | 05/29 | 196.3 | 196.2 | 192.2 | 4.1 | 4 | .1 | 65.6 | 62.7 | 2.9 |
| 97 | 05/29 | 224.1 | 222.5 | 219.6 | 4.5 | 2.9 | 1.6 | 66.6 | 62.7 | 3.9 |
| 98 | 05/30 | 201 | 201 | 198.1 | 2.9 | 2.9 | 0 | 65.3 | 62.7 | 2.6 |
| 99 | 05/30 | 242 | 241.8 | 237.7 | 4.3 | 4.1 | .2 | 65.5 | 62.7 | 2.8 |
| 100 | 05/31 | 213.1 | 213 | 208.7 | 4.4 | 4.3 | .1 | 65.6 | 62.7 | 2.9 |
| 101 | 06/01 | 200.4 | 200.4 | 196.5 | 3.9 | 3.9 | 0 | 65.6 | 62.7 | 2.9 |
| 102 | 06/01 | 219.4 | 219.4 | 214.6 | 4.8 | 4.8 | 0 | 65.6 | 62.7 | 2.9 |
| 103 | 06/02 | 217.2 | 217 | 213 | 4.2 | 4 | .2 | 65.4 | 62.7 | 2.7 |
| 104 | 06/02 | 218.5 | 218.3 | 214.3 | 4.2 | 4 | .2 | 65.4 | 62.7 | 2.7 |
| 105 | 06/03 | 206.2 | 206.1 | 201.4 | 4.8 | 4.7 | .1 | 65.4 | 62.7 | 2.7 |
| 106 | 06/04 | 214.7 | 214.6 | 210.7 | 4 | 3.9 | .1 | 65.5 | 62.4 | 3.1 |
| 107 | 06/04 | 226.4 | 226.4 | 221.2 | 5.2 | 5.2 | 0 | 65.5 | 62.7 | 2.8 |
| 108 | 06/04 | 219.7 | 220 | 215.3 | 4.4 | 4.7 | -.3 | 65.2 | 62.7 | 2.5 |
| 109 | 06/05 | 234.2 | 234.1 | 229.5 | 4.7 | 4.6 | .1 | 65.5 | 62.7 | 2.8 |
| 110 | 06/05 | 205.4 | 205.3 | 201.4 | 4 | 3.9 | .1 | 65.4 | 62.7 | 2.7 |
| 111 | 06/05 | 226.3 | 226.1 | 222.2 | 4.1 | 3.9 | .2 | 65.5 | 62.7 | 2.8 |
| 112 | 06/06 | 231 | 230.9 | 227.2 | 3.8 | 3.7 | .1 | 65.4 | 62.4 | 3 |
| 113 | 06/06 | 218.6 | 218.6 | 214.6 | 4 | 4 | 0 | 65.4 | 62.7 | 2.7 |
| 114 | 06/07 | 222.3 | 222.1 | 218.6 | 3.7 | 3.5 | .2 | 65.4 | 62.7 | 2.7 |
| 115 | 06/07 | 230.2 | 229.8 | 226.2 | 4 | 3.6 | .4 | 65.2 | 62.1 | 3.1 |
| 116 | 06/07 | 212.3 | 212.1 | 208 | 4.3 | 4.1 | .2 | 65.5 | 62.7 | 2.8 |
| 117 | 06/08 | 228.1 | 227.8 | 224.5 | 3.6 | 3.3 | .3 | 65.6 | 62.7 | 2.9 |
| 118 | 06/09 | 231.3 | 231.1 | 227.8 | 3.5 | 3.3 | .2 | 65.6 | 62.7 | 2.9 |
| 119 | 06/09 | 235.5 | 235.7 | 231.1 | 4.4 | 4.6 | -.2 | 65.8 | 62.7 | 3.1 |
| 120 | 06/09 | 217.4 | 217.3 | 213 | 4.4 | 4.3 | .1 | 66.3 | 62.7 | 3.6 |
| 121 | 06/10 | 219 | 218.9 | 214.6 | 4.4 | 4.3 | .1 | 66 | 62.7 | 3.3 |
| 122 | 06/10 | 223.1 | 222.9 | 217.9 | 5.2 | 5 | .2 | 66.1 | 62.7 | 3.4 |
| 123 | 06/10 | 214.9 | 214.8 | 211 | 3.9 | 3.8 | .1 | 66 | 62.7 | 3.3 |
| 124 | 06/11 | 229.4 | 230.3 | 224.5 | 4.9 | 5.8 | -.9 | 65.9 | 62.7 | 3.2 |
| 125 | 06/11 | 227.4 | 227.2 | 222.9 | 4.5 | 4.3 | .2 | 65.6 | 62.7 | 2.9 |
| 126 | 06/11 | 224.2 | 224.1 | 219.6 | 4.6 | 4.5 | .1 | 65.5 | 62.7 | 2.8 |
| 127 | 06/12 | 219.4 | 219.3 | 215 | 4.4 | 4.3 | .1 | 65.4 | 62.7 | 2.7 |
| 128 | 06/12 | 206 | 205.9 | 201.4 | 4.6 | 4.5 | .1 | 65.5 | 62.7 | 2.8 |
| 129 | 06/13 | 239 | 238.5 | 234.4 | 4.6 | 4.1 | .5 | 65.4 | 62.4 | 3 |
| 130 | 06/13 | 225.6 | 225.4 | 221.2 | 4.4 | 4.2 | .2 | 65.5 | 62.7 | 2.8 |
| 131 | 06/14 | 232.5 | 232.4 | 227.8 | 4.7 | 4.6 | .1 | 65.5 | 62.7 | 2.8 |
| 132 | 06/14 | 229.3 | 229.1 | 224.5 | 4.8 | 4.6 | .2 | 65.5 | 62.7 | 2.8 |
| 133 | 06/14 | 223.2 | 222.9 | 218.6 | 4.6 | 4.3 | .3 | 65.4 | 62.7 | 2.7 |
| 134 | 06/15 | 234.4 | 234.3 | 230.8 | 3.6 | 3.5 | .1 | 65.5 | 62.7 | 2.8 |
| 135 | 06/15 | 221.6 | 221.6 | 217.3 | 4.3 | 4.3 | 0 | 221.6 | 217.3 | 4.3 |

U PRODUCT SAMPLE TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 136 | 06/16 | 375.2 | 375.1 | 330.2 | 45 | 44.9 | .1 | 188.7 | 184.9 | 3.8 |
| 137 | 06/16 | 313.5 | 313.3 | 307.1 | 6.4 | 6.2 | .2 | 101.5 | 99.1 | 2.4 |
| 138 | 06/17 | 145.6 | 145.2 | 143.3 | 2.3 | 1.9 | .4 | 145.6 | 143 | 2.6 |
| 139 | 06/19 | 159.3 | 159.3 | 156.2 | 3.1 | 3.1 | 0 | 159.3 | 156.2 | 3.1 |
| 140 | 06/25 | 159 | 158.9 | 155.5 | 3.5 | 3.4 | .1 | 159 | 155.5 | 3.5 |
| 141 | 06/26 | 258.7 | 258.6 | 254.3 | 4.4 | 4.3 | .1 | 97.7 | 95.8 | 1.9 |
| 142 | 06/26 | 276.4 | 276.3 | 272.4 | 4 | 3.9 | .1 | 83.8 | 82.6 | 1.2 |
| 143 | 06/26 | 244.6 | 244.5 | 241 | 3.6 | 3.5 | .1 | 63.2 | 62.7 | .5 |
| 144 | 06/27 | 218 | 217.8 | 214.6 | 3.4 | 3.2 | .2 | 63.2 | 62.4 | .8 |
| 145 | 06/27 | 229.6 | 229.4 | 224.5 | 5.1 | 4.9 | .2 | 63.3 | 62.1 | 1.2 |
| 146 | 06/28 | 214.6 | 214.5 | 211.3 | 3.3 | 3.2 | .1 | 63.2 | 62.7 | .5 |
| 147 | 06/28 | 238.3 | 238.2 | 234.4 | 3.9 | 3.8 | .1 | 63.2 | 62.1 | 1.1 |
| 148 | 06/29 | 185.6 | 185.2 | 181.6 | 4 | 3.6 | .4 | 63.1 | 62.7 | .4 |
| 149 | 06/29 | 217.7 | 217.9 | 213 | 4.7 | 4.9 | -.2 | 63.2 | 62.1 | 1.1 |
| 150 | 06/30 | 284.7 | 284.7 | 280.3 | 4.4 | 4.4 | 0 | 78.6 | 76.6 | 2 |
| 151 | 06/30 | 236.1 | 236 | 231.1 | 5 | 4.9 | .1 | 63.4 | 61.7 | 1.7 |
| 152 | 06/30 | 195.1 | 195 | 191.5 | 3.6 | 3.5 | .1 | 63.6 | 62.7 | .9 |
| 153 | 07/01 | 224.7 | 224.6 | 221.2 | 3.5 | 3.4 | .1 | 63.4 | 62.1 | 1.3 |
| 154 | 07/01 | 234.4 | 234.3 | 228.5 | 5.9 | 5.8 | .1 | 63.5 | 61.7 | 1.8 |
| 155 | 07/01 | 213.6 | 213.5 | 209.7 | 3.9 | 3.8 | .1 | 63.4 | 62.4 | 1 |
| 156 | 07/02 | 252.7 | 252.6 | 247.7 | 5 | 4.9 | .1 | 63.4 | 62.4 | 1 |
| 157 | 07/02 | 231.3 | 231.1 | 227.2 | 4.1 | 3.9 | .2 | 63.4 | 59.4 | 4 |
| 158 | 07/02 | 245.5 | 245.5 | 238.1 | 7.4 | 7.4 | 0 | 63.3 | 59.8 | 3.5 |
| 159 | 07/03 | 284.7 | 284.6 | 277.4 | 7.3 | 7.2 | .1 | 75.4 | 72.6 | 2.8 |
| 160 | 07/03 | 246.3 | 246.2 | 239.7 | 6.6 | 6.5 | .1 | 63.5 | 62.1 | 1.4 |
| 161 | 07/05 | 226.8 | 226.6 | 221.2 | 5.6 | 5.4 | .2 | 63.4 | 60.1 | 3.3 |
| 162 | 07/05 | 230 | 229.8 | 224.5 | 5.5 | 5.3 | .2 | 63.4 | 60.1 | 3.3 |
| 163 | 07/06 | 231.2 | 231 | 226.5 | 4.7 | 4.5 | .2 | 63.4 | 61.7 | 1.7 |
| 164 | 07/06 | 233.4 | 232.3 | 227.8 | 5.6 | 4.5 | 1.1 | 61.5 | 61.1 | .4 |
| 165 | 07/07 | 237.3 | 237.2 | 232.8 | 4.5 | 4.4 | .1 | 63.4 | 61.7 | 1.7 |
| 166 | 07/07 | 221.5 | 221.4 | 215.3 | 6.2 | 6.1 | .1 | 63.4 | 60.4 | 3 |
| 167 | 07/07 | 248.9 | 248.9 | 242.7 | 6.2 | 6.2 | 0 | 63.4 | 61.1 | 2.3 |
| 168 | 07/07 | 231.8 | 231.7 | 226.5 | 5.3 | 5.2 | .1 | 63.4 | 61.1 | 2.3 |
| 169 | 07/08 | 227.7 | 227.5 | 221.9 | 5.8 | 5.6 | .2 | 63.4 | 61.1 | 2.3 |
| 170 | 07/08 | 231 | 230.8 | 225.5 | 5.5 | 5.3 | .2 | 63.4 | 61.1 | 2.3 |
| 171 | 07/08 | 220.1 | 219.8 | 214.6 | 5.5 | 5.2 | .3 | 63.4 | 61.1 | 2.3 |
| 172 | 07/09 | 224.2 | 224.3 | 219.6 | 4.6 | 4.7 | -.1 | 63.6 | 61.7 | 1.9 |
| 173 | 07/09 | 219 | 218.9 | 214.3 | 4.7 | 4.6 | .1 | 63.5 | 61.1 | 2.4 |
| 174 | 07/09 | 225.9 | 225.8 | 221.2 | 4.7 | 4.6 | .1 | 63.5 | 61.4 | 2.1 |
| 175 | 07/10 | 229 | 228.8 | 224.5 | 4.5 | 4.3 | .2 | 63.5 | 61.4 | 2.1 |
| 176 | 07/10 | 232.6 | 232.4 | 227.5 | 5.1 | 4.9 | .2 | 63.5 | 61.1 | 2.4 |
| 177 | 07/10 | 230.1 | 229.9 | 224.5 | 5.6 | 5.4 | .2 | 63.5 | 61.4 | 2.1 |
| 178 | 07/11 | 241.9 | 241.7 | 236.1 | 5.8 | 5.6 | .2 | 81.3 | 78.3 | 3 |
| 179 | 07/11 | 271 | 270.9 | 264.2 | 6.8 | 6.7 | .1 | 81.2 | 78.6 | 2.6 |
| 180 | 07/11 | 243.5 | 243.3 | 237.7 | 5.8 | 5.6 | .2 | 81.3 | 79.2 | 2.1 |

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U PRODUCT SAMPLE TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH NO. | DATE | AFTER SAMPLE RUSKA LEVEL (1) | BACKUP LEVEL (2) | TAYLOR LEVEL (3) | (1-3) CM. | (2-3) CM. | (1-2) CM. | AFTER TRANSFER RUSKA LEVEL (4) | TAYLOR LEVEL (5) | (4-5) CM. |
|---|---|---|---|---|---|---|---|---|---|---|
| 181 | 07/13 | 231.2 | 231 | 227.5 | 3.7 | 3.5 | .2 | 74.5 | 69.3 | 5.2 |
| 182 | 07/14 | 215.9 | 215.8 | 211.3 | 4.6 | 4.5 | .1 | 81.1 | 79.2 | 1.9 |
| 183 | 07/15 | 229.7 | 229.7 | 224.5 | 5.2 | 5.2 | 0 | 79.4 | 75.9 | 3.5 |
| 184 | 07/20 | 219.6 | 219.6 | 214.6 | 5 | 5 | 0 | 78.2 | 75.9 | 2.3 |
| 185 | 07/22 | 162.3 | 162.2 | 158.5 | 3.8 | 3.7 | .1 | 30.5 | 29.1 | 1.4 |
| 186 | 07/23 | 61.5 | 61.4 | 60.1 | 1.4 | 1.3 | .1 | 28.7 | 27.1 | 1.6 |



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GFW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 475 | 67.7 | 70.6 | -2.9 | 3.8 | 5.7 | -1.9 |
| 476 | 59.3 | 61.4 | -2.1 | 6.4 | 7.7 | -1.3 |
| 477 | 59.7 | 62 | -2.3 | .6 | 2.1 | -1.5 |
| 478 | 62.2 | 64.6 | -2.4 | 11.1 | 12.4 | -1.3 |
| 479 | 57.9 | 60.1 | -2.2 | 21.5 | 23.3 | -1.8 |
| 480 | 22.8 | 24.6 | -1.8 | 0 | -17.8 | 17.8 |
| 481 | 25.7 | 26.6 | -.9 | 4.3 | 5.1 | -.8 |
| 482 | 58.1 | 60.4 | -2.3 | 5.7 | 6.6 | -.9 |
| 483 | 36.5 | 38 | -1.5 | 0 | .4 | -.4 |
| 484 | 57 | 57.8 | -.8 | 8.2 | 9.4 | -1.2 |
| 485 | 52 | 54.4 | -2.4 | 2.5 | 3.3 | -.8 |
| 486 | 37.4 | 38 | -.6 | .7 | 1.7 | -1 |
| 487 | 36.7 | 37.9 | -1.2 | 6.4 | 7.9 | -1.5 |
| 488 | 42.8 | 44.1 | -1.3 | 3.4 | 4.3 | -.9 |
| 489 | 61.1 | 63 | -1.9 | 6.8 | 7.4 | -.6 |
| 490 | 61 | 63.4 | -2.4 | 2.9 | 3.7 | -.8 |
| 491 | 59.2 | 61.2 | -2 | 4.7 | 5.6 | -.9 |
| 492 | 57.8 | 59.3 | -1.5 | 6.8 | 8.2 | -1.4 |
| 493 | 60.5 | 62.5 | -2 | 7.1 | 8.2 | -1.1 |
| 494 | 58.5 | 60.1 | -1.6 | 7.1 | 7.8 | -.7 |
| 495 | 51.5 | 53.2 | -1.7 | 6.6 | 7.5 | -.9 |
| 496 | 71.3 | 87 | -15.7 | 9.6 | 11.6 | -2 |
| 497 | 60.5 | 62.5 | -2 | 5.1 | 6.1 | -1 |
| 498 | 58.5 | 60.7 | -2.2 | 5.7 | 6.6 | -.9 |
| 499 | 57.8 | 59.4 | -1.6 | 0 | .9 | -.9 |
| 500 | 47.1 | 48.8 | -1.7 | 7.1 | 7.9 | -.8 |
| 501 | 58.5 | 60.4 | -1.9 | 5.7 | 6.6 | -.9 |
| 502 | 53.5 | 55.3 | -1.8 | 7.1 | 8.1 | -1 |
| 503 | 61 | 62.1 | -1.1 | 47.8 | 62.1 | -14.3 |
| 504 | 49.9 | 52.2 | -2.3 | 5.3 | 6.3 | -1 |
| 505 | 60.2 | 62.5 | -2.3 | 5.7 | 6.8 | -1.1 |
| 506 | 50.3 | 52 | -1.7 | 5.8 | 6.8 | -1 |
| 507 | 57.8 | 60 | -2.2 | 6.3 | 7 | -.7 |
| 508 | 59.5 | 61.7 | -2.2 | 6.3 | 7.4 | -1.1 |
| 509 | 57.2 | 60.3 | -3.1 | 0 | .2 | -.2 |
| 510 | 60 | 62.2 | -2.2 | 8.5 | 9.6 | -1.1 |
| 511 | 57.2 | 60.2 | -3 | 4.3 | 5.6 | -1.3 |
| 512 | 42.8 | 44.7 | -1.9 | 5.7 | 7 | -1.3 |
| 513 | 53.1 | 55.1 | -2 | 6.4 | 7.5 | -1.1 |
| 514 | 57.8 | 59.6 | -1.8 | 6.9 | 7.9 | -1 |
| 515 | 41.9 | 43.5 | -1.6 | 5.3 | 6.4 | -1.1 |
| 516 | 53.5 | 55.3 | -1.8 | 5.3 | 6.2 | -.9 |
| 517 | 25.3 | 26.7 | -1.4 | 0 | -.8 | .8 |
| 518 | 55.3 | 57.1 | -1.8 | 6.6 | 7.7 | -1.1 |
| 519 | 51.3 | 53.2 | -1.9 | 5.3 | 6.5 | -1.2 |
| 520 | 27.8 | 29.1 | -1.3 | 5.3 | 6.7 | -1.4 |
| 521 | 62.7 | 67.5 | -4.8 | 6.4 | 7.5 | -1.1 |

GPW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 522 | 57 | 59.5 | -2.5 | 19.6 | 21 | -1.4 |
| 523 | 37.8 | 39.1 | -1.3 | 0 | .9 | -.9 |
| 524 | 58.5 | 60.6 | -2.1 | 0 | 1 | -1 |
| 525 | 47.6 | 49.8 | -2.2 | 8.4 | 9.6 | -1.2 |
| 526 | 69.2 | 71.7 | -2.5 | 8.1 | 9.6 | -1.5 |
| 527 | 61.7 | 63.9 | -2.2 | 7.3 | 8.5 | -1.2 |
| 528 | 55.1 | 57.4 | -2.3 | 2.7 | 3.7 | -1 |
| 529 | 58.5 | 60.6 | -2.1 | 6.8 | 8.1 | -1.3 |
| 530 | 42.6 | 44.3 | -1.7 | 7.8 | 8.8 | -1 |
| 531 | 60.2 | 62.7 | -2.5 | 6.6 | 8.5 | -1.9 |
| 532 | 60.6 | 63.1 | -2.5 | 4.3 | 5.5 | -1.2 |
| 533 | 35.9 | 37.8 | -1.9 | 4.3 | 5.3 | -1 |
| 534 | 62.4 | 67.5 | -5.1 | 2.9 | 3.7 | -.8 |
| 535 | 62 | 64.1 | -2.1 | 6.4 | 7 | -.6 |
| 536 | 59.2 | 61.1 | -1.9 | 7.1 | 8 | -.9 |
| 537 | 61.7 | 63.2 | -1.5 | 6.4 | 7.1 | -.7 |
| 538 | 58.1 | 59.9 | -1.8 | 11.1 | 12.2 | -1.1 |
| 539 | 57.6 | 59.4 | -1.8 | 22.7 | 23.8 | -1.1 |
| 540 | 22.7 | 23.8 | -1.1 | 0 | .7 | -.7 |
| 541 | 56.9 | 58.9 | -2 | 7.7 | 8.7 | -1 |
| 542 | 56 | 57.7 | -1.7 | 12.1 | 13.3 | -1.2 |
| 543 | 12.5 | 13.5 | -1 | 0 | .9 | -.9 |
| 544 | 31 | 32.2 | -1.2 | 0 | 0 | 0 |
| 545 | 58.8 | 60.6 | -1.8 | 16.2 | 17.7 | -1.5 |
| 546 | 59.2 | 61.1 | -1.9 | 12.8 | 13.7 | -.9 |
| 547 | NO WESTINGHOUSE MEASUREMENT | | | | | |
| 548 | 62.9 | 65.1 | -2.2 | 6.4 | 7.4 | -1 |
| 549 | 54.5 | 56.1 | -1.6 | 0 | -17.8 | 17.8 |
| 550 | 30.8 | 31.8 | -1 | 7.8 | 8.3 | -.5 |
| 551 | 41 | 42.2 | -1.2 | 7.8 | 8.4 | -.6 |
| 552 | NO WESTINGHOUSE MEASUREMENT | | | | | |
| 553 | 55.6 | 56.5 | -.9 | 5.7 | 6 | -.3 |
| 554 | 62 | 63.3 | -1.3 | 15 | 15.9 | -.9 |
| 555 | 71.3 | 87.4 | -16.1 | 7.5 | 8.8 | -1.3 |
| 556 | 29.6 | 31 | -1.4 | 0 | .4 | -.4 |
| 557 | 52.4 | 54.4 | -2 | 7.1 | 7.4 | -.3 |
| 558 | 62 | 64.3 | -2.3 | 3.9 | 5.2 | -1.3 |
| 559 | 60.2 | 62.5 | -2.3 | 7.7 | 8.9 | -1.2 |
| 560 | 58 | 60.3 | -2.3 | 8.2 | 9.3 | -1.1 |
| 561 | 58.1 | 60 | -1.9 | 8.9 | 10 | -1.1 |
| 562 | 49.8 | 51.5 | -1.7 | 5.7 | 6.9 | -1.2 |
| 563 | 34.9 | 36.7 | -1.8 | 5 | 6.2 | -1.2 |
| 564 | 53.5 | 55.1 | -1.6 | 8.9 | 9.2 | -.3 |
| 565 | 49.9 | 34.8 | 15.1 | 5.7 | 6.4 | -.7 |
| 566 | 57.3 | 58.5 | -1.2 | 9.1 | 9.4 | -.3 |
| 567 | 32.8 | 33.6 | -.8 | 7.1 | 7.1 | 0 |
| 568 | 54.9 | 56.3 | -1.4 | 10 | 10.2 | -.2 |

GPW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 569 | 54.2 | 55.5 | -1.3 | 6.4 | 6.8 | -.4 |
| 570 | 55.3 | 56.5 | -1.2 | 7.1 | 7.4 | -.3 |
| 571 | 58.5 | 60.2 | -1.7 | 6.4 | 6.7 | -.3 |
| 572 | 55.6 | 57.2 | -1.6 | 5.7 | 6.2 | -.5 |
| 573 | 57.8 | 59.4 | -1.6 | 11.6 | 12.2 | -.6 |
| 574 | 54.2 | 55.6 | -1.4 | 10 | 10.6 | -.6 |
| 575 | 55.5 | 56.8 | -1.3 | 8.9 | 9.7 | -.8 |
| 576 | 57 | 58.5 | -1.5 | 3.6 | 3.8 | -.2 |
| 577 | 54.9 | 56.7 | -1.8 | 8.2 | 9 | -.8 |
| 578 | 56.2 | 57.7 | -1.5 | 6.1 | 6.8 | -.7 |
| 579 | 56.3 | 57.5 | -1.2 | 7.8 | 8.2 | -.4 |
| 580 | 57.8 | 59.1 | -1.3 | 8.6 | 9.3 | -.7 |
| 581 | 57.4 | 59 | -1.6 | 8.6 | 9.2 | -.6 |
| 582 | 56 | 57.4 | -1.4 | 8.8 | 9.2 | -.4 |
| 583 | 59.7 | 61.1 | -1.4 | 8.3 | 8.6 | -.3 |
| 584 | 59.2 | 60.9 | -1.7 | 8 | 8.2 | -.2 |
| 585 | 58.8 | 60.6 | -1.8 | 8.9 | 9.4 | -.5 |
| 586 | 56.3 | 57.4 | -1.1 | 7.8 | 8.3 | -.5 |
| 587 | 58.5 | 60.1 | -1.6 | 6.4 | 8 | -1.6 |
| 588 | 52 | 53.5 | -1.5 | 5.7 | 6 | -.3 |
| 589 | 38.4 | 39.7 | -1.3 | 7.5 | 8.2 | -.7 |
| 590 | 54.9 | 56.5 | -1.6 | 8.2 | 9.1 | -.9 |
| 591 | 59.1 | 60.5 | -1.4 | 7.1 | 7.6 | -.5 |
| 592 | 57.8 | 59.4 | -1.6 | 57.4 | 59 | -1.6 |
| 593 | 57.8 | 59.1 | -1.3 | 1.1 | 1.4 | -.3 |
| 594 | 56 | 57.5 | -1.5 | 7.8 | 8.6 | -.8 |
| 595 | 57.2 | 58.8 | -1.6 | 6.8 | 7.3 | -.5 |
| 596 | 57.8 | 59.4 | -1.6 | 2.9 | 3.1 | -.2 |
| 597 | 56.5 | 58 | -1.5 | 9.3 | 9.7 | -.4 |
| 598 | 56.3 | 57.9 | -1.6 | 3 | 3.4 | -.4 |
| 599 | 60.5 | 62 | -1.5 | 9.6 | 10.1 | -.5 |
| 600 | 57.8 | 59.2 | -1.4 | 7 | 7.1 | -.1 |
| 601 | 54.1 | 55.2 | -1.1 | 19.3 | 19.9 | -.6 |
| 602 | 60.6 | 62.3 | -1.7 | 3.9 | 4.3 | -.4 |
| 603 | 57.4 | 58.9 | -1.5 | 8.6 | 8.9 | -.3 |
| 604 | 60.6 | 62 | -1.4 | 7.3 | 8 | -.7 |
| 605 | 58.5 | 59.3 | -.8 | .9 | 1 | -.1 |
| 606 | 36.5 | 37.6 | -1.1 | 7 | 7.3 | -.3 |
| 607 | 59.9 | 61.8 | -1.9 | 9.6 | 10.7 | -1.1 |
| 608 | 56.3 | 58.1 | -1.8 | 8.2 | 8.9 | -.7 |
| 609 | 57.8 | 59.1 | -1.3 | 5.1 | 5.6 | -.5 |
| 610 | 57.7 | 59.1 | -1.4 | 5.7 | 6.3 | -.6 |
| 611 | 58 | 59.8 | -1.8 | 6.7 | 7.3 | -.6 |
| 612 | 57 | 58.8 | -1.8 | 8.5 | 9 | -.5 |
| 613 | 26.2 | 27 | -.8 | 8.6 | 8.9 | -.3 |
| 614 | 57 | 58.4 | -1.4 | 5.1 | 5.8 | -.7 |
| 615 | 55.6 | 57.2 | -1.6 | 7.6 | 8.1 | -.5 |

GPW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 616 | 56.2 | 57.5 | -1.3 | 7.8 | 8.5 | -.7 |
| 617 | 56.5 | 58.1 | -1.6 | 7.3 | 8.1 | -.8 |
| 618 | 54.2 | 55.7 | -1.5 | 7.8 | 8.3 | -.5 |
| 619 | 63.5 | 66.2 | -2.7 | 13.9 | 15.3 | -1.4 |
| 620 | 14.3 | 15.7 | -1.4 | 0 | .7 | -.7 |
| 621 | 56.7 | 58.6 | -1.9 | 8.9 | 10 | -1.1 |
| 622 | 57.8 | 59.3 | -1.5 | 9.4 | 10.1 | -.7 |
| 623 | 57 | 58.8 | -1.8 | 7.1 | 7.8 | -.7 |
| 624 | 51.8 | 53.2 | -1.4 | 7.5 | 8.2 | -.7 |
| 625 | 58.5 | 59.8 | -1.3 | 5.5 | 6 | -.5 |
| 626 | 62 | 64.1 | -2.1 | 9.1 | 9.9 | -.8 |
| 627 | 60.6 | 62.4 | -1.8 | 8.6 | 9.4 | -.8 |
| 628 | 57.9 | 59.6 | -1.7 | 8.6 | 9.5 | -.9 |
| 629 | 57 | 59 | -2 | 7.2 | 8.4 | -1.2 |
| 630 | 57.8 | 59.9 | -2.1 | 8.7 | 9.7 | -1 |
| 631 | 54.5 | 56.3 | -1.8 | 7.8 | 8.4 | -.6 |
| 632 | 55.6 | 57.5 | -1.9 | 4.5 | 5.5 | -1 |
| 633 | 63.2 | 65 | -1.8 | 7.8 | 8.8 | -1 |
| 634 | 63.4 | 65.2 | -1.8 | 8.6 | 9.7 | -1.1 |
| 635 | 57.8 | 59.4 | -1.6 | 8.7 | 9.6 | -.9 |
| 636 | 63.5 | 65.1 | -1.6 | 7.7 | 8.4 | -.7 |
| 637 | 65.2 | 67.1 | -1.9 | 9.3 | 10.1 | -.8 |
| 638 | 58.9 | 60.7 | -1.8 | 7.7 | 8.2 | -.5 |
| 639 | 23.7 | 25.1 | -1.4 | 7.8 | 9 | -1.2 |
| 640 | 59.6 | 61.6 | -2 | 8.1 | 9 | -.9 |
| 641 | 62.5 | 64.5 | -2 | 5.8 | 6.9 | -1.1 |
| 642 | 61.5 | 63.6 | -2.1 | 6.3 | 7.2 | -.9 |
| 643 | 57.8 | 59.5 | -1.7 | 6.6 | 6.8 | -.2 |
| 644 | 56.3 | 58.3 | -2 | 6.4 | 7.4 | -1 |
| 645 | 54.5 | 56.4 | -1.9 | 7.1 | 7.9 | -.8 |
| 646 | 53.3 | 54.9 | -1.6 | 16.5 | 17.6 | -1.1 |
| 647 | 20.9 | 22 | -1.1 | 6.8 | 7.4 | -.6 |
| 648 | 39.8 | 40.9 | -1.1 | 7.5 | 8.2 | -.7 |
| 649 | 39.2 | 40.6 | -1.4 | 6.8 | 7.4 | -.6 |
| 650 | 53.1 | 54.8 | -1.7 | 5.5 | 6.1 | -.6 |
| 651 | 58.5 | 60.2 | -1.7 | 7.4 | 8 | -.6 |
| 652 | 62.5 | 64.2 | -1.7 | 4.9 | 5.4 | -.5 |
| 653 | 61.7 | 63.2 | -1.5 | 8.7 | 9.2 | -.5 |
| 654 | 57 | 59.2 | -2.2 | 18.7 | 19.6 | -.9 |
| 655 | 57.8 | 59 | -1.2 | 6.6 | 6.9 | -.3 |
| 656 | 53.1 | 54.7 | -1.6 | 10.3 | 11.1 | -.8 |
| 657 | 53.8 | 55.5 | -1.7 | 0 | 1.9 | -1.9 |
| 658 | 58 | 59.7 | -1.7 | 9.8 | 10.4 | -.6 |
| 659 | 43.1 | 43.5 | -.4 | 9.9 | 9.6 | .3 |
| 660 | 25 | 24.6 | .4 | 8 | 7.8 | .2 |
| 661 | 51.3 | 51.9 | -.6 | 7.8 | 7.1 | .7 |
| 662 | 59.4 | 61.1 | -1.7 | 6.5 | 7.5 | -1 |

GPW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 663 | 69.8 | 71.7 | -1.9 | 29.4 | 30.9 | -1.5 |
| 664 | 60 | 62 | -2 | 4.4 | 5.3 | -.9 |
| 665 | 57.9 | 59.9 | -2 | 7.2 | 8.1 | -.9 |
| 666 | 57.9 | 59.9 | -2 | 7.2 | 8.1 | -.9 |
| 667 | 53.1 | 54.9 | -1.8 | 7.1 | 7.9 | -.8 |
| 668 | 53.5 | 55.5 | -2 | 7.8 | 8.4 | -.6 |
| 669 | 60 | 61.9 | -1.9 | 7.7 | 8.4 | -.7 |
| 670 | 65.3 | 67.4 | -2.1 | 8 | 8.4 | -.4 |
| 671 | 53.6 | 55.5 | -1.9 | 8.9 | 9.9 | -1 |
| 672 | 58.8 | 60.8 | -2 | 6.8 | 7.5 | -.7 |
| 673 | 69.2 | 70.7 | -1.5 | 1.6 | 1.8 | -.2 |
| 674 | 24.2 | 24.1 | .1 | 1.8 | .5 | 1.3 |
| 675 | 41.2 | 41.1 | .1 | .6 | -.4 | 1 |
| 676 | 33.5 | 32.9 | .6 | 3.2 | 2.2 | 1 |
| 677 | 45.6 | 42.1 | 3.5 | 6.3 | 5.4 | .9 |
| 678 | 60.5 | 60.8 | -.3 | 7.7 | 6.8 | .9 |
| 679 | 64.1 | 64.5 | -.4 | 3.9 | 2.9 | 1 |
| 680 | 52 | 52.2 | -.2 | 6.8 | 6.2 | .6 |
| 681 | 55.9 | 56.1 | -.2 | 7.1 | 6.6 | .5 |
| 682 | 56 | 55.7 | .3 | 10.3 | 9.2 | 1.1 |
| 683 | 61.7 | 61.5 | .2 | 4.5 | 3.1 | 1.4 |
| 684 | 56.4 | 56.2 | .2 | 6.8 | 5.7 | 1.1 |
| 685 | 60.2 | 60.3 | -.1 | 1.4 | .1 | 1.3 |
| 686 | 56.6 | 56.6 | 0 | 8.9 | 7.8 | 1.1 |
| 687 | 59.9 | 59.9 | 0 | 8.6 | 7.5 | 1.1 |
| 688 | 57.7 | 57.8 | -.1 | 5.9 | 5 | .9 |
| 689 | 48.1 | 48.1 | 0 | 5.8 | 4.6 | 1.2 |
| 690 | 48.1 | 48.1 | 0 | 0 | -1.3 | 1.3 |
| 691 | 57.8 | 57.9 | -.1 | 2.4 | 1.3 | 1.1 |
| 692 | 57.8 | 57.6 | .2 | 8.6 | 7.6 | 1 |
| 693 | 51.3 | 51.6 | -.3 | 8 | 7.2 | .8 |
| 694 | 64.9 | 65.2 | -.3 | 8.5 | 7.3 | 1.2 |
| 695 | 45.1 | 44.9 | .2 | 8.2 | 7.2 | 1 |
| 696 | 49.1 | 48.9 | .2 | 5 | 3.7 | 1.3 |
| 697 | 54.5 | 54.1 | .4 | 8.4 | 7.2 | 1.2 |
| 698 | 71.3 | 86.9 | -15.6 | 57 | 56.7 | .3 |
| 699 | 58.5 | 58.8 | -.3 | 5.3 | 4.1 | 1.2 |
| 700 | 70.6 | 74.4 | -3.8 | 62.4 | 74.9 | -12.5 |
| 701 | 63.8 | 64.2 | -.4 | 7.8 | 7.1 | .7 |
| 702 | 53.5 | 53.7 | -.2 | 5 | 3.7 | 1.3 |
| 703 | 59.3 | 59.6 | -.3 | 10.7 | 9.7 | 1 |
| 704 | 62 | 62.2 | -.2 | 5.7 | 4.6 | 1.1 |
| 705 | 54.2 | 54.4 | -.2 | 4.5 | 3.4 | 1.1 |
| 706 | 48.6 | 48.6 | 0 | 8.1 | 7.2 | .9 |
| 707 | 54 | 54.1 | -.1 | 4.4 | 3.2 | 1.2 |
| 708 | 54.3 | 54.7 | -.4 | 5.1 | 4.2 | .9 |
| 709 | 57.6 | 57.7 | -.1 | 7.1 | 6.4 | .7 |

GPW CHECK TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 710 | 57.4 | 57.7 | -.3 | 6.8 | 5.9 | .9 |
| 711 | 60.6 | 61.5 | -.9 | 6.4 | 5.5 | .9 |
| 712 | 62 | 62.5 | -.5 | 5.8 | 4.9 | .9 |
| 713 | 61 | 61.5 | -.5 | 7.1 | 6.5 | .6 |
| 714 | 59.5 | 60.2 | -.7 | 6.4 | 5.9 | .5 |
| 715 | 58.4 | 58.7 | -.3 | 5.7 | 5 | .7 |
| 716 | 62 | 62.6 | -.6 | 6.9 | 6 | .9 |
| 717 | 57 | 57.6 | -.6 | 7.1 | 6.3 | .8 |
| 718 | 56 | 56.3 | -.3 | 7.8 | 7.3 | .5 |
| 719 | 52.4 | 52.4 | 0 | 7.1 | 6.5 | .6 |
| 720 | 54.2 | 54.7 | -.5 | 5.6 | 4.8 | .8 |
| 721 | 38.5 | 40.5 | -2 | 6.4 | 5.6 | .8 |
| 722 | 57.6 | 58.1 | -.5 | 6.4 | 6.5 | -.1 |
| 723 | 51.2 | 51.6 | -.4 | 6.6 | 5.9 | .7 |
| 724 | 55.8 | 56.4 | -.6 | 7.8 | 7.2 | .6 |
| 725 | 57.8 | 58.1 | -.3 | 7.1 | 6.5 | .6 |
| 726 | 50.5 | 51.6 | -1.1 | 5.7 | 4.7 | 1 |
| 727 | 59.2 | 59.7 | -.5 | 7.3 | 6.6 | .7 |
| 728 | NO WESTINGHOUSE MEASUREMENT | | | | | |
| 729 | 53.4 | 53.7 | -.3 | 5.1 | 4.2 | .9 |
| 730 | 43 | 43.1 | -.1 | 6 | 5.3 | .7 |
| 731 | 49.3 | 49.6 | -.3 | 6.1 | 5.5 | .6 |
| 732 | 56.3 | 56.9 | -.6 | 5.8 | 5.4 | .4 |
| 733 | 55.9 | 56.3 | -.4 | 6.4 | 5.7 | .7 |
| 734 | 56 | 57.1 | -1.1 | 5.6 | 4.7 | .9 |
| 735 | 58.5 | 58.4 | .1 | 4.4 | 3.5 | .9 |
| 736 | 60.6 | 61.1 | -.5 | 6.4 | 5.4 | 1 |
| 737 | 51.3 | 51.7 | -.4 | 6.8 | 10.4 | -3.6 |
| 738 | 58.3 | 58.8 | -.5 | 5.7 | 4.9 | .8 |
| 739 | 36.9 | 36.7 | .2 | 5.7 | 4.7 | 1 |
| 740 | 29 | 28.6 | .4 | 7.1 | 6.4 | .7 |

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# HWW SAMPLE TANK
# LEVEL MEASUREMENT
# COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 106 | 153 | 154.6 | -1.6 | 18.4 | 19 | -.6 |
| 107 | 132 | 133.5 | -1.5 | 20.4 | 20.5 | -.1 |
| 108 | 142.8 | 144.4 | -1.6 | 127.9 | 129.5 | -1.6 |
| 109 | 127.9 | 129.5 | -1.6 | 16.3 | 16.6 | -.3 |
| 110 | 146.9 | 149 | -2.1 | 20.4 | 20.4 | 0 |
| 111 | 144.8 | 146.3 | -1.5 | 122 | 123.6 | -1.6 |
| 112 | 95.9 | 123.6 | -27.7 | 15.3 | 15.4 | -.1 |
| 113 | 122.4 | 123.3 | -.9 | 0 | .1 | -.1 |
| 114 | 104 | 106.4 | -2.4 | 16.3 | 16.1 | .2 |
| 115 | 113.2 | 133.2 | -20 | 5.1 | 4.5 | .6 |
| 116 | 95.3 | 97.4 | -2.1 | 29 | 28.9 | .1 |
| 117 | 122.4 | 124.3 | -1.9 | 17.5 | 17.7 | -.2 |
| 118 | 154.2 | 157 | -2.8 | 20.2 | 21.3 | -1.1 |
| 119 | 142.8 | 145.4 | -2.6 | 18.6 | 20.3 | -1.7 |
| 120 | 118.3 | 120.7 | -2.4 | 16.3 | 19.2 | -2.9 |
| 121 | 122.4 | 125 | -2.6 | 13.3 | 14.7 | -1.4 |
| 122 | 150.9 | 152.7 | -1.8 | 20.2 | 20.9 | -.7 |
| 123 | 142.8 | 146 | -3.2 | 20.4 | 21.8 | -1.4 |
| 124 | 142.8 | 145.2 | -2.4 | 17.3 | 18.5 | -1.2 |
| 125 | 157.1 | 159.9 | -2.8 | 18.4 | 19 | -.6 |
| 126 | 154 | 156.9 | -2.9 | 18.4 | 20.2 | -1.8 |
| 127 | 148.9 | 152.4 | -3.5 | 14.3 | 14.4 | -.1 |
| 128 | 131.4 | 133.7 | -2.3 | 13.9 | 14 | -.1 |
| 129 | 133.8 | 136.6 | -2.8 | 18.4 | 20 | -1.6 |
| 130 | 141.8 | 144.2 | -2.4 | 16.3 | 29.8 | -13.5 |
| 131 | 153 | 155.6 | -2.6 | 18.2 | 19 | -.8 |
| 132 | 147.3 | 150.1 | -2.8 | 18.4 | 18.6 | -.2 |
| 133 | 126.5 | 129.4 | -2.9 | 19.4 | 20.7 | -1.3 |
| 134 | 134.6 | 137 | -2.4 | 18.8 | 19.8 | -1 |
| 135 | 153.2 | 156.4 | -3.2 | 18.4 | 18.7 | -.3 |
| 136 | 129.5 | 132.6 | -3.1 | 16.3 | 16.8 | -.5 |
| 137 | 142.8 | 145.4 | -2.6 | 9.2 | 9.6 | -.4 |
| 138 | 148.9 | 150.4 | -1.5 | 20.4 | 21.6 | -1.2 |
| 139 | 146.9 | 148.9 | -2 | 18.4 | 19.6 | -1.2 |
| 140 | 136.7 | 139.8 | -3.1 | 12.2 | 13.2 | -1 |
| 141 | 151.4 | 153.9 | -2.5 | 10.2 | 10.9 | -.7 |
| 142 | 141.8 | 144 | -2.2 | 19.4 | 20.4 | -1 |
| 143 | 129.5 | 131.8 | -2.3 | 14.3 | 15.3 | -1 |
| 144 | 146.3 | 148.9 | -2.6 | 19.4 | 28.6 | -9.2 |
| 145 | 138.7 | 141.3 | -2.6 | 19.4 | 19.7 | -.3 |
| 146 | 151 | 154 | -3 | 19.4 | 28.8 | -9.4 |
| 147 | 144.8 | 147.2 | -2.4 | 17.1 | 17.8 | -.7 |
| 148 | 143.8 | 146.4 | -2.6 | 20 | 20.9 | -.9 |
| 149 | 143.4 | 146.3 | -2.9 | 20.4 | 21.6 | -1.2 |

# HWW SAMPLE TANK
# LEVEL MEASUREMENT
# COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 150 | 142.8 | 144.6 | -1.8 | 18.8 | 19.8 | -1 |
| 151 | 142.8 | 144.8 | -2 | 24.5 | 24.7 | -.2 |
| 152 | 151 | 152.6 | -1.6 | 21.6 | 22.7 | -1.1 |
| 153 | 151 | 152.6 | -1.6 | 16.3 | 17.3 | -1 |
| 154 | 132.6 | 136 | -3.4 | 0 | -.1 | .1 |
| 155 | 93.8 | 96.4 | -2.6 | 19.4 | 20.4 | -1 |
| 156 | 102 | 104.2 | -2.2 | 12.2 | 12.3 | -.1 |
| 157 | 123.4 | 123.8 | -.4 | 0 | -51 | 51 |
| 158 | 49 | 50.3 | -1.3 | 19.4 | 20.1 | -.7 |
| 159 | 141.8 | 147 | -5.2 | 22.4 | 21.7 | .7 |
| 160 | 139.9 | 141.1 | -1.2 | 20 | 19.3 | .7 |
| 161 | 138.5 | 139.1 | -.6 | 17.5 | 16.7 | .8 |
| 162 | 139.7 | 141.2 | -1.5 | 22.4 | 23.2 | -.8 |
| 163 | 152.6 | 153.4 | -.8 | 22 | 21 | 1 |
| 164 | 152 | 152.4 | -.4 | 18.4 | 18.2 | .2 |
| 165 | 134.6 | 135.8 | -1.2 | 20.4 | 19.8 | .6 |
| 166 | 136.7 | 137.2 | -.5 | 10.6 | 10.4 | .2 |
| 167 | 126.5 | 128.2 | -1.7 | 18.8 | 18.6 | .2 |
| 168 | 134.6 | 136.1 | -1.5 | 18 | 17.6 | .4 |
| 169 | 148.9 | 149.8 | -.9 | 20.4 | 20.3 | .1 |
| 170 | 135.7 | 136.9 | -1.2 | 17.3 | 17.3 | 0 |
| 171 | 153 | 153.4 | -.4 | 10.2 | 9.3 | .9 |
| 172 | 157.1 | 158.8 | -1.7 | 13.5 | 12.5 | 1 |
| 173 | 154 | 155 | -1 | 18.8 | 18.6 | .2 |
| 174 | 136.7 | 137.5 | -.8 | 18 | 17.4 | .6 |
| 175 | 157.1 | 157.4 | -.3 | 18.4 | 17.8 | .6 |
| 176 | 157.3 | 171.4 | -14.1 | 15.5 | 14.2 | 1.3 |
| 177 | 161.2 | 162.3 | -1.1 | 20 | 19.3 | .7 |
| 178 | 163.6 | 165.1 | -1.5 | 18.4 | 18.4 | 0 |
| 179 | 154.2 | 155.2 | -1 | 19 | 18.7 | .3 |
| 180 | 156.1 | 157 | -.9 | 13.9 | 12.9 | 1 |
| 181 | 149.9 | 151.1 | -1.2 | 17.3 | 16.4 | .9 |
| 182 | 164 | 165 | -1 | 14.5 | 14.1 | .4 |
| 183 | 166.3 | 166.8 | -.5 | 18.4 | 17.7 | .7 |
| 184 | 147.9 | 148.8 | -.9 | 18.8 | 18.5 | .3 |
| 185 | 163.2 | 164.2 | -1 | 17.3 | 16.6 | .7 |
| 186 | 163.2 | 164.1 | -.9 | 16.3 | 15.6 | .7 |
| 187 | 155 | 156.4 | -1.4 | 20.4 | 20.2 | .2 |
| 188 | 145.2 | 146.5 | -1.3 | .6 | -.4 | 1 |
| 189 | 128.7 | 130.2 | -1.5 | 21.4 | 20.9 | .5 |
| 190 | 118.3 | 118.6 | -.3 | 20.4 | 20.4 | 0 |
| 191 | 164.6 | 165.4 | -.8 | 22.4 | 21.6 | .8 |
| 192 | 165.6 | 166.3 | -.7 | 18.4 | 18.4 | 0 |
| 193 | 155 | 155.7 | -.7 | 31 | 31.1 | -.1 |
| 194 | 144.2 | 145 | -.8 | 18.8 | 18.6 | .2 |

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# HWW SAMPLE TANK LEVEL MEASUREMENT COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 195 | 144.8 | 146.1 | -1.3 | 18.4 | 17.6 | .8 |
| 196 | 162.2 | 163.4 | -1.2 | 1.8 | 1.1 | .7 |
| 197 | 142.8 | 144.2 | -1.4 | 19.6 | 8.6 | 11 |
| 198 | 131 | 134 | -3 | 18.4 | 19.4 | -1 |
| 199 | 175.4 | 178.6 | -3.2 | 20 | 21.1 | -1.1 |
| 200 | 164.4 | 167.3 | -2.9 | 20 | 21.1 | -1.1 |
| 201 | 148.9 | 151.2 | -2.3 | 17.3 | 18.3 | -1 |
| 202 | 81.6 | 84.2 | -2.6 | 81.6 | 84.2 | -2.6 |
| 203 | 81.6 | 84.2 | -2.6 | 17.3 | 18.3 | -1 |
| 204 | 54.7 | 56 | -1.3 | 15.9 | 16.5 | -.6 |
| 205 | 147.5 | 150.1 | -2.6 | 20.2 | 20.6 | -.4 |
| 206 | 151 | 154.3 | -3.3 | 14.3 | 15.5 | -1.2 |
| 207 | 165.2 | 167.9 | -2.7 | 18.4 | 19 | -.6 |
| 208 | 153 | 155.3 | -2.3 | 20.4 | 21.7 | -1.3 |
| 209 | 147.3 | 150.1 | -2.8 | 14.9 | 15.7 | -.8 |
| 210 | 141.8 | 144.6 | -2.8 | 26.5 | 28.3 | -1.8 |
| 211 | 160.8 | 163.3 | -2.5 | 16.1 | 16.8 | -.7 |
| 212 | 155 | 157.8 | -2.8 | 18.8 | 19.7 | -.9 |
| 213 | 169.7 | 172.6 | -2.9 | 18.4 | 20.5 | -2.1 |
| 214 | 152.8 | 155.8 | -3 | 15.9 | 16.4 | -.5 |
| 215 | 154.2 | 157 | -2.8 | 18.8 | 20.4 | -1.6 |
| 216 | 151 | 153.5 | -2.5 | 16.1 | 17.2 | -1.1 |
| 217 | 153.8 | 156.8 | -3 | 19 | 20.1 | -1.1 |
| 218 | 161.8 | 164.8 | -3 | 15.3 | 13.7 | 1.6 |
| 219 | 163.2 | 166.5 | -3.3 | 20.4 | 21.8 | -1.4 |
| 220 | 159.1 | 163.2 | -4.1 | 13.1 | 14.4 | -1.3 |
| 221 | 160.3 | 163.7 | -3.4 | 5.9 | 6.2 | -.3 |
| 222 | 151.4 | 155.2 | -3.8 | 22.4 | 24.6 | -2.2 |
| 223 | 30.6 | 32.9 | -2.3 | 9.2 | 10.7 | -1.5 |
| 224 | 153.4 | 156.8 | -3.4 | 12 | 12.7 | -.7 |
| 225 | 153.4 | 156.9 | -3.5 | 19 | 20.7 | -1.7 |
| 226 | 126.1 | 130.9 | -4.8 | 20.4 | 21.3 | -.9 |
| 227 | 153.8 | 156.9 | -3.1 | 18.4 | 19.4 | -1 |
| 228 | 165.2 | 168.2 | -3 | 18.4 | 19.5 | -1.1 |
| 229 | 132.6 | 135.9 | -3.3 | 18.4 | 19.8 | -1.4 |
| 230 | 159.1 | 162.9 | -3.8 | 18.4 | 19.7 | -1.3 |
| 231 | 162.2 | 165.3 | -3.1 | 18.4 | 19.3 | -.9 |
| 232 | 162.2 | 165.5 | -3.3 | 18.4 | 19.7 | -1.3 |
| 233 | 132.2 | 135 | -2.8 | 18.4 | 20 | -1.6 |
| 234 | 158.1 | 161.9 | -3.8 | 34.7 | 37 | -2.3 |
| 235 | 155 | 158 | -3 | 19.4 | 20.3 | -.9 |
| 236 | 143.8 | 146.9 | -3.1 | 18.4 | 20.4 | -2 |
| 237 | 163.2 | 166.1 | -2.9 | 18.4 | 19.8 | -1.4 |
| 238 | 140.6 | 143.4 | -2.8 | 18.2 | 18.7 | -.5 |
| 239 | 153 | 156.1 | -3.1 | 18.6 | 19.8 | -1.2 |

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HWW SAMPLE TANK
LEVEL MEASUREMENT
COMPARISONS

| BATCH | AFTER SAMPLE INCHES OF WATER TAY | WEST | T-W | AFTER TRANSFER INCHES OF WATER TAY | WEST | T-W |
|---|---|---|---|---|---|---|
| 240 | 159.1 | 162.5 | -3.4 | 18 | 19.4 | -1.4 |
| 241 | 144.8 | 148.5 | -3.7 | 16.3 | 17.5 | -1.2 |
| 242 | 147.3 | 150.3 | -3 | 15.9 | 17.2 | -1.3 |
| 243 | 138.3 | 141.5 | -3.2 | 16.1 | 17.3 | -1.2 |
| 244 | 163.2 | 166 | -2.8 | 19.4 | 21 | -1.6 |
| 245 | 141.8 | 144.6 | -2.8 | 18.8 | 20.2 | -1.4 |
| 246 | 164 | 167.5 | -3.5 | 15.9 | 17.1 | -1.2 |
| 247 | 151 | 154.5 | -3.5 | 14.3 | 15.1 | -.8 |
| 248 | 154 | 157.3 | -3.3 | 18.4 | 19.4 | -1 |
| 249 | 144.8 | 147.8 | -3 | 16.7 | 18 | -1.3 |
| 250 | 131.6 | 134.5 | -2.9 | 18.8 | 19.6 | -.8 |
| 251 | 134.8 | 137.9 | -3.1 | 15.3 | 15.7 | -.4 |
| 252 | 85.5 | 88 | -2.5 | 18.4 | 19.5 | -1.1 |
| 253 | 85.7 | 88.6 | -2.9 | 20.4 | 20.9 | -.5 |

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INPUT ACCOUNTABILITY SAMPLE TANK
U ANALYSIS COMPARISONS

| BATCH NO. | ACID | DENSITY | LOG.NO. | U CALC NEW EQN (1) | U MASS SPEC (2) | U VP (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | DIFF MG/G (1-2) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | % DIFF (1-2)/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 | .93 | 1.3947 | 21142 | 197 | 198.18 | 197.18 | -.18 | 1 | -1.18 | -.09 | .51 | -.6 |
| 129 | 1.12 | 1.4778 | 21160 | 225.53 | 225.93 | 226.1 | -.57 | -.17 | -.4 | -.25 | -.08 | -.18 |
| 130 | 1.16 | 1.4813 | 21509 | 226.19 | 226.78 | 228.6 | -2.41 | -1.82 | -.59 | -1.05 | -.8 | -.26 |
| 131 | 1.12 | 1.4982 | 21538 | 232.85 | 232.09 | 232.73 | .12 | -.64 | .76 | .05 | -.27 | .33 |
| 132 | 1.12 | 1.4982 | 21538 | 232.85 | 232.09 | 232.73 | .12 | -.64 | .76 | .05 | -.27 | .33 |
| 133 | 1.56 | 1.3654 | 22051 | 174.56 | 172.63 | 173.32 | 1.24 | -.69 | 1.93 | .72 | -.4 | 1.11 |
| 134 | 1.54 | 1.4181 | 22172 | 196.45 | 196.28 | 196.17 | .28 | .11 | .17 | .14 | .06 | .09 |
| 135 | 1.77 | 1.5283 | 22230 | 233.94 | 233.2 | 233.23 | .71 | -.03 | .74 | .3 | -.01 | .32 |
| 136 | 1.6 | 1.5871 | 22294 | 256.36 | 256.52 | 256.18 | .18 | .34 | -.16 | .07 | .13 | -.06 |
| 137 | 1.1 | 1.5438 | 22340 | 248.97 | 273.02 | 273.52 | -24.55 | -.5 | -24.05 | -8.98 | -.18 | -8.79 |
| 138 | .71 | 1.643 | 22368 | 286.56 | 284.66 | 285.66 | .9 | -1 | 1.9 | .32 | -.35 | .67 |
| 139 | .55 | 1.6507 | 22407 | 291.15 | 291.6 | 292.19 | -1.04 | -.59 | -.45 | -.36 | -.2 | -.15 |
| 140 | .45 | 1.6527 | 22475 | 293.14 | 291.08 | 293.76 | -.62 | -2.68 | 2.06 | -.21 | -.91 | .7 |
| 141 | 1.01 | 1.6266 | 22533 | 277.29 | 275.85 | 277.21 | .08 | -1.36 | 1.44 | .03 | -.49 | .52 |
| 142 | .98 | 1.6126 | 22562 | 273.28 | 273.6 | 275.3 | -2.02 | -1.7 | -.32 | -.73 | -.62 | -.12 |
| 143 | .54 | 1.6164 | 22622 | 280.67 | 279.07 | 279.79 | .88 | -.72 | 1.6 | .31 | -.26 | .57 |
| 144 | .475 | 1.6133 | 22656 | 280.61 | 281.1 | 281.21 | -.6 | -.11 | -.49 | -.21 | -.04 | -.17 |
| 145 | .35 | 1.607 | 22687 | 280.41 | 281.34 | 281.54 | -1.13 | -.2 | -.93 | -.4 | -.07 | -.33 |
| 146 | .28 | 1.6005 | 22727 | 279.37 | 282.41 | 281.04 | -1.67 | 1.37 | -3.04 | -.59 | .49 | -1.08 |
| 147 | .4 | 1.6182 | 22788 | 283.21 | 284.15 | 282.36 | .85 | 1.79 | -.94 | .3 | .63 | -.33 |
| 148 | .38 | 1.6227 | 22829 | 284.9 | 283.82 | 284.1 | .8 | -.28 | 1.08 | .28 | -.1 | .38 |
| 149 | .38 | 1.6227 | 22829 | 284.9 | 283.82 | 284.1 | .8 | -.28 | 1.08 | .28 | -.1 | .38 |
| 150 | .677 | 1.6233 | 22880 | 280.9 | 280.7 | 281.32 | -.42 | -.62 | .2 | -.15 | -.22 | .07 |
| 151 | .655 | 1.6339 | 22920 | 284.51 | 282.64 | 283.92 | .59 | -1.28 | 1.87 | .21 | -.45 | .66 |
| 152 | .66 | 1.6399 | 22978 | 286.3 | 288.58 | 287.7 | -1.4 | .88 | -2.28 | -.49 | .31 | -.79 |
| 153 | .605 | 1.6328 | 22997 | 284.87 | 284.53 | 283.97 | .9 | .56 | .34 | .32 | .2 | .12 |
| 154 | .485 | 1.6204 | 23057 | 282.7 | 281.14 | 280.61 | 2.09 | .53 | 1.56 | .74 | .19 | .56 |
| 155 | .545 | 1.6387 | 23092 | 287.53 | 287.14 | 286.21 | 1.32 | .93 | .39 | .46 | .32 | .14 |
| 156 | .9 | 1.6037 | 23142 | 271.56 | 271.61 | 271.7 | -.14 | -.09 | -.05 | -.05 | -.03 | -.02 |
| 157 | .94 | 1.6079 | 23171 | 272.34 | 270.73 | 271.45 | .89 | -.72 | 1.61 | .33 | -.27 | .59 |
| 158 | .77 | 1.5905 | 23218 | 269.16 | 266.83 | 268.44 | .72 | -1.61 | 2.33 | .27 | -.6 | .87 |
| 159 | .7 | 1.5983 | 23265 | 272.66 | 270.93 | 272.11 | .55 | -1.18 | 1.73 | .2 | -.43 | .64 |
| 160 | .687 | 1.5744 | 23319 | 265.13 | 266.87 | 266.46 | -1.33 | .41 | -1.74 | -.5 | .15 | -.65 |
| 161 | .995 | 1.6025 | 23346 | 269.84 | 269.64 | 270.2 | -.36 | -.56 | .2 | -.13 | -.21 | .07 |
| 162 | 1.36 | 1.6434 | 23398 | 277.76 | 277.35 | 277.88 | -.12 | -.53 | .41 | -.04 | -.19 | .15 |
| 163 | .92 | 1.6059 | 23434 | 271.98 | 272.43 | 271.72 | .26 | .71 | -.45 | .1 | .26 | -.17 |
| 164 | .765 | 1.5561 | 23477 | 257.97 | 259.57 | 259.35 | -1.38 | .22 | -1.6 | -.53 | .08 | -.62 |
| 165 | .653 | 1.5782 | 23532 | 266.86 | 265.81 | 266.11 | .75 | -.3 | 1.05 | .28 | -.11 | .39 |
| 166 | .465 | 1.5974 | 23579 | 275.73 | 274.25 | 273.93 | 1.8 | .32 | 1.48 | .66 | .12 | .54 |
| 167 | .54 | 1.613 | 22615 | 279.6 | 278.17 | 279.21 | .39 | -1.04 | 1.43 | .14 | -.37 | .51 |
| 168 | .46 | 1.5944 | 23648 | 274.85 | 272.74 | 272.87 | 1.98 | -.13 | 2.11 | .73 | -.05 | .77 |
| 169 | .78 | 1.5504 | 23683 | 255.85 | 254.57 | 254.96 | .89 | -.39 | 1.28 | .35 | -.15 | .5 |
| 170 | .4 | 1.5745 | 23702 | 269.32 | 264.16 | 267.61 | 1.71 | -3.45 | 5.16 | .64 | -1.29 | 1.93 |
| 171 | .55 | 1.5613 | 23749 | 262.83 | 262.28 | 262.52 | .31 | -.24 | .55 | .12 | -.09 | .21 |

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INPUT ACCOUNTABILITY SAMPLE TANK
U ANALYSIS COMPARISONS

| BATCH NO. | ACID | DENSITY | LOG.NO. | U CALC NEW EQN (1) | U MASS SPEC (2) | U VP (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | DIFF MG/G (1-2) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | % DIFF (1-2)/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 172 | .445 | 1.5347 | 23776 | 255.53 | 255.14 | 255.66 | -.13 | -.52 | .39 | -.05 | -.2 | .15 |
| 173 | .37 | 1.5086 | 23792 | 247.8 | 247.88 | 248.07 | -.27 | -.19 | -.08 | -.11 | -.08 | -.03 |
| 174 | .35 | 1.4993 | 23874 | 244.89 | 244.21 | 245.33 | -.44 | -1.12 | .68 | -.18 | -.46 | .28 |
| 175 | .345 | 1.4976 | 23911 | 244.38 | 243.97 | 244.3 | .08 | -.33 | .41 | .03 | -.14 | .17 |
| 176 | .49 | 1.4954 | 23940 | 241.4 | 241.59 | 242.3 | -.9 | -.71 | -.19 | -.37 | -.29 | -.08 |
| 177 | .545 | 1.4945 | 23976 | 240.24 | 240.65 | 241.2 | -.96 | -.55 | -.41 | -.4 | -.23 | -.17 |
| 178 | .48 | 1.4963 | 21765 | 241.86 | 242.72 | 243 | -1.14 | -.28 | -.86 | -.47 | -.12 | -.35 |
| 179 | .42 | 1.5004 | 21803 | 244.21 | 242.45 | 242.46 | 1.75 | -.01 | 1.76 | .72 | 0 | .73 |
| 180 | .405 | 1.4951 | 21849 | 242.59 | 241.48 | 242.49 | .1 | -1.01 | 1.11 | .04 | -.42 | .46 |
| 181 | .317 | 1.4762 | 21883 | 237.31 | 236.97 | 237.13 | .18 | -.16 | .34 | .08 | -.07 | .14 |
| 182 | .348 | 1.4652 | 21915 | 232.91 | 232.46 | 233.76 | -.85 | -1.3 | .45 | -.36 | -.56 | .19 |
| 183 | .455 | 1.488 | 21947 | 239.34 | 238.46 | 239.22 | .12 | -.76 | .88 | .05 | -.32 | .37 |
| 184 | .36 | 1.509 | 24429 | 248.09 | 246.73 | 248.21 | -.12 | -1.48 | 1.36 | -.05 | -.6 | .55 |
| 185 | .56 | 1.5071 | 24466 | 244.4 | 244.38 | 245.62 | -1.22 | -1.24 | .02 | -.5 | -.5 | .01 |
| 186 | .68 | 1.5323 | 24489 | 251.23 | 250.09 | 250.51 | .72 | -.42 | 1.14 | .29 | -.17 | .46 |
| 187 | .61 | 1.5249 | 24928 | 249.76 | 249.19 | 250.84 | -1.08 | -1.65 | .57 | -.43 | -.66 | .23 |
| 188 | .46 | 1.522 | 24979 | 251.02 | 249.39 | 251.22 | -.2 | -1.83 | 1.63 | -.08 | -.73 | .65 |
| 189 | .423 | 1.5114 | 25024 | 247.95 | 247.05 | 248.8 | -.85 | -1.75 | .9 | -.34 | -.7 | .36 |
| 190 | .48 | 1.5142 | 25041 | 248.05 | 247.73 | 247.98 | .07 | -.25 | .32 | .03 | -.1 | .13 |
| 191 | .53 | 1.5058 | 25075 | 244.4 | 244.53 | 244.14 | .26 | .39 | -.13 | .11 | .16 | -.05 |
| 192 | .675 | 1.5112 | 25136 | 244.09 | 242.73 | 244.35 | -.26 | -1.62 | 1.36 | -.11 | -.66 | .56 |
| 193 | .717 | 1.5188 | 25161 | 246.08 | 241.99 | 246.22 | -.14 | -4.23 | 4.09 | -.06 | -1.72 | 1.66 |
| 194 | .58 | 1.5107 | 25177 | 245.34 | 244.23 | 245.66 | -.32 | -1.43 | 1.11 | -.13 | -.58 | .45 |
| 195 | .433 | 1.5097 | 25235 | 247.22 | 247.55 | 247.7 | -.48 | -.15 | -.33 | -.19 | -.06 | -.13 |
| 196 | .45 | 1.5156 | 25253 | 249.05 | 249.1 | 249.91 | -.86 | -.81 | -.05 | -.34 | -.32 | -.02 |
| 197 | .523 | 1.5045 | 25312 | 244.06 | 221.99 | 222.25 | 21.81 | -.26 | 22.07 | 9.81 | -.12 | 9.93 |
| 198 | .51 | 1.5087 | 25337 | 245.71 | 244.58 | 246.11 | -.4 | -1.53 | 1.13 | -.16 | -.62 | .46 |
| 199 | .59 | 1.5144 | 25394 | 246.47 | 244.45 | 246.35 | .12 | -1.9 | 2.02 | .05 | -.77 | .82 |
| 200 | .43 | 1.5078 | 25427 | 246.61 | 245 | 246.49 | .12 | -1.49 | 1.61 | .05 | -.6 | .65 |
| 201 | .41 | 1.5073 | 25464 | 246.74 | 245.58 | 247.1 | -.36 | -1.52 | 1.16 | -.15 | -.62 | .47 |
| 202 | .4 | 1.5049 | 25494 | 246.07 | 245.41 | 246.45 | -.38 | -1.04 | .66 | -.15 | -.42 | .27 |
| 203 | .42 | 1.5023 | 25526 | 244.86 | 243.06 | 244.4 | .46 | -1.34 | 1.8 | .19 | -.55 | .74 |
| 204 | .42 | 1.5023 | 25526 | 244.86 | 243.06 | 244.4 | .46 | -1.34 | 1.8 | .19 | -.55 | .74 |
| 205 | .55 | 1.4857 | 25677 | 237.07 | 237.31 | 236.99 | .08 | .32 | -.24 | .03 | .14 | -.1 |
| 206 | 1.9 | 1.419 | 25983 | 191.15 | 189.4 | 190.76 | .39 | -1.36 | 1.75 | .2 | -.71 | .92 |
| 207 | 2.02 | 1.415 | 26023 | 187.67 | 186.79 | 186.71 | .96 | .08 | .88 | .51 | .04 | .47 |
| 208 | 1.35 | 1.4684 | 26061 | 218.59 | 218.78 | 218.82 | -.23 | -.04 | -.19 | -.11 | -.02 | -.09 |
| 209 | .89 | 1.4904 | 26100 | 233.55 | 232.13 | 233.45 | .1 | -1.32 | 1.42 | .04 | -.57 | .61 |
| 210 | .675 | 1.4976 | 26147 | 239.35 | 238.55 | 239.17 | .18 | -.62 | .8 | .08 | -.26 | .33 |
| 211 | .633 | 1.5035 | 26195 | 242.05 | 242.09 | 242.12 | -.07 | -.03 | -.04 | -.03 | -.01 | -.02 |
| 212 | .513 | 1.4884 | 26246 | 238.59 | 236.88 | 239.01 | -.42 | -2.13 | 1.71 | -.18 | -.89 | .72 |
| 213 | .48 | 1.4772 | 26286 | 235.14 | 234.84 | 234.98 | .16 | -.14 | .3 | .07 | -.06 | .13 |
| 214 | .52 | 1.476 | 26317 | 234.09 | 232.59 | 234.12 | -.03 | -1.53 | 1.5 | -.01 | -.65 | .64 |
| 215 | .597 | 1.4931 | 26349 | 238.96 | 238.26 | 238.99 | -.03 | -.73 | .7 | -.01 | -.31 | .29 |
| 216 | .43 | 1.4941 | 26407 | 241.86 | 242.42 | 242.21 | -.35 | .21 | -.56 | -.14 | .09 | -.23 |

INPUT ACCOUNTABILITY SAMPLE TANK
U ANALYSIS COMPARISONS

| BATCH NO. | ACID | DENSITY | LOG.NO. | U CALC NEW EQN (1) | U MASS SPEC (2) | U VP (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | DIFF MG/G (1-2) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | % DIFF (1-2)/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 217 | .43 | 1.4962 | 26423 | 242.59 | 243.8 | 243.74 | -1.15 | .06 | -1.21 | -.47 | .02 | -.5 |
| 218 | .79 | 1.5141 | 26475 | 243.36 | 242.24 | 242.56 | .8 | -.32 | 1.12 | .33 | -.13 | .46 |
| 219 | .93 | 1.5147 | 26522 | 241.48 | 241.01 | 241.07 | .41 | -.06 | .47 | .17 | -.02 | .19 |
| 220 | .985 | 1.5118 | 26556 | 239.66 | 239.41 | 239.3 | .36 | .11 | .25 | .15 | .05 | .1 |
| 221 | .8 | 1.5112 | 26591 | 242.21 | 241.49 | 241.55 | .66 | -.06 | .72 | .27 | -.02 | .3 |
| 222 | .725 | 1.4935 | 26621 | 237.15 | 236.46 | 237.6 | -.45 | -1.14 | .69 | -.19 | -.48 | .29 |
| 223 | .46 | 1.4894 | 26665 | 239.76 | 239.45 | 240.03 | -.27 | -.58 | .31 | -.11 | -.24 | .13 |
| 224 | .33 | 1.4999 | 26682 | 245.41 | 245.37 | 244.81 | .6 | .56 | .04 | .25 | .23 | .02 |
| 225 | .625 | 1.4881 | 26725 | 236.77 | 236.64 | 237.31 | -.54 | -.67 | .13 | -.23 | -.28 | .05 |
| 226 | .83 | 1.4937 | 26762 | 235.63 | 235.73 | 236.01 | -.38 | -.28 | -.1 | -.16 | -.12 | -.04 |
| 227 | .75 | 1.4937 | 26798 | 236.84 | 238.52 | 236.31 | .53 | 2.21 | -1.68 | .22 | .94 | -.71 |
| 228 | .88 | 1.4889 | 26832 | 233.17 | 232.77 | 233.78 | -.61 | -1.01 | .4 | -.26 | -.43 | .17 |
| 229 | 1.2 | 1.4981 | 26865 | 231.62 | 230.53 | 231.66 | -.04 | -1.13 | 1.09 | -.02 | -.49 | .47 |
| 230 | 1.26 | 1.5053 | 26912 | 233.28 | 232.66 | 233.2 | .08 | -.54 | .62 | .03 | -.23 | .27 |
| 231 | 1.58 | 1.509 | 26947 | 229.88 | 229.93 | 229.65 | .23 | .28 | -.05 | .1 | .12 | -.02 |
| 232 | 1.1 | 1.5084 | 27006 | 236.75 | 236.01 | 236.99 | -.24 | -.98 | .74 | -.1 | -.41 | .31 |
| 233 | .61 | 1.5024 | 27036 | 242.01 | 241.16 | 242.37 | -.36 | -1.21 | .85 | -.15 | -.5 | .35 |
| 234 | 1.2 | 1.5108 | 27055 | 236.11 | 234.93 | 235.38 | .73 | -.45 | 1.18 | .31 | -.19 | .5 |
| 235 | 1.87 | 1.5155 | 27151 | 227.97 | 225.86 | 226.65 | 1.32 | -.79 | 2.11 | .58 | -.35 | .93 |
| 236 | 1.2 | 1.5024 | 27195 | 233.15 | 233.41 | 234.02 | -.87 | -.61 | -.26 | -.37 | -.26 | -.11 |
| 237 | 1.1 | 1.4822 | 27281 | 227.43 | 227.23 | 228.62 | -1.19 | -1.39 | .2 | -.52 | -.61 | .09 |
| 238 | .75 | 1.488 | 27305 | 234.82 | 234.92 | 235.27 | -.45 | -.35 | -.1 | -.19 | -.15 | -.04 |
| 239 | 1.51 | 1.4837 | 27344 | 221.79 | 221.15 | 221.55 | .24 | -.4 | .64 | .11 | -.18 | .29 |
| 240 | 1.6 | 1.5137 | 27401 | 231.25 | 229.94 | 230.79 | .46 | -.85 | 1.31 | .2 | -.37 | .57 |
| 241 | .98 | 1.5052 | 27433 | 237.42 | 237.21 | 237.4 | .02 | -.19 | .21 | .01 | -.08 | .09 |
| 242 | .725 | 1.5003 | 27461 | 239.54 | 237.2 | 239.58 | -.04 | -2.38 | 2.34 | -.02 | -.99 | .98 |
| 243 | .33 | 1.5051 | 27518 | 247.2 | 245.75 | 246.44 | .76 | -.69 | 1.45 | .31 | -.28 | .59 |
| 244 | .454 | 1.5049 | 27549 | 245.25 | 242.57 | 242.94 | 2.31 | -.37 | 2.68 | .95 | -.15 | 1.1 |
| 245 | .7 | 1.5033 | 27594 | 240.96 | 238.16 | 240.26 | .7 | -2.1 | 2.8 | .29 | -.87 | 1.17 |
| 246 | .8 | 1.496 | 27624 | 236.89 | 236.02 | 236.69 | .2 | -.67 | .87 | .08 | -.28 | .37 |
| 247 | .865 | 1.4944 | 27678 | 235.35 | 234.85 | 235.47 | -.12 | -.62 | .5 | -.05 | -.26 | .21 |
| 248 | .74 | 1.4861 | 27726 | 234.3 | 233.15 | 234.74 | -.44 | -1.59 | 1.15 | -.19 | -.68 | .49 |
| 249 | .68 | 1.4732 | 27763 | 230.61 | 230.26 | 230.36 | .25 | -.1 | .35 | .11 | -.04 | .15 |
| 250 | .33 | 1.4753 | 27795 | 236.79 | 233.66 | 234.82 | 1.97 | -1.16 | 3.13 | .84 | -.49 | 1.33 |
| 251 | .483 | 1.4881 | 27893 | 238.95 | 238.11 | 239.48 | -.53 | -1.37 | .84 | -.22 | -.57 | .35 |
| 252 | .465 | 1.5015 | 27938 | 243.9 | 243.27 | 243.89 | .01 | -.62 | .63 | 0 | -.25 | .26 |
| 253 | .88 | 1.5041 | 27980 | 238.53 | 237.35 | 238.45 | .08 | -1.1 | 1.18 | .03 | -.46 | .49 |
| 254 | 1.08 | 1.5006 | 28.06 | 234.3 | 234.08 | 234.55 | -.25 | -.47 | .22 | -.11 | -.2 | .09 |
| 255 | .973 | 1.5113 | 28057 | 239.66 | 239.11 | 240.18 | -.52 | -1.07 | .55 | -.22 | -.45 | .23 |
| 256 | .98 | 1.5146 | 28094 | 240.7 | 239 | 240.65 | .05 | -1.65 | 1.7 | .02 | -.69 | .71 |
| 257 | 1.075 | 1.5107 | 28127 | 237.93 | 236.56 | 237.84 | .09 | -1.28 | 1.37 | .04 | -.54 | .58 |
| 258 | 1.2 | 1.5073 | 28170 | 234.88 | 233.75 | 234.54 | .34 | -.79 | 1.13 | .14 | -.34 | .48 |
| 259 | 1.195 | 1.507 | 28210 | 234.85 | 233.38 | 235.28 | -.43 | -1.9 | 1.47 | -.18 | -.81 | .62 |
| 260 | 1.05 | 1.5135 | 28243 | 239.28 | 237.64 | 237.03 | 2.25 | .61 | 1.64 | .95 | .26 | .69 |
| 261 | .845 | 1.5094 | 28307 | 240.91 | 240.24 | 241.06 | -.15 | -.82 | .67 | -.06 | -.34 | .28 |

INPUT ACCOUNTABILITY SAMPLE TANK
U ANALYSIS COMPARISONS

| BATCH NO. | ACID | DENSITY | LOG.NO. | U CALC NEW EQN (1) | U MASS SPEC (2) | U VP (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | DIFF MG/G (1-2) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | % DIFF (1-2)/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 262 | .865 | 1.5051 | 28348 | 239.11 | 238.17 | 239.19 | -.08 | -1.02 | .94 | -.03 | -.43 | .39 |
| 263 | .785 | 1.5083 | 28402 | 241.43 | 240 | 241.47 | -.04 | -1.47 | 1.43 | -.02 | -.61 | .59 |
| 264 | .6 | 1.503 | 28441 | 242.37 | 241.8 | 242.67 | -.3 | -.87 | .57 | -.12 | -.36 | .23 |
| 265 | .52 | 1.5104 | 28480 | 246.14 | 246.3 | 247.19 | -1.05 | -.89 | -.16 | -.42 | -.36 | -.06 |
| 266 | .49 | 1.5047 | 28621 | 244.63 | 243.66 | 244.97 | -.34 | -1.31 | .97 | -.14 | -.53 | .4 |
| 267 | 1 | 1.5126 | 28659 | 239.71 | 239.8 | 240.62 | -.91 | -.82 | -.09 | -.38 | -.34 | -.04 |
| 268 | 1.11 | 1.5124 | 28735 | 238.01 | 236.72 | 238.35 | -.34 | -1.63 | 1.29 | -.14 | -.68 | .54 |
| 269 | 1.08 | 1.4956 | 28819 | 232.53 | 232.33 | 232.75 | -.22 | -.42 | .2 | -.09 | -.18 | .09 |
| 270 | .97 | 1.5067 | 28830 | 238.1 | 236.75 | 237.25 | .85 | -.5 | 1.35 | .36 | -.21 | .57 |
| 271 | 1.65 | 1.4692 | 29058 | 214.34 | 213.7 | 213.92 | .42 | -.22 | .64 | .2 | -.1 | .3 |
| 272 | 1.65 | 1.4692 | 29058 | 214.34 | 213.7 | 213.92 | .42 | -.22 | .64 | .2 | -.1 | .3 |
| 273 | 1.65 | 1.4692 | 29058 | 214.34 | 213.92 | 213.7 | .64 | .22 | .42 | .3 | .1 | .2 |
| 274 | 1.91 | 1.4357 | 29285 | 197.6 | 198.45 | 196.96 | .64 | 1.49 | -.85 | .32 | .76 | -.43 |
| 275 | 1.61 | 1.4584 | 29326 | 210.9 | 212.65 | 210.42 | .48 | 2.23 | -1.75 | .23 | 1.06 | -.83 |
| 276 | 1.02 | 1.4761 | 29392 | 226.44 | 226.2 | 226.03 | .41 | .17 | .24 | .18 | .08 | .11 |
| 277 | .85 | 1.4856 | 29425 | 232.45 | 233.61 | 231.68 | .77 | 1.93 | -1.16 | .33 | .83 | -.5 |
| 278 | 1.02 | 1.5071 | 29513 | 237.49 | 237.04 | 236.89 | .6 | .15 | .45 | .25 | .06 | .19 |
| 279 | 1.1 | 1.4944 | 29537 | 231.8 | 232.7 | 231.56 | .24 | 1.14 | -.9 | .1 | .49 | -.39 |
| 280 | 1.75 | 1.452 | 29614 | 206.34 | 206.51 | 205.1 | 1.24 | 1.41 | -.17 | .6 | .69 | -.08 |
| 281 | 1.24 | 1.4467 | 29668 | 212.18 | 215.38 | 211.74 | .44 | 3.64 | -3.2 | .21 | 1.72 | -1.51 |
| 282 | 1.37 | 1.4615 | 29735 | 215.73 | 215.83 | 215.19 | .54 | .64 | -.1 | .25 | .3 | -.05 |
| 283 | 1.1 | 1.466 | 29758 | 221.53 | 219.97 | 220.25 | 1.28 | -.28 | 1.56 | .58 | -.13 | .71 |
| 284 | 1 | 1.466 | 29792 | 223.07 | 223.4 | 222.15 | .92 | 1.25 | -.33 | .41 | .56 | -.15 |
| 285 | .975 | 1.4707 | 29825 | 225.17 | 225.77 | 223.78 | 1.39 | 1.99 | -.6 | .62 | .89 | -.27 |
| 286 | .97 | 1.4893 | 29861 | 231.94 | 229.31 | 231.5 | .44 | -2.19 | 2.63 | .19 | -.95 | 1.14 |
| 287 | .72 | 1.4909 | 29897 | 236.31 | 237.7 | 236.79 | -.48 | .91 | -1.39 | -.2 | .38 | -.59 |
| 288 | .493 | 1.4848 | 29941 | 237.63 | 236.41 | 236.96 | .67 | -.55 | 1.22 | .28 | -.23 | .51 |
| 289 | .43 | 1.4814 | 29971 | 237.4 | 239.61 | 236.06 | 1.34 | 3.55 | -2.21 | .57 | 1.5 | -.94 |
| 290 | .48 | 1.4546 | 30011 | 227 | 223.78 | 225.73 | 1.27 | -1.95 | 3.22 | .56 | -.86 | 1.43 |
| 291 | .583 | 1.4628 | 30053 | 228.37 | 228.04 | 228.17 | .2 | -.13 | .33 | .09 | -.06 | .14 |
| 292 | .91 | 1.4723 | 30090 | 228.28 | 228.93 | 227.41 | .87 | 1.52 | -.65 | .38 | .67 | -.29 |
| 293 | .65 | 1.4704 | 30221 | 230.07 | 229.06 | 229.58 | .49 | -.52 | 1.01 | .21 | -.23 | .44 |
| 294 | .775 | 1.4619 | 30296 | 225.05 | 223.16 | 225.4 | -.35 | -2.24 | 1.89 | -.16 | -.99 | .84 |
| 295 | .61 | 1.458 | 30322 | 226.2 | 224.85 | 227.6 | -1.4 | -2.75 | 1.35 | -.62 | -1.21 | .59 |
| 296 | .55 | 1.451 | 30353 | 224.58 | 224.59 | 224.66 | -.08 | -.07 | -.01 | -.04 | -.03 | 0 |
| 297 | 1.04 | 1.4642 | 30422 | 221.79 | 221.82 | 222.25 | -.46 | -.43 | -.03 | -.21 | -.19 | -.01 |
| 298 | .55 | 1.471 | 30452 | 231.84 | 231.22 | 229.54 | 2.3 | 1.68 | .62 | 1 | .73 | .27 |
| 299 | .517 | 1.475 | 30484 | 233.78 | 233.11 | 232.34 | 1.44 | .77 | .67 | .62 | .33 | .29 |
| 300 | .57 | 1.4666 | 30518 | 229.94 | 228.58 | 229.88 | .06 | -1.3 | 1.36 | .03 | -.57 | .59 |
| 301 | .77 | 1.4705 | 30538 | 228.25 | 230.515 | 229.42 | -1.17 | 1.1 | -2.27 | -.51 | .48 | -.99 |
| 302 | .713 | 1.4916 | 30579 | 236.66 | 236.6 | 235 | 1.66 | 1.6 | .06 | .71 | .68 | .03 |
| 303 | .58 | 1.5116 | 30611 | 245.65 | 246.19 | 245.36 | .29 | .83 | -.54 | .12 | .34 | -.22 |
| 304 | .57 | 1.51 | 30653 | 245.25 | 245.611 | 244.87 | .38 | .74 | -.36 | .16 | .3 | -.15 |
| 305 | .57 | 1.5133 | 30686 | 246.39 | 246.91 | 246.29 | .1 | .62 | -.52 | .04 | .25 | -.21 |
| 306 | .56 | 1.5146 | 30707 | 246.99 | 246.72 | 245.62 | 1.37 | 1.1 | .27 | .56 | .45 | .11 |

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INPUT ACCOUNTABILITY SAMPLE TANK
U ANALYSIS COMPARISONS

| BATCH NO. | ACID | DENSITY | LOG.NO. | U CALC NEW EQN (1) | U MASS SPEC (2) | U VP (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | DIFF MG/G (1-2) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | % DIFF (1-2)/3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 307 | .605 | 1.5112 | 30743 | 245.14 | 244.84 | 244.13 | 1.01 | .71 | .3 | .41 | .29 | .12 |
| 308 | .73 | 1.5305 | 30771 | 249.88 | 249.42 | 248.54 | 1.34 | .88 | .46 | .54 | .35 | .19 |
| 309 | .6 | 1.529 | 30818 | 251.3 | 251.56 | 250.24 | 1.06 | 1.32 | -.26 | .42 | .53 | -.1 |
| 310 | .5 | 1.5259 | 30855 | 251.74 | 252.94 | 250.89 | .85 | 2.05 | -1.2 | .34 | .82 | -.48 |
| 311 | .117 | 1.1145 | 31060 | CONCENTRATION TOO LOW | | | | | | | | |
| 312 | 1.16 | 1.038 | 31104 | CONCENTRATION TOO LOW | | | | | | | | |
| 313 | .715 | 1.0198 | 31223 | CONCENTRATION TOO LOW | | | | | | | | |
| 314 | .61 | 1.0172 | 31230 | CONCENTRATION TOO LOW | | | | | | | | |
| 315 | .75 | 1.0215 | 31251 | CONCENTRATION TOO LOW | | | | | | | | |

31-Oct-79 04:16 PM

U PRODUCT SAMPLE TANK
U ANALYSIS VS U CALC

| BATCH NO. | ACID | DENSITY | U CALC NEW EQN (1) | U CALC OLD EQN (2) | U ANAL (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | DIFF MG/G (1-2) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.75 | 1.3506 | 165 | 162.78 | 165.56 | -.56 | -2.78 | -.34 | -1.68 | 2.22 |
| 3 | 1.57 | 1.428 | 199.87 | 197.56 | 199.96 | -.09 | -2.4 | -.05 | -1.2 | 2.31 |
| 4 | 1.85 | 1.5365 | 235.67 | 232.12 | 235.015 | .65 | -2.9 | .28 | -1.23 | 3.55 |
| 5 | 1.37 | 1.6178 | 269.52 | 265.2 | 269.15 | .37 | -3.95 | .14 | -1.47 | 4.32 |
| 6 | 1.03 | 1.6237 | 276.1 | 271.97 | 275.63 | .47 | -3.66 | .17 | -1.33 | 4.13 |
| 7 | .725 | 1.645 | 286.97 | 282.59 | 288.57 | -1.6 | -5.98 | -.55 | -2.07 | 4.38 |
| 8 | .505 | 1.6562 | 293.45 | 288.92 | 292.85 | .6 | -3.93 | .2 | -1.34 | 4.53 |
| 9 | .385 | 1.6523 | 293.93 | 289.58 | 292.72 | 1.21 | -3.14 | .41 | -1.07 | 4.35 |
| 10 | 1.37 | 1.6095 | 266.86 | 262.7 | 266.81 | .05 | -4.11 | .02 | -1.54 | 4.16 |
| 11 | .99 | 1.6192 | 275.23 | 271.24 | 275.2 | .03 | -3.96 | .01 | -1.44 | 3.99 |
| 12 | .34 | 1.6166 | 283.57 | 280.1 | 282.05 | 1.52 | -1.95 | .54 | -.69 | 3.47 |
| 13 | .34 | 1.6131 | 282.47 | 279.09 | 282.05 | .42 | -2.96 | .15 | -1.05 | 3.38 |
| 14 | .32 | 1.6108 | 282.04 | 278.71 | 280.94 | 1.1 | -2.23 | .39 | -.79 | 3.33 |
| 15 | .345 | 1.6143 | 282.78 | 279.36 | 282.44 | .34 | -3.08 | .12 | -1.09 | 3.42 |
| 16 | .485 | 1.6242 | 283.88 | 280.16 | 283.85 | .03 | -3.69 | .01 | -1.3 | 3.72 |
| 17 | .375 | 1.6244 | 285.5 | 281.84 | 284.1 | 1.4 | -2.26 | .49 | -.8 | 3.66 |
| 18 | .66 | 1.6244 | 281.48 | 277.63 | 281.27 | .21 | -3.64 | .07 | -1.29 | 3.85 |
| 19 | .727 | 1.6352 | 283.91 | 279.77 | 283.79 | .12 | -4.02 | .04 | -1.42 | 4.14 |
| 20 | .63 | 1.6494 | 289.64 | 285.21 | 289.3 | .34 | -4.09 | .12 | -1.41 | 4.43 |
| 21 | .61 | 1.6296 | 283.8 | 279.87 | 275.64 | 8.16 | 4.23 | 2.96 | 1.53 | 3.93 |
| 22 | .445 | 1.609 | 279.69 | 276.33 | 279.24 | .45 | -2.91 | .16 | -1.04 | 3.36 |
| 23 | .565 | 1.6497 | 290.63 | 286.24 | 289.66 | .97 | -3.42 | .33 | -1.18 | 4.39 |
| 24 | .95 | 1.5982 | 269.09 | 265.56 | 269.37 | -.28 | -3.81 | -.1 | -1.41 | 3.53 |
| 25 | .97 | 1.6105 | 272.75 | 268.96 | 272.89 | -.14 | -3.93 | -.05 | -1.44 | 3.79 |
| 26 | .73 | 1.5882 | 268.99 | 265.84 | 267.71 | 1.28 | -1.87 | .48 | -.7 | 3.15 |
| 27 | .675 | 1.6006 | 273.75 | 270.4 | 273.15 | .6 | -2.75 | .22 | -1.01 | 3.35 |
| 28 | 1.35 | 1.5764 | 256.32 | 252.8 | 265.36 | -9.04 | -12.56 | -3.41 | -4.73 | 3.52 |
| 29 | 1 | 1.6015 | 269.45 | 265.81 | 270.02 | -.57 | -4.21 | -.21 | -1.56 | 3.64 |
| 30 | 1.37 | 1.6511 | 280.03 | 274.95 | 279.78 | .25 | -4.83 | .09 | -1.73 | 5.08 |
| 31 | .9 | 1.593 | 268.12 | 264.74 | 272.13 | -4.01 | -7.39 | -1.47 | -2.72 | 3.38 |
| 32 | .7 | 1.5594 | 260.01 | 257.38 | 258.15 | 1.86 | -.77 | .72 | -.3 | 2.63 |
| 33 | .617 | 1.5928 | 272.09 | 268.93 | 271.51 | .58 | -2.58 | .21 | -.95 | 3.16 |
| 34 | .41 | 1.6026 | 278.17 | 274.96 | 277.49 | .68 | -2.53 | .25 | -.91 | 3.21 |
| 35 | .55 | 1.6229 | 282.56 | 278.82 | 281.94 | .62 | -3.12 | .22 | -1.11 | 3.74 |
| 36 | .61 | 1.5878 | 270.58 | 267.53 | 271.58 | -1 | -4.05 | -.37 | -1.49 | 3.05 |
| 37 | .57 | 1.5794 | 268.44 | 265.58 | 267.89 | .55 | -2.31 | .21 | -.86 | 2.86 |
| 38 | .67 | 1.5594 | 260.45 | 257.84 | 262.36 | -1.91 | -4.52 | -.73 | -1.72 | 2.61 |
| 39 | .42 | 1.5286 | 253.85 | 251.87 | 254.12 | -.27 | -2.25 | -.11 | -.89 | 1.98 |
| 40 | .3 | 1.4998 | 245.83 | 244.24 | 245.58 | .25 | -1.34 | .1 | -.55 | 1.59 |
| 41 | .35 | 1.4931 | 242.74 | 241.18 | 243.67 | -.93 | -2.49 | -.38 | -1.02 | 1.56 |
| 42 | .38 | 1.4875 | 240.32 | 238.78 | 241.5 | -1.18 | -2.72 | -.49 | -1.13 | 1.54 |
| 43 | .47 | 1.4956 | 241.77 | 240.1 | 241.43 | .34 | -1.33 | .14 | -.55 | 1.67 |
| 44 | .535 | 1.4947 | 240.47 | 238.75 | 240.91 | -.44 | -2.16 | -.18 | -.9 | 1.72 |
| 45 | .38 | 1.4981 | 244.02 | 242.39 | 244.1 | -.08 | -1.71 | -.03 | -.7 | 1.63 |

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U PRODUCT SAMPLE TANK
U ANALYSIS VS U CALC

| BATCH NO. | ACID | DENSITY | U CALC NEW EQN (1) | U CALC OLD EQN (2) | U ANAL (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | DIFF MG/G (1-2) |
|---|---|---|---|---|---|---|---|---|---|---|
| 46 | .39 | 1.4986 | 244.04 | 242.4 | 241.85 | 2.19 | .55 | .91 | .23 | 1.64 |
| 47 | .385 | 1.4937 | 242.41 | 240.82 | 242.8 | -.39 | -1.98 | -.16 | -.82 | 1.59 |
| 48 | .33 | 1.4678 | 234.12 | 232.75 | 234.37 | -.25 | -1.62 | -.11 | -.69 | 1.37 |
| 49 | .395 | 1.4436 | 224.32 | 223.02 | 224.67 | -.35 | -1.65 | -.16 | -.73 | 1.3 |
| 50 | .465 | 1.4938 | 241.22 | 239.57 | 240.87 | .35 | -1.3 | .15 | -.54 | 1.65 |
| 51 | .335 | 1.5129 | 249.8 | 248.06 | 249.53 | .27 | -1.47 | .11 | -.59 | 1.74 |
| 52 | .53 | 1.5081 | 245.2 | 243.37 | 244.88 | .32 | -1.51 | .13 | -.62 | 1.83 |
| 53 | .683 | 1.5342 | 251.83 | 249.57 | 251.63 | .2 | -2.06 | .08 | -.82 | 2.26 |
| 54 | .7 | 1.5259 | 248.76 | 246.59 | 249.52 | -.76 | -2.93 | -.3 | -1.17 | 2.17 |
| 55 | .443 | 1.5221 | 251.31 | 249.38 | 251.77 | -.46 | -2.39 | -.18 | -.95 | 1.93 |
| 56 | .41 | 1.5098 | 247.6 | 245.84 | 247.36 | .24 | -1.52 | .1 | -.61 | 1.76 |
| 57 | .49 | 1.516 | 248.52 | 246.63 | 247.74 | .78 | -1.11 | .31 | -.45 | 1.89 |
| 58 | .54 | 1.5018 | 242.87 | 241.09 | 241.83 | 1.04 | -.74 | .43 | -.31 | 1.78 |
| 59 | .74 | 1.5133 | 243.84 | 241.78 | 243.81 | .03 | -2.03 | .01 | -.83 | 2.06 |
| 60 | .725 | 1.5242 | 247.81 | 245.64 | 247.77 | .04 | -2.13 | .02 | -.86 | 2.17 |
| 61 | .52 | 1.5089 | 245.63 | 243.79 | 245.84 | -.21 | -2.05 | -.09 | -.83 | 1.84 |
| 62 | .38 | 1.5101 | 248.16 | 246.41 | 248.09 | .07 | -1.68 | .03 | -.68 | 1.75 |
| 63 | .41 | 1.5194 | 250.88 | 249.02 | 251.49 | -.61 | -2.47 | -.24 | -.98 | 1.86 |
| 64 | .56 | 1.5034 | 243.12 | 241.31 | 243.34 | -.22 | -2.03 | -.09 | -.83 | 1.81 |
| 65 | .48 | 1.5091 | 246.3 | 244.49 | 246.43 | -.13 | -1.94 | -.05 | -.79 | 1.81 |
| 66 | .54 | 1.515 | 247.42 | 245.51 | 246.67 | .75 | -1.16 | .3 | -.47 | 1.91 |
| 67 | .415 | 1.5069 | 246.53 | 244.79 | 246.65 | -.12 | -1.86 | -.05 | -.75 | 1.74 |
| 68 | .35 | 1.5057 | 247.1 | 245.42 | 247.66 | -.56 | -2.24 | -.23 | -.9 | 1.68 |
| 69 | .4 | 1.5041 | 245.79 | 244.09 | 246.23 | -.44 | -2.14 | -.18 | -.87 | 1.7 |
| 70 | .46 | 1.501 | 243.8 | 242.09 | 243.81 | -.01 | -1.72 | 0 | -.71 | 1.71 |
| 71 | .425 | 1.5015 | 244.51 | 242.82 | 244.39 | .12 | -1.57 | .05 | -.64 | 1.69 |
| 72 | 2.29 | 1.4075 | 180.39 | 177.28 | 181.02 | -.63 | -3.74 | -.35 | -2.07 | 3.11 |
| 73 | 2.07 | 1.4137 | 186.36 | 183.51 | 185.85 | .51 | -2.34 | .27 | -1.26 | 2.85 |
| 74 | 1.163 | 1.4845 | 227.3 | 225.11 | 227.59 | -.29 | -2.48 | -.13 | -1.09 | 2.19 |
| 75 | .77 | 1.4997 | 238.65 | 236.7 | 239.76 | -1.11 | -3.06 | -.46 | -1.28 | 1.95 |
| 76 | .61 | 1.5009 | 241.49 | 239.66 | 241.83 | -.34 | -2.17 | -.14 | -.9 | 1.83 |
| 77 | .66 | 1.5083 | 243.01 | 241.05 | 244 | -.99 | -2.95 | -.41 | -1.21 | 1.96 |
| 78 | .46 | 1.4873 | 239.02 | 237.42 | 239.01 | .01 | -1.59 | 0 | -.67 | 1.6 |
| 79 | .495 | 1.4774 | 234.98 | 233.43 | 235.17 | -.19 | -1.74 | -.08 | -.74 | 1.55 |
| 80 | .54 | 1.4776 | 234.35 | 232.77 | 234.45 | -.1 | -1.68 | -.04 | -.72 | 1.58 |
| 81 | .63 | 1.498 | 240.17 | 238.36 | 240.31 | -.14 | -1.95 | -.06 | -.81 | 1.81 |
| 82 | .415 | 1.4959 | 242.72 | 241.09 | 243.44 | -.72 | -2.35 | -.3 | -.97 | 1.63 |
| 83 | .36 | 1.4967 | 243.84 | 242.24 | 244.46 | -.62 | -2.22 | -.25 | -.91 | 1.6 |
| 84 | .87 | 1.5156 | 242.69 | 240.49 | 242.95 | -.26 | -2.46 | -.11 | -1.01 | 2.2 |
| 85 | .96 | 1.5144 | 240.93 | 238.66 | 240.81 | .12 | -2.15 | .05 | -.89 | 2.27 |
| 86 | .97 | 1.5108 | 239.53 | 237.29 | 239.41 | .12 | -2.12 | .05 | -.89 | 2.24 |
| 87 | .825 | 1.5115 | 241.94 | 239.83 | 241.84 | .1 | -2.01 | .04 | -.83 | 2.11 |
| 88 | .703 | 1.4931 | 237.34 | 235.51 | 237.52 | -.18 | -2.01 | -.08 | -.85 | 1.83 |
| 89 | .39 | 1.4899 | 241.01 | 239.44 | 241.28 | -.27 | -1.84 | -.11 | -.76 | 1.57 |
| 90 | .325 | 1.4981 | 244.86 | 243.27 | 245.28 | -.42 | -2.01 | -.17 | .02 | 1.59 |

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U PRODUCT SAMPLE TANK
U ANALYSIS VS U CALC

| BATCH NO. | ACID | DENSITY | U CALC NEW EQN (1) | U CALC OLD EQN (2) | U ANAL (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | DIFF MG/G (1-2) |
|---|---|---|---|---|---|---|---|---|---|---|
| 91 | .6 | 1.4867 | 236.66 | 234.96 | 236.5 | .16 | -1.54 | .07 | -.65 | 1.7 |
| 92 | .81 | 1.4936 | 235.9 | 233.97 | 235.78 | .12 | -1.81 | .05 | -.77 | 1.93 |
| 93 | .81 | 1.4944 | 236.18 | 234.24 | 244.24 | -8.06 | -10 | -3.3 | -4.09 | 1.94 |
| 94 | .93 | 1.4888 | 232.37 | 230.38 | 233.17 | -.8 | -2.79 | -.34 | -1.2 | 1.99 |
| 95 | 1.3 | 1.4994 | 230.59 | 228.13 | 231.18 | -.59 | -3.05 | -.26 | -1.32 | 2.46 |
| 96 | 1.34 | 1.5061 | 232.38 | 229.81 | 233.57 | -1.19 | -3.76 | -.51 | -1.61 | 2.57 |
| 97 | 1.56 | 1.5092 | 230.24 | 227.38 | 229.63 | .61 | -2.25 | .27 | -.98 | 2.86 |
| 98 | 1.01 | 1.5086 | 238.16 | 235.91 | 238.06 | .1 | -2.15 | .04 | -.9 | 2.25 |
| 99 | 1.13 | 1.5025 | 234.23 | 231.91 | 242.93 | -8.7 | -11.02 | -3.58 | -4.54 | 2.32 |
| 100 | 1.105 | 1.512 | 237.94 | 235.56 | 235.86 | 2.08 | -.3 | .88 | -.13 | 2.38 |
| 101 | 2 | 1.5167 | 226.53 | 223.01 | 225.75 | .78 | -2.74 | .35 | -1.21 | 3.52 |
| 102 | 1.07 | 1.5036 | 235.51 | 233.25 | 234.97 | .54 | -1.72 | .23 | -.73 | 2.26 |
| 103 | 1.09 | 1.4805 | 226.96 | 224.88 | 227.03 | -.07 | -2.15 | -.03 | -.95 | 2.08 |
| 104 | .72 | 1.4892 | 235.71 | 233.89 | 236.45 | -.74 | -2.56 | -.31 | -1.08 | 1.82 |
| 105 | 1.65 | 1.4838 | 219.74 | 217 | 219.87 | -.13 | -2.87 | -.06 | -1.31 | 2.74 |
| 106 | 1.65 | 1.5184 | 232.19 | 229.12 | 232.37 | -.18 | -3.25 | -.08 | -1.4 | 3.07 |
| 107 | .79 | 1.5047 | 240.1 | 238.08 | 238.51 | 1.59 | -.43 | .67 | -.18 | 2.02 |
| 108 | .69 | 1.4998 | 239.89 | 238.01 | 239.6 | .29 | -1.59 | .12 | -.66 | 1.88 |
| 109 | .405 | 1.5069 | 246.68 | 244.95 | 247.16 | -.48 | -2.21 | -.19 | -.89 | 1.73 |
| 110 | .445 | 1.5056 | 245.62 | 243.88 | 245.2 | .42 | -1.32 | .17 | -.54 | 1.74 |
| 111 | .735 | 1.5029 | 240.3 | 238.35 | 239.98 | .32 | -1.63 | .13 | -.68 | 1.95 |
| 112 | .79 | 1.4962 | 237.12 | 235.18 | 236.44 | .68 | -1.26 | .29 | -.53 | 1.94 |
| 113 | .83 | 1.4945 | 235.91 | 233.96 | 235.64 | .27 | -1.68 | .11 | -.71 | 1.95 |
| 114 | .7 | 1.488 | 235.59 | 233.8 | 235.43 | .16 | -1.63 | .07 | -.69 | 1.79 |
| 115 | .67 | 1.4712 | 230.05 | 228.41 | 229.98 | .07 | -1.57 | .03 | -.68 | 1.64 |
| 116 | .475 | 1.4767 | 235.04 | 233.51 | 235.61 | -.57 | -2.1 | -.24 | -.89 | 1.53 |
| 117 | .495 | 1.4857 | 237.92 | 236.31 | 239.89 | -1.97 | -3.58 | -.82 | -1.49 | 1.61 |
| 118 | .505 | 1.5036 | 244.02 | 242.25 | 244.02 | 0 | -1.77 | 0 | -.73 | 1.77 |
| 119 | .91 | 1.5051 | 238.43 | 236.31 | 237.32 | 1.11 | -1.01 | .47 | -.43 | 2.12 |
| 120 | 1.1 | 1.5002 | 233.86 | 231.6 | 234.13 | -.27 | -2.53 | -.12 | -1.08 | 2.26 |
| 121 | .92 | 1.513 | 241.04 | 238.83 | 240.92 | .12 | -2.09 | .05 | -.87 | 2.21 |
| 122 | 1 | 1.5153 | 240.65 | 238.33 | 240.75 | -.1 | -2.42 | -.04 | -1.01 | 2.32 |
| 123 | 1.04 | 1.5109 | 238.22 | 235.9 | 237.53 | .69 | -1.63 | .29 | -.69 | 2.32 |
| 124 | 1.21 | 1.5068 | 234.56 | 232.12 | 233.84 | .72 | -1.72 | .31 | -.74 | 2.44 |
| 125 | 1.18 | 1.5073 | 235.18 | 232.76 | 234.41 | .77 | -1.65 | .33 | -.7 | 2.42 |
| 126 | 1.065 | 1.5097 | 237.73 | 235.41 | 237.57 | .16 | -2.16 | .07 | -.91 | 2.32 |
| 127 | .82 | 1.5088 | 241.08 | 238.99 | 241.19 | -.11 | -2.2 | -.05 | -.91 | 2.09 |
| 128 | .87 | 1.5038 | 238.58 | 236.5 | 238.77 | -.19 | -2.27 | -.08 | -.95 | 2.08 |
| 129 | .76 | 1.5073 | 241.45 | 239.44 | 241.83 | -.38 | -2.39 | -.16 | -.99 | 2.01 |
| 130 | .54 | 1.5018 | 242.87 | 241.09 | 243.02 | -.15 | -1.93 | -.06 | -.79 | 1.78 |
| 131 | .5 | 1.511 | 246.65 | 244.81 | 247.75 | -1.1 | -2.94 | -.44 | -1.19 | 1.84 |
| 132 | .49 | 1.5039 | 244.35 | 242.59 | 245.07 | -.72 | -2.48 | -.29 | -1.01 | 1.76 |
| 133 | 1.02 | 1.5109 | 238.82 | 236.53 | 238.69 | .13 | -2.16 | .05 | -.9 | 2.29 |
| 134 | 1.05 | 1.5114 | 238.55 | 236.22 | 237.2 | 1.35 | -.98 | .57 | -.41 | 2.33 |
| 135 | .93 | 1.4957 | 234.82 | 232.77 | 234.95 | -.13 | -2.18 | -.06 | -.93 | 2.05 |

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U PRODUCT SAMPLE TANK
U ANALYSIS VS U CALC

| BATCH NO. | ACID | DENSITY | U CALC NEW EQN (1) | U CALC OLD EQN (2) | U ANAL (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | DIFF MG/G (1-2) |
|---|---|---|---|---|---|---|---|---|---|---|
| 136 | 1.02 | 1.4908 | 231.72 | 229.62 | 231.63 | .09 | -2.01 | .04 | -.87 | 2.1 |
| 137 | .94 | 1.5073 | 238.75 | 236.58 | 238.38 | .37 | -1.8 | .16 | -.76 | 2.17 |
| 138 | 1.33 | 1.4797 | 223.04 | 220.71 | 224.55 | -1.51 | -3.84 | -.67 | -1.71 | 2.33 |
| 139 | 1.92 | 1.4508 | 203.3 | 200.45 | 202.68 | .62 | -2.23 | .31 | -1.1 | 2.85 |
| 140 | 1.95 | 1.4541 | 204.11 | 201.2 | 203.54 | .57 | -2.34 | .28 | -1.15 | 2.91 |
| 141 | 1.87 | 1.4334 | 197.31 | 194.62 | 196.48 | .83 | -1.86 | .42 | -.95 | 2.69 |
| 142 | 1.62 | 1.4624 | 212.26 | 209.71 | 211.73 | .53 | -2.02 | .25 | -.95 | 2.55 |
| 143 | 1.43 | 1.4774 | 220.69 | 218.27 | 227.22 | -6.53 | -8.95 | -2.87 | -3.94 | 2.42 |
| 144 | .81 | 1.4885 | 234.09 | 232.2 | 233.63 | .46 | -1.43 | .2 | -.61 | 1.89 |
| 145 | .99 | 1.5092 | 238.67 | 236.43 | 238.38 | .29 | -1.95 | .12 | -.82 | 2.24 |
| 146 | 1.01 | 1.4936 | 232.87 | 230.76 | 231.58 | 1.29 | -.82 | .56 | -.35 | 2.11 |
| 147 | 1.84 | 1.4482 | 203.52 | 200.78 | 202.09 | 1.43 | -1.31 | .71 | -.65 | 2.74 |
| 148 | 1.19 | 1.4466 | 212.92 | 210.94 | 213.41 | -.49 | -2.47 | -.23 | -1.16 | 1.98 |
| 149 | 1.415 | 1.4727 | 219.19 | 216.82 | 219.57 | -.38 | -2.75 | -.17 | -1.25 | 2.37 |
| 150 | 1.04 | 1.4749 | 225.7 | 223.7 | 223.86 | 1.84 | -.16 | .82 | -.07 | 2 |
| 151 | .95 | 1.4656 | 223.69 | 221.84 | 222.98 | .71 | -1.14 | .32 | -.51 | 1.85 |
| 152 | .98 | 1.4707 | 225.09 | 223.18 | 225.33 | -.24 | -2.15 | -.11 | -.95 | 1.91 |
| 153 | .98 | 1.493 | 233.11 | 231.03 | 233.1 | .01 | -2.07 | 0 | -.89 | 2.08 |
| 154 | .67 | 1.4945 | 238.34 | 236.52 | 238.28 | .06 | -1.76 | .03 | -.74 | 1.82 |
| 155 | .5 | 1.4842 | 237.31 | 235.71 | 237.55 | -.24 | -1.84 | -.1 | -.77 | 1.6 |
| 156 | .4 | 1.4816 | 237.93 | 236.43 | 236.8 | 1.13 | -.37 | .48 | -.16 | 1.5 |
| 157 | .48 | 1.451 | 225.69 | 224.3 | 223.87 | 1.82 | .43 | .81 | .19 | 1.39 |
| 158 | .59 | 1.4632 | 228.4 | 226.87 | 227.5 | .9 | -.63 | .4 | -.28 | 1.53 |
| 159 | .81 | 1.4727 | 228.43 | 226.66 | 228.42 | .01 | -1.76 | 0 | -.77 | 1.77 |
| 160 | .63 | 1.4744 | 231.82 | 230.19 | 231.07 | .75 | -.88 | .32 | -.38 | 1.63 |
| 161 | .81 | 1.4625 | 224.72 | 223.02 | 224.29 | .43 | -1.27 | .19 | -.57 | 1.7 |
| 162 | .5 | 1.4562 | 227.27 | 225.84 | 227.16 | .11 | -1.32 | .05 | -.58 | 1.43 |
| 163 | .505 | 1.4498 | 224.85 | 223.45 | 223.19 | 1.66 | .26 | .74 | .12 | 1.4 |
| 164 | 1.1 | 1.4658 | 221.46 | 219.46 | 221.3 | .16 | -1.84 | .07 | -.83 | 2 |
| 165 | .57 | 1.4719 | 231.85 | 230.28 | 231.3 | .55 | -1.02 | .24 | -.44 | 1.57 |
| 166 | .51 | 1.4749 | 233.85 | 232.31 | 233.25 | .6 | -.94 | .26 | -.4 | 1.54 |
| 167 | .595 | 1.4643 | 228.72 | 227.18 | 225.96 | 2.76 | 1.22 | 1.22 | .54 | 1.54 |
| 168 | .8 | 1.4719 | 228.29 | 226.54 | 226.92 | 1.37 | -.38 | .6 | -.17 | 1.75 |
| 169 | .73 | 1.4915 | 236.37 | 234.53 | 235.28 | 1.09 | -.75 | .46 | -.32 | 1.84 |
| 170 | .56 | 1.5121 | 246.13 | 244.23 | 245.07 | 1.06 | -.84 | .43 | -.34 | 1.9 |
| 171 | .575 | 1.5105 | 245.35 | 243.45 | 246.14 | -.79 | -2.69 | -.32 | -1.09 | 1.9 |
| 172 | .57 | 1.5114 | 245.73 | 243.83 | 245.92 | -.19 | -2.09 | -.08 | -.85 | 1.9 |
| 173 | .545 | 1.5148 | 247.28 | 245.36 | 247.53 | -.25 | -2.17 | -.1 | -.88 | 1.92 |
| 174 | .61 | 1.5112 | 245.06 | 243.13 | 243.33 | 1.73 | -.2 | .71 | -.08 | 1.93 |
| 175 | .75 | 1.5321 | 250.13 | 247.84 | 249.35 | .78 | -1.51 | .31 | -.61 | 2.29 |
| 176 | .55 | 1.5278 | 251.64 | 249.57 | 251.83 | -.19 | -2.26 | -.08 | -.9 | 2.07 |
| 177 | .49 | 1.525 | 251.59 | 249.6 | 251.44 | .15 | -1.84 | .06 | -.73 | 1.99 |
| 178 | .47 | 1.5034 | 244.48 | 242.74 | 242.1 | 2.38 | .64 | .98 | .26 | 1.74 |
| 179 | .785 | 1.4761 | 230.04 | 228.27 | 229.57 | .47 | -1.3 | .2 | -.57 | 1.77 |
| 180 | 1.26 | 1.4866 | 226.6 | 224.29 | 227.48 | -.88 | -3.19 | -.39 | -1.4 | 2.31 |

31-Oct-79 04:20 PM

U PRODUCT SAMPLE TANK
U ANALYSIS VS U CALC

| BATCH NO. | ACID | DENSITY | U CALC NEW EQN (1) | U CALC OLD EQN (2) | U ANAL (3) | DIFF MG/G (1-3) | DIFF MG/G (2-3) | % DIFF (1-3)/3 | % DIFF (2-3)/3 | DIFF MG/G (1-2) |
|---|---|---|---|---|---|---|---|---|---|---|
| 181 | 1.01 | 1.5133 | 239.81 | 237.5 | 239.68 | .13 | -2.18 | .05 | -.91 | 2.31 |
| 182 | 1.74 | 1.4452 | 203.89 | 201.3 | 199.23 | 4.66 | 2.07 | 2.34 | 1.04 | 2.59 |
| 183 | 3.79 | 1.2833 | 96.85 | 93.96 | 95.94 | .91 | -1.98 | .95 | -2.06 | 2.89 |
| 184 | 4.3 | 1.2004 | CONCENTRATION TOO LOW | | | | | | | |
| 185 | 3.01 | 1.1327 | CONCENTRATION TOO LOW | | | | | | | |
| 186 | 2.8 | 1.1004 | CONCENTRATION TOO LOW | | | | | | | |

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX M

## GLOSSARY

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

## APPENDIX M

## GLOSSARY

1. Accuracy - A qualitative term used to describe the agreement between the value of the average of repeat measurements and the true value.

2. Bias - A constant, fixed error.

   Note: The distinction between bias and systematic error is that the latter is the error that remains after attempts are made to remove the bias by the use of standards or by some other means.

3. Book Inventory - The quantity of nuclear material assigned to an area based on a beginning inventory plus additions to and removals from the beginning inventory.

4. Inventory Difference (ID) - The ID is determined by subtracting the ending inventory (EI) and removals (R) from the beginning inventory (BI) plus additions to inventory (A). Mathematically ID = BI + A - EI - R.

5. Coefficient of Variation ($\gamma$) - The standard deviation divided by the mean.

6. Duplicate Measurement - Two measurements of the same parameter made on the same item by the same individual at approximately the same time.

7. Error - Any discrepancy between a computed, observed, or measured quantity and the time specified or theoretically correct value of that quantity.

8. Error of a Measurement - The magnitude and the sign of the difference between the measured value and the "true" value.

9. Inventory - The quantity of nuclear material contained in an area.

10. Limit of Error - The uncertainty component used in constructing a 95% confidence interval associated with a quantity after any recognized bias has been eliminated or its effect accounted for.

11. Measured Process Holdup - The quantity of nuclear material contained in process equipment as determined by measurements.

12. Physical Inventory - The measured quantity of nuclear material contained in an area.

13. Precision - A qualitative term used to describe the internal consistency of repeat measurements without regard to whether or not they are centered about their "true" value.

    Note: Synonyms for precision are reproducible and repeatable.

14. Process Holdup - The quantity of nuclear material contained in processing equipment. Process holdup includes measured and unmeasured holdup. The book inventory is used as an estimate of process holdup. (Process holdup and in-process inventory are used interchangeably for the Separations Facility.)

15. Random Error - The chance variation encountered in all measurement work, characterized by the random occurrence of both positive and negative deviations from a mean value. The algebraic average of the random error approaches zero with a sufficiently large number of measurements.

16. Replicate Measurement - A repeat measurement used to estimate the random variation of the measurement system.

17. Standard Deviation(s) - A measure of variation within a population, or sample which is derived from the effect of all values considered, not just the extremes. The standard deviation for a single value is calculated using the following formula:

$$s = \sqrt{\frac{\Sigma x_i^2 - (\Sigma x_i)^2/n}{(n-1)}}$$

    where:

    $s$ = standard deviation of a single result

    $x_i$ = an individual value

    $n$ = the total number of values considered.

18. Systematic Error - A constant component of error that affects all members of a data set; its value can, in some instances, be estimated by the deviation of the mean of a measurement process from a reference value. A systematic error whose value has been determined in this manner is called a bias.

19. Uncertainty - A general term used to describe the total measurement error.

20. Unmeasured Process Holdup - The quantity of nuclear material in processing equipment which is not measured. Unmeasured holdup is estimated by the difference between process holdup and measured process holdup.

21. Variance - The square of the standard deviation ($s^2$). A much used statistic of particular value in statistical inference, significance testing, experimentation, and propagation of errors.

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX N

## EXHIBITS FOR SECTION 4.0

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

## EXHIBITS


4-1 Measurement Program Dialogue
4-2 Measurement Program Status
4-3 Inventory Period - Lot/Batch Correlation
4-4 Material Balance Report for Periods 6-9
4-5 NMC Summary Input/Output Report for Measurement Point 02-003
4-6 NMC Summary Input/Output Report for Measurement Point 02-007
4-7 NMC Summary Input/Output Report for Measurement Point 02-023
4-8 NMC Summary Input/Output Report for Measurement Point 02-028
4-9 Material Balance Report for Periods 10-10
4-10 NMC Accounting Input/Output Report for Measurement Point 02-003
4-11 NMC Accounting Input/Output Report for Measurement Point 02-007
4-12 NMC Accounting Input/Output Report for Measurement Point 02-023
4-13 NMC Accounting Input/Output Report for Measurement Point 02-028
4-14 Material Balance Report for Period 6-10
4-15 Material Balance Report for Periods 6-10 (Adjusted Beginning Inventory)
4-16 MBA Transfer Comparison Report (02-007 to 02-003)
4-17 Level Comparisons - 02-003
4-18 Level Comparisons - 02-007
4-19 Level Comparisons - 02-023
4-20 Density Comparisons - 02-003
4-21 Density Comparisons - 02-023
4-22 Replicate Comparisons - 02-003
4-23 Replicate Comparisons- 02-007
4-24 Product to Input Comparisons - Process Control
4-25 Product to Input Comparisons - Accountability
4-26 Concentration Comparisons
4-27 Summary of Measurement Point Standard Deviations
4-28 Limit of Error Summary

# EXHIBIT 4-1

## MEASUREMENT PROGRAM DIALOGUE

## Chronological July 10, 1979, 01:01 a.m. through 07:28 a.m.

```
>M07

TANK 02007      BATCH  175          10-Jul-79          01:01 AM

02007             >    ENTER OPERATOR INITIALS
BKH

TANK 02007      BATCH  175          10-Jul-79          01:02 AM

02007             >    ENTER SOURCE VESSEL ID
02053

TANK 02007      BATCH  175          10-Jul-79          01:02 AM

02007             >    YOUR NEXT STEP IS TO MAKE THE TRANSFER
02007             >    WHEN TRANSFER IS COMPLETE, SPARGE FOR MINIMUM OF 15 MINUTES,
02007             >    SHUT DOWN SPARGER, SET PURGES, AND CALL ME

>M07

TANK 02007      BATCH  175          10-Jul-79          01:03 AM

02007             >    ENTER OPERATOR INITIALS
```

# EXHIBIT 4-1 (CONTINUED)

```
BN\N\KH

TANK 02007     BATCH  175          10-Jul-79          01:03 AM

02007            >    I'M READY TO MEASURE BEFORE-SAMPLE DATA
02007            >    THE SPARGER SHOULD BE OFF
02007            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02007            >    SHALL I PROCEED  (YES OR NO)
YES

TANK 02007     BATCH  175          10-Jul-79          01:03 AM

02007            >    RTP COMMUNICATION IS STARTING
02007            >    WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02007     BATCH  175          10-Jul-79          01:10 AM

02007            >    RTP COMMUNICATION IS COMPLETE

02007            >    LR-235             = 89.7003
02007            >    LR-235R            = 228.924
02007            >    DR-269             = 15.3051
02007            >    DR-269R            = 190.714
02007            >    TJR-108-14         = 32.9222
02007            >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02007            >                           2 = REMEASURE
02007            >    ENTER OPTION ( 1 OR 2 )
02007            >    ? 1

TANK 02007     BATCH  175          10-Jul-79          01:10 AM

02007            >    TANK CONTAINS  9733.75  KG SOLUTION
02007            >    TANK CONTAINS  6360.94  LITERS SOLUTION
02007            >    TANK CONTAINS  2385.38  KG URANIUM


TANK 02007     BATCH  175          10-Jul-79          01:11 AM

02007            >    THE BEFORE-SAMPLE COMPARISON FOR:
02007            >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02007            >    LR-235R  =  228.924  AND  LR-235  =  227.839


TANK 02007     BATCH  175          10-Jul-79          01:11 AM

02007            >    THE BEFORE-SAMPLE COMPARISON FOR:
02007            >    PRIMARY TO TAYLOR DENSITY IS SATISFACTORY
02007            >    DR-269R  =  1.53024  AND  DR-269  =  1.55698


TANK 02007     BATCH  175          10-Jul-79          01:11 AM

02007            >

02007> YOU HAVE COMPLETED THE BEFORE SAMPLE READINGS.
02007> THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.
```

## EXHIBIT 4-1 (CONTINUED)

TANK 02007 BATCH NO. 175
AT 01:11 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | N/A | 1.085 | | |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | -0.027 | | |
| PRIMARY - LAB @ T | N/A | 0.000 | | |
| TAYLOR - LAB @ T | N/A | 0.000 | | |

```
TANK 02007     BATCH  175         10-Jul-79         01:12 AM

02007            >    ENTER OPERATOR INITIALS
BKH


TANK 02007     BATCH  175         10-Jul-79         01:12 AM

02007            >    I'M GOING TO REQUEST LDS TO SAMPLE
02007            >    THE SPARGER SHOULD BE OFF
02007            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02007            >    SHALL I PROCEED  (YES OR NO)
YES


TANK 02007     BATCH  175         10-Jul-79         01:13 AM

02007            >    LDS COMMUNICATION IS STARTING
02007            >    CALL ME WHEN READY TO PROCEED

>M03


TANK 02003     BATCH  307         10-Jul-79         01:13 AM

02003            >    ENTER OPERATOR INITIALS
BKH


TANK 02003     BATCH  307         10-Jul-79         01:13 AM

02003            >    I'M READY TO MEASURE AFTER-TRANSFER DATA
02003            >    THE SPARGER SHOULD BE OFF
02003            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003            >    SHALL I PROCEED  (YES OR NO)
YES


TANK 02003     BATCH  307         10-Jul-79         01:14 AM
```

# EXHIBIT 4-1 (CONTINUED)

```
02003          >   RTF COMMUNICATION IS STARTING
02003          >   WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02003     BATCH  307        10-Jul-79        01:18 AM

02003          >   RTF COMMUNICATION IS COMPLETE

02003          >    LR-125          = 17.3447
02003          >    LR-125R         = 42.1733
02003          >    DR-166          = 14.9418
02003          >    DR-166R         = 4.14999
02003          >    DT-166S1        = 35.363
02003          >   TJR-108-10       = 33.0496
02003          >    TI-109          = 28.5798
02003          >   POSSIBLE OPTIONS ARE:  1 = PROCEED
02003          >                          2 = REMEASURE
02003          >   ENTER OPTION ( 1 OR 2 )
02003          >   ? 1


TANK 02003     BATCH  307        10-Jul-79        01:19 AM

02003          >   TANK CONTAINS  696.6  KG SOLUTION
02003          >   TANK CONTAINS  462.746  LITERS SOLUTION
02003          >   TANK CONTAINS  170.763  KG URANIUM


TANK 02003     BATCH  307        10-Jul-79        01:19 AM

02003          >   THE AFTER-TRANSFER COMPARISON FOR:
02003          >   PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02003          >    LR-125R  =  42.1733  AND   LR-125  =  44.0556


TANK 02003     BATCH  307        10-Jul-79        01:19 AM

02003          >   THE AFTER-TRANSFER COMPARISON FOR:
02003          >   TJR TO TI TEMPERATURE IS SATISFACTORY
02003          >   TJR-108-10  =  33.0496  AND   TI-109  =  28.5798


TANK 02003     BATCH  307        10-Jul-79        01:20 AM

02003          >

02003> YOU HAVE COMPLETED THE AFTER TRANSFER READINGS.
02003> THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.
```

TANK 02003 BATCH NO. 307
AT 01:20 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | -1.868 | -4.810 | -4.848 | -1.882 |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | 0.005 | 0.007 | N/A |

## EXHIBIT 4-1 (CONTINUED)

| | | | | |
|---|---|---|---|---|
| PRIMARY - LAB @ T | N/A | -0.002 | -0.002 | N/A |
| TAYLOR - LAB @ T | N/A | -0.007 | -0.009 | N/A |

KG SOLUTION BS - KG SOLUTION AS = -.0927734

ADVANCE PAPER TO TOP OF PAGE AND <CR>

# EXHIBIT 4-1 (CONTINUED)

BATCH SUMMARY FOR

02003 - 307 ACCT TK 10-Jul-79 01:21 AM

| REC FROM 02007 / SENT TO 02006 | | BEFORE RECEIPT | BEFORE SAMPLE | AFTER SAMPLE | AFTER TRANSFER |
|---|---|---|---|---|---|
| LR-125 | (IN H2O) | 20.05 | 139.65 | 139.67 | 17.34 |
| LR-125R | (CM H2O) | 49.054 | 349.91 | 349.914 | 42.173 |
| DR-166 | | 14.914 | 14.888 | 14.874 | 14.942 |
| DR-166R | (CM H2O) | 11.085 | 311.957 | 311.956 | 4.15 |
| DT-166S1 | | 35.692 | 35.445 | 35.51 | 35.363 |
| TJR-108-10 | (DEG C) | 33.5 | 33.4 | 33.4 | 33 |
| TI-109 | (DEG C) | 29.1 | 29.3 | 29.2 | 28.6 |
| LR-125 | (CM H2O) | 50.92 | 354.72 | 354.76 | 44.06 |
| LR-125R | (CM H2O) | 49.054 | 349.91 | 349.914 | 42.173 |
| DR-166 | (G/ML) | 1.5 | 1.498 | 1.496 | 1.503 |
| DR-166R | (G/ML) | 1.504 | 1.503 | 1.503 | 1.506 |
| DT-166S1 | (G/ML) | 3.591 | 3.566 | 3.572 | 3.558 |
| TJR-108-10 | (DEG C) | 33.5 | 33.4 | 33.4 | 33 |
| TI-109 | (DEG C) | 29.1 | 29.3 | 29.2 | 28.6 |
| SAMPLE RESULTS | | | | | |
| LOG NO. | | 30707 | NA | 30743 | NA |
| DENSITY @ 25 (G/ML) | | 1.5146 | NA | 1.5112 | NA |
| U (MG/G) | | 246.986 | NA | 245.138 | NA |
| H+ | | .56 | NA | .605 | NA |
| VOLUME (LITERS) | | 573.387 | 5556.15 | 5556.09 | 462.746 |
| KGS SOLN | | 864.885 | 8362.56 | 8362.65 | 696.6 |
| KGS URANIUM | | 213.615 | 2049.98 | 2050.01 | 170.763 |

RECEIVED 4982.47 LITERS TRANSFERRED 5093.34 LITERS
7497.39 KG SOLN 7666.05 KG SOLN
1836.3 KG U 1879.24 KG U

PRIMARY TO TAYLOR LEVEL
-1.868 -4.81 -4.848 -1.882

TJR TO TI TEMPERATURE
4.4 4.12 4.15 4.47

TAYLOR TO TAYLOR DENSITY
NA

PRIMARY TO TAYLOR DENSITY
.0054 .0071

LAB @ 25 TO PRIMARY DENSITY
NA

LAB @ 25 TO TAYLOR DENSITY
NA

LAB @ T TO PRIMARY DENSITY
.002 .0018

LAB @ T TO TAYLOR DENSITY
.0074 .009

AT TO BR SOLUTION
.3808

BS TO AS SOLUTION

## EXHIBIT 4-1 (CONTINUED)

```
          -.0928

PRODUCT TO INPUT SOLUTION
          9.0942
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------

TANK 02003     BATCH  307        10-Jul-79        01:25 AM

02003            >   MEASUREMENT FOR THIS BATCH IS COMPLETE
02003            >   CALL ME WHEN READY FOR THE NEXT BATCH

>LDSLN2>  LDS DATA RECEIVED FROM 02007
LDSLN2>  LDS DATA RECEIVED FROM 02007
LDSLN2>  LDS DATA RECEIVED FROM 02007
M07

TANK 02007     BATCH  175        10-Jul-79        02:34 AM

02007            >   ENTER OPERATOR INITIALS
BKH

TANK 02007     BATCH  175        10-Jul-79        02:34 AM

02007            >   I'M READY TO MEASURE AFTER-SAMPLE DATA
02007            >   THE SPARGER SHOULD BE OFF
02007            >   INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02007            >   SHALL I PROCEED  (YES OR NO)
YES

TANK 02007     BATCH  175        10-Jul-79        02:34 AM

02007            >   RTP COMMUNICATION IS STARTING
02007            >   WILL CALL WHEN MEASUREMENT IS COMPLETE

TANK 02007     BATCH  175        10-Jul-79        02:41 AM

02007            >   RTP COMMUNICATION IS COMPLETE

02007            >   LR-235          = 89.7102
02007            >   LR-235R         = 228.95
02007            >   DR-269          = 15.3185
02007            >   DR-269R         = 190.752
02007            >   TJR-108-14      = 33.2836
02007            >   POSSIBLE OPTIONS ARE:  1 = PROCEED
02007            >                          2 = REMEASURE
02007            >   ENTER OPTION ( 1 OR 2 )
02007            >   ? 1
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02007     BATCH  175          10-Jul-79          02:42 AM

02007            >    TANK CONTAINS  9737.32  KG SOLUTION
02007            >    TANK CONTAINS  6381.06  LITERS SOLUTION
02007            >    TANK CONTAINS  2435.76  KG URANIUM


TANK 02007     BATCH  175          10-Jul-79          02:42 AM

02007            >    THE BEFORE-SAMPLE COMPARISON FOR:
02007            >    LAB @ T TO PRIMARY DENSITY IS SATISFACTORY
02007            >    LAB AT T  =  1.52625  AND  DR-269R  =  1.53024


TANK 02007     BATCH  175          10-Jul-79          02:42 AM

02007            >    THE BEFORE-SAMPLE COMPARISON FOR:
02007            >    LAB @ T TO TAYLOR DENSITY IS SATISFACTORY
02007            >    LAB AT T  =  1.52625  AND  DR-269  =  1.55698


TANK 02007     BATCH  175          10-Jul-79          02:42 AM

02007            >    THE AFTER-SAMPLE COMPARISON FOR:
02007            >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02007            >    LR-235R  =  228.95  AND  LR-235  =  227.864


TANK 02007     BATCH  175          10-Jul-79          02:43 AM

02007            >    THE AFTER-SAMPLE COMPARISON FOR:
02007            >    PRIMARY TO TAYLOR DENSITY IS SATISFACTORY
02007            >    DR-269R  =  1.52976  AND  DR-269  =  1.55834


TANK 02007     BATCH  175          10-Jul-79          02:43 AM

02007            >    THE AFTER-SAMPLE COMPARISON FOR:
02007            >    LAB @ T TO PRIMARY DENSITY IS SATISFACTORY
02007            >    LAB AT T  =  1.52597  AND  DR-269R  =  1.52976


TANK 02007     BATCH  175          10-Jul-79          02:43 AM

02007            >    THE AFTER-SAMPLE COMPARISON FOR:
02007            >    LAB @ T TO TAYLOR DENSITY IS MARGINAL
02007            >    LAB AT T  =  1.52597  AND  DR-269  =  1.55834


TANK 02007     BATCH  175          10-Jul-79          02:44 AM

02007            >    THE AFTER-SAMPLE COMPARISON FOR:
02007            >    BS TO AS SOLUTION QUANTITY IS SATISFACTORY
02007            >    B.S. DATA SHOWS  9735.96  KG SOLUTION AND A.S. DATA SHOWS
02007            >    TANK CONTAINS  9737.32  KG SOLUTION


TANK 02007     BATCH  175          10-Jul-79          02:44 AM
```

## EXHIBIT 4-1 (CONTINUED)

```
02007           >

02007>  YOU HAVE COMPLETED THE AFTER SAMPLE READINGS.
02007>  THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.
```

TANK 02007 BATCH NO. 175
AT 02:44 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | N/A | 1.085 | 1.086 | |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | -0.027 | -0.029 | |
| PRIMARY - LAB @ T | N/A | 0.004 | 0.004 | |
| TAYLOR - LAB @ T | N/A | 0.031 | 0.032 | |

KG SOLUTION BS - KG SOLUTION AS = -1.3584

```
TANK 02007      BATCH  175          10-Jul-79          02:45 AM

02007             >    TANK CONTAINS  9737.32  KG SOLUTION
02007             >    TANK CONTAINS  6381.06  LITERS SOLUTION
02007             >    TANK CONTAINS  2435.76  KG URANIUM


TANK 02007      BATCH  175          10-Jul-79          02:45 AM

02007             >    ENTER OPERATOR INITIALS
BKH


TANK 02007      BATCH  175          10-Jul-79          02:45 AM

02007             >    POSSIBLE OPTIONS ARE:     1 = PROCEED WITH TRANSFER
02007             >                              2 = GO BACK TO AS MEASUREMENT
02007             >                              3 = GO BACK TO BS MEASUREMENT
02007             >    ENTER OPTION  ( 1, 2, OR 3 )
1


TANK 02007      BATCH  175          10-Jul-79          02:45 AM

02007             >    SUPERVISOR IS REQUIRED TO PROCEED
02007             >    ENTER PASSWORD

02007           >
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02007     BATCH  175          10-Jul-79          02:45 AM

02007            >    ENTER DESTINATION VESSEL ID
02003

TANK 02007     BATCH  175          10-Jul-79          02:46 AM

02007            >    YOUR NEXT STEP IS TO MAKE THE TRANSFER
02007            >    I'LL WAIT TO HEAR FROM YOU

>M03

TANK 02003     BATCH  308          10-Jul-79          02:53 AM

02003            >    ENTER OPERATOR INITIALS
BKH

TANK 02003     BATCH  308          10-Jul-79          02:53 AM

02003            >    ENTER SOURCE VESSEL ID
02007

TANK 02003     BATCH  308          10-Jul-79          02:53 AM

02003            >    ENTER OPERATOR INITIALS
BKH

TANK 02003     BATCH  308          10-Jul-79          02:53 AM

02003            >    I'M READY TO MEASURE BEFORE-RECEIPT DATA
02003            >    THE SPARGER SHOULD BE OFF
02003            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003            >    SHALL I PROCEED  (YES OR NO)
YES

TANK 02003     BATCH  308          10-Jul-79          02:54 AM

02003            >    RTP COMMUNICATION IS STARTING
02003            >    WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02003     BATCH  308          10-Jul-79          02:58 AM

02003            >    RTP COMMUNICATION IS COMPLETE

02003            >     LR-125          = 17.2594
02003            >     LR-125R         = 42.076
02003            >     DR-166          = 14.9066
02003            >     DR-166R         = 4.12399
02003            >     DT-166S1        = 34.9561
02003            >    TJR-108-10       = 33.5396
02003            >     TI-109          = 27.7108
02003            >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02003            >                           2 = REMEASURE
02003            >    ENTER OPTION ( 1 OR 2 )
02003            >    ? 1
```

# EXHIBIT 4-1 (CONTINUED)

```
TANK 02003     BATCH  308          10-Jul-79          02:59 AM

02003            >   TANK CONTAINS  694.294  KG SOLUTION
02003            >   TANK CONTAINS  461.325  LITERS SOLUTION
02003            >   TANK CONTAINS  170.198  KG URANIUM


TANK 02003     BATCH  308          10-Jul-79          02:59 AM

02003            >   THE BEFORE-RECEIPT COMPARISON FOR:
02003            >   PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02003            >    LR-125R  =  42.076  AND   LR-125  =  43.839


TANK 02003     BATCH  308          10-Jul-79          02:59 AM

02003            >   THE BEFORE-RECEIPT COMPARISON FOR:
02003            >   TJR TO TI TEMPERATURE IS SATISFACTORY
02003            >   TJR-108-10  =  33.5396  AND   TI-109  =  27.7108


TANK 02003     BATCH  308          10-Jul-79          03:00 AM

02003            >   THE BEFORE-RECEIPT COMPARISON FOR:
02003            >   AT TO BR SOLUTION QUANTITY IS SATISFACTORY
02003            >   A.T. DATA SHOWS  696.6  KG SOLUTION AND B.R. DATA SHOWS
02003            >   TANK CONTAINS  694.294  KG SOLUTION


TANK 02003     BATCH  308          10-Jul-79          03:00 AM

02003            >

02003>  YOU HAVE COMPLETED THE BEFORE RECIEPT READINGS.
02003>  THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.
```

TANK 02003 BATCH NO. 308
AT 03:00 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | -1.763 | | | |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | | | |
| PRIMARY - LAB @ T | N/A | | | |
| TAYLOR - LAB @ T | N/A | | | |

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02003      BATCH  308          10-Jul-79          03:00 AM

02003             >    YOUR NEXT STEP IS TO MAKE THE TRANSFER
02003             >    WHEN TRANSFER IS COMPLETE, SPARGE FOR MINIMUM OF 15 MINUTES,
02003             >    SHUT DOWN SPARGER, SET PURGES, AND CALL ME

>M07


TANK 02007      BATCH  175          10-Jul-79          04:09 AM

02007             >    ENTER OPERATOR INITIALS
BKH


TANK 02007      BATCH  175          10-Jul-79          04:09 AM

02007             >    I'M READY TO MEASURE AFTER-TRANSFER DATA
02007             >    THE SPARGER SHOULD BE OFF
02007             >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02007             >    SHALL I PROCEED  (YES OR NO)
YES


TANK 02007      BATCH  175          10-Jul-79          04:10 AM

02007             >    RTP COMMUNICATION IS STARTING
02007             >    WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02007      BATCH  175          10-Jul-79          04:14 AM

02007             >    RTP COMMUNICATION IS COMPLETE

02007             >    LR-235            = 25.4164
02007             >    LR-235R           = 63.504
02007             >    DR-269            = 15.2869
02007             >    DR-269R           = 25.296
02007             >    TJR-108-14        = 35.6979
02007             >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02007             >                           2 = REMEASURE
02007             >    ENTER OPTION ( 1 OR 2 )
02007             >    ? 1


TANK 02007      BATCH  175          10-Jul-79          04:15 AM

02007             >    TANK CONTAINS  2093.47  KG SOLUTION
02007             >    TANK CONTAINS  1371.89  LITERS SOLUTION
02007             >    TANK CONTAINS  523.674  KG URANIUM


TANK 02007      BATCH  175          10-Jul-79          04:15 AM

02007             >    THE AFTER-TRANSFER COMPARISON FOR:
02007             >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02007             >    LR-235R  =  63.504  AND  LR-235  =  64.5577


TANK 02007      BATCH  175          10-Jul-79          04:15 AM

02007             >
```

## EXHIBIT 4-1 (CONTINUED)

02007> YOU HAVE COMPLETED THE AFTER TRANSFER READINGS.
02007> THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.

TANK 02007 BATCH NO. 175
AT 04:15 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | N/A | 1.085 | 1.086 | -1.054 |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | -0.027 | -0.029 | N/A |
| PRIMARY - LAB @ T | N/A | 0.004 | 0.004 | N/A |
| TAYLOR - LAB @ T | N/A | 0.031 | 0.032 | N/A |

KG SOLUTION BS - KG SOLUTION AS = -1.3584

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# EXHIBIT 4-1 (CONTINUED)

BATCH SUMMARY FOR

02007 - 175 U PROD SPL TK 10-Jul-79 04:17 AM

| REC FROM 02053 / SENT TO 02003 | | BEFORE RECEIPT | BEFORE SAMPLE | AFTER SAMPLE | AFTER TRANSFER |
|---|---|---|---|---|---|
| LR-235 | (IN H2O) | NA | 89.7 | 89.71 | 25.42 |
| LR-235R | (CM H2O) | NA | 228.924 | 228.95 | 63.504 |
| DR-269 | | NA | 15.305 | 15.319 | 15.287 |
| DR-269R | (CM H2O) | NA | 190.714 | 190.752 | 25.296 |
| TJR-108-14 | (DEG C) | NA | 32.9 | 33.3 | 35.7 |
| LR-235 | (CM H2O) | NA | 227.84 | 227.86 | 64.56 |
| LR-235R | (CM H2O) | NA | 228.924 | 228.95 | 63.504 |
| DR-269 | (G/ML) | NA | 1.557 | 1.558 | 1.555 |
| DR-269R | (G/ML) | NA | 1.53 | 1.53 | 1.53 |
| TJR-108-14 | (DEG C) | NA | 32.9 | 33.3 | 35.7 |
| SAMPLE RESULTS | | | | | |
| LOG NO. | | 30730 | NA | 30763 | NA |
| DENSITY @ 25 (G/ML) | | 1.5112 | NA | 1.5322 | NA |
| U (MG/G) | | 245.063 | NA | 250.146 | NA |
| H+ | | .61 | NA | .75 | NA |
| VOLUME (LITERS) | | NA | 6379.02 | 6381.06 | 1371.89 |
| KGS SOLN | | NA | 9735.96 | 9737.32 | 2093.47 |
| KGS URANIUM | | NA | 2435.42 | 2435.76 | 523.674 |

RECEIVED 4984.48 LITERS
7634.94 KG SOLN
1920.54 KG U

TRANSFERRED 5009.17 LITERS
7643.85 KG SOLN
1912.08 KG U

PRIMARY TO TAYLOR LEVEL
NA 1.085 1.086 -1.054

PRIMARY TO TAYLOR DENSITY
-.0267 -.0286

LAB @ T TO PRIMARY DENSITY
-.004 -.0038

LAB @ T TO TAYLOR DENSITY
-.0307 -.0324

BS TO AS SOLUTION
-1.3584

## EXHIBIT 4-1 (CONTINUED)

```
MCR -- ILLEGAL FUNCTION

>TANK 02007    BATCH  175          10-Jul-79          04:20 AM

02007            >    MEASUREMENT FOR THIS BATCH IS COMPLETE
02007            >    CALL ME WHEN READY FOR THE NEXT BATCH

>M23


TANK 02023     BATCH  238          10-Jul-79          04:20 AM

02023            >    ENTER OPERATOR INITIALS
BKH


TANK 02023     BATCH  238          10-Jul-79          04:21 AM

02023            >    ENTER SOURCE VESSEL ID
02056


TANK 02023     BATCH  238          10-Jul-79          04:21 AM

02023            >    YOUR NEXT STEP IS TO MAKE THE TRANSFER
02023            >    WHEN TRANSFER IS COMPLETE, SPARGE FOR MINIMUM OF 15 MINUTES,
02023            >    SHUT DOWN SPARGER, SET PURGES, AND CALL ME

>M07


TANK 02007     BATCH  176          10-Jul-79          04:21 AM

02007            >    ENTER OPERATOR INITIALS
BKH


TANK 02007     BATCH  176          10-Jul-79          04:22 AM

02007            >    ENTER SOURCE VESSEL ID
02053

>


TANK 02007     BATCH  176          10-Jul-79          04:22 AM

02007            >    YOUR NEXT STEP IS TO MAKE THE TRANSFER
02007            >    WHEN TRANSFER IS COMPLETE, SPARGE FOR MINIMUM OF 15 MINUTES,
02007            >    SHUT DOWN SPARGER, SET PURGES, AND CALL ME

>M03


TANK 02003     BATCH  308          10-Jul-79          04:33 AM

02003            >    ENTER OPERATOR INITIALS
```

## EXHIBIT 4-1 (CONTINUED)

```
BKH

TANK 02003      BATCH  308          10-Jul-79          04:33 AM

02003             >    I'M READY TO MEASURE BEFORE-SAMPLE DATA
02003             >    THE SPARGER SHOULD BE OFF
02003             >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003             >    SHALL I PROCEED  (YES OR NO)
YES

TANK 02003      BATCH  308          10-Jul-79          04:33 AM

02003             >    RTP COMMUNICATION IS STARTING
02003             >    WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02003      BATCH  308          10-Jul-79          04:38 AM

02003             >    RTP COMMUNICATION IS COMPLETE

02003             >     LR-125           = 139.234
02003             >     LR-125R          = 348.763
02003             >     DR-166           = 15.0683
02003             >     DR-166R          = 310.382
02003             >     DT-166S1         = 35.2845
02003             >    TJR-108-10        = 33.466
02003             >     TI-109           = 29.3318
02003             >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02003             >                           2 = REMEASURE
02003             >    ENTER OPTION ( 1 OR 2 )
02003             >    ? 1

TANK 02003      BATCH  308          10-Jul-79          04:39 AM

02003             >    TANK CONTAINS  8330.26  KG SOLUTION
02003             >    TANK CONTAINS  5480.2  LITERS SOLUTION
02003             >    TANK CONTAINS  2042.07  KG URANIUM


TANK 02003      BATCH  308          10-Jul-79          04:39 AM

02003             >    THE BEFORE-SAMPLE COMPARISON FOR:
02003             >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02003             >     LR-125R  =  348.763  AND   LR-125  =  353.653


TANK 02003      BATCH  308          10-Jul-79          04:39 AM

02003             >    THE BEFORE-SAMPLE COMPARISON FOR:
02003             >    TJR TO TI TEMPERATURE IS SATISFACTORY
02003             >    TJR-108-10  =  33.466  AND   TI-109  =  29.3318


TANK 02003      BATCH  308          10-Jul-79          04:40 AM

02003             >    THE BEFORE-SAMPLE COMPARISON FOR:
02003             >    PRIMARY TO TAYLOR DENSITY IS SATISFACTORY
02003             >     DR-166R  =  1.52007  AND   DR-166  =  1.51577
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02003     BATCH  308         10-Jul-79         04:40 AM

02003            >

02003>  YOU HAVE COMPLETED THE BEFORE SAMPLE READINGS.
02003>  THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.
```

TANK 02003 BATCH NO. 308
AT 04:40 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | -1.763 | -4.890 | | |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | 0.004 | | |
| PRIMARY - LAB @ T | N/A | 0.000 | | |
| TAYLOR - LAB @ T | N/A | 0.000 | | |

```
TANK 02003     BATCH  308         10-Jul-79         04:41 AM

02003            >   ENTER OPERATOR INITIALS
BKH


TANK 02003     BATCH  308         10-Jul-79         04:41 AM

02003            >   I'M GOING TO REQUEST LDS TO SAMPLE
02003            >   THE SPARGER SHOULD BE OFF
02003            >   INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003            >   SHALL I PROCEED  (YES OR NO)
YES


TANK 02003     BATCH  308         10-Jul-79         04:41 AM

02003            >   LDS COMMUNICATION IS STARTING
02003            >   CALL ME WHEN READY TO PROCEED

>LDSLN2>  LDS DATA RECEIVED FROM 02003
LDSLN2>  LDS DATA RECEIVED FROM 02003
LDSLN2>  LDS DATA RECEIVED FROM 02003
M03


TANK 02003     BATCH  308         10-Jul-79         06:10 AM

02003            >   ENTER OPERATOR INITIALS
BKH
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02003     BATCH  308          10-Jul-79          06:10 AM

02003            >    I'M READY TO MEASURE AFTER-SAMPLE DATA
02003            >    THE SPARGER SHOULD BE OFF
02003            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003            >    SHALL I PROCEED  (YES OR NO)
YES

TANK 02003     BATCH  308          10-Jul-79          06:10 AM

02003            >    RTP COMMUNICATION IS STARTING
02003            >    WILL CALL WHEN MEASUREMENT IS COMPLETE


TANK 02003     BATCH  308          10-Jul-79          06:17 AM

02003            >    RTP COMMUNICATION IS COMPLETE

02003            >     LR-125           = 139.25
02003            >     LR-125R          = 348.78
02003            >     DR-166           = 15.0696
02003            >     DR-166R          = 310.372
02003            >     DT-166S1         = 35.1624
02003            >    TJR-108-10        = 33.3853
02003            >     TI-109           = 29.1753
02003            >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02003            >                           2 = REMEASURE
02003            >    ENTER OPTION ( 1 OR 2 )
02003            >    ? 1

TANK 02003     BATCH  308          10-Jul-79          06:18 AM

02003            >    TANK CONTAINS  8329.64  KG SOLUTION
02003            >    TANK CONTAINS  5464.54  LITERS SOLUTION
02003            >    TANK CONTAINS  2081.57  KG URANIUM


TANK 02003     BATCH  308          10-Jul-79          06:18 AM

02003            >    THE BEFORE-SAMPLE COMPARISON FOR:
02003            >    LAB @ T TO PRIMARY DENSITY IS SATISFACTORY
02003            >    LAB AT T  =  1.52425  AND   DR-166R  =  1.52007


TANK 02003     BATCH  308          10-Jul-79          06:18 AM

02003            >    THE BEFORE-SAMPLE COMPARISON FOR:
02003            >    LAB @ T TO TAYLOR DENSITY IS SATISFACTORY
02003            >    LAB AT T  =  1.52425  AND   DR-166  =  1.51577


TANK 02003     BATCH  308          10-Jul-79          06:19 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    PRODUCT TO INPUT SOLUTION QUANTITY IS MARGINAL
02003            >    7643.85  KG SOLUTION WAS TRANSFERRED FROM TANK 02007
02003            >    AND  7633.04  KG SOLUTION WAS RECEIVED
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02003     BATCH  308          10-Jul-79          06:20 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02003            >     LR-125R  =  348.78  AND   LR-125  =  353.695


TANK 02003     BATCH  308          10-Jul-79          06:20 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    TJR TO TI TEMPERATURE IS SATISFACTORY
02003            >    TJR-108-10  =  33.3853  AND   TI-109  =  29.1753


TANK 02003     BATCH  308          10-Jul-79          06:20 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    PRIMARY TO TAYLOR DENSITY IS SATISFACTORY
02003            >     DR-166R  =  1.52111  AND   DR-166  =  1.51591


TANK 02003     BATCH  308          10-Jul-79          06:21 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    LAB @ T TO PRIMARY DENSITY IS SATISFACTORY
02003            >    LAB AT T  =  1.52431  AND   DR-166R  =  1.52111


TANK 02003     BATCH  308          10-Jul-79          06:21 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    LAB @ T TO TAYLOR DENSITY IS MARGINAL
02003            >    LAB AT T  =  1.52431  AND   DR-166  =  1.51591


TANK 02003     BATCH  308          10-Jul-79          06:21 AM

02003            >    THE AFTER-SAMPLE COMPARISON FOR:
02003            >    BS TO AS SOLUTION QUANTITY IS SATISFACTORY
02003            >    B.S. DATA SHOWS  8329.23  KG SOLUTION AND A.S. DATA SHOWS
02003            >    TANK CONTAINS  8329.64  KG SOLUTION


TANK 02003     BATCH  308          10-Jul-79          06:22 AM

02003            >

02003>  YOU HAVE COMPLETED THE AFTER SAMPLE READINGS.
02003>  THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.


                    TANK 02003 BATCH NO.  308
                      AT 06:22 AM 10-Jul-79

                BR                  BS                  AS                  AT
```

# EXHIBIT 4-1 (CONTINUED)

```
LEVEL COMPARISON:
     PRIMARY - TAYLOR          -1.763          -4.890          -4.915
DENSITY COMPARISONS:
     PRIMARY - TAYLOR            N/A            0.004           0.005

     PRIMARY - LAB @ T           N/A           -0.004          -0.003

     TAYLOR - LAB @ T            N/A           -0.008          -0.008
```

---

KG SOLUTION BS - KG SOLUTION AS = -.405273

```
TANK 02003     BATCH  308         10-Jul-79         06:22 AM

02003            >   TANK CONTAINS  8329.64  KG SOLUTION
02003            >   TANK CONTAINS  5464.54  LITERS SOLUTION
02003            >   TANK CONTAINS  2081.57  KG URANIUM


TANK 02003     BATCH  308         10-Jul-79         06:23 AM

02003            >   ENTER OPERATOR INITIALS
BKH

TANK 02003     BATCH  308         10-Jul-79         06:23 AM

02003            >   POSSIBLE OPTIONS ARE:    1 = PROCEED WITH TRANSFER
02003            >                            2 = GO BACK TO AS MEASUREMENT
02003            >                            3 = GO BACK TO BS MEASUREMENT
02003            >   ENTER OPTION  ( 1, 2, OR 3 )
1

TANK 02003     BATCH  308         10-Jul-79         06:23 AM

02003            >   SUPERVISOR IS REQUIRED TO PROCEED
02003            >   ENTER PASSWORD

02003            >


TANK 02003     BATCH  308         10-Jul-79         06:24 AM

02003            >   ENTER DESTINATION VESSEL ID
02005

TANK 02003     BATCH  308         10-Jul-79         06:28 AM

02003            >   YOUR NEXT STEP IS TO MAKE THE TRANSFER
02003            >   I'LL WAIT TO HEAR FROM YOU

>M03
```

## EXHIBIT 4-1 (CONTINUED)

```
TANK 02003     BATCH  308          10-Jul-79          07:13 AM

02003            >    ENTER OPERATOR INITIALS
BKH


TANK 02003     BATCH  308          10-Jul-79          07:14 AM

02003            >    I'M READY TO MEASURE AFTER-TRANSFER DATA
02003            >    THE SPARGER SHOULD BE OFF
02003            >    INSTRUMENT PURGES SHOULD BE SET AT 0.5 SCFH
02003            >    SHALL I PROCEED  (YES OR NO)
YES


TANK 02003     BATCH  308          10-Jul-79          07:14 AM

02003            >    RTP COMMUNICATION IS STARTING
02003            >    WILL CALL WHEN MEASUREMENT IS COMPLETE

>


TANK 02003     BATCH  308          10-Jul-79          07:21 AM

02003            >    RTP COMMUNICATION IS COMPLETE

02003            >     LR-125           = 18.9719
02003            >     LR-125R          = 46.352
02003            >     DR-166           = 15.0725
02003            >     DR-166R          = 7.98199
02003            >     DT-166S1         = 35.3698
02003            >    TJR-108-10        = 33.4281
02003            >     TI-109           = 28.6375
02003            >    POSSIBLE OPTIONS ARE:  1 = PROCEED
02003            >                           2 = REMEASURE
02003            >    ENTER OPTION ( 1 OR 2 )
02003            >    ? 1


TANK 02003     BATCH  308          10-Jul-79          07:22 AM

02003            >    TANK CONTAINS  794.899  KG SOLUTION
02003            >    TANK CONTAINS  521.493  LITERS SOLUTION
02003            >    TANK CONTAINS  198.644  KG URANIUM


TANK 02003     BATCH  308          10-Jul-79          07:22 AM

02003            >    THE AFTER-TRANSFER COMPARISON FOR:
02003            >    PRIMARY TO TAYLOR LEVEL IS SATISFACTORY
02003            >     LR-125R  =  46.352  AND   LR-125  =  48.1887


TANK 02003     BATCH  308          10-Jul-79          07:22 AM

02003            >    THE AFTER-TRANSFER COMPARISON FOR:
02003            >    TJR TO TI TEMPERATURE IS SATISFACTORY
02003            >    TJR-108-10  =  33.4281  AND   TI-109  =  28.6375


TANK 02003     BATCH  308          10-Jul-79          07:23 AM
```

## EXHIBIT 4-1 (CONTINUED)

02003 >

02003> YOU HAVE COMPLETED THE AFTER TRANSFER READINGS.
02003> THE FOLLOWING COMPARISON TABLE IS TO ASSIST YOU TO DETERMINE MEASUREMENT TRENDS.

TANK 02003 BATCH NO. 308
AT 07:23 AM 10-Jul-79

| | BR | BS | AS | AT |
|---|---|---|---|---|
| LEVEL COMPARISON: | | | | |
| PRIMARY - TAYLOR | -1.763 | -4.890 | -4.915 | -1.837 |
| DENSITY COMPARISONS: | | | | |
| PRIMARY - TAYLOR | N/A | 0.004 | 0.005 | N/A |
| PRIMARY - LAB @ T | N/A | -0.004 | -0.003 | N/A |
| TAYLOR - LAB @ T | N/A | -0.008 | -0.008 | N/A |

KG SOLUTION BS - KG SOLUTION AS = -.405273

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# EXHIBIT 4-1 (CONTINUED)

BATCH SUMMARY FOR

02003 - 308 ACCT TK 10-Jul-79 07:24 AM

| REC FROM 02007<br>SENT TO 02005 | | BEFORE RECEIPT | BEFORE SAMPLE | AFTER SAMPLE | AFTER TRANSFER |
|---|---|---|---|---|---|
| LR-125 | (IN H2O) | 17.26 | 139.23 | 139.25 | 18.97 |
| LR-125R | (CM H2O) | 42.076 | 348.763 | 348.78 | 46.352 |
| DR-166 | | 14.907 | 15.068 | 15.07 | 15.073 |
| DR-166R | (CM H2O) | 4.124 | 310.382 | 310.372 | 7.982 |
| DT-166S1 | | 34.956 | 35.285 | 35.162 | 35.37 |
| TJR-108-10 | (DEG C) | 33.5 | 33.5 | 33.4 | 33.4 |
| TI-109 | (DEG C) | 27.7 | 29.3 | 29.2 | 28.6 |
| LR-125 | (CM H2O) | 43.84 | 353.65 | 353.7 | 48.19 |
| LR-125R | (CM H2O) | 42.076 | 348.763 | 348.78 | 46.352 |
| DR-166 | (G/ML) | 1.5 | 1.516 | 1.516 | 1.516 |
| DR-166R | (G/ML) | 1.503 | 1.52 | 1.521 | 1.52 |
| DT-166S1 | (G/ML) | 3.517 | 3.55 | 3.537 | 3.558 |
| TJR-108-10 | (DEG C) | 33.5 | 33.5 | 33.4 | 33.4 |
| TI-109 | (DEG C) | 27.7 | 29.3 | 29.2 | 28.6 |
| SAMPLE RESULTS | | | | | |
| LOG NO. | | 30743 | NA | 30771 | NA |
| DENSITY @ 25 (G/ML) | | 1.5112 | NA | 1.5306 | NA |
| U (MG/G) | | 245.138 | NA | 249.899 | NA |
| H+ | | .605 | NA | .73 | NA |
| VOLUME (LITERS) | | 461.325 | 5464.49 | 5464.54 | 521.493 |
| KGS SOLN | | 694.294 | 8329.23 | 8329.64 | 794.899 |
| KGS URANIUM | | 170.198 | 2081.46 | 2081.57 | 198.644 |

RECEIVED 5001.79 LITERS
7633.04 KG SOLN
1910.8 KG U

TRANSFERRED 4943.04 LITERS
7534.74 KG SOLN
1882.92 KG U

PRIMARY TO TAYLOR LEVEL

-1.763 -4.89 -4.915 -1.837

TJR TO TI TEMPERATURE

5.83 4.13 4.21 4.79

TAYLOR TO TAYLOR DENSITY

NA

PRIMARY TO TAYLOR DENSITY

.0043 .0052

LAB @ 25 TO PRIMARY DENSITY

NA

LAB @ 25 TO TAYLOR DENSITY

NA

LAB @ T TO PRIMARY DENSITY

.0042 .0032

LAB @ T TO TAYLOR DENSITY

.0085 .0084

AT TO BR SOLUTION

2.306

BS TO AS SOLUTION

## EXHIBIT 4-1 (CONTINUED)

-.4053

PRODUCT TO INPUT SOLUTION
10.8169

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---

TANK 02003 BATCH 308 10-Jul-79 07:28 AM

02003 > MEASUREMENT FOR THIS BATCH IS COMPLETE
02003 > CALL ME WHEN READY FOR THE NEXT BATCH

EXHIBIT 4-2

MEASUREMENT PROGRAM STATUS AS OF 06-JUL-79 -- 01:45 PM

| TANK ID | BATCH # | INITIAL | BR | BS | SAMPLE | AS | TRANSFER | AT |
|---|---|---|---|---|---|---|---|---|
| 02003 | 296 | F | F | F | F | | | |
| 02007 | 163 | F | NA | F | F | F | F | F |
| 02023 | 229 | F | NA | F | F | | | |
| 02028 | 685 | F | NA | F | F | F | F | F |

FLOW RATE = 6.17 MTU/DAY (1039 LITERS/HR.) BY FLOWMETER

FLOW RATE = 5.71 MTU/DAY (960 LITERS/HR.) BY DEPLETION

EXHIBIT 4-3

INVENTORY PERIOD - LOT/BATCH CORRELATION
FY 1979 INTEGRATED URANIUM RUN

| | Accountability Tank 02-003 | | | Product Tank 02-007 | | | HWW Waste 02-023 | | | GPW Waste 02-028 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I.P.* | Lot | Batches | I.P. | Lot | Batches | I.P. | Lot | Batches | I.P. | Lot | Batches |
| Campaign 1 | 5 | 6 | 170-189 | 5 | 6 | 37-71 | 5 | 6 | 144-158 | 5 | 6 | 534-563 |
| | 5 | 7 | 190-205 | | | | | | | | | |
| Campaign 2 | 6 | 8 | 206-238 | 6 | 7 | 72-104 | 6 | 7 | 159-171 | 6 | 7 | 564-602 |
| | 7 | 9 | 239-242 | 7 | 8 | 105-108 | 7 | 8 | 172-173 | 7 | 8 | 603-610 |
| | 8 | 10 | 243-250 | 8 | 9 | 109-116 | 8 | 9 | 174-178 | 8 | 9 | 611-623 |
| | 9 | 11 | 251-271 | 9 | 10 | 117-139 | 9 | 10 | 179-204 | 9 | 10 | 624-657 |
| Campaign 3 | 10 | 12 | 272-292 | 10 | 11 | 140-159 | 10 | 11 | 205-221 | 10 | 11 | 658-673 |
| | 10 | 13 | 293-315 | 10 | 12 | 160-187 | 10 | 12 | 222-253 | 10 | 12 | 674-740 |

*Inventory Period (I.P.).

NUCLEAR MATERIAL ACCOUNTING
MATERIAL BALANCE REPORT FOR PERIODS 6 - 9
DATE OF REPORT 05-Sep-79
TIME OF REPORT 01:46 PM

| | FROM/TO | CODE | DETAIL LITERS | DETAIL KG SOL | DETAIL KG U | MBR LITERS | MBR KG SOL | MBR KG U |
|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | 11014.000 |
| INPUT | | | | | | | | |
| 02003 ACCT TK | | | | | | | | |
| | 2007 | F | 314162.0 | 467814.0 | 110077.000 | | | |
| 6 8 206 THRU 9 11 271 | | | | | | | | |
| TOTAL FOR MBA | | | 314162.0 | 467814.0 | 110077.000 | 314162.0 | 467814.0 | 110077.000 |
| OUTPUT | | | | | | | | |
| 02007 U PROD SPL TK | | | | | | | | |
| | 2003 | F | 313321.0 | 466842.0 | 110170.000 | | | |
| | 2007 | F | 6.1 | 8.9 | 1.984 | | | |
| 6 7 72 THRU 9 10 139 | | | | | | | | |
| TOTAL FOR MBA | | | 313327.0 | 466851.0 | 110172.000 | 313327.0 | 466851.0 | 110172.000 |
| OUTPUT | | | | | | | | |
| 02023 HWW SPL TK | | | | | | | | |
| | 2425 | F | 70790.2 | 90472.9 | 97.339 | | | |
| | 2023 | RF | -1.0 | -1.1 | 0.000 | | | |
| | 2029 | RF | 24471.7 | 32067.4 | 172.934 | | | |
| 6 7 159 THRU 9 10 204 | | | | | | | | |
| TOTAL FOR MBA | | | 95260.9 | 122539.0 | 270.273 | 70790.2 | 90472.9 | 97.339 |
| OUTPUT | | | | | | | | |
| 02028 GPW CK TK | | | | | | | | |
| | 2425 | F | 42904.9 | 53768.6 | 213.215 | | | |
| | 2021 | RF | 6769.1 | 8474.7 | 236.616 | | | |
| | 2028 | RF | -1.1 | -1.5 | -.079 | | | |
| | 2029 | RF | 3783.6 | 4885.3 | 51.764 | | | |
| | 2036 | RF | 736.9 | 813.7 | 9.054 | | | |
| 6 7 564 THRU 9 10 657 | | | | | | | | |
| TOTAL FOR MBA | | | 54193.4 | 67940.8 | 510.570 | 42904.9 | 53768.6 | 213.215 |
| ENDING INVENTORY | | | | | | | | 10608.400 |

EXHIBIT 4-4
PAGE 1 OF 1

NMC - SUMMARY
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02003
DATE OF REPORT 05-Sep-79
TIME OF REPORT 12:26 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | F/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | QUANTITY RECEIVED KG SOLUT | QUANTITY RECEIVED U-CONTENT | QUANTITY TRANSFERED LITERS | QUANTITY TRANSFERED KG SOLUT | QUANTITY TRANSFERED U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 1480.8 | 2213.7 | 524.771 | | | | |
| LOT TOTAL | 8 | 206 | 238 | | F | | | | 154813.0 | 229890.0 | 53610.600 | 155768.0 | 231325.0 | 53952.100 | |
| LOT TOTAL | 9 | 239 | 242 | | F | | | | 18690.7 | 27929.1 | 6500.690 | 18677.3 | 27902.3 | 6490.920 | |
| LOT TOTAL | 10 | 243 | 250 | | F | | | | 39051.2 | 58004.1 | 13782.900 | 39044.9 | 58008.2 | 13787.700 | |
| LOT TOTAL | 11 | 251 | 271 | | F | | | | 101607.0 | 151990.0 | 36182.900 | 96771.8 | 144938.0 | 34693.300 | |
| LOTS | 8 11 | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | F | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | 2007 | | 314162.0 | 467814.0 | 110077.000 | 310262.0 | 462173.0 | 108924.000 | |
| SUB TOTAL | | | | | F | | | | 314162.0 | 467814.0 | 110077.000 | 310262.0 | 462173.0 | 108924.000 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| TOTAL | | | | | | | | | 314162.0 | 467814.0 | 110077.000 | 310262.0 | 462173.0 | 108924.000 | |
| ENDING BALANCE | | | | | | | | | | | | 5380.7 | 7854.3 | 1677.940 | |

EXHIBIT 4-5
PAGE 1 OF 1

NMC - SUMMARY
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02007
DATE OF REPORT 05-Sep-79
TIME OF REPORT 12:32 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | F/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | KG SOLUT | U-CONTENT | QUANTITY TRANSFERED LITERS | KG SOLUT | U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 1457.5 | 2174.0 | 532.671 | | | | |
| LOT TOTAL | 7 | 72 | 104 | | F | | | | 154623.0 | 229721.0 | 53672.800 | 154593.0 | 229689.0 | 53684.000 | |
| LOT TOTAL | 8 | 105 | 108 | | F | | | | 18666.0 | 27923.4 | 6517.920 | 18687.6 | 27939.5 | 6514.820 | |
| LOT TOTAL | 9 | 109 | 116 | | F | | | | 39028.9 | 57970.0 | 13783.800 | 39015.5 | 57984.3 | 13795.900 | |
| LOT TOTAL | 10 | 117 | 139 | | F | | | | 104099.0 | 155617.0 | 36993.100 | 101031.0 | 151238.0 | 36177.500 | |
| LOTS | 7 | 10 | | | | | | | | | | | | | |
| SUB TOTAL | | | | | F | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 309566.0 | 461316.0 | 108868.000 | 313321.0 | 466842.0 | 110170.000 | 2003 |
| | | | | | F | | | | 6850.7 | 9915.3 | 2099.450 | 6.1 | 8.9 | 1.984 | 2007 |
| SUB TOTAL | | | | | F | | | | 316417.0 | 471231.0 | 110968.000 | 313327.0 | 466851.0 | 110172.000 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| TOTAL | | | | | | | | | 316417.0 | 471231.0 | 110968.000 | 313327.0 | 466851.0 | 110172.000 | |
| ENDING BALANCE | | | | | | | | | | | | 4547.3 | 6554.2 | 1328.080 | |

EXHIBIT 4-6
PAGE 1 OF 1

NMC - SUMMARY
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02023
DATE OF REPORT 05-Sep-79
TIME OF REPORT 12:39 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | QUANTITY RECEIVED KG SOLUT | QUANTITY RECEIVED U-CONTENT | QUANTITY TRANSFERED LITERS | QUANTITY TRANSFERED KG SOLUT | QUANTITY TRANSFERED U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 510.1 | 562.4 | .380 | | | | |
| LOT TOTAL | 7 | 159 | | 171 | F | | | | 26622.0 | 33484.8 | 23.966 | 26840.2 | 33699.6 | 23.398 | |
| LOT TOTAL | 8 | 172 | | 173 | F | | | | 4965.5 | 6129.3 | 12.494 | 4815.4 | 5929.3 | 12.804 | |
| LOT TOTAL | 9 | 174 | | 178 | F | | | | 11306.2 | 14564.0 | 14.362 | 11323.3 | 14558.9 | 14.820 | |
| LOT TOTAL | 10 | 179 | | 204 | F | | | | 52310.1 | 68281.3 | 219.092 | 52282.1 | 68351.5 | 219.252 | |
| LOTS | 7 10 | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | F | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 69323.4 | 88928.1 | 90.870 | 70790.2 | 90472.9 | 97.339 | 2425 |
| SUB TOTAL | | | | | F | | | | 69323.4 | 88928.1 | 90.870 | 70790.2 | 90472.9 | 97.339 | |
| | | | | | RF | | | | 1268.0 | 1366.3 | .080 | -1.0 | -1.1 | 0.000 | 2023 |
| | | | | | RF | | | | 24612.3 | 32164.9 | 178.965 | 24471.7 | 32067.4 | 172.934 | 2029 |
| SUB TOTAL | | | | | RF | | | | 25880.3 | 33531.2 | 179.044 | 24470.7 | 32066.3 | 172.934 | |
| TOTAL | | | | | | | | | 95203.7 | 122459.0 | 269.915 | 95260.9 | 122539.0 | 270.273 | |
| ENDING BALANCE | | | | | | | | | | | | 452.9 | 482.5 | .021 | |

EXHIBIT 4-7
PAGE 1 OF 1

NMC - SUMMARY
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02028
DATE OF REPORT 05-Sep-79
TIME OF REPORT 12:45 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | QUANTITY RECEIVED KG SOLUT | QUANTITY RECEIVED U-CONTENT | QUANTITY TRANSFERED LITERS | QUANTITY TRANSFERED KG SOLUT | QUANTITY TRANSFERED U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 97.2 | 75.9 | .062 | | | | |
| LOT TOTAL | 7 | 564 | 602 | | F | | | | 22025.4 | 28069.9 | 323.090 | 22092.8 | 28110.1 | 322.782 | |
| LOT TOTAL | 8 | 603 | 610 | | F | | | | 4805.4 | 6138.1 | 29.204 | 4784.9 | 6111.5 | 29.402 | |
| LOT TOTAL | 9 | 611 | 623 | | F | | | | 6886.9 | 8817.9 | 22.266 | 6821.5 | 8782.1 | 22.320 | |
| LOT TOTAL | 10 | 624 | 657 | | F | | | | 20387.1 | 24848.4 | 136.053 | 20494.2 | 24937.0 | 136.066 | |
| LOTS | 7 10 | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | P | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RP | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 43126.5 | 53919.3 | 207.519 | 42904.9 | 53768.6 | 213.215 | 2425 |
| SUB TOTAL | | | | | F | | | | 43126.5 | 53919.3 | 207.519 | 42904.9 | 53768.6 | 213.215 | |
| | | | | | RF | | | | 6266.0 | 7964.6 | 208.722 | 6769.1 | 8474.7 | 236.616 | 2021 |
| | | | | | RF | | | | 583.9 | 784.3 | 44.212 | -1.1 | -1.5 | -.079 | 2028 |
| | | | | | RF | | | | 3493.3 | 4521.3 | 46.563 | 3783.6 | 4885.3 | 51.764 | 2029 |
| | | | | | RF | | | | 635.1 | 684.8 | 3.596 | 736.9 | 813.7 | 9.054 | 2036 |
| SUB TOTAL | | | | | RF | | | | 10978.2 | 13955.0 | 303.094 | 11288.4 | 14172.2 | 297.354 | |
| TOTAL | | | | | | | | | 54104.7 | 67874.3 | 510.613 | 54193.4 | 67940.8 | 510.570 | |
| ENDING BALANCE | | | | | | | | | | | | 8.5 | 9.4 | .105 | |

EXHIBIT 4-8
PAGE 1 OF 1

NUCLEAR MATERIAL ACCOUNTING
MATERIAL BALANCE REPORT FOR PERIODS 10 - 10
DATE OF REPORT 05-Sep-79
TIME OF REPORT 05:38 PM

| | FROM/TO | CODE | DETAIL LITERS | DETAIL KG SOL | DETAIL KG U | MBR LITERS | MBR KG SOL | MBR KG U |
|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | 10529.000 |
| INPUT | | | | | | | | |
| 02003 ACCT TK | | | | | | | | |
| | 2001 | F | 19471.8 | 19694.5 | 12.741 | | | |
| | 2003 | F | -23.6 | -5.5 | 1.106 | | | |
| | 2007 | F | 194510.0 | 286573.0 | 65968.900 | | | |
| 10 12 272 THRU 10 13 315 | | | | | | | | |
| TOTAL FOR MBA | | | 213958.0 | 306262.0 | 65982.800 | 213958.0 | 306262.0 | 65982.800 |
| OUTPUT | | | | | | | | |
| 02007 U PROD SPL TK | | | | | | | | |
| | 2003 | F | 194258.0 | 286510.0 | 66041.700 | | | |
| | 2007 | F | 3.2 | 3.6 | .031 | | | |
| | 4001 | F | 42691.2 | 58153.0 | 9560.650 | | | |
| 10 11 140 THRU 10 12 187 | | | | | | | | |
| TOTAL FOR MBA | | | 236953.0 | 344667.0 | 75602.400 | 236953.0 | 344667.0 | 75602.400 |
| OUTPUT | | | | | | | | |
| 02023 HWW SPL TK | | | | | | | | |
| | 2425 | F | 71731.1 | 93934.5 | 153.970 | | | |
| | 2029 | RF | 30125.9 | 40395.8 | 360.967 | | | |
| 10 11 205 THRU 10 12 253 | | | | | | | | |
| TOTAL FOR MBA | | | 101857.0 | 134330.0 | 514.938 | 71731.1 | 93934.5 | 153.970 |
| OUTPUT | | | | | | | | |
| 02028 GPW CK TK | | | | | | | | |
| | 2425 | F | 47563.3 | 52987.9 | 359.182 | | | |
| | 2021 | RF | 1297.0 | 1426.1 | 23.437 | | | |
| | 2029 | RF | 3619.9 | 4322.9 | 233.200 | | | |
| | 2036 | RF | 293.0 | 373.6 | 1.998 | | | |
| | 2125 | RF | 0.0 | 0.0 | 0.000 | | | |
| | 2127 | RF | 487.7 | 640.0 | 0.000 | | | |
| 10 11 658 THRU 10 12 740 | | | | | | | | |
| TOTAL FOR MBA | | | 53260.9 | 59750.5 | 617.818 | 47563.3 | 52987.9 | 359.182 |
| ENDING INVENTORY | | | | | | | | 396.277 |

EXHIBIT 4-9
PAGE 1 OF 1

NMC - ACCOUNTING
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02003
DATE OF REPORT 05-Sep-79
TIME OF REPORT 12:55 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | KG SOLUT | U-CONTENT | QUANTITY TRANSFERED LITERS | KG SOLUT | U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 5380.8 | 7854.3 | 1677.910 | | | | |
| 12 | 272 | C | 20 6 79 | 29058 | F | 272 | 2003 | 213.920 | -23.6 | -5.5 | 1.106 | 2178.0 | 3191.1 | 682.640 | 2005 |
| 12 | 273 | C | 25 6 79 | 29058 | F | 140 | 2007 | 213.920 | 0.0 | -.8 | -.165 | 2696.7 | 3950.4 | 845.061 | 2006 |
| 12 | 274 | C | 26 6 79 | 29285 | F | 141 | 2007 | 196.960 | 5183.5 | 7388.3 | 1443.220 | 5074.1 | 7248.9 | 1427.740 | 2006 |
| 12 | 275 | C | 26 6 79 | 29326 | F | 142 | 2007 | 210.420 | 6183.5 | 8992.0 | 1903.490 | 5996.8 | 8707.2 | 1832.160 | 2005 |
| 12 | 276 | C | 26 6 79 | 29392 | F | 143 | 2007 | 226.030 | 5682.4 | 8368.6 | 1909.220 | 5860.9 | 8617.0 | 1947.700 | 2006 |
| 12 | 277 | C | 27 6 79 | 29425 | F | 144 | 2007 | 231.680 | 4818.3 | 7137.5 | 1658.610 | 4978.0 | 7368.1 | 1707.030 | 2005 |
| 12 | 278 | C | 27 6 79 | 29513 | F | 145 | 2007 | 236.890 | 5101.4 | 7670.6 | 1820.480 | 5077.9 | 7626.0 | 1806.520 | 2006 |
| 12 | 279 | C | 28 6 79 | 29537 | F | 146 | 2007 | 231.560 | 4695.5 | 6986.8 | 1614.150 | 4676.6 | 6964.6 | 1612.720 | 2005 |
| 12 | 280 | C | 28 6 79 | 29614 | F | 147 | 2007 | 205.100 | 5598.9 | 8079.3 | 1638.050 | 5479.0 | 7926.3 | 1625.680 | 2006 |
| 12 | 281 | C | 29 6 79 | 29668 | F | 148 | 2007 | 211.740 | 3925.7 | 5652.1 | 1202.560 | 4082.7 | 5881.7 | 1245.400 | 2005 |
| 12 | 282 | | 29 6 79 | 29735 | F | 149 | 2007 | 215.190 | 4893.3 | 7126.1 | 1535.680 | 4721.5 | 6869.6 | 1478.270 | 2006 |
| 12 | 283 | C | 30 6 79 | 29758 | F | 150 | 2007 | 220.250 | 6524.5 | 9526.8 | 2102.820 | 6520.8 | 9518.6 | 2096.470 | 2005 |
| 12 | 284 | | 30 6 79 | 29792 | F | 151 | 2007 | 222.150 | 5456.1 | 7967.2 | 1771.630 | 5586.2 | 8157.0 | 1812.080 | 2006 |
| 12 | 285 | C | 30 6 79 | 29825 | F | 152 | 2007 | 223.780 | 4146.5 | 6078.3 | 1361.380 | 4046.7 | 5929.7 | 1326.940 | 2005 |
| 12 | 286 | C | 1 7 79 | 29861 | F | 153 | 2007 | 231.500 | 5009.7 | 7443.0 | 1729.740 | 5003.0 | 7422.2 | 1718.240 | 2006 |
| 12 | 287 | | 1 7 79 | 29897 | F | 154 | 2007 | 236.790 | 5309.4 | 7884.7 | 1871.720 | 5454.2 | 8098.9 | 1917.730 | 2005 |
| 12 | 288 | C | 1 7 79 | 29941 | F | 155 | 2007 | 236.960 | 4690.3 | 6932.2 | 1642.760 | 4591.2 | 6788.5 | 1608.590 | 2006 |
| 12 | 289 | C | 2 7 79 | 29971 | F | 156 | 2007 | 236.060 | 5925.3 | 8738.9 | 2062.160 | 5846.9 | 8625.1 | 2036.030 | 2005 |
| 12 | 290 | C | 2 7 79 | 30011 | F | 157 | 2007 | 225.730 | 5362.1 | 7748.4 | 1739.450 | 5414.8 | 7842.0 | 1770.160 | 2006 |
| 12 | 291 | C | 2 7 79 | 30053 | F | 158 | 2007 | 228.170 | 5770.7 | 8411.0 | 1921.180 | 5778.3 | 8417.1 | 1920.520 | 2006 |
| 12 | 292 | C | 3 7 79 | 30090 | F | 159 | 2007 | 227.410 | 6598.9 | 9680.4 | 2200.780 | 6537.6 | 9585.0 | 2179.720 | 2005 |
| LOT TOTAL | 12 | 272 | 292 | | F | | | | 100852.0 | 147806.0 | 33130.000 | 105602.0 | 154735.0 | 34597.400 | |
| 13 | 293 | C | 5 7 79 | 30221 | F | 160 | 2007 | 229.580 | 5786.0 | 8456.2 | 1943.380 | 5806.7 | 8489.1 | 1948.920 | 2006 |
| 13 | 294 | C | 5 7 79 | 30296 | F | 161 | 2007 | 225.400 | 5203.4 | 7558.0 | 1699.840 | 5330.2 | 7747.5 | 1746.280 | 2005 |
| 13 | 295 | C | 5 7 79 | 30322 | F | 162 | 2007 | 227.600 | 5301.9 | 7688.5 | 1751.450 | 5173.6 | 7503.9 | 1707.880 | 2006 |
| 13 | 296 | C | 6 7 79 | 30353 | F | 163 | 2007 | 224.660 | 5363.2 | 7744.4 | 1737.250 | 5543.0 | 8007.8 | 1799.030 | 2005 |
| 13 | 297 | C | 6 7 79 | 30422 | F | 164 | 2007 | 221.875 | 5401.6 | 7880.4 | 1746.730 | 5369.3 | 7827.7 | 1736.770 | 2006 |
| 13 | 298 | C | 7 7 79 | 30452 | F | 165 | 2007 | 229.540 | 5476.3 | 8026.2 | 1847.520 | 5499.8 | 8057.3 | 1849.460 | 2005 |
| 13 | 299 | C | 7 7 79 | 30484 | F | 166 | 2007 | 232.340 | 4961.0 | 7292.1 | 1696.050 | 4938.0 | 7256.4 | 1685.950 | 2006 |
| 13 | 300 | C | 7 7 79 | 30518 | F | 167 | 2007 | 229.880 | 5868.2 | 8567.0 | 1967.700 | 5700.2 | 8325.8 | 1913.930 | 2005 |
| 13 | 301 | C | 7 7 79 | 30538 | F | 168 | 2007 | 229.420 | 5305.3 | 7770.5 | 1782.270 | 5454.4 | 7986.5 | 1832.270 | 2006 |
| 13 | 302 | C | 8 7 79 | 30579 | F | 169 | 2007 | 235.000 | 5102.1 | 7590.1 | 1787.630 | 5112.3 | 7595.1 | 1784.850 | 2005 |
| 13 | 303 | C | 8 7 79 | 30611 | F | 170 | 2007 | 245.360 | 5133.0 | 7737.0 | 1905.630 | 5142.1 | 7741.2 | 1899.380 | 2006 |
| 13 | 304 | C | 8 7 79 | 30653 | F | 171 | 2007 | 244.870 | 4812.1 | 7236.9 | 1771.760 | 4684.7 | 7046.1 | 1725.380 | 2005 |
| 13 | 305 | C | 9 7 79 | 30686 | F | 172 | 2007 | 246.290 | 4921.7 | 7420.2 | 1828.790 | 5044.3 | 7602.9 | 1872.530 | 2006 |
| 13 | 306 | C | 9 7 79 | 30707 | F | 173 | 2007 | 245.620 | 4757.7 | 7178.3 | 1762.670 | 4652.4 | 7019.0 | 1724.010 | 2005 |
| 13 | 307 | C | 9 7 79 | 30743 | F | 174 | 2007 | 244.130 | 4982.3 | 7497.4 | 1829.050 | 5093.1 | 7666.1 | 1871.510 | 2006 |
| 13 | 308 | C | 10 7 79 | 30771 | F | 175 | 2007 | 248.540 | 5001.5 | 7633.0 | 1900.180 | 4942.7 | 7534.7 | 1872.680 | 2005 |
| 13 | 309 | C | 10 7 79 | 30818 | F | 176 | 2007 | 250.240 | 5127.2 | 7801.6 | 1953.620 | 4892.1 | 7444.9 | 1863.010 | 2006 |
| 13 | 310 | C | 10 7 79 | 30855 | F | 177 | 2007 | 250.890 | 5130.3 | 7683.7 | 1928.520 | 5285.2 | 7933.6 | 1990.460 | 2006 |
| 13 | 311 | C | 12 7 79 | 31060 | F | 0 | 2001 | 75.430 | 2252.8 | 2240.3 | 10.777 | 2841.5 | 3127.8 | 235.933 | 2005 |
| 13 | 312 | C | 13 7 79 | 31104 | F | 0 | 2001 | .771 | 1999.6 | 2067.7 | .537 | 1557.2 | 1610.8 | 1.242 | 2006 |
| 13 | 313 | C | 13 7 79 | 31223 | F | 0 | 2001 | .149 | 7659.7 | 7743.5 | .858 | 7681.5 | 7773.9 | 1.156 | 2005 |
| 13 | 314 | C | 16 7 79 | 31230 | F | 0 | 2001 | .114 | 4910.4 | 4953.3 | .547 | 4883.0 | 4928.4 | .559 | 2006 |
| 13 | 315 | C | 16 7 79 | 31251 | F | 0 | 2001 | .024 | 2649.4 | 2689.6 | .023 | 2755.9 | 2795.7 | .067 | 2002 |
| LOT TOTAL | 13 | 293 | 315 | | F | | | | 113106.0 | 158456.0 | 32852.800 | 113383.0 | 159022.0 | 33063.300 | |
| LOTS 12 13 | | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | P | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RP | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | 2001 | | 19471.8 | 19694.5 | 12.741 | 19719.0 | 20236.5 | 238.957 | |
| | | | | | F | | 2003 | | -23.6 | -5.5 | 1.106 | 2178.0 | 3191.1 | 682.640 | |
| | | | | | F | | 2007 | | 194510.0 | 286573.0 | 65968.900 | 197088.0 | 290329.0 | 66739.100 | |
| SUB TOTAL | | | | | F | | | | 213958.0 | 306262.0 | 65982.800 | 218985.0 | 313757.0 | 67660.700 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| TOTAL | | | | | | | | | 213958.0 | 306262.0 | 65982.800 | 218985.0 | 313757.0 | 67660.700 | |
| ENDING BALANCE | | | | | | | | | | | | 354.4 | 359.6 | 0.000 | |

EXHIBIT 4-10
PAGE 1 OF 1

NMC - ACCOUNTING
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02007
DATE OF REPORT 05-Sep-79
TIME OF REPORT 01:05 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | KG SOLUT | U-CONTENT | QUANTITY TRANSFERED LITERS | KG SOLUT | U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 4552.4 | 6562.7 | 1329.800 | | | | |
| 11 | 140 | | 20 6 79 | 29208 | F | 0 | 2053 | 203.540 | -29.8 | -25.1 | .861 | -8.2 | -11.8 | -2.409 | 2003 |
| 11 | 141 | | 25 6 79 | 29255 | F | 0 | 2053 | 196.480 | 3298.7 | 4611.9 | 859.906 | 5217.5 | 7437.8 | 1461.370 | 2003 |
| 11 | 142 | | 26 6 79 | 29289 | F | 0 | 2053 | 211.730 | 5601.9 | 8237.3 | 1800.870 | 6111.6 | 8899.5 | 1884.290 | 2003 |
| 11 | 143 | | 26 6 79 | 29332 | F | 0 | 2053 | 227.220 | 5022.6 | 7421.6 | 1733.760 | 5690.9 | 8373.1 | 1902.530 | 2003 |
| 11 | 144 | | 27 6 79 | 29393 | F | 0 | 2053 | 233.630 | 4795.9 | 7135.9 | 1680.690 | 4812.9 | 7142.8 | 1668.780 | 2003 |
| 11 | 145 | | 27 6 79 | 29438 | F | 0 | 2053 | 238.300 | 5077.3 | 7666.5 | 1837.520 | 5102.5 | 7675.8 | 1829.760 | 2003 |
| 11 | 146 | | 27 6 79 | 29534 | F | 0 | 2053 | 231.580 | 4712.0 | 6993.4 | 1605.290 | 4691.0 | 6983.7 | 1617.290 | 2003 |
| 11 | 147 | | 28 6 79 | 29605 | F | 0 | 2053 | 202.090 | 5661.8 | 8105.5 | 1576.020 | 5603.8 | 8086.4 | 1634.180 | 2003 |
| 11 | 148 | | 29 6 79 | 29638 | F | 0 | 2053 | 213.410 | 3927.8 | 5652.8 | 1230.380 | 3925.2 | 5653.1 | 1206.420 | 2003 |
| 11 | 149 | C | 29 6 79 | 29713 | F | 0 | 2053 | 219.570 | 4830.8 | 7119.4 | 1576.290 | 4863.2 | 7129.1 | 1565.340 | 2003 |
| 11 | 150 | C | 30 6 79 | 29746 | F | 0 | 2053 | 223.860 | 6956.7 | 10223.3 | 2297.660 | 6481.0 | 9520.2 | 2131.180 | 2003 |
| 11 | 151 | | 30 6 79 | 29774 | F | 0 | 2053 | 222.980 | 4998.8 | 7281.7 | 1621.200 | 5460.4 | 7972.6 | 1777.740 | 2003 |
| 11 | 152 | | 30 6 79 | 29810 | F | 0 | 2053 | 225.330 | 4139.3 | 6073.9 | 1373.630 | 4140.8 | 6068.2 | 1367.350 | 2003 |
| 11 | 153 | | 1 7 79 | 29841 | F | 0 | 2053 | 233.100 | 4968.2 | 7424.3 | 1747.160 | 5002.4 | 7442.7 | 1734.880 | 2003 |
| 11 | 154 | | 1 7 79 | 29880 | F | 0 | 2053 | 238.280 | 5296.8 | 7887.3 | 1890.310 | 5296.9 | 7886.0 | 1879.070 | 2003 |
| 11 | 155 | | 1 7 79 | 29916 | F | 0 | 2053 | 237.550 | 4700.2 | 6933.1 | 1645.420 | 4688.5 | 6930.8 | 1646.410 | 2003 |
| 11 | 156 | | 1 7 79 | 29942 | F | 0 | 2053 | 236.800 | 5924.3 | 8740.1 | 2068.070 | 5921.1 | 8738.7 | 2069.320 | 2003 |
| 11 | 157 | | 2 7 79 | 29975 | F | 0 | 2053 | 223.870 | 5400.9 | 7763.4 | 1710.620 | 5362.9 | 7752.1 | 1735.460 | 2003 |
| 11 | 158 | | 2 7 79 | 30040 | F | 0 | 2053 | 227.500 | 5756.1 | 8407.5 | 1920.440 | 5772.8 | 8414.2 | 1914.220 | 2003 |
| 11 | 159 | | 2 7 79 | 30060 | F | 0 | 2053 | 228.420 | 6956.2 | 10219.2 | 2336.230 | 6593.2 | 9672.7 | 2209.440 | 2003 |
| LOT TOTAL | 11 | 140 | 159 | | F | | | | 97996.6 | 143873.0 | 32512.300 | 100730.0 | 147768.0 | 33232.600 | |
| 12 | 160 | | 3 7 79 | 30114 | F | 0 | 2053 | 231.070 | 5372.6 | 7895.5 | 1831.470 | 5744.9 | 8439.0 | 1950.000 | 2003 |
| 12 | 161 | | 5 7 79 | 30272 | F | 0 | 2053 | 224.290 | 5206.9 | 7546.4 | 1678.170 | 5189.6 | 7543.4 | 1691.920 | 2003 |
| 12 | 162 | | 5 7 79 | 30298 | F | 0 | 2053 | 227.160 | 5314.0 | 7693.4 | 1753.740 | 5308.6 | 7692.2 | 1747.370 | 2003 |
| 12 | 163 | | 6 7 79 | 30332 | F | 0 | 2053 | 223.190 | 5371.9 | 7750.5 | 1721.390 | 5366.4 | 7749.7 | 1729.660 | 2003 |
| 12 | 164 | C | 6 7 79 | 30381 | F | 0 | 2053 | 221.300 | 5322.5 | 7795.1 | 1721.030 | 5401.7 | 7887.1 | 1745.420 | 2003 |
| 12 | 165 | | 6 7 79 | 30440 | F | 0 | 2053 | 231.300 | 5528.1 | 8113.6 | 1897.050 | 5477.1 | 8030.4 | 1857.430 | 2003 |
| 12 | 166 | | 7 7 79 | 30456 | F | 0 | 2053 | 233.250 | 4961.0 | 7293.6 | 1705.360 | 4964.0 | 7293.5 | 1701.200 | 2003 |
| 12 | 167 | C | 7 7 79 | 30489 | F | 0 | 2053 | 225.960 | 5883.8 | 8570.7 | 1921.170 | 5872.1 | 8568.2 | 1936.080 | 2003 |
| 12 | 168 | | 7 7 79 | 30521 | F | 0 | 2053 | 226.920 | 5293.7 | 7771.7 | 1765.600 | 5302.5 | 7774.5 | 1764.190 | 2003 |
| 12 | 169 | | 8 7 79 | 30553 | F | 0 | 2053 | 235.280 | 5073.4 | 7573.7 | 1799.660 | 5101.3 | 7585.3 | 1784.660 | 2003 |
| 12 | 170 | C | 8 7 79 | 30585 | F | 0 | 2053 | 245.070 | 5109.7 | 7722.9 | 1913.290 | 5133.0 | 7730.8 | 1894.580 | 2003 |
| 12 | 171 | | 8 7 79 | 30613 | F | 0 | 2053 | 246.140 | 4805.9 | 7230.1 | 1781.860 | 4805.5 | 7231.2 | 1779.890 | 2003 |
| 12 | 172 | | 9 7 79 | 30667 | F | 0 | 2053 | 245.920 | 4925.7 | 7419.2 | 1824.080 | 4925.3 | 7417.0 | 1823.990 | 2003 |
| 12 | 173 | | 9 7 79 | 30702 | F | 0 | 2053 | 247.530 | 4752.3 | 7176.0 | 1779.660 | 4756.7 | 7178.2 | 1776.820 | 2003 |
| 12 | 174 | | 9 7 79 | 30730 | F | 0 | 2053 | 243.330 | 4984.9 | 7499.8 | 1816.100 | 4980.1 | 7497.4 | 1824.350 | 2003 |
| 12 | 175 | | 10 7 79 | 30763 | F | 0 | 2053 | 249.350 | 4978.4 | 7625.8 | 1914.150 | 5003.0 | 7634.7 | 1903.710 | 2003 |
| 12 | 176 | | 10 7 79 | 30776 | F | 0 | 2053 | 251.830 | 5139.1 | 7805.5 | 1970.850 | 5132.2 | 7802.7 | 1964.950 | 2003 |
| 12 | 177 | | 10 7 79 | 30823 | F | 0 | 2053 | 251.440 | 5067.7 | 7688.9 | 1932.480 | 5064.2 | 7687.0 | 1932.820 | 2003 |
| 12 | 178 | | 10 7 79 | 30871 | F | 0 | 2053 | 242.100 | 5528.8 | 8243.7 | 1976.200 | 4957.2 | 7418.1 | 1795.920 | 4001 |
| 12 | 179 | | 11 7 79 | 30886 | F | 0 | 2053 | 229.570 | 6011.6 | 8782.6 | 1979.580 | 5968.6 | 8771.7 | 2013.710 | 4001 |
| 12 | 180 | | 11 7 79 | 30938 | F | 0 | 2053 | 227.480 | 5044.9 | 7488.3 | 1697.310 | 5060.6 | 7490.4 | 1703.930 | 4001 |
| 12 | 181 | | 13 7 79 | 31072 | F | 0 | 2053 | 239.680 | 4558.2 | 6911.2 | 1692.250 | 4805.3 | 7233.3 | 1733.680 | 4001 |
| 12 | 182 | | 14 7 79 | 31166 | F | 0 | 2053 | 199.230 | 4641.9 | 6561.3 | 1201.620 | 4325.5 | 6222.1 | 1239.640 | 4001 |
| 12 | 183 | | 15 7 79 | 31200 | F | 0 | 2053 | 95.940 | 5689.3 | 6953.2 | 362.427 | 5428.9 | 6946.0 | 666.403 | 4001 |
| 12 | 184 | | 20 7 79 | 31361 | F | 0 | 2053 | 38.406 | 5610.4 | 6524.1 | 80.444 | 5455.6 | 6529.6 | 250.773 | 4001 |
| 12 | 185 | | 21 7 79 | 31653 | F | 0 | 2053 | 23.700 | 3591.2 | 3915.4 | 49.395 | 5344.7 | 6059.1 | 143.601 | 4001 |
| 12 | 186 | C | 23 7 79 | 31678 | F | 0 | 2053 | 8.769 | 1309.6 | 1421.5 | .410 | 1344.9 | 1482.6 | 13.001 | 4001 |
| 12 | 187 | | 30 7 79 | 31776 | F | 0 | 2011 | 8.841 | 107.3 | 115.1 | 1.071 | 3.2 | 3.6 | .031 | 2007 |
| LOT TOTAL | 12 | 160 | 187 | | F | | | | 135185.0 | 195089.0 | 41767.800 | 136222.0 | 196899.0 | 42369.700 | |
| LOTS 11 12 | | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | P | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RP | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 191088.0 | 282045.0 | 65239.400 | 194258.0 | 286510.0 | 66041.700 | 2003 |
| | | | | | F | | | | 107.3 | 115.1 | 1.071 | 3.2 | 3.6 | .031 | 2007 |
| | | | | | F | | | | 41985.9 | 56801.1 | 9039.630 | 42691.2 | 58153.0 | 9560.650 | 4001 |
| SUB TOTAL | | | | | F | | | | 233181.0 | 338962.0 | 74280.100 | 236953.0 | 344667.0 | 75602.400 | |
| SUB TOTAL | | | | | RF | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| TOTAL | | | | | | | | | 233181.0 | 338962.0 | 74280.100 | 236953.0 | 344667.0 | 75602.400 | |
| ENDING BALANCE | | | | | | | | | | | | 781.0 | 857.8 | 7.586 | |

EXHIBIT 4-11
PAGE 1 OF 1

NMC - ACCOUNTING
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02023
DATE OF REPORT 05-Sep-79
TIME OF REPORT 01:15 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | KG SOLUT | U-CONTENT | QUANTITY TRANSFERED LITERS | KG SOLUT | U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 452.8 | 482.5 | .021 | | | | |
| 11 | 205 | | 20 6 79 | 29181 | RF | 0 | 2023 | 3.108 | 2259.8 | 2821.4 | 10.247 | 2229.2 | 2715.2 | 8.438 | 2029 |
| 11 | 206 | | 25 6 79 | 29249 | RF | 0 | 2056 | 1.818 | 2087.3 | 2817.8 | 4.362 | 2197.0 | 2911.4 | 5.292 | 2029 |
| 11 | 207 | | 26 6 79 | 29321 | RF | 0 | 2056 | 14.496 | 2287.5 | 3200.2 | 52.669 | 2246.1 | 3118.9 | 45.212 | 2029 |
| 11 | 208 | C | 26 6 79 | 29399 | RF | 0 | 2056 | 9.251 | 2069.7 | 2856.7 | 23.403 | 2038.0 | 2815.8 | 26.049 | 2029 |
| 11 | 209 | | 27 6 79 | 29510 | RF | 0 | 2056 | 4.690 | 1941.6 | 2708.6 | 9.887 | 2023.6 | 2817.8 | 13.215 | 2029 |
| 11 | 210 | | 28 6 79 | 29538 | RF | 0 | 2056 | 7.151 | 2023.6 | 2697.1 | 20.537 | 1817.4 | 2438.8 | 17.439 | 2029 |
| 11 | 211 | | 28 6 79 | 29576 | RF | 0 | 2056 | 5.234 | 2220.7 | 2824.3 | 13.313 | 2389.7 | 3073.5 | 16.087 | 2029 |
| 11 | 212 | | 29 6 79 | 29633 | RF | 0 | 2029 | 2.476 | 2268.0 | 2959.3 | 5.900 | 2223.5 | 2895.0 | 7.168 | 2029 |
| 11 | 213 | | 29 6 79 | 29678 | F | 0 | 2056 | .835 | 2471.7 | 3204.5 | 1.722 | 2458.4 | 3189.3 | 2.663 | 2425 |
| 11 | 214 | | 29 6 79 | 29714 | F | 0 | 2056 | .733 | 2128.1 | 2839.3 | 2.020 | 2200.2 | 2921.1 | 2.141 | 2425 |
| 11 | 215 | | 30 6 79 | 29745 | F | 0 | 2056 | 1.403 | 2246.2 | 2946.4 | 4.480 | 2180.2 | 2865.0 | 4.021 | 2425 |
| 11 | 216 | | 30 6 79 | 29809 | F | 0 | 2053 | 4.460 | 2178.8 | 2788.8 | 14.260 | 2224.2 | 2860.0 | 12.755 | 2425 |
| 11 | 217 | | 1 7 79 | 29856 | F | 0 | 2056 | 3.920 | 2284.4 | 2928.8 | 11.196 | 2236.5 | 2868.7 | 11.244 | 2425 |
| 11 | 218 | | 1 7 79 | 29917 | RF | 0 | 2056 | 6.823 | 2326.6 | 3038.6 | 22.431 | 2426.7 | 3160.0 | 21.561 | 2029 |
| 11 | 219 | | 1 7 79 | 29940 | RF | 0 | 2056 | 24.588 | 2421.9 | 3196.4 | 86.833 | 2302.3 | 3033.4 | 74.586 | 2029 |
| 11 | 220 | | 2 7 79 | 30012 | RF | 0 | 2056 | 21.289 | 2118.2 | 2973.9 | 61.243 | 2247.3 | 3119.5 | 66.411 | 2029 |
| 11 | 221 | | 2 7 79 | 30050 | RF | 0 | 2056 | 11.219 | 2237.6 | 3131.5 | 30.287 | 2364.4 | 3305.3 | 37.083 | 2029 |
| LOT TOTAL | 11 205 | | 221 | | F | | | | 37571.5 | 49933.5 | 374.790 | 37804.5 | 50108.7 | 371.362 | |
| 12 | 222 | | 3 7 79 | 30129 | RF | 0 | 2056 | 6.717 | 2262.2 | 3122.2 | 19.589 | 1979.6 | 2735.3 | 18.374 | 2029 |
| 12 | 223 | | 3 7 79 | 30145 | F | 0 | 2127 | 4.963 | 124.2 | 171.8 | -.365 | 335.6 | 463.8 | 2.302 | 2425 |
| 12 | 224 | | 3 7 79 | 30157 | F | 0 | 2056 | 4.043 | 2227.6 | 3060.1 | 12.000 | 2196.9 | 3020.0 | 12.209 | 2425 |
| 12 | 225 | | 4 7 79 | 30186 | F | 0 | 2056 | 2.223 | 2139.3 | 3027.9 | 5.925 | 2025.6 | 2856.1 | 6.348 | 2425 |
| 12 | 226 | | 4 7 79 | 30192 | RF | 0 | 2056 | 1.797 | 1659.8 | 2265.9 | 3.811 | 1641.2 | 2255.8 | 4.054 | 2029 |
| 12 | 227 | | 5 7 79 | 30220 | F | 0 | 2056 | .947 | 2187.0 | 2835.9 | 2.156 | 2202.1 | 2885.0 | 2.733 | 2425 |
| 12 | 228 | | 5 7 79 | 30297 | F | 0 | 2056 | .499 | 2403.2 | 3117.9 | 1.298 | 2399.1 | 3117.3 | 1.555 | 2425 |
| 12 | 229 | | 6 7 79 | 30372 | F | 0 | 2056 | 1.616 | 1801.3 | 2448.0 | 4.599 | 1808.5 | 2436.5 | 3.937 | 2425 |
| 12 | 230 | | 6 7 79 | 30442 | F | 0 | 2056 | 1.533 | 2249.3 | 3000.9 | 4.553 | 2247.0 | 3002.6 | 4.604 | 2425 |
| 12 | 231 | | 7 7 79 | 30485 | F | 0 | 2056 | 1.132 | 2285.7 | 3053.4 | 3.223 | 2292.4 | 3062.5 | 3.468 | 2425 |
| 12 | 232 | | 7 7 79 | 30493 | F | 0 | 2056 | 2.220 | 2245.5 | 3069.8 | 7.441 | 2245.2 | 3058.1 | 6.789 | 2425 |
| 12 | 233 | | 8 7 79 | 30552 | F | 0 | 2056 | 4.001 | 1791.3 | 2415.8 | 10.712 | 1784.3 | 2411.0 | 9.646 | 2425 |
| 12 | 234 | | 8 7 79 | 30590 | F | 0 | 2056 | 5.369 | 2234.3 | 2973.6 | 16.777 | 1962.3 | 2618.2 | 14.058 | 2425 |
| 12 | 235 | | 8 7 79 | 30616 | F | 0 | 2056 | 4.034 | 1885.9 | 2536.4 | 8.965 | 2150.1 | 2885.4 | 11.639 | 2425 |
| 12 | 236 | | 9 7 79 | 30668 | F | 0 | 2056 | 3.108 | 2009.8 | 2650.3 | 7.681 | 2004.4 | 2651.7 | 8.241 | 2425 |
| 12 | 237 | | 9 7 79 | 30728 | F | 0 | 2023 | 3.634 | 2276.3 | 3057.6 | 11.427 | 2289.7 | 3067.8 | 11.149 | 2425 |
| 12 | 238 | | 10 7 79 | 30789 | F | 0 | 2056 | 2.697 | 1896.2 | 2593.9 | 6.445 | 1918.2 | 2613.9 | 7.049 | 2425 |
| 12 | 239 | | 11 7 79 | 30883 | F | 0 | 2056 | 2.919 | 2099.2 | 2880.5 | 8.535 | 2085.1 | 2857.8 | 8.343 | 2425 |
| 12 | 240 | | 11 7 79 | 30916 | F | 0 | 2056 | .868 | 2202.1 | 2991.9 | 1.387 | 2204.3 | 2999.2 | 2.604 | 2425 |
| 12 | 241 | | 12 7 79 | 31058 | F | 0 | 2053 | .445 | 1922.2 | 2712.1 | .959 | 1960.3 | 2747.9 | 1.222 | 2425 |
| 12 | 242 | | 13 7 79 | 31126 | F | 0 | 2056 | .359 | 2079.4 | 2777.9 | .949 | 2065.9 | 2781.3 | .998 | 2425 |
| 12 | 243 | | 14 7 79 | 31176 | F | 0 | 2056 | .200 | 1922.3 | 2594.9 | .432 | 1928.6 | 2602.2 | .520 | 2425 |
| 12 | 244 | | 15 7 79 | 31204 | F | 0 | 2056 | .164 | 2382.9 | 3116.2 | .494 | 2317.0 | 3043.9 | .501 | 2425 |
| 12 | 245 | | 16 7 79 | 31238 | F | 0 | 2056 | .094 | 2047.1 | 2585.9 | .199 | 2048.4 | 2606.6 | .244 | 2425 |
| 12 | 246 | | 16 7 79 | 31260 | F | 0 | 2056 | .075 | 2450.3 | 3085.6 | .221 | 2499.3 | 3152.5 | .237 | 2425 |
| 12 | 247 | | 17 7 79 | 31285 | F | 0 | 2056 | 0.000 | 2307.6 | 2877.3 | -.038 | 2338.2 | 2920.6 | .001 | 2425 |
| 12 | 248 | | 18 7 79 | 31297 | F | 0 | 2056 | .048 | 2501.4 | 2975.1 | .165 | 2416.2 | 2892.9 | .139 | 2425 |
| 12 | 249 | | 18 7 79 | 31516 | F | 0 | 2056 | .050 | 2338.8 | 2685.8 | .137 | 2352.3 | 2720.5 | .137 | 2425 |
| 12 | 250 | | 19 7 79 | 31542 | F | 0 | 2056 | .071 | 1980.4 | 2449.9 | .185 | 1969.4 | 2406.7 | .171 | 2425 |
| 12 | 251 | | 20 7 79 | 31563 | F | 0 | 2056 | .090 | 1963.5 | 2484.7 | .233 | 2035.7 | 2559.1 | .229 | 2425 |
| 12 | 252 | | 20 7 79 | 31582 | F | 0 | 2056 | .036 | 1278.1 | 1505.9 | .028 | 1144.4 | 1369.6 | .049 | 2425 |
| 12 | 253 | | 20 7 79 | 31595 | F | 0 | 2056 | .018 | 1179.0 | 1378.9 | .013 | 1205.2 | 1419.8 | .025 | 2425 |
| LOT TOTAL | 12 222 | | 253 | | F | | | | 64333.2 | 84503.9 | 140.137 | 64052.5 | 84221.6 | 143.575 | |
| LOTS 11 12 | | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | P | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RP | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 71720.4 | 93823.6 | 150.415 | 71731.1 | 93934.5 | 153.970 | 2425 |
| SUB TOTAL | | | | | F | | | | 71720.4 | 93823.6 | 150.415 | 71731.1 | 93934.5 | 153.970 | |
| | | | | | RF | | | | 30184.3 | 40613.8 | 364.512 | 30125.9 | 40395.8 | 360.967 | 2029 |
| SUB TOTAL | | | | | RF | | | | 30184.3 | 40613.8 | 364.512 | 30125.9 | 40395.8 | 360.967 | |
| TOTAL | | | | | | | | | 101905.0 | 134437.0 | 514.927 | 101857.0 | 134330.0 | 514.938 | |
| ENDING BALANCE | | | | | | | | | | | | 500.6 | 589.6 | .010 | |

EXHIBIT 4-12
PAGE 1 OF 1

NMC - ACCOUNTING
INPUT/OUTPUT REPORT FOR MEASUREMENT POINT 02028
DATE OF REPORT 05-Sep-79
TIME OF REPORT 01:31 PM

| LOT NO | BATCH NO | C | AS DATE | LOG NO | P/F | BATCH NO | REC FROM | U-CONC MG-U/G | QUANTITY RECEIVED LITERS | KG SOLUT | U-CONTENT | QUANTITY TRANSFERED LITERS | KG SOLUT | U-CONTENT | DEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | | 8.5 | 9.4 | .105 | | | | |
| 11 | 658 | | 22 6 79 | 29146 | F | 0 | 2125 | 2.163 | 852.8 | 880.3 | 1.819 | 732.8 | 757.0 | 1.637 | 2425 |
| 11 | 659 | | 24 6 79 | 29222 | F | 0 | 2037 | 1.024 | 449.4 | 506.1 | .367 | 470.6 | 520.2 | .533 | 2425 |
| 11 | 660 | C | 26 6 79 | 29359 | F | 0 | 2127 | 1.077 | 198.9 | 229.3 | .253 | 226.9 | 257.8 | .278 | 2425 |
| 11 | 661 | C | 27 6 79 | 29432 | F | 0 | 2125 | 20.369 | 567.6 | 674.3 | 15.475 | 577.0 | 681.8 | 13.887 | 2425 |
| 11 | 662 | | 28 6 79 | 29606 | F | 0 | 2024 | 3.671 | 638.2 | 821.8 | 1.636 | 642.2 | 820.2 | 3.011 | 2425 |
| 11 | 663 | | 29 6 79 | 9999 | RF | 0 | 2125 | .001 | 758.0 | 997.0 | -.309 | 487.7 | 640.0 | 0.000 | 2127 |
| 11 | 664 | | 29 6 79 | 29719 | F | 0 | 2125 | .789 | 483.4 | 479.2 | .726 | 773.0 | 868.1 | .685 | 2425 |
| 11 | 665 | | 30 6 79 | 29736 | F | 0 | 2024 | 1.773 | 745.0 | 874.0 | 1.601 | 714.9 | 836.6 | 1.483 | 2425 |
| 11 | 666 | | 30 6 79 | 29752 | F | 0 | 2024 | 2.675 | 639.1 | 796.2 | 2.211 | 640.0 | 792.1 | 2.119 | 2425 |
| 11 | 667 | | 30 6 79 | 29775 | F | 0 | 2024 | 3.332 | 566.9 | 715.4 | 2.446 | 538.9 | 678.6 | 2.261 | 2425 |
| 11 | 668 | | 30 6 79 | 29790 | F | 0 | 2024 | 6.668 | 569.3 | 688.3 | 5.026 | 591.4 | 719.5 | 4.798 | 2425 |
| 11 | 669 | | 30 6 79 | 29808 | F | 0 | 2127 | 2.768 | 673.9 | 817.6 | 1.875 | 673.5 | 817.3 | 2.262 | 2425 |
| 11 | 670 | | 30 6 79 | 29819 | F | 0 | 2125 | 17.671 | 701.5 | 899.2 | 17.376 | 703.0 | 896.1 | 15.835 | 2425 |
| 11 | 671 | C | 1 7 79 | 29863 | RF | 0 | 2125 | 33.000 | 578.5 | 719.4 | 82.052 | 560.7 | 699.3 | 71.333 | 2029 |
| 11 | 672 | C | 1 7 79 | 29918 | RF | 0 | 2125 | 36.990 | 626.1 | 775.1 | 72.416 | 456.1 | 813.2 | 76.924 | 2029 |
| 11 | 673 | | 2 7 79 | 30058 | RF | 0 | 2125 | 31.751 | 837.7 | 964.9 | 25.303 | 898.4 | 1040.7 | 33.045 | 2029 |
| LOT TOTAL | 11 | 658 | 673 | | F | | | | 9886.3 | 11838.1 | 230.274 | 9887.0 | 11838.5 | 230.093 | |
| 12 | 674 | | 3 7 79 | 30160 | F | 0 | 2036 | 38.412 | 277.6 | 331.8 | 12.804 | 276.2 | 329.8 | 12.669 | 2425 |
| 12 | 675 | | 4 7 79 | 30172 | F | 0 | 2127 | 5.248 | 544.4 | 591.9 | 2.744 | 553.5 | 602.8 | 3.163 | 2425 |
| 12 | 676 | C | 4 7 79 | 30184 | F | 0 | 2127 | 4.165 | 307.3 | 336.9 | 1.403 | 289.7 | 317.6 | 1.323 | 2425 |
| 12 | 677 | | 4 7 79 | 30188 | F | 0 | 2125 | .245 | 635.9 | 659.0 | .086 | 592.1 | 614.6 | .150 | 2425 |
| 12 | 678 | | 4 7 79 | 30203 | RF | 0 | 2125 | 20.021 | 719.5 | 838.6 | 18.050 | 711.9 | 822.6 | 16.470 | 2029 |
| 12 | 679 | | 5 7 79 | 30223 | RF | 0 | 2125 | 37.407 | 737.2 | 883.3 | 34.425 | 792.9 | 947.1 | 35.428 | 2029 |
| 12 | 680 | | 5 7 79 | 30265 | RF | 0 | 2125 | 32.315 | 661.2 | 760.6 | 24.499 | 622.0 | 716.1 | 23.139 | 2021 |
| 12 | 681 | | 5 7 79 | 30275 | F | 0 | 2125 | 28.837 | 689.8 | 771.2 | 22.029 | 675.4 | 756.7 | 21.822 | 2425 |
| 12 | 682 | | 5 7 79 | 30305 | F | 0 | 2125 | 25.541 | 680.0 | 746.3 | 18.814 | 641.7 | 705.5 | 18.018 | 2425 |
| 12 | 683 | | 6 7 79 | 30324 | F | 0 | 2036 | 7.861 | 779.0 | 800.6 | 4.248 | 866.3 | 897.7 | 7.056 | 2425 |
| 12 | 684 | | 6 7 79 | 30338 | F | 0 | 2036 | 12.995 | 768.5 | 816.0 | 10.700 | 729.8 | 774.5 | 10.065 | 2425 |
| 12 | 685 | | 6 7 79 | 30370 | F | 0 | 2125 | 21.599 | 747.3 | 838.1 | 18.620 | 802.9 | 897.1 | 19.376 | 2425 |
| 12 | 686 | | 6 7 79 | 30379 | F | 0 | 2024 | 4.178 | 661.0 | 834.2 | 3.465 | 590.7 | 745.3 | 3.114 | 2425 |
| 12 | 687 | | 6 7 79 | 30401 | F | 0 | 2125 | 2.304 | 656.9 | 795.6 | 1.664 | 656.4 | 798.3 | 1.839 | 2425 |
| 12 | 688 | | 6 7 79 | 30441 | F | 0 | 2024 | 2.445 | 624.5 | 766.4 | 1.886 | 659.4 | 808.5 | 1.976 | 2425 |
| 12 | 689 | | 7 7 79 | 30474 | F | 0 | 2061 | .154 | 581.0 | 671.5 | 0.000 | 581.8 | 674.9 | .104 | 2425 |
| 12 | 690 | | 7 7 79 | 30520 | RF | 0 | 2127 | .419 | 638.9 | 668.2 | .291 | 675.0 | 710.0 | .298 | 2021 |
| 12 | 691 | | 8 7 79 | 30580 | F | 0 | 2027 | .060 | 848.1 | 856.3 | .051 | 841.5 | 849.7 | .051 | 2425 |
| 12 | 692 | | 8 7 79 | 30607 | F | 0 | 2125 | 10.240 | 698.2 | 845.2 | 8.723 | 632.9 | 765.1 | 7.834 | 2425 |
| 12 | 693 | | 9 7 79 | 30708 | F | 0 | 2125 | 6.627 | 621.1 | 673.3 | 4.148 | 617.4 | 677.3 | 4.488 | 2425 |
| 12 | 694 | | 10 7 79 | 30822 | F | 0 | 2125 | 11.244 | 742.0 | 886.1 | 10.345 | 748.5 | 887.2 | 9.975 | 2425 |
| 12 | 695 | | 10 7 79 | 30846 | F | 0 | 2061 | 2.438 | 492.3 | 576.8 | .687 | 492.9 | 578.4 | 1.410 | 2425 |
| 12 | 696 | | 11 7 79 | 30882 | F | 0 | 2125 | 8.958 | 541.0 | 638.8 | 6.245 | 583.9 | 689.0 | 6.172 | 2425 |
| 12 | 697 | | 12 7 79 | 31068 | F | 0 | 2125 | 12.379 | 644.4 | 768.4 | 9.614 | 602.8 | 718.5 | 8.894 | 2425 |
| 12 | 698 | | 13 7 79 | 31123 | RF | 0 | 2127 | 3.439 | 688.5 | 1007.0 | 2.749 | 176.9 | 254.4 | .875 | 2036 |
| 12 | 699 | C | 13 7 79 | 31135 | F | 0 | 2125 | 5.578 | 266.9 | 43.7 | 2.025 | 806.9 | 836.1 | 4.664 | 2425 |
| 12 | 700 | C | 15 7 79 | 31203 | RF | 0 | 2125 | 9.496 | 767.8 | 894.6 | 8.651 | 0.0 | 0.0 | 0.000 | 2125 |
| 12 | 701 | | 15 7 79 | 31208 | F | 0 | 2028 | 9.222 | 32.4 | 18.6 | -.084 | 770.5 | 875.6 | 8.074 | 2425 |
| 12 | 702 | | 16 7 79 | 31247 | F | 0 | 2037 | 2.389 | 710.5 | 719.3 | 1.189 | 750.8 | 768.3 | 1.836 | 2425 |
| 12 | 703 | | 17 7 79 | 31273 | F | 0 | 2125 | 6.682 | 795.8 | 855.8 | 5.841 | 711.0 | 763.3 | 5.100 | 2425 |
| 12 | 704 | | 17 7 79 | 3128 | F | 0 | 2125 | 12.372 | 743.6 | 803.9 | 10.634 | 815.6 | 880.9 | 10.899 | 2425 |
| 12 | 705 | | 17 7 79 | 31287 | F | 0 | 2024 | 1.350 | 739.4 | 761.0 | .544 | 753.3 | 777.3 | 1.050 | 2425 |
| 12 | 706 | | 18 7 79 | 31501 | F | 0 | 2125 | 11.770 | 603.3 | 688.8 | 8.394 | 556.7 | 632.9 | 7.450 | 2425 |
| 12 | 707 | | 19 7 79 | 31546 | F | 0 | 2037 | 1.903 | 721.9 | 720.4 | .548 | 770.3 | 778.7 | 1.482 | 2425 |
| 12 | 708 | | 20 7 79 | 31560 | F | 0 | 2024 | .238 | 756.1 | 787.5 | .146 | 743.0 | 773.1 | .184 | 2425 |
| 12 | 709 | | 20 7 79 | 31580 | F | 0 | 2024 | .007 | 753.6 | 824.6 | -.003 | 725.8 | 792.4 | .006 | 2425 |
| 12 | 710 | | 20 7 79 | 31592 | F | 0 | 2125 | 13.699 | 650.6 | 779.7 | 11.664 | 635.2 | 754.9 | 10.342 | 2425 |
| 12 | 711 | | 21 7 79 | 31615 | F | 0 | 2060 | 1.048 | 741.1 | 816.3 | -.366 | 769.9 | 854.6 | .896 | 2425 |
| 12 | 712 | | 21 7 79 | 31627 | F | 0 | 2125 | 10.197 | 787.3 | 869.6 | 9.400 | 795.3 | 878.7 | 8.960 | 2425 |
| 12 | 713 | | 22 7 79 | 31636 | F | 0 | 2125 | 17.548 | 749.6 | 863.7 | 15.517 | 732.8 | 842.3 | 14.781 | 2425 |
| 12 | 714 | | 22 7 79 | 31639 | F | 0 | 2125 | 20.341 | 674.8 | 820.7 | 16.891 | 685.5 | 830.0 | 16.882 | 2425 |
| 12 | 715 | | 22 7 79 | 31644 | F | 0 | 2125 | 17.619 | 680.2 | 808.4 | 14.076 | 692.2 | 823.8 | 14.514 | 2425 |
| 12 | 716 | | 22 7 79 | 31652 | F | 0 | 2125 | 12.176 | 777.1 | 885.1 | 10.529 | 758.5 | 865.8 | 10.542 | 2425 |
| 12 | 717 | | 22 7 79 | 31657 | F | 0 | 2125 | 5.623 | 704.7 | 787.5 | 4.002 | 701.5 | 785.2 | 4.416 | 2425 |
| 12 | 718 | | 22 7 79 | 31661 | F | 0 | 2125 | 4.598 | 658.1 | 765.7 | 3.451 | 647.8 | 751.3 | 3.454 | 2425 |
| 12 | 719 | | 23 7 79 | 31665 | F | 0 | 2125 | 4.924 | 582.3 | 691.5 | 3.432 | 593.0 | 702.4 | 3.459 | 2425 |
| 12 | 720 | | 23 7 79 | 31674 | F | 0 | 2024 | 2.499 | 658.8 | 738.3 | 1.673 | 677.5 | 762.7 | 1.906 | 2425 |
| 12 | 721 | | 23 7 79 | 31681 | F | 0 | 2060 | .376 | 462.5 | 539.3 | .104 | 473.6 | 550.8 | .207 | 2425 |
| 12 | 722 | | 23 7 79 | 31685 | F | 0 | 2125 | 3.308 | 724.7 | 824.6 | 2.830 | 695.9 | 792.5 | 2.621 | 2425 |
| 12 | 723 | | 23 7 79 | 31693 | F | 0 | 2024 | 5.230 | 599.0 | 692.4 | 3.750 | 603.6 | 696.7 | 3.644 | 2425 |
| 12 | 724 | | 23 7 79 | 31696 | F | 0 | 2024 | 5.463 | 673.9 | 771.6 | 4.230 | 655.0 | 750.4 | 4.100 | 2425 |
| 12 | 725 | | 24 7 79 | 31699 | F | 0 | 2024 | 5.016 | 697.4 | 777.4 | 3.862 | 706.1 | 789.2 | 3.958 | 2425 |
| 12 | 726 | | 24 7 79 | 31702 | F | 0 | 2024 | 4.689 | 618.4 | 688.2 | 3.203 | 642.6 | 715.5 | 3.355 | 2425 |
| 12 | 727 | | 24 7 79 | 31705 | F | 0 | 2125 | 8.631 | 693.2 | 838.3 | 7.412 | 674.1 | 811.7 | 7.006 | 2425 |
| 12 | 728 | C | 24 7 79 | 31709 | RF | 0 | 2036 | 9.423 | 830.0 | 841.4 | 7.985 | 116.1 | 119.2 | 1.123 | 2036 |
| 12 | 729 | | 24 7 79 | 31713 | F | 0 | 2036 | 9.423 | 6.7 | 3.5 | .033 | 743.1 | 759.5 | 7.156 | 2425 |
| 12 | 730 | | 24 7 79 | 31713 | F | 0 | 2036 | 9.423 | 600.4 | 597.8 | 5.633 | 580.9 | 579.3 | 5.459 | 2425 |
| 12 | 731 | | 25 7 79 | 31716 | F | 0 | 2024 | .305 | 687.7 | 677.7 | -.307 | 683.2 | 673.8 | .205 | 2425 |
| 12 | 732 | | 25 7 79 | 31719 | F | 0 | 2024 | .097 | 787.6 | 786.5 | .064 | 789.9 | 788.2 | .076 | 2425 |
| 12 | 733 | | 25 7 79 | 31724 | F | 0 | 2036 | .377 | 779.7 | 778.8 | .310 | 775.0 | 774.1 | .292 | 2425 |
| 12 | 734 | | 25 7 79 | 31725 | F | 0 | 2061 | .268 | 715.6 | 703.3 | .203 | 735.6 | 799.4 | .214 | 2425 |
| 12 | 735 | | 25 7 79 | 31727 | F | 0 | 2036 | .482 | 830.0 | 824.1 | .407 | 845.3 | 843.2 | .406 | 2425 |
| 12 | 736 | | 25 7 79 | 31728 | F | 0 | 2125 | .436 | 882.5 | 881.5 | .383 | 852.3 | 851.3 | .371 | 2425 |
| 12 | 737 | | 26 7 79 | 31729 | F | 0 | 2027 | .193 | 696.7 | 707.2 | .122 | 687.4 | 696.9 | .134 | 2425 |
| 12 | 738 | | 26 7 79 | 31730 | F | 0 | 2027 | .627 | 814.2 | 804.6 | .534 | 829.9 | 821.7 | .515 | 2425 |
| 12 | 739 | | 26 7 79 | 31732 | F | 0 | 2061 | .260 | 423.1 | 482.1 | .106 | 435.6 | 489.3 | .127 | 2425 |
| 12 | 740 | | 26 7 79 | 31735 | F | 0 | 2125 | .432 | 374.0 | 369.0 | .167 | 340.8 | 340.6 | .147 | 2425 |
| LOT TOTAL | 12 | 674 | 740 | | F | | | | 43438.8 | 47975.6 | 387.470 | 43373.9 | 47912.0 | 387.725 | |
| LOTS 11 12 | | | | | | | | | | | | | | | |
| SUB TOTAL | | | | | P | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| SUB TOTAL | | | | | RP | | | | 0.0 | 0.0 | 0.000 | 0.0 | 0.0 | 0.000 | |
| | | | | | F | | | | 45481.6 | 50463.7 | 341.630 | 47563.3 | 52987.9 | 359.182 | 2425 |
| SUB TOTAL | | | | | F | | | | 45481.6 | 50463.7 | 341.630 | 47563.3 | 52987.9 | 359.182 | |
| | | | | | RF | | | | 1300.2 | 1428.8 | 24.790 | 1297.0 | 1426.1 | 23.437 | 2021 |
| | | | | | RF | | | | 3498.9 | 4181.2 | 232.247 | 3619.9 | 4322.9 | 233.200 | 2029 |
| | | | | | RF | | | | 1518.5 | 1848.4 | 10.734 | 293.0 | 373.6 | 1.998 | 2036 |
| | | | | | RF | | | | 767.8 | 894.6 | 8.651 | 0.0 | 0.0 | 0.000 | 2125 |
| | | | | | RF | | | | 758.0 | 997.0 | -.309 | 487.7 | 640.0 | 0.000 | 2127 |
| SUB TOTAL | | | | | RF | | | | 7843.4 | 9350.0 | 276.113 | 5697.7 | 6762.6 | 250.636 | |
| TOTAL | | | | | | | | | 53325.0 | 59813.7 | 617.744 | 53260.9 | 59750.5 | 617.818 | |
| ENDING BALANCE | | | | | | | | | | | | 72.6 | 72.6 | .031 | |

NUCLEAR MATERIAL ACCOUNTING
MATERIAL BALANCE REPORT FOR PERIODS 6 - 10
DATE OF REPORT 06-Sep-79
TIME OF REPORT 07:55 AM

| | FROM/TO | CODE | DETAIL LITERS | DETAIL KG SOL | DETAIL KG U | MBR LITERS | MBR KG SOL | MBR KG U |
|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | 11014.000 |
| INPUT | | | | | | | | |
| 02003 ACCT TK | | | | | | | | |
| | 2001 | F | 19471.8 | 19694.5 | 12.741 | | | |
| | 2003 | F | -23.6 | -5.5 | 1.106 | | | |
| | 2007 | F | 508672.0 | 754387.0 | 176046.000 | | | |
| 6 8 206 THRU 10 13 315 | | | | | | | | |
| TOTAL FOR MBA | | | 528120.0 | 774076.0 | 176060.000 | 528120.0 | 774076.0 | 176060.000 |
| OUTPUT | | | | | | | | |
| 02007 U PROD SPL TK | | | | | | | | |
| | 2003 | F | 507579.0 | 753352.0 | 176212.000 | | | |
| | 2007 | F | 9.3 | 12.5 | 2.015 | | | |
| | 4001 | F | 42691.2 | 58153.0 | 9560.650 | | | |
| 6 7 72 THRU 10 12 187 | | | | | | | | |
| TOTAL FOR MBA | | | 550280.0 | 811517.0 | 185775.000 | 550280.0 | 811517.0 | 185775.000 |
| OUTPUT | | | | | | | | |
| 02023 HWW SPL TK | | | | | | | | |
| | 2425 | F | 142521.0 | 184407.0 | 251.309 | | | |
| | 2023 | RF | -1.0 | -1.1 | 0.000 | | | |
| | 2029 | RF | 54597.6 | 72463.2 | 533.901 | | | |
| 6 7 159 THRU 10 12 253 | | | | | | | | |
| TOTAL FOR MBA | | | 197118.0 | 256869.0 | 785.211 | 142521.0 | 184407.0 | 251.309 |
| OUTPUT | | | | | | | | |
| 02028 GPW CK TK | | | | | | | | |
| | 2425 | F | 90468.2 | 106756.0 | 572.397 | | | |
| | 2021 | RF | 8066.1 | 9900.8 | 260.052 | | | |
| | 2028 | RF | -1.1 | -1.5 | -.079 | | | |
| | 2029 | RF | 7403.5 | 9208.2 | 284.964 | | | |
| | 2036 | RF | 1029.9 | 1187.4 | 11.052 | | | |
| | 2125 | RF | 0.0 | 0.0 | 0.000 | | | |
| | 2127 | RF | 487.7 | 640.0 | 0.000 | | | |
| 6 7 564 THRU 10 12 740 | | | | | | | | |
| TOTAL FOR MBA | | | 107454.0 | 127691.0 | 1128.390 | 90468.2 | 106756.0 | 572.397 |
| ENDING INVENTORY | | | | | | | | 475.668 |

EXHIBIT 4-14
PAGE 1 OF 1

NUCLEAR MATERIAL ACCOUNTING
MATERIAL BALANCE REPORT FOR PERIODS 6 - 10 (ADJUSTED BEGINNING INVENTORY)
DATE OF REPORT 12-Sep-79
TIME OF REPORT 10:59 AM

| | FROM/TO | CODE | DETAIL LITERS | DETAIL KG SOL | DETAIL KG U | MBR LITERS | MBR KG SOL | MBR KG U |
|---|---|---|---|---|---|---|---|---|
| BEGINNING INVENTORY | | | | | | | | 21543.000 |
| INPUT | | | | | | | | |
| 02003 ACCT TK | | | | | | | | |
| | 2001 | F | 19471.8 | 19694.5 | 12.741 | | | |
| | 2003 | F | -23.6 | -5.5 | 1.106 | | | |
| | 2007 | F | 508672.0 | 754387.0 | 176046.000 | | | |
| 6 8 206 THRU 10 13 315 | | | | | | | | |
| TOTAL FOR MBA | | | 528120.0 | 774076.0 | 176060.000 | 528120.0 | 774076.0 | 176060.000 |
| OUTPUT | | | | | | | | |
| 02007 U PROD SPL TK | | | | | | | | |
| | 2003 | F | 507579.0 | 753352.0 | 176212.000 | | | |
| | 2007 | F | 9.3 | 12.5 | 2.015 | | | |
| | 4001 | F | 42691.2 | 58153.0 | 9560.650 | | | |
| 6 7 72 THRU 10 12 187 | | | | | | | | |
| TOTAL FOR MBA | | | 550280.0 | 811517.0 | 185775.000 | 550280.0 | 811517.0 | 185775.000 |
| OUTPUT | | | | | | | | |
| 02023 HWW SPL TK | | | | | | | | |
| | 2425 | F | 142521.0 | 184407.0 | 251.309 | | | |
| | 2023 | RF | -1.0 | -1.1 | 0.000 | | | |
| | 2029 | RF | 54597.6 | 72463.2 | 533.901 | | | |
| 6 7 159 THRU 10 12 253 | | | | | | | | |
| TOTAL FOR MBA | | | 197118.0 | 256869.0 | 785.211 | 142521.0 | 184407.0 | 251.309 |
| OUTPUT | | | | | | | | |
| 02028 GPW CK TK | | | | | | | | |
| | 2425 | F | 90468.2 | 106756.0 | 572.397 | | | |
| | 2021 | RF | 8066.1 | 9900.8 | 260.052 | | | |
| | 2028 | RF | -1.1 | -1.5 | -.079 | | | |
| | 2029 | RF | 7403.5 | 9208.2 | 284.964 | | | |
| | 2036 | RF | 1029.9 | 1187.4 | 11.052 | | | |
| | 2125 | RF | 0.0 | 0.0 | 0.000 | | | |
| | 2127 | RF | 487.7 | 640.0 | 0.000 | | | |
| 6 7 564 THRU 10 12 740 | | | | | | | | |
| TOTAL FOR MBA | | | 107454.0 | 127691.0 | 1128.390 | 90468.2 | 106756.0 | 572.397 |
| ENDING INVENTORY | | | | | | | | 11004.700 |

EXHIBIT 4-15
PAGE 1 OF 1

# EXHIBIT 4-16

## MBA TRANSFER COMPARISON REPORT

## 2-007 to 2-003

TANK 02003 BATCH 308 10-Jul-79 06:19 AM

02003 > THE AFTER-SAMPLE COMPARISON FOR:
02003 > PRODUCT TO INPUT SOLUTION QUANTITY IS MARGINAL
02003 > 7643.85 KG SOLUTION WAS TRANSFERRED FROM TANK 02007
02003 > AND 7633.04 KG SOLUTION WAS RECEIVED

SOLUTION QUANTITY TRANSFERRED VERSUS RECEIVED

TRANSFER: 02007 TO 02003

| TRANSFERRED DATA | RECEIVED DATA |
|---|---|
| BATCH NO.: 02007-175 | BATCH NO.: 02003-308 |
| KG SOLN = 7643.85 | KG SOLN = 7633.04 |

TRANSFERRED VERSUS RECEIVED DIFFERENCE = 10.8169

ACCEPTABLE RANGE = 150

02003 LEVEL COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:20 AM

| BATCH NO. | BEFORE RECEIPT PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 206 | 103.33 | -2.28 | 5.68 | 402.99 | -5.74 | 5.68 | 402.95 | -5.78 | 6.01 | 114.28 | -2.43 | 5.20 |
| 207 | 114.30 | -2.44 | 5.58 | 434.17 | -6.17 | 5.75 | 434.19 | -6.10 | 5.80 | 107.93 | -2.37 | 5.62 |
| 208 | 107.89 | -2.37 | 5.80 | 453.56 | -7.04** | 5.60 | 453.56 | -6.28 | 5.84 | 126.33 | -2.53 | 5.48 |
| 209 | 126.31 | -2.55 | 5.86 | 411.46 | -5.76 | 5.92 | 411.43 | -5.83 | 5.84 | 122.91 | -2.50 | 5.68 |
| 210 | 122.98 | -2.60 | 6.65 | 424.53 | -5.91 | 7.40 | 424.30 | -5.97 | 5.98 | 133.51 | -2.57 | 5.68 |
| 211 | 133.49 | -2.59 | 6.10 | 368.04 | -5.36 | 6.10 | 368.09 | -5.32 | 5.98 | 65.77 | -2.18 | 5.63 |
| 212 | 65.75 | -2.10 | 6.44 | 367.90 | -5.33 | 6.04 | 367.92 | -5.35 | 6.04 | 52.00 | -2.07 | 6.21 |
| 213 | 51.98 | -2.08 | 6.33 | 334.79 | -4.91 | 5.91 | 334.85 | -5.06 | 5.84 | 50.58 | -2.07 | 5.90 |
| 214 | 50.59 | -2.05 | 6.06 | 309.53 | -4.62 | 6.03 | 309.55 | -4.64 | 6.09 | 48.72 | -2.06 | 6.26 |
| 215 | 48.71 | -2.09 | 6.24 | 286.36 | -4.34 | 5.95 | 286.36 | -4.41 | 6.07 | 50.72 | -2.07 | 6.29 |
| 216 | 50.74 | -2.08 | 6.07 | 300.92 | -4.53 | 5.84 | 300.99 | -4.54 | 5.84 | 80.77 | -2.28 | 5.45 |
| 217 | 80.75 | -2.25 | 5.40 | 321.13 | -4.83 | 6.06 | 321.13 | -4.84 | 6.41 | 42.38 | -2.10 | 6.21 |
| 218 | 42.38 | -2.04 | 6.32 | 347.98 | -5.62 | 6.27 | 347.97 | -5.16 | 5.78 | 40.91 | -1.98 | 4.71 |
| 219 | 40.90 | -1.99 | 6.04 | 344.46 | -5.09 | 5.62 | 344.46 | -5.02 | 5.52 | 51.93 | -2.06 | 6.03 |
| 220 | 51.93 | -2.02 | 5.87 | 299.77 | -4.46 | 5.20 | 299.70 | -4.63 | 5.26 | 47.17 | -2.02 | 5.58 |
| 221 | 47.18 | -2.01 | 5.46 | 291.93 | -4.37 | 5.34 | 289.31 | -4.42 | 5.49 | 44.96 | -1.98 | 7.02 |
| 222 | 44.98 | -1.98 | 6.35 | 384.31 | -5.51 | 5.87 | 384.31 | -5.52 | 7.31 | 68.95 | -2.05 | 5.45 |
| 223 | 68.91 | -2.10 | 5.80 | 338.11 | -4.96 | 5.58 | 338.07 | -4.96 | 5.39 | 51.27 | -1.99 | 5.97 |
| 224 | 51.25 | -1.97 | 5.94 | 308.23 | -4.62 | 5.60 | 308.25 | -4.64 | 5.31 | 45.54 | -1.97 | 6.07 |
| 225 | 45.53 | -1.94 | 6.48 | 350.12 | -5.11 | 5.84 | 350.07 | -5.08 | 5.69 | 42.58 | -1.97 | 6.27 |
| 226 | 42.60 | -1.97 | 6.53 | 306.53 | -4.61 | 6.06 | 306.09 | -4.63 | 5.72 | 48.16 | -2.00 | 6.13 |
| 227 | 48.13 | -2.05 | 6.02 | 304.10 | -4.67 | 5.74 | 304.10 | -4.63 | 5.92 | 45.53 | -2.07 | 5.65 |
| 228 | 45.51 | -2.07 | 5.48 | 354.58 | -5.30 | 6.82 | 354.60 | -5.32 | 5.77 | 48.58 | -2.13 | 6.15 |
| 229 | 48.58 | -2.09 | 5.83 | 329.17 | -4.97 | 5.65 | 329.17 | -4.97 | 6.44 | 46.72 | -2.06 | 6.21 |
| 230 | 46.71 | -2.02 | 6.23 | 288.76 | -4.98 | 5.78 | 288.78 | -4.45 | 5.43 | 40.43 | -2.03 | 5.81 |
| 231 | 40.47 | -1.99 | 5.33 | 334.80 | -5.15 | 5.19 | 334.78 | -5.06 | 5.60 | 43.35 | -2.08 | 5.74 |
| 232 | .01 | -45.26** | 6.18 | 294.40 | -4.63 | 5.63 | 294.35 | -4.55 | 5.11 | 47.38 | -2.16 | 4.90 |
| 233 | 47.50 | -2.04 | 5.00 | 374.98 | -5.50 | 4.99 | 374.99 | -5.44 | 7.40 | 42.87 | -1.98 | 6.70 |
| 234 | 42.88 | -1.90 | 7.61 | 315.95 | -4.62 | 7.55 | 315.95 | -4.71 | 7.54 | 45.47 | -1.94 | 5.83 |
| 235 | 45.50 | -1.91 | 7.13 | 295.09 | -4.44 | 7.15 | 294.98 | -4.55 | 7.92 | 42.48 | -1.94 | 8.04 |
| 236 | 42.49 | -1.97 | 7.98 | 327.51 | -4.93 | 6.87 | 327.51 | -4.88 | 7.10 | 46.28 | -1.98 | 7.64 |
| 237 | 46.48 | -1.87 | 6.38 | 327.30 | -4.88 | 6.60 | 327.30 | -4.88 | 6.76 | 47.47 | -1.94 | 6.60 |
| 238 | 47.46 | -1.91 | 6.94 | 331.08 | -4.91 | 7.11 | 331.07 | -4.91 | 6.80 | 45.31 | -1.97 | 7.23 |
| 239 | 45.30 | -1.94 | 7.21 | 306.08 | -4.60 | 6.68 | 306.10 | -4.51 | 6.85 | 45.51 | -1.96 | 6.97 |
| 240 | 45.52 | -1.90 | 6.71 | 321.89 | -4.78 | 7.29 | 321.78 | -4.93 | 7.15 | 43.32 | -1.95 | 7.41 |
| 241 | 43.33 | -1.94 | 7.28 | 341.44 | -4.92 | 7.25 | 341.40 | -4.95 | 7.22 | 48.50 | -2.00 | 8.23 |
| 242 | 48.51 | -2.01 | 7.02 | 334.60 | -4.80 | 7.36 | 334.58 | -4.61 | 7.51 | 46.52 | -2.02 | 7.69 |
| 243 | 46.56 | -2.01 | 6.55 | 359.08 | -5.19 | 7.05 | 359.07 | -5.23 | 7.51 | 48.80 | -1.98 | 7.46 |
| 244 | 48.74 | -2.02 | 7.72 | 308.19 | -4.52 | 7.05 | 308.09 | -4.49 | 7.17 | 47.45 | -1.66 | 7.14 |
| 245 | 47.44 | -1.92 | 6.35 | 345.27 | -4.89 | 6.77 | 345.21 | -4.91 | 6.67 | 50.31 | -1.86 | 6.91 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 LEVEL COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:21 AM

| BATCH NO. | BEFORE RECEIPT PRIMARY LEVEL ( CM.) | BEFORE RECEIPT PRI-TAY ( CM.) | BEFORE RECEIPT TJR-TI (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | BEFORE SAMPLE PRI-TAY ( CM.) | BEFORE SAMPLE TJR-TI (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | AFTER SAMPLE PRI-TAY ( CM.) | AFTER SAMPLE TJR-TI (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | AFTER TRANSFER PRI-TAY ( CM.) | AFTER TRANSFER TJR-TI (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 246 | 50.33 | -1.89 | 6.58 | 357.27 | -4.92 | 6.78 | 356.73 | -5.03 | 6.68 | 56.22 | -1.97 | 6.79 |
| 247 | 56.12 | -2.03 | 6.87 | 339.70 | -4.83 | 6.99 | 339.67 | -4.86 | 6.94 | 49.31 | -1.97 | 7.08 |
| 248 | 49.32 | -1.96 | 6.93 | 339.78 | -4.86 | 6.67 | 339.72 | -4.86 | 6.71 | 49.82 | -1.95 | 6.52 |
| 249 | 49.80 | -1.95 | 6.03 | 355.61 | -5.00 | 6.16 | 355.60 | -5.05 | 6.30 | 45.31 | -1.96 | 6.47 |
| 250 | 45.33 | -1.90 | 6.53 | 317.10 | -4.61 | 6.44 | 317.11 | -4.55 | 4.52 | 46.12 | -1.96 | 6.47 |
| 251 | 46.15 | -1.89 | 5.89 | 347.12 | -5.48 | 6.07 | 347.11 | -4.97 | 6.13 | 50.20 | -1.97 | 7.34 |
| 252 | 50.19 | -1.94 | 6.42 | 357.22 | -4.97 | 6.83 | 357.23 | -5.04 | 6.62 | 51.74 | -1.95 | 7.40 |
| 253 | 51.73 | -1.97 | 7.41 | 365.50 | -5.09 | 7.11 | 365.51 | -5.04 | 6.99 | 49.57 | -2.00 | 7.39 |
| 254 | 49.54 | -2.03 | 6.65 | 329.40 | -4.73 | 6.38 | 329.43 | -4.70 | 6.50 | 47.58 | -1.99 | 6.73 |
| 255 | 47.53 | -2.00 | 6.50 | 331.07 | -4.76 | 2.71 | 331.04 | -4.86 | 6.38 | 42.66 | -2.03 | 6.84 |
| 256 | 42.63 | -1.95 | 6.85 | 333.51 | -4.84 | 6.54 | 333.51 | -4.84 | 6.36 | 50.33 | -2.10 | 6.77 |
| 257 | 50.34 | -2.01 | 6.88 | 326.12 | -5.36 | 6.76 | 326.15 | -4.85 | 6.56 | 42.33 | -2.03 | 6.88 |
| 258 | 42.35 | -2.01 | 6.79 | 345.11 | -5.09 | 6.82 | 345.11 | -4.93 | 6.57 | 46.09 | -1.99 | 6.45 |
| 259 | 46.06 | -2.00 | 6.59 | 345.69 | -4.97 | 6.56 | 345.65 | -4.94 | 6.57 | 43.01 | -2.03 | 6.96 |
| 260 | 43.07 | -1.96 | 7.08 | 337.12 | -4.93 | 7.02 | 337.10 | -4.91 | 7.00 | 47.02 | -1.92 | 7.19 |
| 261 | 46.10 | -1.98 | 7.52 | 331.23 | -4.86 | 6.94 | 331.22 | -4.87 | 6.73 | 42.54 | -1.91 | 7.04 |
| 262 | 42.51 | -1.95 | 6.79 | 302.64 | -4.99 | 6.61 | 302.64 | -4.53 | 6.79 | 41.46 | -1.97 | 7.04 |
| 263 | 41.46 | -1.93 | 7.06 | 362.90 | -5.26 | 6.94 | 362.90 | -5.34 | 6.59 | 43.34 | -2.02 | 7.24 |
| 264 | 43.36 | -1.89 | 7.20 | 339.78 | -5.00 | 6.84 | 339.78 | -5.00 | 6.73 | 48.93 | -1.99 | 6.74 |
| 265 | 48.94 | -1.92 | 7.08 | 358.28 | -5.14 | 7.58 | 358.27 | -5.23 | 7.37 | 43.14 | -2.02 | 7.52 |
| 266 | 43.15 | -2.01 | 7.40 | 346.53 | -5.03 | 8.35 | 346.52 | -5.00 | 8.20 | 49.28 | -1.99 | 8.71 |
| 267 | 49.26 | -1.98 | 8.62 | 341.66 | -4.88 | 9.32 | 341.52 | -4.88 | 8.54 | 49.65 | -2.01 | 8.81 |
| 268 | 49.66 | -1.99 | 8.66 | 362.52 | -5.21 | 9.01 | 362.48 | -5.17 | 8.59 | 87.12 | -2.23 | 7.53 |
| 269 | 87.13 | -2.22 | 7.69 | 433.10 | -6.00 | 9.07 | 433.10 | -5.91 | 8.72 | 45.57 | -399.38** | 9.30 |
| 270 | 45.56 | -399.30** | 9.12 | 438.91 | -5.99 | 8.83 | 439.10 | -5.93 | 9.13 | 297.30 | -4.54** | 9.09 |
| 271 | 296.91 | -4.33** | 7.97 | 329.27 | -4.74 | 7.50 | 329.11 | -4.74 | 7.43 | 329.10 | -4.79** | 7.37 |
| 272 | 328.86 | -4.74** | 5.46 | 328.93 | -4.80 | 5.33 | 328.93 | -4.82 | 5.00 | 201.07 | -3.27** | 6.19 |
| 273 | 201.08 | -3.27** | 6.57 | 201.06 | -3.15** | 8.56 | 201.03 | -3.27** | 7.35 | 42.21 | -1.88 | 7.46 |
| 274 | 42.21 | -1.87 | 7.41 | 338.49 | -4.66 | 7.29 | 338.43 | -4.80 | 7.44 | 47.56 | -1.77 | 7.49 |
| 275 | 47.80 | -1.79 | 7.35 | 408.52 | -5.58 | 7.40 | 408.51 | -5.51 | 7.06 | 59.33 | -1.86 | 6.25 |
| 276 | 59.35 | -1.83 | 6.15 | 395.13 | -5.40 | 7.07 | 395.12 | -5.37 | 7.17 | 49.42 | -1.86 | 7.19 |
| 277 | 49.43 | -1.86 | 6.58 | 335.95 | -4.76 | 7.11 | 335.94 | -4.77 | 6.93 | 40.13 | -1.78 | 7.46 |
| 278 | 40.08 | -1.79 | 7.58 | 348.31 | -4.90 | 6.93 | 348.28 | -4.90 | 6.96 | 42.14 | -1.81 | 8.56 |
| 279 | 42.08 | -1.95 | 6.41 | 322.56 | -4.58 | 6.44 | 322.54 | -4.46 | 6.32 | 42.93 | -1.79 | 6.70 |
| 280 | 42.80 | -1.80 | 6.90 | 366.90 | -5.09 | 6.76 | 366.79 | -5.12 | 6.79 | 48.77 | -1.93 | 6.70 |
| 281 | 48.77 | -1.89 | 6.76 | 275.59 | -4.06 | 6.82 | 275.60 | -4.05 | 6.44 | 39.37 | -1.90 | 6.64 |
| 282 | 39.34 | -1.89 | 7.34 | 325.57 | -4.70 | 7.49 | 325.60 | -4.73 | 7.43 | 49.94 | -1.87 | 7.46 |
| 283 | 49.93 | -1.84 | 7.66 | 432.17 | -5.77 | 7.49 | 432.12 | -5.91 | 7.11 | 50.31 | -1.92 | 7.54 |
| 284 | 50.30 | -1.93 | 7.46 | 369.96 | -5.10 | 6.97 | 369.96 | -5.14 | 6.55 | 42.59 | -1.91 | 5.84 |
| 285 | 42.59 | -1.88 | 6.36 | 286.70 | -4.22 | 6.56 | 286.72 | -4.20 | 6.56 | 48.69 | -1.92 | 6.58 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 LEVEL COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:22 AM

| BATCH NO. | BEFORE RECEIPT -- PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 286 | 48.65 | -1.91 | 6.85 | 347.52 | -4.97 | 6.64 | 347.54 | -4.91 | 6.86 | 49.70 | -1.88 | 7.12 |
| 287 | 49.69 | -1.90 | 7.08 | 366.02 | -5.16 | 6.38 | 366.09 | -5.13 | 6.57 | 41.00 | -1.89 | 7.00 |
| 288 | 40.98 | -1.91 | 6.65 | 319.27 | -4.59 | 7.29 | 319.27 | -4.62 | 6.30 | 46.80 | -1.94 | 6.70 |
| 289 | 46.78 | -1.95 | 6.54 | 397.40 | -5.53 | 6.44 | 397.39 | -5.44 | 6.49 | 51.39 | -1.95 | 6.91 |
| 290 | 51.38 | -1.92 | 6.88 | 361.97 | -5.15 | 7.00 | 362.00 | -5.04 | 7.17 | 47.34 | -1.88 | 8.32 |
| 291 | 47.33 | -1.88 | 7.95 | 384.84 | -5.36 | 7.32 | 384.89 | -5.32 | 7.02 | 47.17 | -1.94 | 7.58 |
| 292 | 47.18 | -1.94 | 7.54 | 435.58 | -5.99 | 7.40 | 435.60 | -5.77 | 8.02 | 51.14 | -2.03 | 7.33 |
| 293 | 51.17 | -1.96 | 7.51 | 390.25 | -5.41 | 7.73 | 390.33 | -5.34 | 8.53 | 49.76 | -2.00 | 7.90 |
| 294 | 49.91 | -1.98 | 7.20 | 353.03 | -4.88 | 6.97 | 352.94 | -5.01 | 7.37 | 41.97 | -1.94 | 8.25 |
| 295 | 41.96 | -1.96 | 8.16 | 350.57 | -4.92 | 6.88 | 350.54 | -4.98 | 6.99 | 49.46 | -2.00 | 7.34 |
| 296 | 49.49 | -1.98 | 7.17 | 360.14 | -5.66 | 6.50 | 360.12 | -5.04 | 4.41 | 38.68 | -1.94 | 4.64 |
| 297 | 355.13 | -5.04** | 4.56 | 355.16 | -4.97 | 4.59 | 355.15 | -4.98 | 4.76 | 40.95 | -1.94 | 4.87 |
| 298 | 40.95 | -1.98 | 4.85 | 363.17 | -5.02 | 4.64 | 363.17 | -5.10 | 4.46 | 39.75 | -1.90 | 4.85 |
| 299 | 39.74 | -1.86 | 4.68 | 332.57 | -4.70 | 4.52 | 332.56 | -4.83 | 4.55 | 41.25 | -1.89 | 4.52 |
| 300 | 41.15 | -2.04 | 5.66 | 384.97 | -5.40 | 4.81 | 384.99 | -5.27 | 4.09 | 50.98 | -2.02 | 5.19 |
| 301 | 50.98 | -1.98 | 6.35 | 362.78 | -5.11 | 4.55 | 362.77 | -4.15 | 4.21 | 42.23 | -1.49 | 4.56 |
| 302 | 42.15 | -1.55 | 5.10 | 347.08 | -4.44 | 4.27 | 347.10 | -4.42 | 4.58 | 42.22 | -1.54 | 4.81 |
| 303 | 353.01 | -4.56** | 4.41 | 353.00 | -4.56 | 4.07 | 352.98 | -4.58 | 4.53 | 42.23 | -1.51 | 4.73 |
| 304 | 42.14 | -1.44 | 4.61 | 332.74 | -4.30 | 4.47 | 332.76 | -4.35 | 4.70 | 49.98 | -1.53 | 4.76 |
| 305 | 49.99 | -1.48 | 4.71 | 347.78 | -4.42 | 4.24 | 347.78 | -4.92 | 4.29 | 42.57 | -1.81 | 4.55 |
| 306 | 42.60 | -1.76 | 4.48 | 330.77 | -4.62 | 4.18 | 330.78 | -4.61 | 4.06 | 49.07 | -1.81 | 4.37 |
| 307 | 49.05 | -1.87 | 4.40 | 349.91 | -4.81 | 4.12 | 349.91 | -4.85 | 4.15 | 42.17 | -1.88 | 4.47 |
| 308 | 42.08 | -1.76 | 5.83 | 348.76 | -4.89 | 4.13 | 348.78 | -4.92 | 4.21 | 46.35 | -1.84 | 4.79 |
| 309 | 46.34 | -1.85 | 4.29 | 359.50 | -5.03 | 4.26 | 359.45 | -5.04 | 4.32 | 60.82 | -1.96 | 3.78 |
| 310 | 60.83 | -1.95 | 4.00 | 369.00 | -5.13 | 4.38 | 368.81 | -3.01** | 4.13 | 50.46 | -1.91 | 4.27 |
| 311 | 50.46 | -1.91 | 4.27 | 136.89 | -2.60** | -4.06 | 136.74 | -2.53** | -2.67 | 1.78 | -14.16** | 3.49 |
| 312 | 1.78 | -14.16** | 3.49 | 93.72 | -2.26** | 7.62 | 93.61 | -2.23** | .64 | 28.67 | -1.90 | 3.57 |
| 313 | 28.65 | -1.92 | 3.64 | 338.40 | -4.67 | 3.99 | 338.09 | -4.68 | 3.61 | 27.27 | -2.02 | 3.98 |
| 314 | 27.29 | -2.00 | 4.35 | 226.20 | -2.92** | 3.96 | 226.08 | -3.46** | 4.20 | 28.23 | -1.96 | 4.89 |
| 315 | 28.16 | -2.07 | 4.46 | 136.52 | -2.59** | 2.30 | 136.43 | -2.60** | 2.03 | 23.94 | -2.11 | 4.51 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 LEVEL COMPARISONS

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**  SUMMARY REPORT  **
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| | BEFORE SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TJR-TI (DEG C) |
| N: | 110 | 104 | 110 | 110 | 105 | 110 |
| AVERAGE: | 339.33 | -4.99 | 6.19 | 56.13 | -1.98 | 6.39 |
| SIGMA: | 53.89 | .42 | 1.61 | 42.13 | .17 | 1.24 |
| ACCEPTABLE RANGE: | NA | -6.50 TO -3.50 | -11.20 TO 18.80 | NA | -2.89 TO -.91 | -20.00 TO 20.00 |

THIS SUMMARY INCLUDES 110 BATCHES

02007 LEVEL COMPARISONS

BATCHES 72 TO 186

21-Aug-79 02:54 PM

| BATCH NO. | BEFORE RECEIPT PRIMARY LEVEL ( CM.) | BEFORE RECEIPT PRI-TAY ( CM.) | BEFORE RECEIPT TEMP (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | BEFORE SAMPLE PRI-TAY ( CM.) | BEFORE SAMPLE TEMP (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | AFTER SAMPLE PRI-TAY ( CM.) | AFTER SAMPLE TEMP (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | AFTER TRANSFER PRI-TAY ( CM.) | AFTER TRANSFER TEMP (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | NA | NA | NA | 225.37 | -.30 | 36.06 | 225.41 | -.28 | 36.20 | 64.72 | .39 | 33.78 |
| 72 | NA | NA | NA | 225.37 | -.30 | 36.06 | 225.41 | -.28 | 36.20 | 64.72 | .39 | 33.78 |
| 73 | NA | NA | NA | 244.04 | -.49 | 30.50 | 243.79 | -.25 | 31.39 | 70.93 | .68 | 37.24 |
| 74 | NA | NA | NA | 253.19 | 1.15 | 32.34 | 253.20 | 1.19 | 32.07 | 66.47 | .60 | 34.15 |
| 75 | NA | NA | NA | 219.08 | 1.15 | 32.06 | 219.19 | 1.15 | 32.14 | 65.37 | .66 | 35.22 |
| 76 | NA | NA | NA | 227.77 | 1.16 | 32.20 | 227.89 | 1.18 | 32.73 | 65.13 | .62 | 34.71 |
| 77 | NA | NA | NA | 193.34 | 1.34 | 32.59 | 192.22 | 1.15 | 32.99 | 65.33 | .65 | 34.34 |
| 78 | NA | NA | NA | 228.70 | 1.13 | 33.05 | 228.76 | 1.54 | 32.98 | 65.47 | .76 | 36.88 |
| 79 | NA | NA | NA | 218.14 | 1.45 | 32.64 | 218.19 | 1.29 | 32.90 | 65.43 | .74 | 35.49 |
| 80 | NA | NA | NA | 205.25 | 1.27 | 32.86 | 205.31 | 1.32 | 33.02 | 65.47 | .76 | 34.82 |
| 81 | NA | NA | NA | 193.58 | 1.21 | 32.80 | 193.68 | 1.25 | 33.04 | 65.47 | .73 | 35.09 |
| 82 | NA | NA | NA | 200.26 | 1.26 | 32.45 | 200.53 | 1.26 | 33.73 | 65.39 | .73 | 35.40 |
| 83 | NA | NA | NA | 195.34 | 1.24 | 32.60 | 195.28 | 1.24 | 32.51 | 65.47 | .76 | 36.70 |
| 84 | NA | NA | NA | 230.53 | 1.27 | 32.90 | 230.29 | 1.29 | 33.58 | 65.44 | .73 | 35.38 |
| 85 | NA | NA | NA | 229.19 | 1.18 | 32.84 | 229.30 | 1.20 | 32.76 | 65.46 | .73 | 35.82 |
| 86 | NA | NA | NA | 198.67 | 1.26 | 33.21 | 199.10 | 1.18 | 32.97 | 67.93 | .74 | 38.32 |
| 87 | NA | NA | NA | 200.63 | 1.18 | 32.98 | 197.68 | 1.40 | 33.35 | 65.48 | .80 | 35.67 |
| 88 | NA | NA | NA | 248.65 | 1.26 | 32.88 | 248.74 | 1.24 | 33.28 | 65.47 | .81 | 35.02 |
| 89 | NA | NA | NA | 210.80 | 1.25 | 33.28 | 210.90 | 1.23 | 33.48 | 65.49 | .78 | 35.16 |
| 90 | NA | NA | NA | 204.17 | 1.25 | 33.26 | 204.18 | 1.26 | 32.81 | 65.54 | .83 | 35.69 |
| 91 | NA | NA | NA | 229.61 | 1.28 | 33.17 | 229.62 | 1.34 | 33.25 | 65.36 | .80 | 36.43 |
| 92 | NA | NA | NA | 207.55 | 1.20 | 33.20 | 207.61 | 1.23 | 33.06 | 65.39 | .76 | 35.99 |
| 93 | NA | NA | NA | 203.54 | 1.24 | 33.34 | 203.69 | 1.49 | 33.44 | 65.47 | .78 | 36.25 |
| 94 | NA | NA | NA | 232.33 | 1.32 | 33.09 | 232.41 | 1.24 | 33.41 | 65.53 | .77 | 35.73 |
| 95 | NA | NA | NA | 216.94 | 1.27 | 32.66 | 216.96 | 1.46 | 33.30 | 65.52 | .84 | 37.12 |
| 96 | NA | NA | NA | 196.11 | 1.27 | 32.60 | 196.25 | 1.31 | 33.01 | 65.56 | .85 | 35.38 |
| 97 | NA | NA | NA | 222.79 | 1.32 | 33.19 | 224.14 | 1.31 | 32.80 | 66.57 | .26 | 36.51 |
| 98 | NA | NA | NA | 201.08 | 1.44 | 33.42 | 201.07 | 1.43 | 33.12 | 65.54 | .80 | 36.17 |
| 99 | NA | NA | NA | 241.97 | 1.37 | 33.13 | 242.14 | 1.38 | 33.73 | 65.46 | .85 | 36.22 |
| 100 | NA | NA | NA | 213.05 | 1.39 | 34.68 | 213.13 | 1.37 | 34.85 | 65.58 | .82 | 36.68 |
| 101 | NA | NA | NA | 200.33 | 1.49 | 34.37 | 200.38 | 1.36 | 34.85 | 65.60 | .86 | 37.15 |
| 102 | NA | NA | NA | 219.43 | 1.45 | 33.27 | 219.43 | 1.39 | 33.72 | 65.56 | .85 | 35.58 |
| 103 | NA | NA | NA | 219.21 | 1.46 | 34.42 | 217.20 | 152.54** | 38.06 | 65.41 | .75 | 38.90 |
| 104 | NA | NA | NA | 218.54 | 1.29 | 34.01 | 218.54 | 1.28 | 34.35 | 65.45 | .74 | 37.12 |
| 105 | NA | NA | NA | 206.18 | 1.30 | 33.81 | 206.22 | 1.29 | 34.54 | 65.42 | .79 | 37.07 |
| 106 | NA | NA | NA | 214.67 | 1.46 | 35.08 | 214.66 | 1.52 | 35.11 | 65.52 | .79 | 37.33 |
| 107 | NA | NA | NA | 226.39 | 1.62 | 33.77 | 226.45 | 1.40 | 33.79 | 65.55 | .81 | 36.34 |
| 108 | NA | NA | NA | 219.72 | 1.38 | 32.90 | 219.78 | 1.38 | 33.04 | 65.22 | .69 | 36.95 |
| 109 | NA | NA | NA | 234.20 | 1.28 | 33.55 | 234.21 | 1.29 | 33.89 | 65.45 | .71 | 36.03 |
| 110 | NA | NA | NA | 205.46 | 1.42 | 32.57 | 205.43 | 1.27 | 33.85 | 65.45 | .71 | 37.06 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 LEVEL COMPARISONS

BATCHES 72 TO 186

21-Aug-79 02:55 PM

| BATCH NO. | BEFORE RECEIPT PRIMARY LEVEL ( CM.) | BEFORE RECEIPT PRI-TAY ( CM.) | BEFORE RECEIPT TEMP (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | BEFORE SAMPLE PRI-TAY ( CM.) | BEFORE SAMPLE TEMP (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | AFTER SAMPLE PRI-TAY ( CM.) | AFTER SAMPLE TEMP (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | AFTER TRANSFER PRI-TAY ( CM.) | AFTER TRANSFER TEMP (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111 | NA | NA | NA | 226.42 | 1.37 | 33.90 | 226.21 | 1.32 | 34.08 | 65.46 | .74 | 38.64 |
| 112 | NA | NA | NA | 231.09 | 1.47 | 33.79 | 230.96 | 1.31 | 34.04 | 65.41 | .72 | 36.26 |
| 113 | NA | NA | NA | 218.85 | 1.32 | 33.81 | 218.65 | 1.55 | 34.18 | 65.41 | .75 | 39.28 |
| 114 | NA | NA | NA | 222.24 | 1.36 | 33.94 | 222.23 | 1.32 | 34.40 | 65.40 | .76 | 35.84 |
| 115 | NA | NA | NA | 230.20 | 1.38 | 34.12 | 230.20 | 1.40 | 34.48 | 65.18 | .80 | 36.67 |
| 116 | NA | NA | NA | 210.80 | -1.45 | 34.04 | 210.82 | -1.42 | 34.28 | 64.64 | -.87 | 36.62 |
| 117 | NA | NA | NA | 228.11 | 1.48 | 35.96 | 228.04 | 1.49 | 36.47 | 65.58 | .89 | 37.98 |
| 118 | NA | NA | NA | 231.28 | 1.45 | 33.87 | 231.31 | 1.51 | 34.90 | 65.58 | .89 | 37.15 |
| 119 | NA | NA | NA | 235.44 | 1.43 | 34.54 | 235.51 | 1.48 | 35.12 | 65.82 | .95 | 38.73 |
| 120 | NA | NA | NA | 217.40 | 1.58 | 34.22 | 217.40 | 1.60 | 34.55 | 66.25 | .92 | 40.57 |
| 121 | NA | NA | NA | 218.99 | 1.57 | 34.40 | 218.96 | 1.48 | 34.77 | 65.96 | .86 | 37.34 |
| 122 | NA | NA | NA | 223.22 | 1.48 | 34.37 | 223.08 | 1.58 | 34.05 | 66.06 | .80 | 38.07 |
| 123 | NA | NA | NA | 214.91 | 1.41 | 34.03 | 214.91 | 1.38 | 34.07 | 65.96 | .80 | 36.97 |
| 124 | NA | NA | NA | 229.41 | 1.35 | 34.45 | 229.41 | 1.43 | 35.05 | 65.92 | .77 | 37.81 |
| 125 | NA | NA | NA | 227.49 | 1.89 | 34.32 | 227.36 | 1.37 | 34.74 | 65.61 | .77 | 37.18 |
| 126 | NA | NA | NA | 224.11 | 1.37 | 34.17 | 224.24 | 1.35 | 34.47 | 65.49 | .78 | 36.66 |
| 127 | NA | NA | NA | 220.38 | .92 | 33.93 | 219.39 | 1.27 | 33.79 | 65.46 | .72 | 37.25 |
| 128 | NA | NA | NA | 205.98 | 1.27 | 33.82 | 205.96 | 1.29 | 33.93 | 65.50 | .73 | 36.47 |
| 129 | NA | NA | NA | 238.96 | 1.19 | 34.52 | 239.02 | 1.09 | 34.66 | 65.42 | .70 | 37.23 |
| 130 | NA | NA | NA | 225.57 | 1.26 | 34.11 | 225.57 | 1.27 | 34.41 | 65.49 | .75 | 36.41 |
| 131 | NA | NA | NA | 232.58 | 1.38 | 34.49 | 232.54 | 1.24 | 34.85 | 65.50 | .76 | 37.78 |
| 132 | NA | NA | NA | 229.31 | 1.60 | 39.77 | 229.30 | 1.36 | 39.92 | 65.50 | .79 | 41.39 |
| 133 | NA | NA | NA | 223.12 | 1.28 | 41.59 | 223.14 | 1.28 | 41.64 | 65.43 | .75 | 42.45 |
| 134 | NA | NA | NA | 234.43 | 1.32 | 42.30 | 234.42 | 1.29 | 42.95 | 65.50 | .76 | 43.77 |
| 135 | NA | NA | NA | 221.73 | 1.32 | 43.00 | 221.68 | 1.29 | 42.79 | 221.62 | .80 | 43.01 |
| 136 | NA | NA | NA | 375.26 | 34.89** | 43.14 | 375.24 | 34.87** | 43.22 | 188.65 | .56 | 42.92 |
| 137 | NA | NA | NA | 313.45 | 1.69 | 42.82 | 313.43 | 1.70 | 42.05 | 101.53 | -.61 | 43.41 |
| 138 | NA | NA | NA | 145.61 | 0.00 | 40.77 | 145.57 | -.02 | 40.92 | 145.48 | .13 | 40.09 |
| 139 | NA | NA | NA | 159.32 | .24 | 38.45 | 159.32 | .26 | 38.37 | 159.27 | .24 | 38.04 |
| 140 | NA | NA | NA | 158.96 | .44 | 36.97 | 158.96 | .30 | 37.16 | 159.22 | .27 | 38.04 |
| 141 | NA | NA | NA | 258.69 | 1.47 | 36.63 | 258.73 | 1.20 | 36.72 | 97.71 | -.64 | 39.24 |
| 142 | NA | NA | NA | 276.36 | 1.39 | 33.73 | 276.39 | 1.34 | 34.15 | 83.75 | -.87 | 36.79 |
| 143 | NA | NA | NA | 244.57 | 1.08 | 32.55 | 244.61 | 1.09 | 33.19 | 63.23 | -1.25 | 36.70 |
| 144 | NA | NA | NA | 218.04 | .78 | 31.48 | 218.01 | .78 | 31.91 | 63.23 | -1.23 | 34.99 |
| 145 | NA | NA | NA | 229.55 | .92 | 31.35 | 229.58 | .95 | 31.84 | 63.26 | -1.25 | 38.57 |
| 146 | NA | NA | NA | 214.61 | .72 | 31.63 | 214.63 | .72 | 32.01 | 63.29 | -1.24 | 36.90 |
| 147 | NA | NA | NA | 238.36 | 1.03 | 32.48 | 238.34 | .96 | 33.11 | 63.17 | -1.20 | 37.40 |
| 148 | NA | NA | NA | 185.50 | .49 | 33.93 | 185.67 | .50 | 34.48 | 63.13 | -1.21 | 38.38 |
| 149 | NA | NA | NA | 217.71 | .85 | 34.91 | 217.69 | .74 | 34.67 | 63.22 | -1.26 | 36.52 |
| 150 | NA | NA | NA | 284.41 | 1.91 | 33.63 | 284.66 | 1.74 | 33.77 | 78.57 | -.79 | 35.93 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 LEVEL COMPARISONS

BATCHES 72 TO 186

21-Aug-79 02:56 PM

| BATCH NO. | BEFORE RECEIPT | | | BEFORE SAMPLE | | | AFTER SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) |
| 151 | NA | NA | NA | 236.08 | 1.22 | 32.87 | 236.13 | 1.12 | 33.17 | 63.42 | -1.06 | 37.76 |
| 152 | NA | NA | NA | 195.09 | .79 | 32.05 | 195.13 | .76 | 32.68 | 63.61 | -1.02 | 38.40 |
| 153 | NA | NA | NA | 225.03 | 1.19 | 31.80 | 224.73 | 1.15 | 32.35 | 63.47 | -1.04 | 36.72 |
| 154 | NA | NA | NA | 234.28 | 1.16 | 32.49 | 234.36 | 1.13 | 33.12 | 63.51 | -1.07 | 35.63 |
| 155 | NA | NA | NA | 213.65 | .96 | 32.80 | 213.63 | 1.14 | 33.47 | 63.44 | -1.02 | 36.36 |
| 156 | NA | NA | NA | 252.60 | 1.34 | 33.02 | 252.73 | 1.31 | 33.38 | 63.44 | -1.06 | 36.55 |
| 157 | NA | NA | NA | 230.91 | 1.22 | 32.70 | 231.27 | 1.05 | 33.36 | 63.33 | -1.04 | 36.20 |
| 158 | NA | NA | NA | 245.55 | 1.23 | 32.91 | 245.59 | 1.21 | 33.43 | 63.33 | -1.10 | 35.76 |
| 159 | NA | NA | NA | 284.67 | 1.44 | 32.95 | 284.75 | 1.42 | 33.15 | 75.35 | -.86 | 35.32 |
| 160 | NA | NA | NA | 246.23 | 1.31 | 32.16 | 246.33 | 1.20 | 33.03 | 63.53 | -1.03 | 40.15 |
| 161 | NA | NA | NA | 226.74 | 1.19 | 37.29 | 226.84 | 1.24 | 37.88 | 63.41 | -.99 | 39.60 |
| 162 | NA | NA | NA | 229.93 | 1.16 | 35.46 | 230.02 | 1.16 | 35.65 | 63.38 | -1.02 | 38.63 |
| 163 | NA | NA | NA | 231.21 | 1.18 | 32.74 | 231.23 | 1.17 | 33.61 | 63.34 | -1.03 | 36.35 |
| 164 | NA | NA | NA | 233.65 | 1.15 | 32.87 | 232.40 | -.19 | 33.35 | 61.52 | -1.18 | 36.96 |
| 165 | NA | NA | NA | 237.35 | 1.18 | 33.16 | 237.37 | 1.18 | 33.35 | 63.41 | -1.07 | 37.05 |
| 166 | NA | NA | NA | 221.37 | 1.02 | 31.87 | 221.47 | .99 | 33.18 | 63.44 | -1.03 | 35.98 |
| 167 | NA | NA | NA | 248.91 | 1.31 | 32.62 | 248.98 | 1.30 | 32.88 | 63.38 | -1.10 | 38.42 |
| 168 | NA | NA | NA | 231.80 | 1.25 | 33.12 | 231.83 | 1.08 | 33.42 | 63.40 | -1.05 | 36.82 |
| 169 | NA | NA | NA | 227.73 | 1.12 | 31.88 | 227.74 | 1.06 | 32.70 | 63.39 | -1.06 | 34.92 |
| 170 | NA | NA | NA | 230.82 | 1.43 | 32.43 | 230.95 | 1.08 | 33.35 | 63.44 | 2.35 | 32.36 |
| 171 | NA | NA | NA | 220.11 | 1.11 | 32.41 | 220.11 | 1.01 | 32.82 | 63.40 | -1.02 | 37.24 |
| 172 | NA | NA | NA | 224.21 | 1.02 | 32.31 | 224.19 | 1.06 | 32.83 | 63.46 | -.99 | 35.18 |
| 173 | NA | NA | NA | 219.04 | .95 | 31.72 | 219.01 | .93 | 32.85 | 63.45 | -1.03 | 36.76 |
| 174 | NA | NA | NA | 225.85 | 1.08 | 32.53 | 225.92 | 1.10 | 33.03 | 63.46 | -1.05 | 35.63 |
| 175 | NA | NA | NA | 228.92 | 1.09 | 32.92 | 228.95 | 1.09 | 33.28 | 63.50 | -1.05 | 35.70 |
| 176 | NA | NA | NA | 232.58 | 1.08 | 34.89 | 232.58 | 1.15 | 35.01 | 63.50 | -1.03 | 37.96 |
| 177 | NA | NA | NA | 230.07 | 1.38 | 34.43 | 230.09 | 1.13 | 34.69 | 63.51 | -1.04 | 37.35 |
| 178 | NA | NA | NA | 241.86 | 1.25 | 34.73 | 241.87 | 1.20 | 34.92 | 81.25 | -.77 | 37.20 |
| 179 | NA | NA | NA | 271.04 | 1.44 | 33.90 | 271.05 | 1.53 | 34.33 | 81.17 | -.75 | 36.86 |
| 180 | NA | NA | NA | 243.32 | 1.52 | 34.52 | 243.42 | 1.31 | 34.02 | 81.25 | -.73 | 39.89 |
| 181 | NA | NA | NA | 231.22 | 1.13 | 35.80 | 231.20 | 1.01 | 35.84 | 74.54 | -.90 | 37.64 |
| 182 | NA | NA | NA | 215.91 | 1.02 | 35.39 | 215.85 | 1.19 | 35.38 | 81.12 | -.70 | 36.90 |
| 183 | NA | NA | NA | 229.73 | 1.17 | 34.20 | 229.73 | 1.09 | 34.59 | 79.37 | -.77 | 36.77 |
| 184 | NA | NA | NA | 219.59 | 1.25 | 37.11 | 219.60 | 1.20 | 36.58 | 78.26 | -.67 | 32.96 |
| 185 | NA | NA | NA | 162.28 | .52 | 29.78 | 162.29 | .54 | 30.33 | 30.51 | -1.63 | 28.56 |
| 186 | NA | NA | NA | 61.46 | -1.01 | 28.47 | 61.48 | -1.04 | 28.80 | 28.72 | -1.68 | 29.00 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 LEVEL COMPARISONS

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**  SUMMARY REPORT  **
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| | BEFORE SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) |
| N: | 116 | 115 | 116 | 116 | 116 | 116 |
| AVERAGE: | 223.83 | 1.15 | 34.00 | 70.84 | .03 | 36.89 |
| SIGMA: | 30.87 | .49 | 2.48 | 24.20 | .90 | 2.24 |
| ACCEPTABLE RANGE: | NA TO NA | -6.00 TO 6.00 | NA TO NA | NA TO NA | -6.00 TO 6.00 | NA TO NA |

THIS SUMMARY INCLUDES 116 BATCHES

02023 LEVEL COMPARISONS

BATCHES 159 TO 253

21-Aug-79 03:19 PM

| BATCH NO. | BEFORE RECEIPT | | | BEFORE SAMPLE | | | AFTER SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) |
| 159 | NA | NA | NA | 363.15 | -.89 | 57.76 | 363.11 | -.93 | 57.64 | 55.12 | -2.51 | 57.39 |
| 160 | NA | NA | NA | 358.31 | -.85 | 66.34 | 358.34 | -.77 | 63.34 | 48.55 | -2.75 | 61.03 |
| 161 | NA | NA | NA | 353.21 | -1.01 | 67.47 | 353.33 | -.85 | 64.44 | 42.54 | -2.02 | 76.31 |
| 162 | NA | NA | NA | 358.79 | -1.01 | 76.17 | 358.75 | -.93 | 71.68 | 58.86 | 1.86** | 78.74 |
| 163 | NA | NA | NA | 389.80 | -1.22 | 77.91 | 389.51 | -1.22 | 69.87 | 53.36 | -2.55 | 66.53 |
| 164 | NA | NA | NA | 387.41 | -.97 | 33.97 | 387.17 | -.93 | 26.16 | 46.17 | -2.79 | 25.65 |
| 165 | NA | NA | NA | 344.53 | -1.30 | 27.72 | 345.06 | -.77 | 25.63 | 59.39 | -2.32 | 25.71 |
| 166 | NA | NA | NA | 348.46 | -.85 | 35.18 | 348.43 | -.69 | 25.90 | 26.46 | -3.23 | 25.60 |
| 167 | NA | NA | NA | 325.61 | -.96 | 35.56 | 325.52 | -.85 | 26.63 | 46.94 | -2.92 | 25.88 |
| 168 | NA | NA | NA | 345.76 | -1.01 | 43.63 | 345.55 | -.73 | 25.95 | 44.71 | -2.80 | 26.23 |
| 169 | NA | NA | NA | 380.37 | -1.53 | 31.64 | 380.48 | -1.34 | 25.81 | 51.35 | -2.96 | 25.35 |
| 170 | NA | NA | NA | 347.78 | -1.21 | 27.94 | 347.73 | -1.18 | 26.22 | 53.08 | -2.72 | 25.77 |
| 171 | NA | NA | NA | 389.67 | -1.75 | 33.70 | 389.72 | -1.53 | 26.49 | 23.57 | -3.76 | 25.51 |
| 172 | NA | NA | NA | 403.20 | -1.65 | 31.48 | 403.40 | -1.38 | 25.52 | 31.63 | -3.44 | 25.41 |
| 173 | NA | NA | NA | 393.36 | -1.78 | 29.36 | 393.60 | -1.58 | 25.56 | 47.06 | -3.24 | 25.58 |
| 174 | NA | NA | NA | 349.11 | -1.49 | 28.76 | 349.28 | -1.42 | 26.77 | 44.32 | -3.40 | 25.92 |
| 175 | NA | NA | NA | 399.63 | -1.86 | 37.30 | 399.63 | -1.82 | 27.13 | 45.09 | -3.44 | 26.37 |
| 176 | NA | NA | NA | 403.28 | -1.94 | 33.51 | 403.97 | -1.17 | 25.94 | 35.94 | -3.28 | 25.81 |
| 177 | NA | NA | NA | 412.22 | -1.29 | 35.57 | 412.39 | -1.21 | 27.76 | 48.74 | -3.00 | 26.17 |
| 178 | NA | NA | NA | 419.18 | -1.46 | 40.98 | 419.14 | -1.30 | 26.27 | 46.71 | -3.04 | 26.85 |
| 179 | NA | NA | NA | 394.29 | -1.34 | 38.90 | 394.34 | -1.13 | 25.96 | 47.42 | -3.04 | 25.74 |
| 180 | NA | NA | NA | 398.70 | -1.22 | 32.86 | 398.79 | -1.21 | 26.51 | 32.69 | -3.28 | 25.83 |
| 181 | NA | NA | NA | 383.49 | -1.25 | 37.99 | 383.65 | -1.09 | 25.93 | 41.57 | -3.08 | 25.75 |
| 182 | NA | NA | NA | 418.78 | -1.45 | 35.00 | 418.85 | -1.34 | 26.63 | 35.50 | -3.36 | 26.50 |
| 183 | NA | NA | NA | 423.55 | -1.58 | 34.09 | 423.55 | -1.38 | 26.89 | 44.89 | -3.04 | 26.17 |
| 184 | NA | NA | NA | 376.48 | -1.91 | 50.08 | 377.81 | -1.10 | 28.27 | 46.94 | -3.00 | 26.17 |
| 185 | NA | NA | NA | 417.00 | -1.66 | 34.64 | 417.07 | 2.44 | 27.00 | 42.07 | -1.97 | 26.50 |
| 186 | NA | NA | NA | 416.67 | -1.34 | 29.22 | 416.67 | -1.30 | 26.15 | 39.78 | -3.08 | 25.99 |
| 187 | NA | NA | NA | 397.13 | -1.25 | 37.89 | 397.09 | -1.09 | 26.29 | 51.16 | -2.87 | 26.49 |
| 188 | NA | NA | NA | 371.95 | -1.21 | 37.85 | 371.83 | -1.13 | 27.49 | .03 | -3.26 | 26.20 |
| 189 | NA | NA | NA | 330.63 | -1.22 | 39.06 | 330.59 | -1.18 | 29.47 | 52.94 | -3.15 | 26.08 |
| 190 | NA | NA | NA | 300.88 | -1.05 | 30.95 | 301.04 | -1.01 | 26.63 | 51.61 | -3.12 | 26.42 |
| 191 | NA | NA | NA | 420.24 | -1.70 | 29.81 | 420.32 | -1.58 | 27.39 | 54.96 | -2.87 | 26.90 |
| 192 | NA | NA | NA | 422.18 | -1.62 | 36.06 | 422.38 | -1.45 | 27.62 | 46.86 | -2.91 | 26.53 |
| 193 | NA | NA | NA | 395.38 | -1.38 | 55.19 | 395.26 | -1.26 | 44.86 | 78.81 | -2.43 | 40.89 |
| 194 | NA | NA | NA | 368.30 | -.97 | 48.00 | 368.31 | -1.05 | 39.57 | 47.19 | -3.04 | 38.32 |
| 195 | NA | NA | NA | 370.85 | -1.22 | 47.72 | 370.97 | -1.09 | 41.03 | 44.61 | -3.15 | 40.82 |
| 196 | NA | NA | NA | 414.77 | -1.70 | 50.46 | 414.49 | -1.74 | 39.66 | 2.78 | -4.29 | 38.98 |
| 197 | NA | NA | NA | 366.43 | -.93 | 43.15 | 366.47 | -.85 | 40.44 | 21.91 | -1.26 | 41.46 |
| 198 | NA | NA | NA | 340.49 | 1.74 | 42.70 | 339.96 | 1.94 | 40.76 | 49.23 | -.44 | 39.32 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02023 LEVEL COMPARISONS

BATCHES 159 TO 253

21-Aug-79 03:20 PM

| BATCH NO. | BEFORE RECEIPT -- PRIMARY LEVEL ( CM.) | BEFORE RECEIPT -- PRI-TAY ( CM.) | BEFORE RECEIPT -- TEMP (DEG C) | BEFORE SAMPLE PRIMARY LEVEL ( CM.) | BEFORE SAMPLE PRI-TAY ( CM.) | BEFORE SAMPLE TEMP (DEG C) | AFTER SAMPLE PRIMARY LEVEL ( CM.) | AFTER SAMPLE PRI-TAY ( CM.) | AFTER SAMPLE TEMP (DEG C) | AFTER TRANSFER PRIMARY LEVEL ( CM.) | AFTER TRANSFER PRI-TAY ( CM.) | AFTER TRANSFER TEMP (DEG C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199 | NA | NA | NA | 453.44 | .89 | 41.72 | 453.56 | 1.06 | 39.71 | 53.74 | -.16 | 38.76 |
| 200 | NA | NA | NA | 425.01 | 1.34 | 46.59 | 424.85 | 1.38 | 39.77 | 55.73 | -.40 | 39.96 |
| 201 | NA | NA | NA | 384.21 | 1.30 | 41.46 | 384.17 | 1.49 | 36.87 | 46.40 | -.65 | 36.97 |
| 202 | NA | NA | NA | 209.59 | 1.65 | 44.80 | 213.88 | 1.42 | 38.62 | 214.01 | 1.54** | 37.23 |
| 203 | NA | NA | NA | 213.93 | 1.49 | 36.68 | 213.93 | 1.49 | 35.74 | 46.52 | -.77 | 36.06 |
| 204 | NA | NA | NA | 142.31 | .97 | 38.49 | 142.27 | .97 | 36.01 | 41.86 | -.85 | 35.53 |
| 205 | NA | NA | NA | 380.85 | .48 | 22.79 | 381.30 | .89 | 22.84 | 52.36 | -.65 | 22.73 |
| 206 | NA | NA | NA | 392.23 | .65 | 40.00 | 392.07 | .89 | 23.28 | 39.36 | -1.05 | 22.80 |
| 207 | NA | NA | NA | 422.79 | .61 | 24.28 | 426.07 | .24 | 22.98 | 48.22 | -.73 | 22.79 |
| 208 | NA | NA | NA | 394.50 | .85 | 36.12 | 394.41 | .96 | 24.33 | 53.28 | -.57 | 23.43 |
| 209 | NA | NA | NA | 381.05 | .93 | 28.98 | 381.25 | 1.09 | 23.32 | 39.88 | -.85 | 23.13 |
| 210 | NA | NA | NA | 367.33 | 1.18 | 32.15 | 367.41 | 1.18 | 22.89 | 71.96 | -.13 | 22.87 |
| 211 | NA | NA | NA | 414.98 | .70 | 34.08 | 414.98 | .77 | 24.96 | 42.63 | -.74 | 22.89 |
| 212 | NA | NA | NA | 400.93 | .93 | 30.38 | 400.89 | 1.05 | 22.87 | 50.17 | -.52 | 22.82 |
| 213 | NA | NA | NA | 438.53 | .69 | 32.52 | 438.46 | .73 | 23.07 | 52.08 | -.57 | 22.79 |
| 214 | NA | NA | NA | 395.70 | .97 | 32.82 | 395.59 | 1.01 | 23.74 | 41.71 | -.85 | 22.82 |
| 215 | NA | NA | NA | 398.95 | .77 | 37.74 | 398.87 | .93 | 24.09 | 51.79 | -.56 | 22.69 |
| 216 | NA | NA | NA | 389.35 | .85 | 33.69 | 390.08 | 1.83 | 23.15 | 43.60 | -.65 | 22.98 |
| 217 | NA | NA | NA | 398.58 | .97 | 34.61 | 398.46 | 1.22 | 24.56 | 50.93 | -.44 | 22.78 |
| 218 | NA | NA | NA | 418.38 | .45 | 34.28 | 418.74 | 1.05 | 22.92 | 35.92 | -.89 | 22.78 |
| 219 | NA | NA | NA | 422.99 | .89 | 28.31 | 422.91 | .85 | 23.45 | 55.42 | -.28 | 22.86 |
| 220 | NA | NA | NA | 413.84 | .93 | 27.84 | 414.61 | 1.70 | 22.95 | 36.69 | -.61 | 22.77 |
| 221 | NA | NA | NA | 415.95 | 1.17 | 35.23 | 415.91 | 1.09 | 23.05 | 15.47 | -1.45 | 22.80 |
| 222 | NA | NA | NA | 394.09 | 1.01 | 36.00 | 393.97 | .97 | 26.91 | 62.60 | -.28 | 24.71 |
| 223 | NA | NA | NA | 83.52 | NA | 23.31 | 83.41 | -.12 | 22.88 | 27.21 | -1.30 | 22.99 |
| 224 | NA | NA | NA | 398.14 | .81 | 39.98 | 398.05 | .89 | 26.83 | 32.19 | -1.18 | 23.38 |
| 225 | NA | NA | NA | 398.54 | 1.05 | 24.03 | 398.46 | 1.05 | 23.04 | 52.44 | -.57 | 22.94 |
| 226 | NA | NA | NA | 327.34 | 1.42 | 23.88 | 327.50 | 1.50 | 22.81 | 54.21 | -.57 | 22.73 |
| 227 | NA | NA | NA | 398.78 | .96 | 31.86 | 398.78 | 1.09 | 23.57 | 49.27 | -.69 | 22.88 |
| 228 | NA | NA | NA | 427.13 | .74 | 27.36 | 427.16 | .93 | 23.04 | 49.52 | -.73 | 22.85 |
| 229 | NA | NA | NA | 344.94 | 1.17 | 27.47 | 345.34 | 1.38 | 22.84 | 50.17 | -.73 | 22.85 |
| 230 | NA | NA | NA | 413.84 | 1.01 | 22.89 | 413.88 | 1.09 | 22.89 | 50.13 | -.52 | 22.86 |
| 231 | NA | NA | NA | 419.67 | .52 | 34.15 | 420.04 | 1.01 | 22.85 | 49.03 | -.61 | 22.85 |
| 232 | NA | NA | NA | 420.40 | .89 | 27.71 | 420.52 | .97 | 25.98 | 50.04 | -.57 | 23.32 |
| 233 | NA | NA | NA | 342.56 | .97 | 31.30 | 342.87 | 1.38 | 23.42 | 50.78 | -.73 | 22.94 |
| 234 | NA | NA | NA | 411.34 | .73 | 26.26 | 411.29 | .81 | 23.37 | 94.10 | .37** | 23.01 |
| 235 | NA | NA | NA | 401.09 | .89 | 32.30 | 401.26 | 1.09 | 22.99 | 51.70 | -.49 | 22.93 |
| 236 | NA | NA | NA | 373.16 | 1.05 | 34.05 | 373.08 | 1.26 | 23.75 | 51.83 | -.48 | 23.26 |
| 237 | NA | NA | NA | 421.69 | .40 | 32.82 | 421.98 | .81 | 23.06 | 50.32 | -.61 | 22.88 |
| 238 | NA | NA | NA | 364.21 | 1.01 | 36.12 | 364.21 | 1.13 | 24.30 | 47.55 | -.89 | 22.94 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02023 LEVEL COMPARISONS

BATCHES 159 TO 253

21-Aug-79 03:21 PM

| BATCH NO. | BEFORE RECEIPT | | | BEFORE SAMPLE | | | AFTER SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) |
| 239 | NA | NA | NA | 396.31 | .65 | 29.53 | 396.39 | .81 | 23.93 | 50.17 | -.77 | 23.33 |
| 240 | NA | NA | NA | 413.04 | 1.30 | 40.05 | 412.79 | 1.30 | 28.52 | 49.45 | -.49 | 25.72 |
| 241 | NA | NA | NA | 377.53 | 1.01 | 39.72 | 377.37 | 1.05 | 27.22 | 44.47 | -.93 | 26.31 |
| 242 | NA | NA | NA | 381.82 | .81 | 29.66 | 381.87 | .97 | 24.84 | 44.92 | -.81 | 24.27 |
| 243 | NA | NA | NA | 359.23 | .85 | 37.29 | 359.23 | 1.01 | 24.77 | 43.98 | -1.05 | 24.46 |
| 244 | NA | NA | NA | 422.22 | .45 | 40.04 | 422.06 | .57 | 26.40 | 53.30 | -.69 | 25.06 |
| 245 | NA | NA | NA | 367.25 | 1.13 | 35.86 | 367.21 | 1.26 | 26.88 | 51.43 | -.69 | 25.38 |
| 246 | NA | NA | NA | 425.38 | .89 | 30.10 | 425.42 | .89 | 26.66 | 43.50 | -.93 | 25.66 |
| 247 | NA | NA | NA | 388.34 | .97 | 33.26 | 392.27 | 1.53 | 25.26 | 38.44 | -1.09 | 25.34 |
| 248 | NA | NA | NA | 399.27 | 1.74 | 26.84 | 399.67 | .93 | 25.73 | 49.21 | -.89 | 25.41 |
| 249 | NA | NA | NA | 375.26 | 1.05 | 38.19 | 375.23 | 1.06 | 23.90 | 45.64 | -1.01 | 24.04 |
| 250 | NA | NA | NA | 341.42 | 1.10 | 26.62 | 341.43 | 1.13 | 24.18 | 49.86 | -1.01 | 24.10 |
| 251 | NA | NA | NA | 350.04 | .81 | 30.96 | 350.33 | 1.09 | 25.28 | 40.30 | -1.26 | 23.84 |
| 252 | NA | NA | NA | 223.59 | 1.09 | 24.22 | 223.68 | 1.22 | 23.88 | 57.75 | -.73 | 24.14 |
| 253 | NA | NA | NA | 225.25 | 1.13 | 30.50 | 225.09 | 1.14 | 23.80 | 53.09 | -1.01 | 23.73 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02023 LEVEL COMPARISONS

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**  SUMMARY REPORT  **
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| | BEFORE SAMPLE | | | AFTER TRANSFER | | |
|---|---|---|---|---|---|---|
| | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) | PRIMARY LEVEL ( CM.) | PRI-TAY ( CM.) | TEMP (DEG C) |
| N: | 95 | 94 | 95 | 95 | 92 | 95 |
| AVERAGE: | 375.40 | .01 | 36.25 | 48.12 | -1.65 | 28.54 |
| SIGMA: | 59.41 | 1.18 | 10.23 | 21.15 | 1.17 | 10.76 |
| ACCEPTABLE RANGE: | NA<br>NA | -3.00<br>TO<br>3.00 | NA<br>TO<br>NA | NA<br>NA | -5.90<br>TO<br>.10 | NA<br>TO<br>NA |

THIS SUMMARY INCLUDES 95 BATCHES

02003 DENSITY COMPARISONS
BEFORE SAMPLE

BATCHES 206 TO 240

29-Aug-79 02:23 PM

| BATCH NO. | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 206 | 1.4190 | 1.4147 | 31.90 | .0083 | -2.2876 | -2.2959 | .0043 | .0126 | .0002 | .0085 | .0002 | .0085 |
| 207 | 1.4150 | 1.4078 | 31.99 | .0051 | -2.2852 | -2.2904 | .0072 | .0124 | .0031 | .0083 | .0032 | .0083 |
| 208 | 1.4684 | 1.4622 | 32.53 | .0107 | -2.2334 | -2.2441 | .0062 | .0169 | .0011 | .0118** | .0011 | .0118** |
| 209 | 1.4904 | 1.4838 | 32.69 | .0060 | -2.1987 | -2.2047 | .0066 | .0126 | .0012 | .0072 | .0012 | .0072 |
| 210 | 1.4970 | 1.4999 | 33.08 | .0099 | -2.1067 | -2.1166 | -.0029 | .0070 | -.0087** | .0013** | -.0087** | .0012** |
| 211 | 1.5035 | 1.4960 | 33.32 | .0060 | -2.1224 | -2.1284 | .0075 | .0135 | .0015 | .0075 | .0021 | .0081 |
| 212 | 1.4885 | 1.4820 | 33.52 | .0074 | -2.1779 | -2.1852 | .0065 | .0139 | .0005 | .0079 | .0005 | .0079 |
| 213 | 1.4772 | 1.4687 | 33.27 | .0072 | -2.1673 | -2.1744 | .0085 | .0157 | .0028 | .0099 | .0028 | .0099 |
| 214 | 1.4760 | 1.4692 | 33.15 | .0055 | -2.1418 | -2.1473 | .0068 | .0123 | .0011 | .0066 | .0011 | .0066 |
| 215 | 1.4931 | 1.4853 | 33.20 | .0084 | -2.0823 | -2.0908 | .0078 | .0163 | .0020 | .0104 | .0020 | .0104 |
| 216 | 1.4942 | 1.4863 | 33.35 | .0064 | -2.1233 | -2.1297 | .0079 | .0143 | .0019 | .0083 | .0019 | .0083 |
| 217 | 1.4963 | 1.4883 | 33.33 | .0050 | -2.1247 | -2.1297 | .0080 | .0130 | .0021 | .0071 | .0020 | .0070 |
| 218 | 1.5152 | 1.5063 | 33.08 | .0064 | -2.1614 | -2.1679 | .0089 | .0153 | .0030 | .0094 | .0031 | .0095 |
| 219 | 1.5148 | 1.5067 | 32.94 | .0070 | -2.0794 | -2.0864 | .0081 | .0150 | .0023 | .0092 | .0023 | .0093 |
| 220 | 1.5122 | 1.5044 | 32.73 | .0089 | -2.0697 | -2.0786 | .0078 | .0167 | .0022 | .0111** | .0022 | .0111 |
| 221 | 1.5112 | 1.5042 | 32.92 | .0067 | -2.1420 | -2.1487 | .0070 | .0137 | .0013 | .0080 | .0013 | .0080 |
| 222 | 1.4935 | 1.4877 | 33.19 | .0076 | -2.1692 | -2.1768 | .0058 | .0134 | 0.0000 | .0076 | 0.0000 | .0076 |
| 223 | 1.4895 | 1.4850 | 33.04 | .0073 | -2.1248 | -2.1321 | .0045 | .0118 | -.0012 | .0061 | -.0012 | .0061 |
| 224 | 1.4999 | 1.4886 | 33.32 | .0039 | -2.1810 | -2.1849 | .0113 | .0151 | .0053 | .0092 | .0054** | .0092 |
| 225 | 1.4881 | 1.4810 | 33.19 | .0071 | -2.1709 | -2.1781 | .0071 | .0142 | .0013 | .0084 | .0013 | .0084 |
| 226 | 1.4937 | 1.5043 | 33.30 | .0196** | -2.1485 | -2.1680 | -.0106 | .0089 | -.0165** | .0031** | -.0165** | .0030** |
| 227 | 1.4933 | 1.4854 | 33.29 | .0056 | -2.1159 | -2.1215 | .0079 | .0135 | .0020 | .0076 | .0020 | .0076 |
| 228 | 1.4889 | 1.4788 | 33.63 | .0044 | -2.1197 | -2.1242 | .0101 | .0145 | .0040 | .0084 | .0040 | .0084 |
| 229 | 1.4981 | 1.4892 | 33.42 | .0045 | -2.1340 | -2.1385 | .0089 | .0133 | .0028 | .0073 | .0028 | .0073 |
| 230 | 1.5053 | 1.4951 | 33.32 | .0066 | -2.1777 | -2.1843 | .0103 | .0169 | .0042 | .0108 | .0042 | .0109 |
| 231 | 1.5090 | 1.4968 | 33.38 | .0034 | -2.0842 | -2.0876 | .0122 | .0156 | .0061 | .0095 | .0061** | .0095 |
| 232 | 1.5071 | 1.4913 | 33.56 | .0024** | -2.1359 | -2.1384 | .0158 | .0182 | .0096** | .0120** | .0095** | .0120** |
| 233 | 1.5011 | 1.4868 | 33.84 | .0045 | -2.1271 | -2.1317 | .0143 | .0188 | .0079** | .0125** | .0079** | .0124** |
| 234 | 1.5094 | 1.4882 | 34.50 | .0029 | -2.1814 | -2.1843 | .0212 | .0241 | .0143** | .0172** | .0145** | .0174** |
| 235 | 1.5155 | 1.5060 | 34.45 | .0037 | -2.1073 | -2.1110 | .0095 | .0133 | .0024 | .0062 | .0025 | .0063 |
| 236 | 1.5024 | 1.4948 | 33.87 | .0017** | -2.0970 | -2.0987 | .0076 | .0093 | .0012 | .0029** | .0011 | .0028** |
| 237 | 1.4823 | 1.4727 | 35.70 | .0057 | -2.1161 | -2.1217 | .0095 | .0152 | .0019 | .0076 | .0018 | .0075 |
| 238 | 1.4881 | 1.4796 | 34.95 | .0039 | -2.1404 | -2.1443 | .0084 | .0123 | .0014 | .0053 | .0014 | .0052 |
| 239 | 1.4833 | 1.4754 | 34.58 | .0057 | -2.1427 | -2.1484 | .0079 | .0136 | .0011 | .0068 | .0011 | .0068 |
| 240 | 1.5137 | 1.5048 | 35.18 | .0067 | -2.1427 | -2.1493 | .0089 | .0156 | .0013 | .0080 | .0014 | .0081 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 DENSITY COMPARISONS
BEFORE SAMPLE

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SUMMARY REPORT
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| | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N: | 35 | 35 | 35.00 | 32 | 35 | 35 | 35 | 35 | 30 | 27 | 28 | 28 |
| AVERAGE: | 1.4924 | 1.4845 | 33.45 | .0062 | -2.1463 | -2.1526 | .0079 | .0143 | .0020 | .0080 | .0018 | .0082 |
| SIGMA: | .0223 | .0216 | .80 | .0019 | .0500 | .0504 | .0049 | .0030 | .0015 | .0013 | .0012 | .0014 |
| ACCEPTABLE RANGE: | NA | NA | NA | .0025 TO .0115 | -6.0000 TO 6.0000 | -4.5000 TO 4.5000 | -.0230 TO .0370 | -.0161 TO .0439 | -.0028 TO .0068 | .0044 TO .0110 | -.0048 TO .0048 | .0044 TO .0116 |

THIS SUMMARY INCLUDES 35 BATCHES

02003 DENSITY COMPARISONS
AFTER SAMPLE

BATCHES 206 TO 240

29-Aug-79 02:24 PM

| BATCH NO. | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 206 | 1.4190 | 1.4124 | 31.93 | .0065 | -2.2735 | -2.2800 | .0066 | .0132 | .0025 | .0090 | .0025 | .0091 |
| 207 | 1.4150 | 1.4077 | 32.04 | .0064 | -2.2823 | -2.2887 | .0073 | .0137 | .0031 | .0096 | .0032 | .0097 |
| 208 | 1.4684 | 1.4631 | 32.60 | .0086 | -2.2304 | -2.2390 | .0053 | .0139 | .0002 | .0088 | .0002 | .0088 |
| 209 | 1.4904 | 1.4831 | 32.74 | .0059 | -2.1252 | -2.1310 | .0073 | .0132 | .0019 | .0077 | .0019 | .0077 |
| 210 | 1.4970 | 1.4914 | 33.02 | .0090 | -2.1106 | -2.1196 | .0056 | .0146 | -.0001 | .0089 | -.0001 | .0089 |
| 211 | 1.5035 | 1.4975 | 33.31 | .0078 | -2.1276 | -2.1354 | .0060 | .0138 | 0.0000 | .0079 | .0007 | .0085 |
| 212 | 1.4885 | 1.4831 | 33.57 | .0079 | -2.1457 | -2.1536 | .0054 | .0133 | -.0006 | .0072 | -.0007 | .0072 |
| 213 | 1.4772 | 1.4699 | 33.26 | .0064 | -2.1680 | -2.1744 | .0073 | .0137 | .0016 | .0080 | .0015 | .0080 |
| 214 | 1.4760 | 1.4699 | 33.20 | .0071 | -2.1320 | -2.1392 | .0061 | .0132 | .0004 | .0075 | .0004 | .0075 |
| 215 | 1.4931 | 1.4854 | 33.23 | .0071 | -2.0895 | -2.0965 | .0077 | .0147 | .0019 | .0089 | .0019 | .0089 |
| 216 | 1.4942 | 1.4860 | 33.34 | .0059 | -2.1273 | -2.1332 | .0082 | .0141 | .0023 | .0082 | .0022 | .0081 |
| 217 | 1.4963 | 1.4889 | 33.29 | .0046 | -2.1558 | -2.1604 | .0074 | .0120 | .0015 | .0061 | .0014 | .0060 |
| 218 | 1.5152 | 1.5050 | 33.11 | .0052 | -2.1670 | -2.1722 | .0103 | .0154 | .0043 | .0095 | .0044 | .0096 |
| 219 | 1.5148 | 1.5083 | 32.81 | .0081 | -2.0780 | -2.0861 | .0065 | .0146 | .0008 | .0090 | .0008 | .0090 |
| 220 | 1.5122 | 1.5055 | 32.77 | .0071 | -2.0994 | -2.1065 | .0067 | .0138 | .0011 | .0082 | .0011 | .0082 |
| 221 | 1.5112 | 1.5045 | 33.16 | .0065 | -2.1348 | -2.1413 | .0067 | .0132 | .0008 | .0073 | .0008 | .0073 |
| 222 | 1.4935 | 1.4884 | 33.00 | .0076 | -2.1484 | -2.1560 | .0051 | .0127 | -.0006 | .0071 | -.0006 | .0070 |
| 223 | 1.4895 | 1.4834 | 32.93 | .0066 | -2.1413 | -2.1479 | .0060 | .0127 | .0004 | .0071 | .0004 | .0070 |
| 224 | 1.4999 | 1.4902 | 33.19 | .0071 | -2.1516 | -2.1587 | .0097 | .0168 | .0038 | .0109 | .0038 | .0109 |
| 225 | 1.4881 | 1.4796 | 33.14 | .0066 | -2.1841 | -2.1907 | .0085 | .0151 | .0028 | .0094 | .0027 | .0093 |
| 226 | 1.4937 | 1.4861 | 33.14 | .0064 | -2.1679 | -2.1743 | .0076 | .0140 | .0018 | .0083 | .0018 | .0082 |
| 227 | 1.4933 | 1.4871 | 33.10 | .0064 | -2.1064 | -2.1128 | .0062 | .0126 | .0005 | .0069 | .0005 | .0069 |
| 228 | 1.4889 | 1.4792 | 33.50 | .0050 | -2.1286 | -2.1336 | .0097 | .0146 | .0037 | .0086 | .0037 | .0086 |
| 229 | 1.4981 | 1.4870 | 33.01 | .0036 | -2.1470 | -2.1505 | .0111 | .0147 | .0054 | .0090 | .0054** | .0090 |
| 230 | 1.5053 | 1.4944 | 33.11 | .0047 | -2.1661 | -2.1708 | .0109 | .0156 | .0050 | .0097 | .0050** | .0097 |
| 231 | 1.5090 | 1.4963 | 33.28 | .0029 | -2.0628 | -2.0657 | .0127 | .0155 | .0067 | .0095 | .0067** | .0095 |
| 232 | 1.5071 | 1.4970 | 32.97 | .0058 | -2.1282 | -2.1339 | .0101 | .0159 | .0044 | .0102 | .0043 | .0101 |
| 233 | 1.5011 | 1.4860 | 33.72 | .0059 | -2.1758 | -2.1817 | .0151 | .0210 | .0089** | .0148** | .0088** | .0147** |
| 234 | 1.5094 | 1.4886 | 34.42 | .0024** | -2.2017 | -2.2041 | .0208 | .0232 | .0139** | .0163** | .0141** | .0165** |
| 235 | 1.5155 | 1.5023 | 34.34 | .0014** | -2.1014 | -2.1029 | .0132 | .0147 | .0063 | .0077 | .0064** | .0078 |
| 236 | 1.5024 | 1.4949 | 33.80 | .0051 | -2.1055 | -2.1107 | .0075 | .0127 | .0012 | .0063 | .0011 | .0063 |
| 237 | 1.4823 | 1.4733 | 35.52 | .0047 | -2.1390 | -2.1437 | .0090 | .0137 | .0015 | .0062 | .0014 | .0061 |
| 238 | 1.4881 | 1.4792 | 34.93 | .0039 | -2.1310 | -2.1349 | .0088 | .0128 | .0018 | .0057 | .0018 | .0057 |
| 239 | 1.4833 | 1.4769 | 34.56 | .0063 | -2.1265 | -2.1328 | .0064 | .0126 | -.0004 | .0059 | -.0004 | .0059 |
| 240 | 1.5137 | 1.5004 | 35.06 | .0007** | -2.1280 | -2.1287 | .0133 | .0140 | .0058 | .0065 | .0059** | .0065 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 DENSITY COMPARISONS
AFTER SAMPLE

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**  SUMMARY REPORT  **
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| | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N: | 35 | 35 | 35.00 | 32 | 35 | 35 | 35 | 35 | 33 | 33 | 28 | 33 |
| AVERAGE: | 1.4924 | 1.4838 | 33.37 | .0062 | -2.1454 | -2.1512 | .0086 | .0144 | .0022 | .0081 | .0015 | .0081 |
| SIGMA: | .0223 | .0213 | .78 | .0014 | .0472 | .0475 | .0033 | .0022 | .0021 | .0013 | .0014 | .0013 |
| ACCEPTABLE RANGE: | NA | NA | NA | .0025 TO .0115 | -6.0000 TO 6.0000 | -4.5000 TO 4.5000 | -.0230 TO .0370 | -.0161 TO .0439 | -.0028 TO .0068 | .0044 TO .0110 | -.0048 TO .0048 | .0044 TO .0116 |

THIS SUMMARY INCLUDES 35 BATCHES

02023 DENSITY COMPARISONS
AFTER SAMPLE

BATCHES 159 TO 189

29-Aug-79 02:28 PM

| BATCH NO. | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 159 | 1.1456 | 1.2307 | 57.64 | .0894 | NA | NA | -.0851 | .0042 | NA | NA | -.0982 | -.0088 |
| 160 | 1.2212 | 1.3046 | 63.34 | .0892 | NA | NA | -.0834 | .0059 | NA | NA | -.0987 | -.0094 |
| 161 | 1.2462 | 1.3198 | 64.44 | .0863 | NA | NA | -.0735 | .0128 | NA | NA | -.0893 | -.0030 |
| 162 | 1.2462 | 1.3233 | 71.68 | .0917** | NA | NA | -.0771 | .0146 | NA | NA | -.0958 | -.0041 |
| 163 | 1.2413 | 1.2375 | 69.87 | -.0002 | NA | NA | .0038 | .0036 | NA | NA | -.0141 | -.0143 |
| 164 | 1.2309 | 1.2714 | 26.16 | .0010 | NA | NA | -.0405 | -.0395 | NA | NA | -.0409 | -.0399 |
| 165 | 1.2390 | 1.2849 | 25.63 | .0047 | NA | NA | -.0459 | -.0412 | NA | NA | -.0462 | -.0414 |
| 166 | 1.2426 | 1.2872 | 25.90 | .0026 | NA | NA | -.0446 | -.0420 | NA | NA | -.0450 | -.0423 |
| 167 | 1.2503 | 1.2910 | 26.63 | .0023 | NA | NA | -.0407 | -.0384 | NA | NA | -.0414 | -.0390 |
| 168 | 1.2409 | 1.2837 | 25.95 | .0026 | NA | NA | -.0429 | -.0403 | NA | NA | -.0432 | -.0406 |
| 169 | 1.1260 | 1.1636 | 25.81 | .0045 | NA | NA | -.0376 | -.0331 | NA | NA | -.0379 | -.0334 |
| 170 | 1.1424 | 1.1830 | 26.22 | .0033 | NA | NA | -.0406 | -.0373 | NA | NA | -.0411 | -.0378 |
| 171 | 1.1548 | 1.1911 | 26.49 | .0007 | NA | NA | -.0363 | -.0356 | NA | NA | -.0369 | -.0362 |
| 172 | 1.1832 | 1.2241 | 25.52 | .0001 | NA | NA | -.0409 | -.0408 | NA | NA | -.0411 | -.0410 |
| 173 | 1.2001 | 1.2392 | 25.56 | .0048 | NA | NA | -.0391 | -.0342 | NA | NA | -.0393 | -.0345 |
| 174 | 1.1838 | 1.2256 | 26.77 | .0044 | NA | NA | -.0418 | -.0374 | NA | NA | -.0425 | -.0381 |
| 175 | 1.2130 | 1.2545 | 27.13 | .0049 | NA | NA | -.0414 | -.0365 | NA | NA | -.0423 | -.0374 |
| 176 | 1.2274 | 1.3120 | 25.94 | .0506 | NA | NA | -.0846 | -.0339 | NA | NA | -.0849 | -.0343 |
| 177 | 1.2287 | 1.3174 | 27.76 | .0485 | NA | NA | -.0887 | -.0402 | NA | NA | -.0898 | -.0413 |
| 178 | 1.2225 | 1.3110 | 26.27 | .0509 | NA | NA | -.0885 | -.0376 | NA | NA | -.0890 | -.0381 |
| 179 | 1.1923 | 1.2778 | 25.96 | .0469 | NA | NA | -.0855 | -.0386 | NA | NA | -.0859 | -.0390 |
| 180 | 1.1467 | 1.2279 | 26.51 | .0476 | NA | NA | -.0812 | -.0335 | NA | NA | -.0818 | -.0341 |
| 181 | 1.1938 | 1.2771 | 25.93 | .0458 | NA | NA | -.0833 | -.0375 | NA | NA | -.0836 | -.0379 |
| 182 | 1.2269 | 1.3107 | 26.63 | .0466 | NA | NA | -.0838 | -.0372 | NA | NA | -.0844 | -.0378 |
| 183 | 1.2394 | 1.3198 | 26.89 | .0506 | NA | NA | -.0804 | -.0298 | NA | NA | -.0811 | -.0305 |
| 184 | 1.2299 | 1.3184 | 28.27 | .0498 | NA | NA | -.0885 | -.0387 | NA | NA | -.0898 | -.0400 |
| 185 | 1.2295 | 1.3038 | 27.00 | .0381 | NA | NA | -.0744 | -.0363 | NA | NA | -.0752 | -.0371 |
| 186 | 1.2205 | 1.3031 | 26.15 | .0506 | NA | NA | -.0827 | -.0320 | NA | NA | -.0831 | -.0325 |
| 187 | 1.2243 | 1.3076 | 26.29 | .0511 | NA | NA | -.0833 | -.0322 | NA | NA | -.0839 | -.0327 |
| 188 | 1.2203 | 1.3016 | 27.49 | .0509 | NA | NA | -.0813 | -.0304 | NA | NA | -.0823 | -.0314 |
| 189 | 1.2331 | 1.3142 | 29.47 | .0483 | NA | NA | -.0811 | -.0329 | NA | NA | -.0829 | -.0346 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02023 DENSITY COMPARISONS
AFTER SAMPLE

**SUMMARY REPORT**

| | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N: | 31 | 31 | 31.00 | 30 | NA | NA | 31 | 31 | NA | NA | 31 | 31 |
| AVERAGE: | 1.2111 | 1.2748 | 32.82 | .0326 | NA | NA | -.0637 | -.0292 | NA | NA | -.0668 | -.0324 |
| SIGMA: | .0352 | .0449 | 14.69 | .0291 | NA | NA | .0242 | .0171 | NA | NA | .0247 | .0114 |
| ACCEPTABLE RANGE: | NA | NA | NA | -.0900 TO .0900 | NA TO NA | NA TO NA | -.1216 TO .0584 | -.1269 TO .0531 | NA TO NA | NA TO NA | -.3300 TO .2700 | -.0720 TO .0120 |

THIS SUMMARY INCLUDES 31 BATCHES

02023 DENSITY COMPARISONS
BEFORE SAMPLE

BATCHES 159 TO 189

29-Aug-79 02:27 PM

| BATCH NO. | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 159 | 1.1456 | 1.2250 | 57.76 | .0882 | NA | NA | -.0794 | .0087 | NA | NA | -.0925 | -.0044 |
| 160 | 1.2212 | 1.3011 | 66.34 | .0951** | NA | NA | -.0799 | .0153 | NA | NA | -.0964 | -.0013 |
| 161 | 1.2462 | 1.3258 | 67.47 | .0886 | NA | NA | -.0795 | .0091 | NA | NA | -.0965 | -.0079 |
| 162 | 1.2462 | 1.3124 | 76.17 | .0896 | NA | NA | -.0662 | .0235 | NA | NA | -.0866 | .0030 |
| 163 | 1.2413 | 1.3080 | 77.91 | .0891 | NA | NA | -.0667 | .0223 | NA | NA | -.0879 | .0012 |
| 164 | 1.2309 | 1.2591 | 33.97 | .0026 | NA | NA | -.0282 | -.0256 | NA | NA | -.0318 | -.0292 |
| 165 | 1.2390 | 1.2733 | 27.72 | 0.0000 | NA | NA | -.0344 | -.0343 | NA | NA | -.0355 | -.0354 |
| 166 | 1.2426 | 1.2696 | 35.18 | .0010 | NA | NA | -.0270 | -.0260 | NA | NA | -.0311 | -.0301 |
| 167 | 1.2503 | 1.2852 | 35.56 | .0020 | NA | NA | -.0349 | -.0328 | NA | NA | -.0391 | -.0371 |
| 168 | 1.2409 | 1.2679 | 43.63 | .0026 | NA | NA | -.0271 | -.0245 | NA | NA | -.0345 | -.0319 |
| 169 | 1.1260 | 1.1581 | 31.64 | -.0003 | NA | NA | -.0321 | -.0324 | NA | NA | -.0348 | -.0351 |
| 170 | 1.1424 | 1.1818 | 27.94 | .0036 | NA | NA | -.0394 | -.0357 | NA | NA | -.0405 | -.0369 |
| 171 | 1.1548 | 1.1844 | 33.70 | .0018 | NA | NA | -.0296 | -.0278 | NA | NA | -.0331 | -.0313 |
| 172 | 1.1832 | 1.2154 | 31.48 | .0009 | NA | NA | -.0322 | -.0313 | NA | NA | -.0348 | -.0339 |
| 173 | 1.2001 | 1.2366 | 29.36 | .0036 | NA | NA | -.0365 | -.0328 | NA | NA | -.0382 | -.0346 |
| 174 | 1.1838 | 1.2273 | 28.76 | .0068 | NA | NA | -.0436 | -.0368 | NA | NA | -.0451 | -.0383 |
| 175 | 1.2130 | 1.2526 | 37.30 | .0112 | NA | NA | -.0396 | -.0284 | NA | NA | -.0445 | -.0333 |
| 176 | 1.2274 | 1.2654 | 33.51 | .0084 | NA | NA | -.0380 | -.0296 | NA | NA | -.0414 | -.0330 |
| 177 | 1.2287 | 1.3089 | 35.57 | .0479 | NA | NA | -.0802 | -.0323 | NA | NA | -.0845 | -.0365 |
| 178 | 1.2225 | 1.2978 | 40.98 | .0485 | NA | NA | -.0753 | -.0268 | NA | NA | -.0817 | -.0332 |
| 179 | 1.1923 | 1.2685 | 38.90 | .0472 | NA | NA | -.0762 | -.0290 | NA | NA | -.0818 | -.0346 |
| 180 | 1.1467 | 1.2253 | 32.86 | .0477 | NA | NA | -.0786 | -.0309 | NA | NA | -.0818 | -.0341 |
| 181 | 1.1938 | 1.2761 | 37.99 | .0491 | NA | NA | -.0823 | -.0332 | NA | NA | -.0875 | -.0384 |
| 182 | 1.2269 | 1.3010 | 35.00 | .0517 | NA | NA | -.0741 | -.0224 | NA | NA | -.0781 | -.0264 |
| 183 | 1.2394 | 1.3217 | 34.09 | .0489 | NA | NA | -.0823 | -.0334 | NA | NA | -.0859 | -.0370 |
| 184 | 1.2299 | 1.2995 | 50.08 | .0473 | NA | NA | -.0697 | -.0223 | NA | NA | -.0797 | -.0324 |
| 185 | 1.2295 | 1.3015 | 34.64 | .0469 | NA | NA | -.0720 | -.0252 | NA | NA | -.0759 | -.0290 |
| 186 | 1.2205 | 1.3019 | 29.22 | .0483 | NA | NA | -.0814 | -.0331 | NA | NA | -.0831 | -.0348 |
| 187 | 1.2243 | 1.2944 | 37.89 | .0499 | NA | NA | -.0701 | -.0202 | NA | NA | -.0753 | -.0254 |
| 188 | 1.2203 | 1.2874 | 37.85 | .0470 | NA | NA | -.0671 | -.0201 | NA | NA | -.0723 | -.0252 |
| 189 | 1.2331 | 1.3047 | 39.06 | .0451 | NA | NA | -.0716 | -.0265 | NA | NA | -.0772 | -.0322 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02023 DENSITY COMPARISONS
BEFORE SAMPLE

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**  SUMMARY REPORT  **
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| | LAB@25 | PRIMARY | TEMP | PRIMARY -TAYLOR | PRIMARY -TAYLOR 2 | TAYLOR -TAYLOR 2 | LAB@25 -PRIMARY | LAB@25 -TAYLOR | LAB@T(PC) -PRIMARY | LAB@T(PC) -TAYLOR | LAB@T(A) -PRIMARY | LAB@T(A) -TAYLOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N: | 31 | 31 | 31.00 | 30 | NA | NA | 31 | 31 | NA | NA | 31 | 31 |
| AVERAGE: | 1.2111 | 1.2690 | 40.63 | .0342 | NA | NA | -.0579 | -.0218 | NA | NA | -.0642 | -.0280 |
| SIGMA: | .0352 | .0434 | 13.84 | .0305 | NA | NA | .0213 | .0175 | NA | NA | .0240 | .0122 |
| ACCEPTABLE RANGE: | NA | NA | NA | -.0900 TO .0900 | NA TO NA | NA TO NA | -.1216 TO .0584 | -.1269 TO .0531 | NA TO NA | NA TO NA | -.3300 TO .2700 | -.0720 TO .0120 |

THIS SUMMARY INCLUDES 31 BATCHES

02003 REPLICATE COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:24 AM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 206 | 2213.8 | -17.59** | 9709.4 | .90 | 2213.7 | -17.67** | 9709.4 | .90 |
| 207 | 2504.2 | -1.43 | 10488.5 | -.51 | 2504.2 | -1.42 | 10488.5 | -.51 |
| 208 | 2347.2 | 13.70 | 10959.7 | .08 | 2347.1 | 13.68 | 10959.7 | .08 |
| 209 | 2792.9 | 6.00 | 9903.6 | .80 | 2792.9 | 6.00 | 9903.6 | .80 |
| 210 | 2702.3 | -.24 | 10228.1 | 5.66 | 2702.3 | -.25 | 10228.2 | 5.65 |
| 211 | 2965.2 | 1.99 | 8816.9 | -1.11 | 2965.2 | 2.15 | 8816.8 | -1.11 |
| 212 | 1279.6 | -3.03 | 8817.1 | -.55 | 1279.4 | -3.18 | 8817.1 | -.55 |
| 213 | 943.2 | -2.21 | 7993.5 | -1.41 | 943.2 | -2.21 | 7993.5 | -1.41 |
| 214 | 910.8 | -.43 | 7363.4 | -.41 | 910.8 | -.43 | 7363.4 | -.41 |
| 215 | 865.3 | 4.16 | 6780.9 | .04 | 865.3 | 4.16 | 6780.9 | .04 |
| 216 | 910.7 | -.17 | 7144.1 | -1.57 | 910.7 | -.17 | 7144.1 | -1.57 |
| 217 | 1653.0 | .78 | 7648.0 | .10 | 1653.0 | .77 | 7648.0 | .10 |
| 218 | 704.9 | 4.24 | 8313.4 | .25 | 704.9 | 4.27 | 8313.3 | .24 |
| 219 | 664.6 | 0.00 | 8225.6 | .02 | 664.6 | -.01 | 8225.6 | .02 |
| 220 | 935.4 | -.51 | 7110.8 | 1.59 | 935.4 | -.51 | 7110.8 | 1.59 |
| 221 | 818.9 | -.48 | 6915.3 | 65.11** | 818.9 | -.47 | 6915.3 | 65.12** |
| 222 | 764.9 | -4.44 | 9225.4 | .08 | 764.9 | -4.46 | 9225.4 | .07 |
| 223 | 1360.4 | .17 | 8073.3 | 1.09 | 1360.4 | .17 | 8073.3 | 1.10 |
| 224 | 924.8 | 2.85 | 7325.0 | -.54 | 924.8 | 2.86 | 7325.0 | -.54 |
| 225 | 781.7 | -2.38 | 8373.5 | 1.31 | 781.6 | -2.40 | 8373.5 | 1.30 |
| 226 | 711.7 | .90 | 7284.1 | 11.01 | 711.7 | .90 | 7284.1 | 11.01 |
| 227 | 847.4 | .63 | 7223.6 | .09 | 847.4 | .64 | 7223.6 | .09 |
| 228 | 782.8 | -.71 | 8484.6 | -.48 | 782.8 | -.73 | 8484.6 | -.48 |
| 229 | 859.0 | 2.15 | 7848.2 | .08 | 859.0 | 2.15 | 7848.2 | .08 |
| 230 | 811.0 | 1.73 | 6837.8 | -.44 | 811.0 | 1.73 | 6837.8 | -.44 |
| 231 | 655.2 | -.05 | 7985.9 | .40 | 655.2 | -.05 | 7985.9 | .40 |
| 232 | 725.9 | 711.77** | 6978.1 | 1.19 | 725.9 | 711.77** | 6978.1 | 1.19 |
| 233 | 825.3 | -4.19 | 8990.7 | -.37 | 825.3 | -4.19 | 8990.7 | -.38 |
| 234 | 716.0 | 1.60 | 7515.7 | .07 | 716.0 | 1.65 | 7515.7 | .06 |
| 235 | 778.0 | .99 | 6993.6 | 2.72 | 778.0 | .97 | 6993.5 | 2.71 |
| 236 | 703.2 | -3.15 | 7805.7 | .06 | 703.2 | -3.19 | 7805.7 | .06 |
| 237 | 799.4 | -9.31 | 7805.7 | NA | 799.4 | -9.32 | 7805.7 | 0.00 |
| 238 | 833.5 | 1.64 | 7898.5 | .21 | 833.5 | 1.65 | 7898.5 | .20 |
| 239 | 778.9 | -.79 | 7275.6 | -.52 | 779.0 | -.78 | 7275.6 | -.52 |
| 240 | 784.8 | 6.39 | 7663.1 | 2.81 | 784.8 | 6.40 | 7663.1 | 2.81 |
| 241 | 724.5 | -2.04 | 8152.7 | .96 | 724.5 | -2.05 | 8152.7 | .96 |
| 242 | 853.5 | -1.25 | 7983.4 | .67 | 853.5 | -1.25 | 7983.4 | .67 |
| 243 | 805.7 | -.02 | 8593.0 | .26 | 805.7 | -.01 | 8593.0 | .26 |
| 244 | 860.7 | 1.45 | 7323.0 | 2.51 | 860.7 | 1.47 | 7323.0 | 2.51 |
| 245 | 827.6 | -.16 | 8248.9 | 1.57 | 827.5 | -.19 | 8248.9 | 1.57 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 REPLICATE COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:30 AM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 246 | 898.4 | -1.99 | 8550.1 | 13.44 | 898.3 | -2.00 | 8550.1 | 13.44 |
| 247 | 1045.4 | 1.96 | 8112.0 | .73 | 1045.4 | 1.96 | 8112.0 | .73 |
| 248 | 875.8 | -2.14 | 8116.1 | 1.60 | 875.8 | -2.14 | 8116.1 | 1.60 |
| 249 | 890.1 | -2.50 | 8514.3 | .26 | 890.1 | -2.59 | 8514.4 | .25 |
| 250 | 782.2 | .07 | 7552.6 | -.25 | 782.3 | .16 | 7552.7 | -.25 |
| 251 | 801.6 | 2.23 | 8298.9 | .28 | 801.6 | 2.23 | 8298.9 | .28 |
| 252 | 899.1 | 3.39 | 8547.7 | -.01 | 899.2 | 3.39 | 8547.7 | -.01 |
| 253 | 934.1 | .90 | 8753.8 | -.14 | 934.1 | .91 | 8753.8 | -.14 |
| 254 | 880.0 | -.12 | 7853.6 | -.76 | 880.0 | -.13 | 7853.6 | -.76 |
| 255 | 831.9 | 3.63 | 7892.6 | .63 | 831.9 | 3.62 | 7892.6 | .63 |
| 256 | 708.8 | 1.61 | 7952.5 | -.02 | 708.8 | 1.62 | 7952.5 | -.02 |
| 257 | 896.2 | -1.40 | 7769.2 | -.73 | 896.2 | -1.41 | 7769.2 | -.73 |
| 258 | 700.8 | -1.30 | 8244.0 | .02 | 700.8 | -1.29 | 8244.0 | .01 |
| 259 | 793.8 | .60 | 8258.6 | 1.00 | 793.8 | .59 | 8258.6 | 1.00 |
| 260 | 718.3 | -1.49 | 8044.5 | .43 | 718.3 | -1.49 | 8044.5 | .43 |
| 261 | 816.5 | 22.94** | 7896.9 | .15 | 816.5 | 22.94** | 7896.9 | .15 |
| 262 | 706.2 | -.09 | 7184.5 | .13 | 706.2 | -.09 | 7184.5 | .13 |
| 263 | 680.5 | .65 | 8687.6 | -.03 | 680.5 | .65 | 8687.6 | -.03 |
| 264 | 726.0 | -1.75 | 8112.0 | .10 | 726.0 | -1.75 | 8112.0 | .11 |
| 265 | 864.5 | 1.38 | 8571.9 | .29 | 864.5 | 1.37 | 8571.9 | .29 |
| 266 | 720.7 | -1.57 | 8280.6 | .29 | 720.7 | -1.56 | 8280.7 | .30 |
| 267 | 873.2 | 2.21 | 8157.5 | 3.65 | 873.2 | 2.20 | 8157.5 | 3.65 |
| 268 | 880.9 | -.18 | 8678.4 | 1.08 | 880.9 | -.17 | 8678.4 | 1.09 |
| 269 | 1807.5 | -4.19 | 10444.1 | .03 | 1807.5 | -4.19 | 10444.1 | .04 |
| 270 | 785.0 | 2.74 | 10586.3 | -4.76 | 785.0 | 2.76 | 10586.3 | -4.75 |
| 271 | 7052.1 | .49 | 7858.7 | 4.12 | 7052.1 | .46 | 7858.7 | 4.12 |
| 272 | 7854.3 | 7.29 | 7848.8 | 0.00 | 7854.3 | 7.30 | 7848.8 | 0.00 |
| 273 | 4657.7 | -.35 | 4657.5 | .52 | 4657.7 | -.35 | 4657.5 | .52 |
| 274 | 706.6 | -7.53 | 8096.4 | 1.53 | 706.6 | -7.53 | 8096.4 | 1.53 |
| 275 | 846.0 | -.87 | 9838.3 | .27 | 846.0 | -.88 | 9838.3 | .27 |
| 276 | 1130.9 | 3.47 | 9499.7 | .17 | 1130.9 | 3.47 | 9499.7 | .17 |
| 277 | 882.5 | 2.04 | 8020.3 | .25 | 882.5 | 2.04 | 8020.3 | .25 |
| 278 | 652.0 | 5.99 | 8323.5 | .96 | 652.0 | 5.99 | 8323.5 | .96 |
| 279 | 696.6 | -1.47 | 7683.9 | .51 | 696.6 | -1.47 | 7683.9 | .51 |
| 280 | 718.8 | -6.29 | 8800.9 | 2.79 | 718.8 | -6.27 | 8800.9 | 2.79 |
| 281 | 871.9 | -1.21 | 6523.6 | -.28 | 871.8 | -1.22 | 6523.6 | -.28 |
| 282 | 642.2 | 3.97 | 7767.5 | -.80 | 642.2 | 3.97 | 7767.5 | -.80 |
| 283 | 898.6 | 1.16 | 10426.8 | 1.38 | 898.6 | 1.18 | 10426.8 | 1.37 |
| 284 | 906.8 | .20 | 8874.1 | .11 | 906.8 | .20 | 8874.1 | .11 |
| 285 | 717.0 | 1.17 | 6794.8 | -.55 | 717.0 | 1.18 | 6794.8 | -.55 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 REPLICATE COMPARISONS

BATCHES 206 TO 315

29-Aug-79 10:37 AM

| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| BATCH NO. | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 286 | 865.7 | 4.94 | 8308.2 | -.50 | 865.7 | 4.92 | 8308.2 | -.50 |
| 287 | 886.5 | .60 | 8769.6 | -1.63 | 886.5 | .59 | 8769.6 | -1.63 |
| 288 | 672.3 | -1.06 | 7604.3 | -.19 | 672.3 | -1.04 | 7604.3 | -.19 |
| 289 | 816.1 | -.42 | 9555.1 | .17 | 816.0 | -.41 | 9555.1 | .17 |
| 290 | 929.9 | -5.89 | 8677.6 | -.75 | 929.8 | -5.89 | 8677.5 | -.75 |
| 291 | 836.3 | 1.95 | 9246.2 | -1.17 | 836.3 | 1.93 | 9246.2 | -1.17 |
| 292 | 830.3 | 1.95 | 10510.3 | -.33 | 830.3 | 1.96 | 10510.3 | -.33 |
| 293 | 925.7 | -1.12 | 9380.0 | -1.84 | 925.7 | -1.12 | 9380.0 | -1.84 |
| 294 | 892.8 | -5.29 | 8453.0 | 2.32 | 892.8 | -5.31 | 8453.0 | 2.32 |
| 295 | 703.2 | -.43 | 8392.4 | .68 | 703.2 | -.45 | 8392.5 | .68 |
| 296 | 887.9 | -2.23 | 8632.8 | .50 | 887.9 | -2.21 | 8632.8 | .50 |
| 297 | 624.5 | -7879.87** | 8505.2 | .29 | 624.5 | -7879.94** | 8505.2 | .29 |
| 298 | 677.2 | 1.53 | 8703.3 | -.21 | 677.3 | 1.62 | 8703.2 | -.21 |
| 299 | 646.2 | 1.18 | 7938.5 | .23 | 646.2 | 1.18 | 7938.5 | .23 |
| 300 | 681.9 | .33 | 9248.6 | -.27 | 681.9 | .31 | 9248.6 | -.27 |
| 301 | 923.1 | .86 | 8693.8 | .24 | 923.1 | .84 | 8693.8 | .23 |
| 302 | 707.0 | 6.46 | 8296.7 | -.46 | 707.0 | 6.50 | 8296.7 | -.45 |
| 303 | 702.1 | -7737.68** | 8439.6 | .55 | 702.0 | -7737.70** | 8439.6 | .55 |
| 304 | 697.9 | 1.89 | 7934.4 | -.41 | 697.9 | 1.89 | 7934.3 | -.42 |
| 305 | 888.6 | .47 | 8308.9 | 0.00 | 888.6 | .46 | 8308.9 | 0.00 |
| 306 | 705.9 | -.24 | 7884.1 | -.19 | 705.9 | -.22 | 7884.1 | -.19 |
| 307 | 865.3 | -.38 | 8362.6 | -.09 | 865.2 | -.39 | 8362.5 | -.09 |
| 308 | 696.6 | 6.61 | 8329.2 | -.41 | 696.6 | 6.62 | 8329.2 | -.40 |
| 309 | 794.9 | -.16 | 8597.8 | 1.31 | 794.9 | -.17 | 8597.8 | 1.32 |
| 310 | 1151.6 | -1.03 | 8835.6 | .24 | 1151.6 | -1.04 | 8835.5 | .24 |
| 311 | 901.7 | -91.14** | 3145.4 | 3.46 | 901.7 | -91.22** | 3145.5 | 3.46 |
| 312 | 14.2 | .53 | 2084.9 | 3.54 | 14.2 | .55 | 2085.5 | 3.64 |
| 313 | 470.6 | -3.48 | 474.2 | -.15 | 471.1 | -3.54 | 472.9 | -.18 |
| 314 | 440.7 | -.93 | 5396.4 | 3.04 | 441.3 | -.90 | 5397.1 | 3.05 |
| 315 | 465.1 | 2.78 | 3157.1 | 2.45 | 465.7 | 2.78 | 3157.8 | 2.46 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02003 REPLICATE COMPARISONS

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**  SUMMARY REPORT  **
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| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | 110 | 104 | 110 | 108 | 110 | 104 | 110 | 109 |
| AVERAGE: | 1070.74 | .33 | 8038.62 | .62 | 1070.75 | .33 | 8038.62 | .62 |
| SIGMA: | 1047.04 | 3.15 | 1517.73 | 2.09 | 1047.03 | 3.15 | 1517.72 | 2.08 |
| ACCEPTABLE RANGE: | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 | NA | -15.00 TO 15.00 |

THIS SUMMARY INCLUDES 110 BATCHES

02007 REPLICATE COMPARISONS

BATCHES 72 TO 186

15-Aug-79 12:59 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 72 | NA | NA | 9641.4 | -2.28 | NA | NA | 9641.5 | -2.29 |
| 72 | NA | NA | 9641.3 | -2.28 | NA | NA | NA | NA |
| 73 | NA | NA | 10499.0 | 11.18 | NA | NA | 10499.0 | 11.19 |
| 74 | NA | NA | 10883.8 | -.51 | NA | NA | 10883.8 | -.51 |
| 75 | NA | NA | 9298.3 | -4.96 | NA | NA | 9298.3 | -4.96 |
| 76 | NA | NA | 9699.5 | -5.99 | NA | NA | 9699.5 | -5.99 |
| 77 | NA | NA | 8103.8 | 51.46** | NA | NA | 8103.8 | 51.47 |
| 78 | NA | NA | 9750.6 | -2.72 | NA | NA | 9750.6 | -2.71 |
| 79 | NA | NA | 9267.5 | -2.40 | NA | NA | 9267.5 | -2.40 |
| 80 | NA | NA | 8671.5 | -2.74 | NA | NA | 8671.5 | -2.74 |
| 81 | NA | NA | 8120.9 | -4.56 | NA | NA | 8120.8 | -4.57 |
| 82 | NA | NA | 8430.3 | -12.99 | NA | NA | 8430.3 | -12.99 |
| 83 | NA | NA | 8202.6 | 2.74 | NA | NA | 8202.6 | 2.73 |
| 84 | NA | NA | 9819.3 | 10.88 | NA | NA | 9819.3 | 10.89 |
| 85 | NA | NA | 9758.1 | -4.97 | NA | NA | 9758.1 | -4.97 |
| 86 | NA | NA | 8349.0 | -19.87** | NA | NA | 8349.0 | -19.88 |
| 87 | NA | NA | 8439.1 | 136.22** | NA | NA | 8439.1 | 136.22** |
| 88 | NA | NA | 10669.5 | -4.33 | NA | NA | 10669.5 | -4.32 |
| 89 | NA | NA | 8921.0 | -5.02 | NA | NA | 8921.0 | -5.01 |
| 90 | NA | NA | 8610.4 | -.10 | NA | NA | 8610.4 | -.10 |
| 91 | NA | NA | 9792.7 | -.75 | NA | NA | 9792.7 | -.74 |
| 92 | NA | NA | 8769.3 | -2.35 | NA | NA | 8769.3 | -2.35 |
| 93 | NA | NA | 8583.3 | -6.92 | NA | NA | 8583.6 | -6.91 |
| 94 | NA | NA | 9917.4 | -3.92 | NA | NA | 9917.5 | -3.92 |
| 95 | NA | NA | 9199.6 | -1.39 | NA | NA | 9199.6 | -1.39 |
| 96 | NA | NA | 8233.8 | -6.66 | NA | NA | 8233.8 | -6.65 |
| 97 | NA | NA | 9464.9 | -62.29** | NA | NA | 9464.9 | -62.29 |
| 98 | NA | NA | 8461.6 | .59 | NA | NA | 8461.6 | .59 |
| 99 | NA | NA | 10356.4 | -8.21 | NA | NA | 10356.7 | -8.21 |
| 100 | NA | NA | 9014.0 | -3.78 | NA | NA | 9013.9 | -3.78 |
| 101 | NA | NA | 8423.1 | -2.63 | NA | NA | 8423.1 | -2.63 |
| 102 | NA | NA | 9313.0 | -.19 | NA | NA | 9313.0 | -.19 |
| 103 | NA | NA | 9316.0 | 91.48** | NA | NA | 9316.1 | 91.48** |
| 104 | NA | NA | 9280.2 | .05 | NA | NA | 9280.2 | .05 |
| 105 | NA | NA | 8711.3 | -2.26 | NA | NA | 8711.3 | -2.26 |
| 106 | NA | NA | 9085.3 | .21 | NA | NA | 9085.3 | .22 |
| 107 | NA | NA | 9634.3 | -2.88 | NA | NA | 9634.3 | -2.87 |
| 108 | NA | NA | 9328.7 | -2.75 | NA | NA | 9328.7 | -2.75 |
| 109 | NA | NA | 9994.1 | -.51 | NA | NA | 9994.1 | -.51 |
| 110 | NA | NA | 8665.5 | .80 | NA | NA | 8665.4 | .79 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 REPLICATE COMPARISONS

BATCHES 72 TO 186

15-Aug-79 01:03 PM

| BATCH NO. | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 111 | NA | NA | 9636.6 | 9.44 | NA | NA | 9636.6 | 9.44 |
| 112 | NA | NA | 9856.5 | 6.19 | NA | NA | 9856.5 | 6.18 |
| 113 | NA | NA | 9291.1 | 9.14 | NA | NA | 9291.1 | 9.14 |
| 114 | NA | NA | 9451.5 | .18 | NA | NA | 9451.5 | .18 |
| 115 | NA | NA | 9829.1 | -.07 | NA | NA | 9829.1 | -.07 |
| 116 | NA | NA | 8929.0 | -1.26 | NA | NA | 8929.0 | -1.26 |
| 117 | NA | NA | 9725.2 | 3.04 | NA | NA | 9725.2 | 3.03 |
| 118 | NA | NA | 9861.0 | -1.80 | NA | NA | 9861.0 | -1.80 |
| 119 | NA | NA | 10052.8 | -3.57 | NA | NA | 10052.8 | -3.58 |
| 120 | NA | NA | 9221.5 | .05 | NA | NA | 9221.5 | .05 |
| 121 | NA | NA | 9287.9 | 1.04 | NA | NA | 9287.9 | 1.05 |
| 122 | NA | NA | 9482.6 | 6.54 | NA | NA | 9482.6 | 6.54 |
| 123 | NA | NA | 9100.3 | -.11 | NA | NA | 9100.3 | -.11 |
| 124 | NA | NA | 9772.9 | -.31 | NA | NA | 9772.8 | -.31 |
| 125 | NA | NA | 9683.9 | 5.82 | NA | NA | 9683.9 | 5.82 |
| 126 | NA | NA | 9526.1 | -6.37 | NA | NA | 9526.0 | -6.37 |
| 127 | NA | NA | 9354.2 | 45.75** | NA | NA | 9354.2 | 45.75 |
| 128 | NA | NA | 8691.1 | .97 | NA | NA | 8691.1 | .97 |
| 129 | NA | NA | 10214.3 | -2.80 | NA | NA | 10214.3 | -2.80 |
| 130 | NA | NA | 9598.7 | -.23 | NA | NA | 9598.7 | -.23 |
| 131 | NA | NA | 9917.4 | 1.98 | NA | NA | 9917.4 | 1.97 |
| 132 | NA | NA | 9772.3 | .40 | NA | NA | 9772.3 | .40 |
| 133 | NA | NA | 9482.9 | -.95 | NA | NA | 9482.9 | -.94 |
| 134 | NA | NA | 10006.0 | -.09 | NA | NA | 10006.0 | -.09 |
| 135 | NA | NA | 9427.8 | 2.63 | NA | NA | 9427.9 | 2.64 |
| 136 | NA | NA | 16528.9 | .82 | NA | NA | 16528.9 | .82 |
| 137 | NA | NA | 13662.1 | 1.35 | NA | NA | 13662.1 | 1.36 |
| 138 | NA | NA | 5916.4 | 1.94 | NA | NA | 5916.5 | 1.94 |
| 139 | NA | NA | 6565.3 | .28 | NA | NA | 6565.3 | .28 |
| 140 | NA | NA | 6545.8 | -.45 | NA | NA | 6545.8 | -.45 |
| 141 | NA | NA | 11168.2 | -1.69 | NA | NA | 11168.2 | -1.70 |
| 142 | NA | NA | 11967.9 | -1.72 | NA | NA | 11967.9 | -1.72 |
| 143 | NA | NA | 10489.6 | -2.03 | NA | NA | 10489.8 | -2.04 |
| 144 | NA | NA | 9255.9 | 1.20 | NA | NA | 9255.9 | 1.19 |
| 145 | NA | NA | 9777.1 | -1.40 | NA | NA | 9777.1 | -1.41 |
| 146 | NA | NA | 9094.7 | -1.24 | NA | NA | 9094.7 | -1.24 |
| 147 | NA | NA | 10218.2 | .65 | NA | NA | 10218.1 | .65 |
| 148 | NA | NA | 7776.0 | -7.80 | NA | NA | 7776.0 | -7.81 |
| 149 | NA | NA | 9250.9 | .66 | NA | NA | 9250.9 | .66 |
| 150 | NA | NA | 12333.3 | -11.33 | NA | NA | 12333.2 | -11.33 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 REPLICATE COMPARISONS

BATCHES 72 TO 186

15-Aug-79 01:07 PM

| BATCH NO | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| 151 | NA | NA | 10103.4 | -2.68 | NA | NA | 10103.4 | -2.67 |
| 152 | NA | NA | 8205.1 | -2.26 | NA | NA | 8205.1 | -2.25 |
| 153 | NA | NA | 9576.9 | 13.28 | NA | NA | 9576.9 | 13.27 |
| 154 | NA | NA | 10004.3 | -3.86 | NA | NA | 10004.3 | -3.86 |
| 155 | NA | NA | 9056.2 | .89 | NA | NA | 9056.2 | .89 |
| 156 | NA | NA | 10858.7 | -5.96 | NA | NA | 10858.6 | -5.97 |
| 157 | NA | NA | 9872.6 | -16.50** | NA | NA | 9872.6 | -16.59 |
| 158 | NA | NA | 10542.8 | -1.87 | NA | NA | 10542.8 | -1.87 |
| 159 | NA | NA | 12346.0 | -3.78 | NA | NA | 12346.0 | -3.78 |
| 160 | NA | NA | 10567.4 | -5.15 | NA | NA | 10567.4 | -5.15 |
| 161 | NA | NA | 9674.9 | -4.91 | NA | NA | 9674.9 | -4.91 |
| 162 | NA | NA | 9825.1 | -4.60 | NA | NA | 9825.1 | -4.60 |
| 163 | NA | NA | 9886.9 | -1.10 | NA | NA | 9886.9 | -1.10 |
| 164 | NA | NA | 9991.1 | 57.67** | NA | NA | 9991.1 | 57.68 |
| 165 | NA | NA | 10159.0 | -1.00 | NA | NA | 10158.9 | -1.00 |
| 166 | NA | NA | 9418.1 | -5.11 | NA | NA | 9418.1 | -5.10 |
| 167 | NA | NA | 10697.2 | -3.20 | NA | NA | 10697.1 | -3.19 |
| 168 | NA | NA | 9902.4 | -1.51 | NA | NA | 9902.4 | -1.50 |
| 169 | NA | NA | 9702.2 | -.98 | NA | NA | 9702.2 | -.97 |
| 170 | NA | NA | 9834.5 | -6.47 | NA | NA | 9834.4 | -6.47 |
| 171 | NA | NA | 9340.1 | -.07 | NA | NA | 9340.1 | -.08 |
| 172 | NA | NA | 9529.2 | .96 | NA | NA | 9529.2 | .97 |
| 173 | NA | NA | 9288.0 | .74 | NA | NA | 9288.0 | .74 |
| 174 | NA | NA | 9605.2 | -3.63 | NA | NA | 9605.2 | -3.62 |
| 175 | NA | NA | 9736.0 | -1.36 | NA | NA | 9735.9 | -1.36 |
| 176 | NA | NA | 9908.4 | .30 | NA | NA | 9908.4 | .29 |
| 177 | NA | NA | 9793.3 | -.99 | NA | NA | 9793.3 | -.98 |
| 178 | NA | NA | 10350.6 | -.31 | NA | NA | 10350.5 | -.31 |
| 179 | NA | NA | 11714.4 | -.79 | NA | NA | 11714.4 | -.79 |
| 180 | NA | NA | 10427.1 | -4.73 | NA | NA | 10427.1 | -4.73 |
| 181 | NA | NA | 9853.9 | 1.15 | NA | NA | 9853.9 | 1.15 |
| 182 | NA | NA | 9183.2 | 2.70 | NA | NA | 9183.1 | 2.70 |
| 183 | NA | NA | 9910.2 | -.27 | NA | NA | 9910.2 | -.26 |
| 184 | NA | NA | 9487.6 | -.22 | NA | NA | 9487.8 | -.23 |
| 185 | NA | NA | 6872.5 | -.45 | NA | NA | 6872.9 | -.45 |
| 186 | NA | NA | 2226.9 | -1.29 | NA | NA | 2227.4 | -1.29 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

02007 REPLICATE COMPARISONS

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**  SUMMARY REPORT  **
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| | PROCESS CONTROL | | | | ACCOUNTABILITY | | | |
|---|---|---|---|---|---|---|---|---|
| | AT TO BR | | BS TO AS | | AT TO BR | | BS TO AS | |
| | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS | KG SOLN (AT) | AT-BR | KG SOLN (BS) | BS-AS |
| N: | NA | NA | 116 | 108 | NA | NA | 115 | 113 |
| AVERAGE: | NA | NA | 9530.13 | -1.06 | NA | NA | 9529.17 | -.49 |
| SIGMA: | NA | NA | 1415.42 | 4.06 | NA | NA | 1421.51 | 11.37 |
| ACCEPTABLE | NA | NA | NA | -15.00 | NA | NA | NA | -75.00 |
| | | TO | | TO | | TO | | TO |
| RANGE: | NA | NA | NA | 15.00 | NA | NA | NA | 75.00 |

THIS SUMMARY INCLUDES 116 BATCHES

PRODUCT TO INPUT COMPARISONS

PROCESS CONTROL

27-Aug-79 09:42 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 72 | 7419.340 | 1338.400 | 206 | 7494.710 | 1317.740 | -75.371 | 20.655 |
| 73 | 7983.220 | 1487.770 | 207 | 7984.850 | 1493.080 | -1.635 | -5.304 |
| 74 | 8621.590 | 1959.710 | 208 | 8612.430 | 1955.280 | 9.157 | 4.434 |
| 75 | 7098.800 | 1694.240 | 209 | 7109.870 | 1702.060 | -11.066 | -7.815 |
| 76 | 7512.390 | 1814.170 | 210 | 7520.170 | 1809.610 | -7.781 | 4.560 |
| 77 | 5853.860 | 1422.520 | 211 | 5852.890 | 1511.590 | .967 | -89.070** |
| 78 | 7537.620 | 1801.620 | 212 | 7538.100 | 1783.810 | -.479 | 17.816 |
| 79 | 7050.920 | 1656.920 | 213 | 7051.740 | 1652.170 | -.824 | 4.750 |
| 80 | 6453.360 | 1512.460 | 214 | 6453.000 | 1509.910 | .362 | 2.555 |
| 81 | 5915.020 | 1420.420 | 215 | 5915.550 | 1417.780 | -.536 | 2.641 |
| 82 | 6235.300 | 1513.420 | 216 | 6235.010 | 1510.900 | .294 | 2.523 |
| 83 | 5989.010 | 1460.450 | 217 | 5994.840 | 1455.590 | -5.831 | 4.860 |
| 84 | 7608.550 | 1846.510 | 218 | 7608.200 | 1855.880 | .344 | -9.367 |
| 85 | 7561.750 | 1822.000 | 219 | 7560.990 | 1824.450 | .753 | -2.442 |
| 86 | 6052.660 | 1449.790 | 220 | 6173.770 | 1478.840 | -121.104 | -29.047 |
| 87 | 6099.020 | 1475.700 | 221 | 6031.310 | 1462.820 | 67.718 | 12.883 |
| 88 | 8460.810 | 2008.120 | 222 | 8460.380 | 2002.510 | .430 | 5.610 |
| 89 | 6710.720 | 1618.270 | 223 | 6711.750 | 1612.870 | -1.027 | 5.400 |
| 90 | 6397.150 | 1566.520 | 224 | 6400.760 | 1576.000 | -3.607 | -9.482 |
| 91 | 7582.380 | 1794.420 | 225 | 7590.490 | 1790.440 | -8.107 | 3.983 |
| 92 | 6562.640 | 1548.100 | 226 | 6561.390 | 1545.230 | 1.252 | 2.865 |
| 93 | 6377.930 | 1506.320 | 227 | 6376.130 | 1510.140 | 1.798 | -3.812 |
| 94 | 7703.200 | 1790.010 | 228 | 7702.300 | 1793.150 | .895 | -3.143 |
| 95 | 6989.100 | 1611.880 | 229 | 6989.110 | 1617.490 | -.013 | -5.613 |
| 96 | 6029.830 | 1398.440 | 230 | 6027.190 | 1407.390 | 2.641 | -8.953 |
| 97 | 7272.520 | 1674.430 | 231 | 7330.290 | 1682.830 | -57.777 | -8.399 |
| 98 | 6253.260 | 1489.300 | 232 | 6251.030 | 1480.720 | 2.232 | 8.585 |
| 99 | 8156.260 | 1906.670 | 233 | 8165.820 | 1977.000 | -9.558 | -70.335 |
| 100 | 6809.270 | 1620.210 | 234 | 6799.710 | 1614.640 | 9.567 | 5.565 |
| 101 | 6218.570 | 1408.220 | 235 | 6212.820 | 1408.660 | 5.747 | -.442 |
| 102 | 7101.520 | 1672.490 | 236 | 7102.380 | 1659.550 | -.858 | 12.946 |
| 103 | 7005.770 | 1590.060 | 237 | 7006.260 | 1588.980 | -.499 | 1.081 |
| 104 | 7065.890 | 1665.480 | 238 | 7064.800 | 1665.280 | 1.087 | .201 |
| 105 | 6497.570 | 1427.770 | 239 | 6497.180 | 1429.810 | .391 | -2.036 |
| 106 | 6882.110 | 1597.950 | 240 | 6875.420 | 1597.510 | 6.689 | .445 |
| 107 | 7426.670 | 1783.120 | 241 | 7427.250 | 1767.850 | -.583 | 15.269 |
| 108 | 7133.140 | 1709.380 | 242 | 7129.230 | 1709.530 | 3.912 | -.151 |
| 109 | 7789.470 | 1921.510 | 243 | 7787.030 | 1931.140 | 2.439 | -9.630 |
| 110 | 6459.080 | 1586.510 | 244 | 6459.760 | 1583.880 | -.680 | 2.626 |
| 111 | 7419.620 | 1782.910 | 245 | 7419.770 | 1784.210 | -.157 | -1.300 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

PRODUCT TO INPUT COMPARISONS

PROCESS CONTROL

27-Aug-79 09:46 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 112 | 7641.270 | 1811.860 | 246 | 7638.320 | 1805.810 | 2.951 | 6.052 |
| 113 | 7072.120 | 1668.510 | 247 | 7065.860 | 1661.300 | 6.261 | 7.214 |
| 114 | 7238.590 | 1705.320 | 248 | 7238.730 | 1695.140 | -.138 | 10.182 |
| 115 | 7617.700 | 1752.580 | 249 | 7623.960 | 1694.790 | -6.254 | 57.790 |
| 116 | 6746.430 | 1585.650 | 250 | 6770.700 | 1594.470 | -24.274 | -8.814 |
| 117 | 7498.910 | 1784.110 | 251 | 7497.000 | 1795.280 | 1.913 | -11.169 |
| 118 | 7649.730 | 1866.700 | 252 | 7648.560 | 1869.940 | 1.170 | -3.235 |
| 119 | 7833.070 | 1867.670 | 253 | 7819.810 | 1860.430 | 13.256 | 7.241 |
| 120 | 6975.940 | 1631.410 | 254 | 6974.290 | 1630.350 | 1.654 | 1.051 |
| 121 | 7061.260 | 1702.060 | 255 | 7060.010 | 1696.460 | 1.252 | 5.603 |
| 122 | 7246.850 | 1741.440 | 256 | 7243.750 | 1746.280 | 3.100 | -4.841 |
| 123 | 6874.210 | 1637.730 | 257 | 6873.730 | 1632.910 | .480 | 4.817 |
| 124 | 7546.140 | 1769.990 | 258 | 7543.260 | 1769.610 | 2.879 | .375 |
| 125 | 7465.350 | 1755.810 | 259 | 7463.730 | 1752.820 | 1.620 | 2.990 |
| 126 | 7326.880 | 1741.950 | 260 | 7325.710 | 1738.150 | 1.169 | 3.804 |
| 127 | 7104.120 | 1712.630 | 261 | 7080.230 | 1708.990 | 23.897 | 3.646 |
| 128 | 6481.330 | 1546.310 | 262 | 6478.180 | 1547.830 | 3.143 | -1.527 |
| 129 | 8013.620 | 1936.040 | 263 | 8007.100 | 1934.690 | 6.524 | 1.347 |
| 130 | 7388.870 | 1792.340 | 264 | 7385.920 | 1790.830 | 2.946 | 1.510 |
| 131 | 7709.680 | 1901.620 | 265 | 7707.060 | 1900.310 | 2.614 | 1.305 |
| 132 | 7560.650 | 1847.470 | 266 | 7559.680 | 1848.240 | .963 | -.767 |
| 133 | 7278.420 | 1738.230 | 267 | 7280.700 | 1740.970 | -2.275 | -2.735 |
| 134 | 7797.140 | 1860.000 | 268 | 7796.400 | 1854.100 | .739 | 5.897 |
| 136 | 8626.750 | 1999.020 | 269 | 8636.530 | 1998.340 | -9.779 | .676 |
| 137 | 9790.220 | 2337.460 | 270 | 9806.080 | 2339.160 | -15.853 | -1.695 |
| 138 | 4.083 | .911 | 271 | 802.530 | -5.870 | -798.447** | 6.781 |
| 140 | -11.840 | -2.417 | 273 | -.767 | -.164 | -11.073 | -2.252 |
| 141 | 7437.770 | 1467.720 | 274 | 7388.320 | 1448.250 | 49.446 | 19.479 |
| 142 | 8899.500 | 1888.960 | 275 | 8992.020 | 1907.690 | -92.527 | -18.724 |
| 143 | 8373.070 | 1847.860 | 276 | 8368.640 | 1912.720 | 4.432 | -64.861 |
| 144 | 7142.810 | 1673.060 | 277 | 7137.530 | 1664.380 | 5.285 | 8.681 |
| 145 | 7675.830 | 1832.010 | 278 | 7670.580 | 1824.970 | 5.251 | 7.042 |
| 146 | 6983.730 | 1626.310 | 279 | 6986.810 | 1615.590 | -3.079 | 10.721 |
| 147 | 8086.420 | 1645.880 | 280 | 8079.330 | 1648.990 | 7.084 | -3.114 |
| 148 | 5653.080 | 1203.670 | 281 | 5652.050 | 1204.470 | 1.031 | -.797 |
| 149 | 7129.100 | 1562.630 | 282 | 7126.090 | 1539.550 | 3.009 | 23.077 |
| 150 | 9520.160 | 2148.680 | 283 | 9526.790 | 2116.440 | -6.628 | 32.239 |
| 151 | 7972.640 | 1783.410 | 284 | 7967.170 | 1778.700 | 5.479 | 4.708 |
| 152 | 6068.210 | 1366.000 | 285 | 6078.340 | 1370.630 | -10.135 | -4.625 |
| 153 | 7442.650 | 1734.960 | 286 | 7443.000 | 1732.160 | -.352 | 2.796 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

PRODUCT TO INPUT COMPARISONS

PROCESS CONTROL

27-Aug-79 09:50 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 154 | 7885.960 | 1879.670 | 287 | 7884.730 | 1867.100 | 1.237 | 12.569 |
| 155 | 6930.770 | 1644.740 | 288 | 6932.190 | 1648.180 | -1.422 | -3.441 |
| 156 | 8738.670 | 2079.380 | 289 | 8738.880 | 2074.420 | -.209 | 4.963 |
| 157 | 7752.080 | 1749.540 | 290 | 7748.430 | 1748.600 | 3.656 | .943 |
| 158 | 8414.140 | 1921.960 | 291 | 8411.000 | 1922.150 | 3.146 | -.199 |
| 159 | 9672.710 | 2209.520 | 292 | 9680.380 | 2209.980 | -7.661 | -.458 |
| 160 | 8439.010 | 1956.450 | 293 | 8456.180 | 1947.150 | -17.164 | 9.307 |
| 161 | 7543.430 | 1695.190 | 294 | 7557.960 | 1696.420 | -14.526 | -1.233 |
| 162 | 7692.240 | 1748.350 | 295 | 7688.500 | 1739.940 | 3.734 | 8.406 |
| 163 | 7749.740 | 1742.550 | 296 | 7744.450 | 1737.990 | 5.291 | 4.559 |
| 164 | 7887.130 | 1746.650 | 297 | 7880.360 | 1713.400 | 6.770 | 33.249 |
| 165 | 8030.380 | 1861.830 | 298 | 8026.270 | 1870.180 | 4.104 | -8.349 |
| 166 | 7293.490 | 1705.600 | 299 | 7292.070 | 1707.550 | 1.414 | -1.953 |
| 167 | 8568.230 | 1959.900 | 300 | 8566.950 | 1967.150 | 1.276 | -7.259 |
| 168 | 7774.500 | 1774.870 | 301 | 7770.440 | 1772.040 | 4.062 | 2.826 |
| 169 | 7585.260 | 1794.990 | 302 | 7590.170 | 1802.260 | -4.916 | -7.266 |
| 170 | 7730.780 | 1902.750 | 303 | 7737.020 | 1906.930 | -6.233 | -4.181 |
| 171 | 7231.210 | 1774.170 | 304 | 7236.890 | 1774.720 | -5.680 | -.548 |
| 172 | 7417.020 | 1823.130 | 305 | 7420.220 | 1829.250 | -3.197 | -6.124 |
| 173 | 7178.210 | 1775.030 | 306 | 7178.350 | 1773.370 | -.133 | 1.658 |
| 174 | 7497.440 | 1837.350 | 307 | 7497.390 | 1836.300 | .055 | 1.048 |
| 175 | 7634.690 | 1909.790 | 308 | 7633.040 | 1910.800 | 1.654 | -1.012 |
| 176 | 7802.690 | 1963.470 | 309 | 7801.570 | 1961.670 | 1.125 | 1.804 |
| 177 | 7686.990 | 1934.080 | 310 | 7683.750 | 1934.540 | 3.245 | -.457 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

PRODUCT TO INPUT COMPARISONS

PROCESS CONTROL

**********
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**  **
**  **
**  SUMMARY REPORT  **
**  **
**  **
**********
**********

PRODUCT - INPUT

| | SOLUTION (KG) | URANIUM (KG) |
|---|---|---|
| N: | 103 | 103 |
| AVERAGE: | -2.2525 | 1.0845 |
| SIGMA: | 20.4364 | 14.1502 |
| ACCEPTABLE RANGE: | -150.0000 TO 150.0000 | -75.0000 TO 75.0000 |

THIS SUMMARY INCLUDES 104 BATCHES

PRODUCT TO INPUT COMPARISONS

ACCOUNTABILITY

27-Aug-79 09:56 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 72 | 7419.340 | 1343.050 | 206 | 7494.790 | 1327.370 | -75.451 | 15.680 |
| 73 | 7983.220 | 1483.680 | 207 | 7984.840 | 1480.710 | -1.621 | 2.974 |
| 74 | 8621.590 | 1962.270 | 208 | 8612.460 | 1959.940 | 9.132 | 2.330 |
| 75 | 7098.800 | 1702.010 | 209 | 7109.860 | 1700.660 | -11.061 | 1.351 |
| 76 | 7512.390 | 1816.720 | 210 | 7520.180 | 1814.060 | -7.793 | 2.662 |
| 77 | 5853.860 | 1428.340 | 211 | 5852.730 | 1425.810 | 1.128 | 2.531 |
| 78 | 7537.620 | 1801.490 | 212 | 7538.250 | 1797.740 | -.629 | 3.753 |
| 79 | 7050.920 | 1658.380 | 213 | 7051.740 | 1653.220 | -.821 | 5.159 |
| 80 | 6453.360 | 1512.670 | 214 | 6452.990 | 1509.990 | .361 | 2.675 |
| 81 | 5915.010 | 1404.110 | 215 | 5915.550 | 1417.970 | -.540 | -13.866 |
| 82 | 6235.300 | 1517.920 | 216 | 6235.010 | 1513.110 | .288 | 4.807 |
| 83 | 5989.010 | 1464.070 | 217 | 5994.860 | 1463.720 | -5.842 | .359 |
| 84 | 7608.550 | 1848.500 | 218 | 7608.170 | 1844.610 | .375 | 3.891 |
| 85 | 7561.750 | 1820.940 | 219 | 7561.000 | 1821.740 | .745 | -.796 |
| 86 | 6052.660 | 1449.070 | 220 | 6173.770 | 1475.730 | -121.103 | -26.658 |
| 87 | 6099.020 | 1474.990 | 221 | 6031.300 | 1458.700 | 67.724 | 16.285 |
| 88 | 8460.810 | 2009.610 | 222 | 8460.400 | 2007.170 | .410 | 2.442 |
| 89 | 6710.720 | 1619.230 | 223 | 6711.740 | 1614.330 | -1.022 | 4.904 |
| 90 | 6397.150 | 1569.090 | 224 | 6400.740 | 1571.390 | -3.591 | -2.293 |
| 91 | 7582.380 | 1793.230 | 225 | 7590.510 | 1795.440 | -8.130 | -2.209 |
| 92 | 6562.640 | 1546.810 | 226 | 6561.390 | 1547.630 | 1.255 | -.813 |
| 93 | 6377.940 | 1557.750 | 227 | 6376.120 | 1507.000 | 1.818 | 50.753 |
| 94 | 7703.200 | 1796.150 | 228 | 7702.320 | 1798.670 | .881 | -2.513 |
| 95 | 6989.100 | 1615.740 | 229 | 6989.100 | 1617.270 | -.006 | -1.535 |
| 96 | 6029.830 | 1408.390 | 230 | 6027.190 | 1406.790 | 2.646 | 1.599 |
| 97 | 7272.510 | 1669.990 | 231 | 7330.290 | 1681.080 | -57.781 | -11.089 |
| 98 | 6253.260 | 1488.650 | 232 | 6251.040 | 1486.760 | 2.213 | 1.887 |
| 99 | 8156.270 | 1981.400 | 233 | 8165.820 | 1983.590 | -9.547 | -2.187 |
| 100 | 6809.270 | 1606.030 | 234 | 6799.650 | 1594.900 | 9.618 | 11.138 |
| 101 | 6218.570 | 1403.840 | 235 | 6212.840 | 1401.270 | 5.729 | 2.571 |
| 102 | 7101.520 | 1668.650 | 236 | 7102.410 | 1667.300 | -.887 | 1.342 |
| 103 | 7005.770 | 1590.520 | 237 | 7006.270 | 1597.460 | -.504 | -6.937 |
| 104 | 7065.890 | 1670.730 | 238 | 7064.800 | 1667.680 | 1.092 | 3.052 |
| 105 | 6497.570 | 1428.620 | 239 | 6497.170 | 1428.760 | .393 | -.142 |
| 106 | 6882.110 | 1599.200 | 240 | 6875.420 | 1594.030 | 6.697 | 5.167 |
| 107 | 7426.670 | 1777.910 | 241 | 7427.260 | 1768.020 | -.595 | 9.886 |
| 108 | 7133.140 | 1709.100 | 242 | 7129.230 | 1709.880 | 3.913 | -.780 |
| 109 | 7789.480 | 1925.560 | 243 | 7787.020 | 1924.560 | 2.450 | .996 |
| 110 | 6459.070 | 1570.850 | 244 | 6459.720 | 1566.310 | -.652 | 4.533 |
| 111 | 7419.610 | 1780.630 | 245 | 7419.800 | 1780.460 | -.187 | .170 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

EXHIBIT 4-25
PAGE 1 OF 4

PRODUCT TO INPUT COMPARISONS

ACCOUNTABILITY

27-Aug-79 10:00 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 112 | 7641.270 | 1806.700 | 246 | 7638.330 | 1804.710 | 2.949 | 1.995 |
| 113 | 7072.120 | 1666.470 | 247 | 7065.870 | 1662.520 | 6.252 | 3.950 |
| 114 | 7238.590 | 1704.180 | 248 | 7238.730 | 1698.580 | -.142 | 5.601 |
| 115 | 7617.700 | 1752.070 | 249 | 7624.060 | 1752.380 | -6.364 | -.310 |
| 116 | 6746.430 | 1589.460 | 250 | 6770.610 | 1593.360 | -24.187 | -3.906 |
| 117 | 7498.920 | 1798.920 | 251 | 7497.000 | 1799.120 | 1.918 | -.202 |
| 118 | 7649.730 | 1866.690 | 252 | 7648.550 | 1869.370 | 1.177 | -2.684 |
| 119 | 7833.070 | 1858.940 | 253 | 7819.810 | 1859.550 | 13.261 | -.608 |
| 120 | 6975.940 | 1633.280 | 254 | 6974.300 | 1632.390 | 1.642 | .887 |
| 121 | 7061.260 | 1701.200 | 255 | 7060.010 | 1700.360 | 1.246 | .841 |
| 122 | 7246.850 | 1744.680 | 256 | 7243.740 | 1743.540 | 3.116 | 1.141 |
| 123 | 6874.210 | 1632.830 | 257 | 6873.730 | 1632.330 | .478 | .501 |
| 124 | 7546.140 | 1764.590 | 258 | 7543.260 | 1766.880 | 2.878 | -2.294 |
| 125 | 7465.350 | 1757.420 | 259 | 7463.740 | 1756.660 | 1.607 | .761 |
| 126 | 7326.880 | 1740.650 | 260 | 7325.700 | 1737.670 | 1.176 | 2.978 |
| 127 | 7104.120 | 1713.440 | 261 | 7080.230 | 1710.050 | 23.896 | 3.394 |
| 128 | 6481.330 | 1547.550 | 262 | 6478.180 | 1548.200 | 3.145 | -.649 |
| 129 | 8013.630 | 1937.940 | 263 | 8007.100 | 1935.030 | 6.528 | 2.909 |
| 130 | 7388.870 | 1795.640 | 264 | 7385.920 | 1793.210 | 2.952 | 2.431 |
| 131 | 7709.680 | 1910.070 | 265 | 7707.080 | 1909.020 | 2.604 | 1.054 |
| 132 | 7560.650 | 1852.890 | 266 | 7559.670 | 1850.290 | .980 | 2.597 |
| 133 | 7278.420 | 1737.290 | 267 | 7280.710 | 1748.090 | -2.287 | -10.799 |
| 134 | 7797.140 | 1849.480 | 268 | 7796.390 | 1856.270 | .750 | -6.789 |
| 136 | 8626.740 | 1998.210 | 269 | 8636.520 | 2000.030 | -9.780 | -1.816 |
| 137 | 9790.220 | 2333.790 | 270 | 9806.050 | 2330.020 | -15.835 | 3.773 |
| 138 | 4.083 | .917 | 271 | 802.557 | 4.881 | -798.474** | -3.964 |
| 140 | -11.837 | -2.409 | 273 | -.769 | -.165 | -11.068 | -2.245 |
| 141 | 7437.770 | 1461.370 | 274 | 7388.320 | 1443.220 | 49.447 | 18.152 |
| 142 | 8899.490 | 1884.290 | 275 | 8992.030 | 1903.490 | -92.536 | -19.200 |
| 143 | 8373.090 | 1902.530 | 276 | 8368.640 | 1909.220 | 4.445 | -6.684 |
| 144 | 7142.820 | 1668.780 | 277 | 7137.520 | 1658.610 | 5.297 | 10.170 |
| 145 | 7675.830 | 1829.760 | 278 | 7670.580 | 1820.480 | 5.251 | 9.284 |
| 146 | 6983.730 | 1617.290 | 279 | 6986.810 | 1614.150 | -3.080 | 3.139 |
| 147 | 8086.410 | 1634.180 | 280 | 8079.310 | 1638.050 | 7.101 | -3.864 |
| 148 | 5653.080 | 1206.420 | 281 | 5652.060 | 1202.560 | 1.025 | 3.869 |
| 149 | 7129.100 | 1565.340 | 282 | 7126.080 | 1535.680 | 3.018 | 29.659 |
| 150 | 9520.160 | 2131.180 | 283 | 9526.780 | 2102.820 | -6.614 | 28.364 |
| 151 | 7972.640 | 1777.740 | 284 | 7967.170 | 1771.630 | 5.466 | 6.109 |
| 152 | 6068.200 | 1367.350 | 285 | 6078.330 | 1361.380 | -10.131 | 5.970 |
| 153 | 7442.650 | 1734.880 | 286 | 7443.010 | 1729.740 | -.362 | 5.142 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

PRODUCT TO INPUT COMPARISONS

ACCOUNTABILITY

27-Aug-79 10:05 AM

| PRODUCT BATCHES | | | INPUT BATCHES | | | PRODUCT - INPUT | |
|---|---|---|---|---|---|---|---|
| BATCH NO. | SOLUTION (KG) | URANIUM (KG) | BATCH NO. | SOLUTION (KG) | URANIUM (KG) | SOLUTION (KG) | URANIUM (KG) |
| 154 | 7885.960 | 1879.070 | 287 | 7884.740 | 1871.720 | 1.219 | 7.349 |
| 155 | 6930.770 | 1646.410 | 288 | 6932.170 | 1642.760 | -1.399 | 3.643 |
| 156 | 8738.670 | 2069.320 | 289 | 8738.870 | 2062.160 | -.194 | 7.155 |
| 157 | 7752.080 | 1735.460 | 290 | 7748.430 | 1739.450 | 3.656 | -3.988 |
| 158 | 8414.150 | 1914.220 | 291 | 8411.010 | 1921.180 | 3.133 | -6.964 |
| 159 | 9672.710 | 2209.440 | 292 | 9680.370 | 2200.780 | -7.651 | 8.661 |
| 160 | 8439.010 | 1950.000 | 293 | 8456.180 | 1943.380 | -17.167 | 6.624 |
| 161 | 7543.430 | 1691.920 | 294 | 7557.970 | 1699.840 | -14.541 | -7.919 |
| 162 | 7692.240 | 1747.370 | 295 | 7688.520 | 1751.450 | 3.717 | -4.086 |
| 163 | 7749.740 | 1729.660 | 296 | 7744.430 | 1737.250 | 5.309 | -7.589 |
| 164 | 7887.130 | 1745.420 | 297 | 7880.430 | 1746.730 | 6.703 | -1.308 |
| 165 | 8030.380 | 1857.430 | 298 | 8026.180 | 1847.520 | 4.198 | 9.906 |
| 166 | 7293.480 | 1701.200 | 299 | 7292.080 | 1696.050 | 1.405 | 5.154 |
| 167 | 8568.220 | 1936.080 | 300 | 8566.980 | 1967.700 | 1.244 | -31.624 |
| 168 | 7774.490 | 1764.190 | 301 | 7770.460 | 1782.270 | 4.034 | -18.086 |
| 169 | 7585.260 | 1784.660 | 302 | 7590.130 | 1787.630 | -4.872 | -2.966 |
| 170 | 7730.780 | 1894.580 | 303 | 7737.040 | 1905.630 | -6.256 | -11.050 |
| 171 | 7231.210 | 1779.890 | 304 | 7236.890 | 1771.760 | -5.679 | 8.135 |
| 172 | 7417.020 | 1823.990 | 305 | 7420.230 | 1828.790 | -3.207 | -4.796 |
| 173 | 7178.210 | 1776.820 | 306 | 7178.330 | 1762.670 | -.117 | 14.155 |
| 174 | 7497.430 | 1824.350 | 307 | 7497.390 | 1829.050 | .047 | -4.697 |
| 175 | 7634.690 | 1903.710 | 308 | 7633.030 | 1900.180 | 1.665 | 3.526 |
| 176 | 7802.690 | 1964.950 | 309 | 7801.570 | 1953.620 | 1.125 | 11.336 |
| 177 | 7686.990 | 1932.820 | 310 | 7683.740 | 1928.520 | 3.249 | 4.295 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

PRODUCT TO INPUT COMPARISONS

ACCOUNTABILITY

**SUMMARY REPORT**

PRODUCT - INPUT

| | SOLUTION (KG) | URANIUM (KG) |
|---|---|---|
| N: | 103 | 104 |
| AVERAGE: | -2.2530 | 1.6019 |
| SIGMA: | 20.4393 | 9.8218 |
| ACCEPTABLE RANGE: | -150.0000 TO 150.0000 | -75.0000 TO 75.0000 |

THIS SUMMARY INCLUDES 104 BATCHES

CONCENTRATION COMPARISONS

BATCHES 206 TO 272

29-Aug-79 02:26 PM

| BATCH | MSID | VP | DIFFERENCE |
|---|---|---|---|
| 206 | 189.2500 | 190.7600 | -1.5100 |
| 207 | 186.6500 | 186.7100 | -.0600 |
| 208 | 218.6100 | 218.8200 | -.2100 |
| 209 | 231.9500 | 233.4500 | -1.5000 |
| 210 | 238.3700 | 239.1700 | -.8000 |
| 211 | 241.9000 | 242.1200 | -.2200 |
| 212 | 236.7000 | 239.0100 | -2.3100 |
| 213 | 234.6600 | 234.9800 | -.3200 |
| 214 | 232.4100 | 234.1200 | -1.7100 |
| 215 | 238.0800 | 238.9900 | -.9100 |
| 216 | 242.2300 | 242.2100 | .0200 |
| 217 | 243.6100 | 243.7400 | -.1300 |
| 218 | 242.0500 | 242.5600 | -.5100 |
| 219 | 240.8200 | 241.0700 | -.2500 |
| 220 | 239.2300 | 239.3000 | -.0700 |
| 221 | 241.3000 | 241.5500 | -.2500 |
| 222 | 236.2800 | 237.6000 | -1.3200 |
| 223 | 239.2600 | 240.0300 | -.7700 |
| 224 | 245.1800 | 244.8100 | .3700 |
| 225 | 236.4000 | 237.3100 | -.9100 |
| 226 | 235.5500 | 236.0100 | -.4600 |
| 227 | 238.3400 | 236.3100 | 2.0300 |
| 228 | 232.5900 | 233.7800 | -1.1900 |
| 229 | 230.3500 | 231.6600 | -1.3100 |
| 230 | 232.4900 | 233.2000 | -.7100 |
| 231 | 229.7500 | 229.6500 | .1000 |
| 232 | 235.8300 | 236.9900 | -1.1600 |
| 233 | 240.9700 | 242.3700 | -1.4000 |
| 234 | 234.7500 | 235.3000 | -.5500 |
| 235 | 225.7000 | 226.6300 | -.9300 |
| 236 | 233.2300 | 234.0200 | -.7900 |
| 237 | 227.0900 | 228.6200 | -1.5300 |
| 238 | 234.7400 | 235.2700 | -.5300 |
| 239 | 220.9800 | 221.5500 | -.5700 |
| 240 | 229.7600 | 230.7900 | -1.0300 |
| 241 | 237.0400 | 237.4000 | -.3600 |
| 242 | 237.0200 | 239.5800 | -2.5600 |
| 243 | 245.5600 | 246.4400 | -.8800 |
| 244 | 242.3800 | 242.9400 | -.5600 |
| 245 | 237.9800 | 240.2600 | -2.2800 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

CONCENTRATION COMPARISONS

BATCHES 206 TO 272

29-Aug-79 02:26 PM

| BATCH | MSID | VF | DIFFERENCE |
|---|---|---|---|
| 246 | 235.8400 | 236.6900 | -.8500 |
| 247 | 234.6700 | 235.4700 | -.8000 |
| 248 | 232.9700 | 234.7400 | -1.7700 |
| 249 | 230.2600 | 230.3600 | -.1000 |
| 250 | 233.6600 | 234.8200 | -1.1600 |
| 251 | 238.1100 | 239.4800 | -1.3700 |
| 252 | 243.2600 | 243.8900 | -.6300 |
| 253 | 237.3500 | 238.4500 | -1.1000 |
| 254 | 234.8800 | 234.5500 | .3300 |
| 255 | 239.1100 | 240.1800 | -1.0700 |
| 256 | 239.0000 | 240.6500 | -1.6500 |
| 257 | 237.9000 | 237.8400 | .0600 |
| 258 | 233.7500 | 234.5400 | -.7900 |
| 259 | 233.3800 | 235.2800 | -1.9000 |
| 260 | 237.6400 | 237.0300 | .6100 |
| 261 | 240.2400 | 241.0600 | -.8200 |
| 262 | 238.1700 | 239.1900 | -1.0200 |
| 263 | 240.0000 | 241.4700 | -1.4700 |
| 264 | 241.8000 | 242.6700 | -.8700 |
| 265 | 246.3000 | 247.1900 | -.8900 |
| 266 | 243.6600 | 244.9700 | -1.3100 |
| 267 | 239.8000 | 240.6200 | -.8200 |
| 268 | 236.7200 | 238.3500 | -1.6300 |
| 269 | 232.3300 | 232.7500 | -.4200 |
| 270 | 236.7500 | 237.2500 | -.5000 |
| 271 | 212.3100 | 213.6300 | -1.3200 |

** INDICATES EXTREME VALUE OMITTED FROM SUMMARY

CONCENTRATION COMPARISONS

**********
SUMMARY REPORT
**********

DIFFERENCE

| | |
|---|---|
| N: | 66 |
| AVERAGE: | -.8076 |
| SIGMA: | .7414 |
| ACCEPTABLE RANGE: | -6.6700 TO 5.3300 |

THIS SUMMARY INCLUDES 66 BATCHES

## SUMMARY OF MEASUREMENT POINT STANDARD DEVIATION

29-Aug-79 02:05 PM

| STANDARD DEVIATION | TANK 02003 BATCHES 206- 315 | TANK 02007 BATCHES 72- 186 | TANK 02023 BATCHES 159- 253 | TANK 02028 BATCHES 564- 740 |
|---|---|---|---|---|
| COMBINED FOR MEASUREMENT POINT | 75.0032 | 140.219 | 4.81561 | 15.7669 |
| NET KILOGRAM SOLUTION MEASUREMENT: RANDOM | 3.97322 | 4.06 | 2.68 | 3.81 |
| NET KILOGRAM SOLUTION MEASUREMENT: SYSTEMATIC | 2.33238 | 3.96989 | 20 | 11.6387 |
| SAMPLING AND ANALYSIS: RANDOM - FIRST METHOD | .616441 | .99 | .17 | 1.3 |
| SAMPLING AND ANALYSIS: RANDOM - SECOND METHOD | 1.3 | 1.3 | .17 | 1.3 |
| ANALYSIS: SYSTEMATIC - FIRST METHOD | 0 | 0 | .01772 | .0696707 |
| ANALYSIS: SYSTEMATIC - SECOND METHOD | .01772 | .01772 | .01 | .01 |
| SAMPLING: SYSTEMATIC | .00004 | .00029 | .01 | .01 |

EXHIBIT 4-27
PAGE 1 OF 1

## LIMIT OF ERROR SUMMARY

29-Aug-79 02:06 PM

| MATERIAL BALANCE COMPONENT | TOTAL KGU | LIMIT OF ERROR (KGU) | LIMIT OF ERROR (% OF INPUT) |
|---|---|---|---|
| BEGINNING INVENTORY | 11118 | 100 | .0567991 |
| INPUT (02003) BATCHES 206 - 315 | 176059 | 150.006 | .0852024 |
| PRODUCT (02007) BATCHES 72 - 186 | 185777 | 280.439 | .159287 |
| WASTE (02023) BATCHES 159 - 253 | 251.309 | 9.63121 | .00547045 |
| WASTE (02028) BATCHES 564 - 740 | 572.397 | 31.5338 | .0179109 |
| ENDING INVENTORY | 531 | 18 | .0102238 |
| TOTAL (INVENTORY DIFFERENCE) | 45.3715 | 335.498 | .19056 |

EXHIBIT 4-28
PAGE 1 OF 1

REPORT NO. AGNS-35900-2.2-22

# NUCLEAR MATERIALS CONTROL AND ACCOUNTING SYSTEM DEVELOPMENT

## APPENDIX O

## RTP-INSTRUMENT IDENTIFICATION AND CORRELATION TABLES

John M. Crawford

November 1979

ALLIED-GENERAL NUCLEAR SERVICES
POST OFFICE BOX 847
BARNWELL, SOUTH CAROLINA 29812

TABLE O-1

RTP DATA ACQUISITION SYSTEM

RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-01 Feed Surge Tank 17-D-113 | LR-121 | Taylor | 0-135"$H_2O$ | 3 | | | 105"$H_2O$ | 11 | 81 | |
| | DR-164 | Taylor | 10-19"$H_2O$ | 3 | 10.47" | | | 12 | 90 | |
| | TJR-108-9 | Type K | | 1 | | | | 45 | 356 | |
| 2-02 Dissolver Flush Accumulator 17-D-111 | LR-128 | Taylor | 0-290" | 3 | | | | 10 | 78 | |
| | DR-167 | Taylor | 10-19" | 3 | 9.93" | | | 11 | 83 | |
| | TJR-108-11 | Type K | | 1 | | | | 45 | 358 | |
| 2-03 Accountability Tank 18-D-101 | LR-125 | Taylor | 0-215"$H_2O$ | 2 | | | 183"$H_2O$ | 9 | 66 | |
| | LR-125R | Ruska | 0-10 psi | 2 | | | | | | RTP-03 (2000) |
| | DR-166 | Taylor | 10-19"$H_2O$ | 2 | 9.94" | | | 11 | 82 | |
| | DR-166R | Ruska | 0-10 psi | 2 | 9.94" | | | | | RTP-03 (2001) |
| | TJR-108-10 | Type K | | 1 | | | | 45 | 357 | |
| | TI-109 | Type K | | 1 | | | | | | 419 (T/C Direct) |
| | DT-16631 | Westinghouse | 0-19"$H_2O$ | 2 | 10.00" | | | 24 | 187 | (New Den Instr.) |
| 2-04 1 SF Tank 42-D-433 | LR-420 | Taylor | 0-129"$H_2O$ | 3 | | | 102"$H_2O$ | 33 | 261 | |
| | DR-439 | Taylor | 9-14"$H_2O$ | 3 | 9.93" | | | 33 | 258 | |
| | AR-401 | Monitor | | 1 | | | | 33 | 259 | |
| | AR-402 | $NO_2$ Monitor | | 1 | | | | 33 | 260 | |
| 2-05 No. 1 Feed Adjustment Tank 17-D-103 | LR-129 | Taylor | 0-285"$H_2O$ | 2 | | | | 10 | 76 | |
| | DR-168 | Taylor | 10-19"$H_2O$ | 2 | 9.95" | | | 10 | 74 | |
| | TJR-108-12 | Type K | | 1 | | | | 45 | 359 | |
| | LT-129S1 | Westinghouse | 0-285"$H_2O$ | 2 | | | | 16 | 126 | |
| | DT-168S1 | Westinghouse | 10-19"$H_2O$ | 2 | 9.95" | | | 16 | 127 | |
| | LT-129S2 | L&N | 0-285"$H_2O$ | 2 | | | | 20 | 155 | |
| | DT-168S2 | L&N | 10-19"$H_2O$ | 2 | 9.95" | | | 20 | 156 | |
| 2-06 No. 2 Feed Adjustment Tank 17-D-104 | LR-130 | Taylor | 0-285"$H_2O$ | 2 | | | | 9 | 65 | |
| | DR-169 | Taylor | 10-19"$H_2O$ | 2 | 10.12" | | | 9 | 68 | |
| | TJR-108-13 | Type K | | 1 | | | | 46 | 360 | |
| | LT-130S1 | Westinghouse | 0-130"$H_2O$ | 2 | | | | 20 | 159 | |
| | LT-130S2 | Rosemont | 0-285"$H_2O$ | 2 | | | | 24 | 188 | |
| | DT-169S2 | Rosemont | 10-19"$H_2O$ | 2 | 10.12" | | | 24 | 189 | |
| 2-07 Uranium Product Sample Tank 24-D-204 | LR-235 | Taylor | 0-130"$H_2O$ | 2 | | | 75"$H_2O$ | 15 | 117 | |
| | DR-269 | Taylor | 10-19"$H_2O$ | 2 | 9.83" | | | 16 | 120 | |
| | LR-235R | Ruska | 0-10 psi | 2 | | | | | | RTP-03 (2002) |
| | DR-269R | Ruska | 0-10 psi | 2 | 9.83" | | | | | RTP-03 (2003) |
| | TJR-108-14 | Type K | | 1 | | | | | 423 | |
| 2-08 Plutonium Rework Tank 32-D-301 | LR-309 | Taylor | 0-150"$H_2O$ | 3 | | | 90"$H_2O$ | 18 | 140 | |
| | DR-335 | Taylor | 10-18"$H_2O$ | 3 | 9.93" | | | 18 | 143 | |
| | TJR-305-3 | Type K | | 1 | | | | 49 | 384 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-09 | LR-239 | Taylor | 0-97"$H_2O$ | 2 | | 7.3" | 73"$H_2O$ | 17 | 129 | |
| Uranium Product | LT-239S | Westinghouse | 0-97"$H_2O$ | 2 | | | | 20 | 157 | |
| Sample Tank | DR-273 | Taylor | 10-19"$H_2O$ | 2 | 10.10" | | | 17 | 130 | |
| 24-D-203 | DT-273S | West. | 10-19"$H_2O$ | 2 | 10.10" | | | 20 | 158 | |
| | TJR-206-17 | Type K | | 1 | | | | 47 | 370 | |
| | | | | | | | | | | |
| 2-10 | LR-326 | Taylor | 0-105"$H_2O$ | 2 | | | 100"$H_2O$ | 21 | 161 | |
| Plutonium Product | LR-326R | Ruska | Not Installed | 2 | | | | | | |
| Sample Tank | DR-374 | Taylor | 12.5-20.5 $H_2O$ | 2 | 10.0" | | | 21 | 162 | |
| 34-D-303 | TJR-305-8 | Type K | | 1 | | | | 49 | 389 | |
| | | | | | | | | | | |
| 2-11 | LR-301 | Taylor | 0-190"$H_2O$ | 2 | | 10"$H_2O$ | 180"$H_2O$ | 21 | 165 | |
| No. 1 | LR-301R | Ruska | *Not Installed | 2 | | | | | | RTP-03 (2001) |
| Plutonium Product | DR-304 | Taylor | 12.5-20.5"$H_2O$ | 2 | 8.98 | | | 21 | 160 | |
| Storage Tank | DR-304R | Ruska | *Not Installed | | | | | | | RTP-03 (2000) |
| 35-D-304 | TJR-305-9 | Type K | | 1 | | | | 49 | 390 | |
| | | | | | | | | | | |
| 2-12 | LR-302 | Taylor | 0-190"$H_2O$ | 2 | | 10"$H_2O$ | 180"$H_2O$ | 21 | 164 | |
| No. 2 | LR-302R | Ruska | Not Installed | 2 | | | | | | |
| Plutonium Product | DR-321 | Taylor | 12.5-20.5 | 2 | 9.26 | | | 22 | 171 | |
| Storage Tank | TJR-305-10 | Type K | | 1 | | | | 49 | 391 | |
| 35-D-305 | | | | | | | | | | |
| 2-13 | LR-303 | Taylor | 0-190"$H_2O$ | 2 | | 10"$H_2O$ | 180"$H_2O$ | 25 | 198 | |
| No. 3 | LR-303R | Ruska | Not Installed | 2 | | | | | | |
| Plutonium Product | DR-321 | Taylor | 12.5-20.5"$H_2O$ | 2 | 8.80 | | | 25 | 199 | |
| Storage Tank | TJR-305-11 | Type K | | 1 | | | | 50 | 392 | |
| 35-D-306 | | | | | | | | | | |
| 2-15 | LR-522 | Taylor | 0-160"$H_2O$ | 3 | | | 110"$H_2O$ | 32 | 248 | |
| No. 1 Solvent | DR-530 | Taylor | 8-10"$H_2O$ | 3 | 9.90" | | | 31 | 245 | |
| System Feed Tank | TJR-504-5 | Type K | | 1 | | | | 47 | 375 | |
| 51-D-502 | | | | | | | | | | |
| 2-16 | LR-507 | Taylor | 0-155"$H_2O$ | 3 | | | 110"$H_2O$ | 26 | 200 | |
| No. 2 Solvent | DR-510 | Taylor | 6-10"$H_2O$ | 3 | 9.88" | | | 27 | 214 | |
| System Feed Tank | TJR-509-8 | Type K | | 1 | | | | 48 | 378 | |
| 52-D-503 | | | | | | | | | | |
| 2-17 | LR-305 | Taylor | 0-120"$H_2O$ | 3 | | 18"$H_2O$ | 90"$H_2O$ | 17 | 131 | |
| 1BP Surge Tank | DR-329 | Taylor | 9-14"$H_2O$ | 3 | 10.22" | | | 19 | 144 | |
| 32-D-307 | TJR-305-1 | Type K | | 1 | | | | 48 | 382 | |
| | | | | | | | | | | |

*To be installed for PM/PS Demo.

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-20 Carbonate Diversion Tank 51-D-501 | LR-516 | Taylor | 0-57"$H_2O$ | 3 | | | 40"$H_2O$ | 29 | 227 | |
| | DR-523 | Taylor | 13.6-17.7"$H_2O$ | 3 | 16.83" | | | 30 | 233 | |
| | TJR-509-2 | Type K | | 1 | | | | 47 | 372 | |
| 2-21 Solvent Batch Stripping Tank 42-D-401 | LR-401 | Taylor | 0-81.7"$H_2O$ | 3 | | | 48"$H_2O$ | 27 | 212 | |
| | DR-401 | Taylor | 15.8-20.8 | 3 | 19.80" | | | 26 | 201 | |
| | TJR-509-9 | Type K | | 1 | | | | 48 | 379 | |
| 2-22 Solvent Burner Feed Tank 42-D-402 | LR-402 | Taylor | 0-147"$H_2O$ | 3 | | 10"$H_2O$ | 110"$H_2O$ | 26 | 207 | |
| | DR-402 | Taylor | 16.4-24"$H_2O$ | 3 | 19.87" | | | 26 | 204 | |
| | TJR-509-12 | Type K | | 1 | | | | 48 | 381 | |
| 2-23 HWW Sample Tank 41-D-405 | LR-419 | Taylor | 0-204"$H_2O$ | 2 | | | 185"$H_2O$ | 33 | 262 | |
| | LR-419 W | Westinghouse | 0-204"$H_2O$ | 2 | | | | 4 | 59 | |
| | DR-430 | Taylor | 10-15"$H_2O$ | 2 | 9.50" | | | 33 | 263 | |
| | DR-430 W | Westinghouse | 10-15"$H_2O$ | 2 | 9.50" | | | 4 | 60 | |
| | TJR-414-5 | Type K | | 1 | | | | 50 | 395 | |
| 2-24 LAWB Check Tank 42-D-434 | LR-427 | Taylor | 0-87"$H_2O$ | 3 | | | | 36 | 281 | |
| | DR-448 | Taylor | 9-14"$H_2O$ | 3 | 10.48" | | | 35 | 276 | |
| | TJR-414-10 | Type K | | 1 | | | | 51 | 400 | |
| 2-25 Recovered Acid Storage Tank 62-D-605 | LR-617 | Taylor | 0-345"$H_2O$ | 1 | | 34.5"$H_2O$ | 310"$H_2O$ | 1 | 1 | |
| | DR-646 | Taylor | 10-16"$H_2O$ | 1 | 9.91" | | | 1 | 0 | |
| | TJR-607-1 | Type K | | 1 | | | | 45 | 352 | |
| 2-26 Service Conc. Feed Tank 44-D-459 | LR-428 | Taylor | 0-57"$H_2O$ | 1 | | 12"$H_2O$ | 43"$H_2O$ | 41 | 321 | |
| | RR-456 | $\gamma$ Monitor | | 1 | | | | 41 | 322 | |
| 2-27 Service Conc. Ck. Tank 44-D-460 | LI-431A | Taylor | 0-75.2"$H_2O$ | 1 | | | | 42 | 331 | |
| | TJR-415-22 | Type K | | 1 | | | | 52 | 415 | |
| 2-28 GPW Check Tank 43-D-409 | LR-412 | Taylor | 0-71.3"$H_2O$ | 2 | | | 50"$H_2O$ | 43 | 340 | |
| | LR-412 W | Westinghouse | 0-71.3"$H_2O$ | 2 | | | | 4 | 61 | |
| | DR-416 | Taylor | 8-14"$H_2O$ | 2 | 9.86" | | | 43 | 336 | |
| | DR-416 W | Westinghouse | 8-14"$H_2O$ | 2 | 9.86" | | | 4 | 62 | |
| | TJR-415-7 | Type K | | 1 | | | | 52 | 409 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | TB NO. | CH NO. | |
| 2-29 Sump Collection Tank 43-D-412 | LR-406 | Taylor | 0-169"$H_2O$ | 3 | | | 100"$H_2O$ | 44 | 346 | |
| | DR-411 | Taylor | 10-16"$H_2O$ | 3 | 9.84" | | | 43 | 337 | |
| | TJR-415-4 | Type K | | 1 | | | | 51 | 406 | |
| | LT-406S | Westinghouse | 0-169"$H_2O$ | 3 | | | | 12 | 95 | |
| | DT-411S | Westinghouse | 10-16"$H_2O$ | 3 | 9.84" | | | 16 | 123 | |
| 2-32 1BU Recycle Tank 21-D-210 | LI-209 | Taylor | 0-61"$H_2O$ | 3 | | | 55"$H_2O$ | 5 | 39 | |
| 2-33 1BX Anolyte Feed Tank 21-D-213 | LI-210 | Taylor | 0-41"$H_2O$ | 1 | | 10"$H_2O$ | | 5 | 33 | |
| | TJR-206-6 | Type K | | 1 | | | | 46 | 366 | |
| 2-34 HAW Surge Tank 41-D-417 | LR-417 | Taylor | 0-117"$H_2O$ | 3 | | | 105"$H_2O$ | 30 | 238 | |
| | DR-426 | Taylor | 10-15"$H_2O$ | 3 | 10.09" | | | 30 | 237 | |
| | TJR-414-3 | Type K | | 1 | | | | 50 | 393 | |
| 2-35 LAW Concentrator Feed Tank 42-D-406 | LR-425 | Taylor | 0-92"$H_2O$ | 3 | | | 75"$H_2O$ | 35 | 274 | |
| | DR-445 | Taylor | 8-13"$H_2O$ | 3 | 9.91" | | | 34 | 264 | |
| | TJR-414-7 | Type K | | 3 | | | | 50 | 397 | |
| 2-36 G. P. Concentrator Feed Tank 43-D-408 | LR-405 | Taylor | 0-145"$H_2O$ | 3 | | | 120"$H_2O$ | 44 | 345 | |
| | DR-410 | Taylor | 7-12"$H_2O$ | 3 | 10.10" | | | 43 | 342 | |
| | TJR-415-2 | Type K | | 1 | | | | 51 | 404 | |
| | LT-405S | Westinghouse | 0-145"$H_2O$ | 3 | | | | 12 | 93 | |
| | DT-410S | Westinghouse | 7-12"$H_2O$ | 3 | 10.10" | | | 12 | 94 | |
| 2-37 No. 1 Iodine Scrubber 45-K-425 | LR-465 | Taylor | 0-49"$H_2O$ | 1 | | | 40"$H_2O$ | 37 | 292 | |
| | LI-464 | Taylor | 0-5"$H_2O$ | 1 | | 4"$H_2O$ | | 38 | 299 | |
| | DR-4137 | Taylor | 9-14"$H_2O$ | 1 | 9.37" | | | 37 | 288 | |
| | TJR-415-9 | Type K | | 1 | | | | 52 | 411 | |
| 2-38 No. 2 Iodine Scrubber 45-K-425 | LR-470 | Taylor | 0-49"$H_2O$ | 1 | | | 42"$H_2O$ | 39 | 306 | |
| | LI-469 | Taylor | 0-5"$H_2O$ | 1 | | 1"$H_2O$ | | 37 | 290 | |
| | DR-4142 | Foxboro | 9-12"$H_2O$ | 1 | 9.92" | | | 37 | 294 | |
| | TJR-415-3 | Type K | | 1 | | | | 51 | 405 | |
| 2-39 Acid Fractionator Diversion Tank 54-D-506 | LR-530 | Taylor | 0-180"$H_2O$ | 1 | | | 160"$H_2O$ | 44 | 344 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-40 | LR-607 | Taylor | 0-150"$H_2O$ | 1 | | 30"$H_2O$ | 105"$H_2O$ | 2 | 14 | |
| Dissolver Acid | DR-615 | Taylor | 10-15"$H_2O$ | 1 | 10.00" | | | 2 | 13 | |
| Surge Tank | AR-605 | $\eta$ Monitor | | 1 | | | | 3 | 18 | |
| 61-D-602 | AR-606 | $\eta$ Monitor | | 1 | | | | 2 | 15 | |
| 2-41 | LR-604 | Taylor | 0-115"$H_2O$ | 1 | | 24"$H_2O$ | | 3 | 17 | |
| Hull Rinse | | | | | | | | | | |
| Surge Tank | | | | | | | | | | |
| 61-D-617 | | | | | | | | | | |
| 2-42 | LR-623 | Taylor | 0-149"$H_2O$ | 1 | | 42"$H_2O$ | 78"$H_2O$ | 1 | 5 | |
| $UF_6$ Recycle | DR-678 | Taylor | 10-15"$H_2O$ | 1 | 9.90" | | | 1 | 4 | |
| Acid Tank | | | | | | | | | | |
| 62-D-621 | | | | | | | | | | |
| 2-43 | LR-611 | Taylor | 0-80"$H_2O$ | 1 | | | 60"$H_2O$ | 3 | 16 | |
| 1UD/2UD Surge Tank | RR-620 | $\gamma$ Monitor | | 1 | | | | 1 | 6 | |
| 62-D-625 | | | | | | | | | | |
| 2-44 | LR-101 | Taylor | 0-235"$H_2O$ | 1 | | | 169"$H_2O$ | 2 | 9 | |
| No. 1 Dissolver | DR-101 | Taylor | 14-24"$H_2O$ | 1 | 14.21" | | 22.6"$H_2O$ | 2 | 8 | |
| 15-C-101 | TR-105 | Type K | | 1 | | | | | | 416 (T/C Direct) |
| 2-45 | LR-102 | Taylor | 0-235"$H_2O$ | 1 | | | 169"$H_2O$ | 11 | 86 | |
| No. 2 Dissolver | DR-102 | Taylor | 14-24"$H_2O$ | 1 | 14.43" | | 22.6"$H_2O$ | 11 | 85 | |
| 15-C-102 | TR-106 | Type K | | 1 | | | | | | 417 (T/C Direct) |
| 2-46 | LR-103 | Taylor | 0-235"$H_2O$ | 1 | | | 169"$H_2O$ | 10 | 73 | |
| No. 3 Dissolver | DR-103 | Taylor | 14-24"$H_2O$ | 1 | 14.56" | | 22.6"$H_2O$ | 12 | 89 | |
| 15-C-103 | TR-107 | Type K | | 1 | | | | | | 418 (T/C Direct) |
| 2-48 | LR-105 | Taylor | 0-330"$H_2O$ | 1 | | | 135.3"$H_2O$ | 2 | 12 | |
| No. 1 Dissolver | DR-160 | Taylor | 5-10"$H_2O$ | 1 | 4.99" | | | 2 | 11 | |
| Transfer Tank | TJR-108-1 | Type K | | 1 | | | | 45 | 353 | |
| 15-D-107 | | | | | | | | | | |
| 2-49 | LR-109 | Taylor | 0-330"$H_2O$ | 1 | | | 135.3"$H_2O$ | 10 | 72 | |
| No. 2 Dissolver | DR-161 | Taylor | 5-10"$H_2O$ | 1 | 5.02" | | | 11 | 84 | |
| Transfer Tank | TJR-108-2 | Type K | | 1 | | | | 45 | 354 | |
| 15-D-108 | | | | | | | | | | |
| 2-50 | LR-113 | Taylor | 0-330"$H_2O$ | 1 | | | 135.3"$H_2O$ | 12 | 88 | |
| No. 3 Dissolver | DR-162 | Taylor | 5-10"$H_2O$ | 1 | 5.03" | | | 11 | 87 | |
| Transfer Tank | TJR-108-3 | Type K | | 1 | | | | 45 | 355 | |
| 15-D-109 | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-52 HA Feed Tank 21-D-201 | LR-201 | Taylor | 0-260"$H_2O$ | 3 | | | 140"$H_2O$ | 9 | 64 | |
| | DR-201 | Taylor | 10-19"$H_2O$ | 3 | 9.91" | | | 9 | 69 | |
| | TJR-206-1 | Type K | | 1 | | | | 46 | 361 | |
| | LT-201S | Westinghouse | 0-260"$H_2O$ | 3 | | | | 16 | 124 | |
| | DT-201S | Westinghouse | 10-19"$H_2O$ | 3 | 9.91" | | | 16 | 125 | |
| 2-53 Uranium Product Catch Tank 24-D-202 | LR-238 | Taylor | 0-97"$H_2O$ | 3 | | | | 17 | 132 | |
| | DR-272 | Taylor | 10-19"$H_2O$ | 3 | 9.76" | | | 17 | 133 | |
| | TJR-206-16 | Type K | | 1 | | | | 47 | 369 | |
| | LT-238S | Westinghouse | 0-97"$H_2O$ | 3 | | | | 12 | 91 | |
| | DT-272S | Westinghouse | 10-19"$H_2O$ | 3 | 9.76" | | | 12 | 92 | |
| 2-54 Plutonium Product Catch Tank 34-D-302 | LR-325 | Taylor | 0-93"$H_2O$ | 3 | | 10"$H_2O$ | 85"$H_2O$ | 22 | 169 | |
| | DR-372 | Taylor | 12.5-20.5"$H_2O$ | 3 | 9.94" | | | 23 | 178 | |
| | TJR-305-7 | Type K | | 1 | | | | 49 | 388 | |
| 2-56 HWW Catch Tank 41-D-404 | LR-418 | Taylor | 0-200"$H_2O$ | 3 | | | | 33 | 256 | |
| | DR-428 | Taylor | 10-15"$H_2O$ | 3 | 9.85" | | | 34 | 268 | |
| | TJR-414-4 | Type K | | 1 | | | | 50 | 394 | |
| 2-57 Solvent Burner Quench Pot 42-D-440 | LR-403 | Taylor | 0-25"$H_2O$ | 1 | | | | 27 | 208 | |
| | DR-403 | Taylor | 8-13"$H_2O$ | 1 | | | | 25 | 195 | |
| | TJR-509-10 | Type K | | 1 | | | | 48 | 380 | |
| | TJR-509-11 | Type K | | 1 | | | | 51 | 403 | |
| 2-58 G.P. Dist. Receiver 43-D-410 | LR-413 | Taylor | 0-48"$H_2O$ | 1 | | 12"$H_2O$ | 40"$H_2O$ | 43 | 338 | |
| | RR-423 | $\gamma$ Monitor | | 1 | | | | 36 | 282 | |
| 2-59 DOG Vacuum Breaker 45-D-432 | LI-466 | Taylor | 0-91"$H_2O$ | 1 | | 78"$H_2O$ | 80"$H_2O$ | 37 | 295 | |
| 2-60 100 Filter Pump Tank 51-D-507 | LR-514 | Taylor | 0-31"$H_2O$ | 1 | | 10"$H_2O$ | 30"$H_2O$ | 30 | 232 | |
| 2-61 200 Filter Pump Tank 52-D-509 | LR-504 | Taylor | 0-31"$H_2O$ | 1 | | 10"$H_2O$ | 30"$H_2O$ | 28 | 218 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-62 Acid Fractionator Accumulator 54-D-505 | LI-529 | Taylor | 0-90"$H_2O$ | 1 | | 12"$H_2O$ | 56"$H_2O$ | 35 | 273 | |
| | TJR-414-13 | Type K | | 1 | | | | 51 | 402 | |
| | RR-555 | $\gamma$ Monitor | | 1 | | | | 35 | 279 | |
| 2-64 0.01 Molar Cold Acid Makeup Tank 62-D-620 | LR-612 | Taylor | | 3 | | | | 3 | 19 | |
| 2-66 HAW Decanter 21-D-211 | LI-203 | Taylor | 0-100"H2O | 1 | | | | 7 | 53 | |
| | DR-206 | Taylor | 8-13"H2O | 1 | 9.78" | | | 8 | 58 | |
| 2-67 1CU Decanter 21-D-212 | LI-221 | Taylor | 0-100"H2O | 1 | | | | 15 | 119 | |
| | DR-230 | Taylor | 8-13"H2O | 1 | 9.97" | | | 15 | 113 | |
| 2-68 2EU Decanter 22-D-209 | LI-230 | Taylor | 0-53"H2O | 1 | | | | 15 | 115 | |
| | DR-260 | Taylor | 8-13"H2O | 1 | 9.89" | | | 15 | 112 | |
| 2-69 Sump Collector Tank Decanter 43-D-411 | LI-409 | Taylor | 0-57"$H_2O$ | 1 | | | | 43 | 339 | |
| | DI-412 | Taylor | 7-12"$H_2O$ | 1 | 9.90" | | | 42 | 335 | |
| | TJR-415-5 | Type K | | 1 | | | | 51 | 407 | |
| 2-70 Solvent Treat Waste Decanter 51-D-511 | LI-515 | Taylor | 0-57"$H_2O$ | 1 | | | 45"$H_2O$ | 31 | 240 | |
| | DR-522 | Taylor | 36-50"$H_2O$ | 1 | 47.00" | | | 31 | 244 | |
| 2-75 HAF Headpot 21-D-241 | FR-241 | Taylor | 0-50"$H_2O$ | 1 | | | | 5 | 38 | |
| 2-76 HAP Headpot 21-D-242 | DR-207 | Taylor | 8-10"$H_2O$ | 1 | | | | 8 | 57 | |
| 2-78 1SP Metering Headpot 21-D-271 | LI-241 | Taylor | 0-29"$H_2O$ | 1 | | 3"H2O | | 7 | 48 | |
| 2-79 1BP Metering Headpot 21-D-273 | FR-205 | Taylor | 0-22.6"$H_2O$ | 1 | | 13"$H_2O$ | | 6 | 41 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-84 | TJR-305-6 | Type K | | 1 | | | | 49 | 387 | |
| 3PD K.O. Pot | AR-306 | α Monitor | | 1 | | | | 23 | 177 | |
| 34-D-378 | | | | | | | | | | |
| 2-86 | LI-468 | Taylor | 0-9"$H_2O$ | 1 | | | 6"$H_2O$ | 37 | 289 | |
| Vessel Off-Gas | | | | | | | | | | |
| K.O. Pot | | | | | | | | | | |
| 45-D-441 | | | | | | | | | | |
| 2-87 | PR-462 | Masoneilan | 3-15 psig | 1 | | | | 38 | 302 | |
| Dissolver Off-Gas | | | | | | | | | | |
| K.O. Pot | | | | | | | | | | |
| 45-D-442 | | | | | | | | | | |
| 2-88 | LI-523 | Taylor | 0-24"$H_2O$ | 1 | | | 12"$H_2O$ | 32 | 249 | |
| No. 1 Solvent | | | | | | | | | | |
| Overflow Headpot | | | | | | | | | | |
| 51-D-552 | | | | | | | | | | |
| 2-94 | LI-510 | Taylor | 0-24"$H_2O$ | 1 | | 6"$H_2O$ | 18"$H_2O$ | 27 | 211 | |
| No. 2 Solvent | | | | | | | | | | |
| Overflow Headpot | | | | | | | | | | |
| 52-D-562 | | | | | | | | | | |
| 2-103 | WR-208 | Taylor | 300-500"$H_2O$ | 1 | | | | 5 | 35 | |
| HS Column | LR-205 | Taylor | 15.5-24"$H_2O$ | 1 | | | | 5 | 34 | |
| 21-C-201 | LT-206 | Taylor | 0-40"$H_2O$ | 1 | | | 22"$H_2O$ | 7 | 51 | |
| | DR-209 | Taylor | 7-11"$H_2O$ | 1 | 9.59" | | | 5 | 37 | |
| | AR-208 | α Monitor | | 1 | | | | 5 | 32 | |
| | | | | | | | | | | |
| 2-104 | WR-224 | Taylor | 320-520"$H_2O$ | 1 | | | | 6 | 40 | |
| 1BX Column | LR-216 | Taylor | 14-23.4"$H_2O$ | 1 | | | | 6 | 42 | |
| 21-C-202 | DR-223 | Taylor | 7-11"$H_2O$ | 1 | 9.93" | | | 6 | 44 | |
| | | | | | | | | | | |
| 2-105 | WR-227 | Taylor | 275to425"$H_2O$ | 1 | | | | 6 | 46 | |
| 1C Column | LR-219 | Taylor | 14.1to22.4"$H_2O$ | 1 | | | | 14 | 106 | |
| 21-C-203 | DR-226 | Taylor | 6-11"$H_2O$ | 1 | 9.83" | | | 14 | 108 | |
| | | | | | | | | | | |
| 2-106 | WR-215 | Taylor | 0-165"$H_2O$ | 1 | | | | 6 | 45 | |
| 1BX Electrocell | LR-212 | Taylor | 8-11"$H_2O$ | 1 | | | | 6 | 47 | |
| 21-C-275 | DR-220 | Taylor | 7-11"$H_2O$ | 1 | 9.84" | | | 7 | 50 | |
| | AR-209 | α Monitor | | 1 | | | | 7 | 54 | |
| | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-107 | WR-252 | Taylor | 300-545"$H_2O$ | 1 | | | | 13 | 96 | |
| 2D Column | LR-225 | Taylor | 14.1-22.4"$H_2O$ | 1 | | | | 13 | 100 | |
| 22-C-204 | LI-224 | Taylor | 0-24"$H_2O$ | 1 | | | 22"$H_2O$ | 13 | 101 | |
| | DR-251 | Taylor | 7-11"$H_2O$ | 1 | 9.6" | | | 14 | 107 | |
| 2-108 | WR-256 | Taylor | 280-420"$H_2O$ | 1 | | | | 16 | 122 | |
| 2E Column | LR-228 | Taylor | 14.6-21.8"$H_2O$ | 1 | | | | 14 | 105 | |
| 22-C-205 | DR-257 | Taylor | 6-11"$H_2O$ | 1 | 10.01" | | | 15 | 114 | |
| 2-109 | WR-334 | Taylor | 0-548.5"$H_2O$ | 1 | | | | 20 | 153 | |
| 2A Column | LR-308 | Taylor | 7.5-27.5"$H_2O$ | 1 | | | | 19 | 149 | |
| 32-C-301 | LI-307 | Taylor | 0-20"$H_2O$ | 1 | | | 15"$H_2O$ | 19 | 150 | |
| | DR-333 | Taylor | 7-10"$H_2O$ | 1 | 19.90" | | | 19 | 146 | |
| 2-110 | WR-341 | Taylor | 0-430"$H_2O$ | 1 | | | | 19 | 147 | |
| 2B Column | LI-314 | Taylor | 0-22"$H_2O$ | 1 | | | | N/A | N/A | |
| 32-C-302 | LR-313 | Taylor | 7.3-10.9"$H_2O$ | 1 | | | 10.7"$H_2O$ | 19 | 151 | |
| | DR-340 | Taylor | 7-10"$H_2O$ | 1 | 9.9" | | | 18 | 141 | |
| | AR-303 | α Monitor | | 1 | | | | 19 | 148 | |
| 2-111 | WR-347 | Taylor | 0-548.5"$H_2O$ | 1 | | | | 23 | 180 | |
| 3A Column | LR-316 | Taylor | 13.6-24.4"$H_2O$ | 1 | | | | 22 | 168 | |
| 33-C-303 | LI-315 | Taylor | 0-45"$H_2O$ | 1 | | | 15"$H_2O$ | 24 | 185 | |
| | DR-346 | Taylor | 7-10"$H_2O$ | 1 | 9.92" | | | 23 | 181 | |
| | TJR-305-5 | Type K | | 1 | | | | 49 | 386 | |
| 2-112 | WR-352 | Taylor | 0-650"$H_2O$ | 1 | | | | 22 | 170 | |
| 3B Column | LR-320 | Taylor | 7.3-11"$H_2O$ | 1 | | | 9.5"$H_2O$ | 24 | 186 | |
| 33-C-306 | LI-327 | Taylor | 0-20"$H_2O$ | 1 | | | | 23 | 183 | |
| | DR-351 | Taylor | 7-10"$H_2O$ | 1 | 9.97" | | | 24 | 184 | |
| 2-113 | WR-358 | Taylor | 0-196"$H_2O$ | 1 | | | | 23 | 182 | |
| 3PS Diluent | LR-323 | Taylor | 12.1-22.4"$H_2O$ | 1 | | | | 21 | 163 | |
| Wash Column | LI-322 | Taylor | 0-20"$H_2O$ | | | | 15"$H_2O$ | 23 | 176 | |
| 33-C-309 | DR-357 | Taylor | 6-10"$H_2O$ | 1 | 9.97" | | | 23 | 179 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-114 | WR-442 | Taylor | 225-375"$H_2O$ | 1 | | | | 34 | 265 | |
| 1S Column | LR-422 | Taylor | 13.4-22.2"$H_2O$ | 1 | | | | 34 | 271 | |
| 42-C-401 | LI-421 | Taylor | 0-20"$H_2O$ | 1 | | | 15"$H_2O$ | 35 | 272 | |
| | DR-441 | Taylor | 7-12"$H_2O$ | 1 | 10.03" | | | 35 | 278 | |
| | | | | | | | | | | |
| 2-115 | WR-520 | Taylor | 250-340"$H_2O$ | 1 | | | | 25 | 193 | |
| 10 Column | LR-513 | Taylor | 14.2-21.4"$H_2O$ | 1 | | | | 25 | 194 | |
| 51-C-501 | LI-511 | Taylor | 0-20"$H_2O$ | 1 | | | 16"$H_2O$ | 25 | 196 | |
| | DR-518 | Taylor | 5-10"$H_2O$ | 1 | 9.49" | | | 27 | 210 | |
| | | | | | | | | | | |
| 2-116 | WR-524 | Taylor | 0-235"$H_2O$ | 1 | | | | 31 | 246 | |
| 1P Column | LR-518 | Taylor | 16.4-20.2"$H_2O$ | 1 | | | | 31 | 243 | |
| 51-C-502 | LI-517 | Taylor | 0-20"$H_2O$ | 1 | | | 15"$H_2O$ | 31 | 242 | |
| | DR-525 | Taylor | 6-10"$H_2O$ | 1 | 9.74" | | | 30 | 239 | |
| | | | | | | | | | | |
| 2-117 | WR-527 | Taylor | 250-389.5"$H_2O$ | 1 | | | | 29 | 225 | |
| 1R Column | LR-520 | Taylor | 14.2-21.4"$H_2O$ | 1 | | | | 29 | 228 | |
| 51-C-503 | LI-519 | Taylor | 0-20"$H_2O$ | 1 | | | 16"$H_2O$ | 30 | 236 | |
| | DR-526 | Taylor | 5-10"$H_2O$ | 1 | 10.4" | | | 29 | 226 | |
| | | | | | | | | | | |
| 2-118 | WR-504 | Taylor | 250-389.5"$H_2O$ | 1 | | | | 28 | 216 | |
| 2O Column | LR-503 | Taylor | 14.2-21.4"$H_2O$ | 1 | | | | 26 | 206 | |
| 52-C-504 | LI-502 | Taylor | 0-20"$H_2O$ | 1 | | | 16"$H_2O$ | 27 | 209 | |
| | DR-502 | Taylor | 5-10"$H_2O$ | 1 | 10.5" | | | 27 | 215 | |
| | | | | | | | | | | |
| 2-119 | WR-508 | Taylor | 0-225"$H_2O$ | 1 | | | | 28 | 217 | |
| 2P Column | LR-506 | Taylor | 15-19"$H_2O$ | 1 | | | | 26 | 202 | |
| 52-C-505 | LI-505 | Taylor | 0-20"$H_2O$ | 1 | | | 11"$H_2O$ | 27 | 213 | |
| | DR-509 | Taylor | 6-10"$H_2O$ | 1 | 9.6" | | | 26 | 205 | |
| | | | | | | | | | | |
| 2-120 | LR-222 | Taylor | 0-138.7"$H_2O$ | 3 | | 55"$H_2O$ | 105"$H_2O$ | 13 | 102 | |
| 1CU Concentrator | DR-249 | Taylor | 10-19"$H_2O$ | 3 | 9.93" | | 14.88"$H_2O$ | 14 | 109 | |
| 21-E-261 | TR-204 | RTD | 75-125°C | 1 | | | | 13 | 103 | |
| | | | | | | | | | | |
| 2-121 | LR-240 | Taylor | 0-125.4"$H_2O$ | 3 | | 55"$H_2O$ | 95"$H_2O$ | 15 | 118 | |
| 2EU Concentrator | DR-267 | Taylor | 10-19"$H_2O$ | 3 | 10.04" | | 14.88"$H_2O$ | 16 | 121 | |
| 24-E-260 | TR-205 | RTD | 75-125°C | 1 | | | | 14 | 111 | |
| | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-122 | LR-324 | Taylor | 0-115"$H_2O$ | 1 | | 80"$H_2O$ | 94"$H_2O$ | 22 | 173 | |
| 3P Concentrator | DR-368 | Taylor | 12.5-20.5"$H_2O$ | 1 | 9.91" | | | 21 | 167 | |
| 34-E-360 | TR-303 | Type K | | 1 | | | 115°C | | | 425 (T/C Direct) |
| | | | | | | | | | | |
| 2-123 | LR-414 | Taylor | 0-88"$H_2O$ | 1 | | | 85"$H_2O$ | 32 | 250 | |
| HAW Concentrator | DR-424 | Taylor | 10-15"$H_2O$ | 1 | 9.74" | | 14.3"$H_2O$ | 30 | 234 | |
| 41-E-460 | TR-405 | Type K | | 1 | | | 118°C | | | 427 (T/C Direct) |
| | | | | | | | | | | |
| 2-124 | LR-426 | Taylor | 0-75"$H_2O$ | 1 | | 21"$H_2O$ | 66"$H_2O$ | 34 | 269 | |
| LAW Concentrator | DR-446 | Taylor | 8-13"$H_2O$ | 1 | 10.18" | | | 34 | 267 | |
| 42-E-461 | TJR-414-8 | Type K | | 1 | | | | 50 | 398 | |
| | TJR-414-9 | Type K | | 1 | | | | 50 | 399 | |
| | | | | | | | | | | |
| 2-125 | LR-411 | Taylor | 0-66.3"$H_2O$ | 1 | | 32"$H_2O$ | 46"$H_2O$ | 42 | 328 | |
| General Purpose | DR-414 | Taylor | 8-13"$H_2O$ | 1 | 9.84" | | | 42 | 329 | |
| Concentrator | TJR-415-6 | Type K | | 1 | | | | 52 | 408 | |
| 43-E-445 | | | | | | | | | | |
| 2-126 | LR-430 | Taylor | 0-110"$H_2O$ | 1 | | 66"$H_2O$ | 99"$H_2O$ | 41 | 325 | |
| Service | DR-458 | Taylor | 9-14"$H_2O$ | 1 | 9.90" | | | 42 | 332 | |
| Concentrator | TJR-415-21 | Type K | | 1 | | | | 52 | 414 | |
| 44-E-462 | | | | | | | | | | |
| 2-127 | LI-131 | Taylor | 0-66"$H_2O$ | 1 | | | | 10 | 77 | |
| Feed Centrifuge | AR-101 | $\gamma$ Monitor | | 1 | | | | 10 | 75 | |
| 16-K-153 | | | | | | | | | | |
| 2-129 | LR-467 | Taylor | 0-31.1"$H_2O$ | 1 | | | 24"$H_2O$ | 38 | 297 | |
| $NO_2$ Absorber | DR-4140 | Taylor | 9-14"$H_2O$ | 1 | 9.97" | | | 37 | 293 | |
| 45-C-490 | TJR-415-10 | Type K | | 1 | | | | 52 | 412 | |
| | | | | | | | | | | |
| 2-130 | LR-528 | Taylor | 0-65"$H_2O$ | 1 | | | | 35 | 277 | |
| Acid Fractionator | DR-551 | Taylor | 10-15"$H_2O$ | 1 | 10.48" | | | 36 | 280 | |
| 54-C-550 | TJR-414-12 | Type K | | 1 | | | | 51 | 401 | |
| | | | | | | | | | | |
| 2-131 | LR-531 | Taylor | 0-36"$H_2O$ | 1 | | | 27" | 41 | 327 | |
| Acid Fractionator | | | | | | | | | | |
| Overhead Vaporizer | | | | | | | | | | |
| 54-E-502 | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-133 HAF Stream | TJR-206-2 | Type K | | 1 | | | | 46 | 362 | |
| 2-134 HAP | TJR-206-4 | Type K | | 1 | | | | 46 | 364 | |
| | TR-202 | Type K | | 1 | | | | | | 420 (T/C Direct) |
| | FR-242 | Taylor | | 1 | | | | 7 | 49 | |
| 2-135 HAW | TJR-206-3 | Type K | | 1 | | | | 46 | 363 | |
| 2-136 HSP | TJR-206-5 | Type K | | 1 | | | | 46 | 365 | |
| | RR-242 | γ Monitor | | 1 | | | | 5 | 36 | |
| 2-137 1BP | TI-304 | Type K | | 1 | | | | | | 426 (T/C Direct) |
| | AR-201 | α Monitor | | 1 | | | | 6 | 43 | |
| 2-139 1CU | FR-222 | Taylor | | 1 | | | | 14 | 110 | |
| | AI-207 | α Monitor | | 1 | | | | 7 | 55 | |
| 2-140 1UD | TJR-206-11 | Type K | | 1 | | | | 46 | 367 | |
| 2-142 2DF | TI-203 | Type K | | 1 | | | | | | 420 (T/C Direct) |
| 2-143 2DW | AR-205 | U Monitor | | 1 | | | | 9 | 71 | |
| 2-146 2EU | FR-229 | Taylor | | 1 | | | | 14 | 104 | |
| | RR-255 | γ Monitor | | 1 | | | | 13 | 98 | |
| 2-147 2UD | TJR-206-14 | Type K | | 1 | | | | 47 | 368 | |
| 2-149 Uranium Product | RR-270 | γ Monitor | | 1 | | | | 13 | 99 | |
| 2-150 2AF | TJR-305-2 | Type K | | 1 | | | | 48 | 383 | |
| 2-152 2AW | AR-302 | α Monitor | | 1 | | | | 18 | 137 | |
| 2-153 3PD | TJR-305-4 | Type K | | 1 | | | | 49 | 385 | |
| 2-155 2BX | CR-667 | Cond. Monitor | | 1 | | | | 1 | 3 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-156 3AF | TI-302 | Type K | | 1 | | | | | | 424 (T/C Direct) |
| 2-157 3AW | AR-304 | α Monitor | | 1 | | | | 20 | 152 | |
| 2-158 2AS | CR-666 | Cond. Monitor | | 1 | | | | 1 | 2 | |
| 2-160 3BW | AR-305 | α Monitor | | 1 | | | | 22 | 174 | |
| 2-161 3BP | RR-364 | γ Monitor | | 1 | | | | 22 | 175 | |
| 2-162 POR | AR-307 | α Monitor | | 1 | | | | 20 | 154 | |
| 2-166 HWD | TJR-414-6 | Type K | | 1 | | | | 50 | 396 | |
| 2-167 GPD | TJR-415-8 | Type K | | 1 | | | | 52 | 410 | |
| | FR-404 | Taylor | | 1 | | | | 41 | 323 | |
| | FR-405 | Taylor | | 1 | | | | 41 | 324 | |
| 2-168 1SW | AR-403 | α Monitor | | 1 | | | | 33 | 257 | |
| 2-170 Diss. OG Condensate | TI-407 | Type K | | 1 | | | | | | 428 (T/C Direct) |
| 2-171 VOG Condensate | TJR-415-12 | Type K | | 1 | | | | 52 | 413 | |
| 2-172 1OF | TJR-509-1 | Type K | | 1 | | | | 47 | 371 | |
| 2-173 1OW | TJR-509-3 | Type K | | 1 | | | | 47 | 373 | |
| 2-175 1PO | TJR-509-4 | Type K | | 1 | | | | 47 | 374 | |
| 2-176 Poisoned Cooling Water | RR-601 | γ Monitor | | 1 | | | | 1 | 7 | |
| 2-178 HAX | TR-505 | Type K | | 1 | | | | | | 429 (T/C Direct) |
| 2-179 2OF | TJR-509-6 | Type K | | 1 | | | | 48 | 376 | |
| 2-180 2PF | TJR-509-7 | Type K | | 1 | | | | 48 | 377 | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-01 TB NO. | RTP-01 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2-181 | TI-507 | Type K | | 1 | | | | | | 430 (T/C Direct) |
| Rec. Acid | | | | | | | | | | |
| 2-182 | TI-508 | Type K | | 1 | | | | | | 431 (T/C Direct) |
| AF Condensate | FR-532 | Taylor | | 1 | | | | 43 | 343 | |
| | FR-531 | Taylor | | 1 | | | | 43 | 341 | |
| | | | | | | | | | | |
| 2-201 | LI-490 | Taylor | | 1 | | | | | | |
| 1SW Decanter | | | | | | | | | | |
| 42-D-464 | | | | | | | | | | |
| | | | | | | | | | | |
| 2-202 | DR-4343 | Taylor | | 1 | | | | | | |
| 1SF Decanter | | | | | | | | | | |
| 42-D-479 | | | | | | | | | | |
| | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 1



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-01 | LJR-3601-1 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 1 | 9 | |
| | DJR-3601-1 | Taylor | 30.48-43.18 | | 25.33cm | | | 1 | 8 | |
| PuNitrate Storage Tank | TJR-3601-1 | Type K | 0-100°C | | | | | 14 | 112 | |
| 36-D-308A | | | | | | | | | | |
| 3-02 | LJR-3601-2 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 1 | 11 | |
| | DJR-3601-2 | Taylor | 30.48-43.18 | | 25.28cm | | | 1 | 10 | |
| | TJR-3601-2 | Type K | 0-100°C | | | | | 14 | 113 | |
| 36-D-308B | | | | | | | | | | |
| 3-03 | LJR-3601-3 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 1 | 13 | |
| | DJR-3601-3 | Taylor | 30.48-43.18 | | 18.21cm | | | 1 | 12 | |
| | TJR-3601-3 | Type K | 0-100°C | | | | | 14 | 114 | |
| 36-D-308C | | | | | | | | | | |
| 3-04 | LJR-3601-4 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 1 | 15 | |
| | DJR-3601-4 | Taylor | 30.48-43.18 | | 25.30 | | | 1 | 14 | |
| | TJR-3601-4 | Type K | 0-100°C | | | | | 14 | 115 | |
| 36-D-308D | | | | | | | | | | |
| 3-05 | LJR-3601-5 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 2 | 17 | |
| | DJR-3601-5 | Taylor | 30.48-43.18 | | 24.91 | | | 2 | 16 | |
| | TJR-3601-5 | Type K | 0-100°C | | | | | 14 | 116 | |
| 36-D-308E | | | | | | | | | | |
| 3-06 | LJR-3601-6 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 2 | 19 | |
| | DJR-3601-6 | Taylor | 30-48-43.18 | | 25.54 | | | 2 | 18 | |
| | TJR-3601-6 | Type K | 0-100°C | | | | | 14 | 117 | |
| 36-D-308F | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 2



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-07 | LJR-3601-7 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 2 | 21 | |
| | DJR-3601-7 | Taylor | 30.48-43.18 | | 25.15cm | | | 2 | 20 | |
| PuNitrate Storage Tank | TJR-3601-7 | Type K | 0-100°C | | | | | 14 | 118 | |
| 36-D-309A | | | | | | | | | | |
| 3-08 | LJR-3601-8 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 2 | 23 | |
| | DJR-3601-8 | Taylor | 30.48-43.18 | | 25.16cm | | | 2 | 22 | |
| | TJR-3601-8 | Type K | 0-100°C | | | | | 14 | 119 | |
| 36-D-309B | | | | | | | | | | |
| 3-09 | LJR-3601-9 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 3 | 25 | |
| | DJR-3601-9 | Taylor | 30.48-43.18 | | 25.09cm | | | 3 | 24 | |
| | TJR-3601-9 | Type K | 0-100°C | | | | | 15 | 120 | |
| 36-D-309C | | | | | | | | | | |
| 3-10 | LJR-3601-10 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 3 | 27 | |
| | DJR-3601-10 | Taylor | 30.48-43.18 | | 25.46cm | | | 3 | 26 | |
| | TJR-3601-10 | Type K | 0-100°C | | | | | 15 | 121 | |
| 36-D-309D | | | | | | | | | | |
| 3-11 | LJR-3601-11 | Taylor | 0-355.6 cm | | | 10cm | 184cm | 3 | 29 | |
| | DJR-3601-11 | Taylor | 30.48-43.18 | | 25.33cm | | | 3 | 28 | |
| | TJR-3601-11 | Type K | 0-100°C | | | | | 15 | 122 | |
| 36-D-309E | | | | | | | | | | |
| 3-12 | LJR-3601-12 | Taylor | 0-355.6 | | | 10cm | 184cm | 3 | 31 | |
| | DJR-3601-12 | Taylor | 30.48-43.18 | | 25.49cm | | | 3 | 30 | |
| | TJR-3601-12 | Type K | 0-100°C | | | | | 15 | 123 | |
| 36-D-309F | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 3



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-13 | LJR-3601-13 | Taylor | 0-355.6cm | | | 10cm | 184cm | 4 | 33 | |
| | DJR-3601-13 | Taylor | 30.48-43.18 | | 25.29cm | | | 4 | 32 | |
| | TJR-3601-13 | Type K | 0-100°C | | | | | 15 | 124 | |
| PuNitrate Storage Tank 36-D-310A | | | | | | | | | | |
| 3-14 | LJR-3601-14 | Taylor | 0-355.6cm | | | 10cm | 184cm | 4 | 35 | |
| | DJR-3601-14 | Taylor | 30.48-43.18 | | 25.02cm | | | 4 | 34 | |
| | TJR-3601-14 | Type K | 0-100°C | | | | | 15 | 125 | |
| 36-D-310B | | | | | | | | | | |
| 3-15 | LJR-3601-15 | Taylor | 0-355.6cm | | | 10cm | 184cm | 4 | 37 | |
| | DJR-3601-15 | Taylor | 30.48-43.18 | | N.C. | | | 4 | 36 | |
| | TJR-3601-15 | Type K | 0-100°C | | | | | 15 | 126 | |
| 36-D-310C | | | | | | | | | | |
| 3-16 | LJR-3601-16 | Taylor | 0-355.6cm | | | 10cm | 184cm | 4 | 39 | |
| | DJR-3601-16 | Taylor | 30.48-43.18 | | 25.22cm | | | 4 | 38 | |
| | TJR-3601-16 | Type K | 0-100°C | | | | | 15 | 127 | |
| 36-D-310D | | | | | | | | | | |
| 3-17 | LJR-3601-17 | Taylor | 0-355.6cm | | | 10cm | 184cm | 5 | 41 | |
| | DJR-3601-17 | Taylor | 30.48-43.18 | | 25.24cm | | | 5 | 40 | |
| | TJR-3601-17 | Type K | 0-100°C | | | | | 16 | 128 | |
| 36-D-310E | | | | | | | | | | |
| 3-18 | LJR-3601-18 | Taylor | 0-355.6cm | | | 10cm | 184cm | 5 | 43 | |
| | DJR-3601-18 | Taylor | 30.48-43.18 | | 25.15cm | | | 5 | 42 | |
| | TJR-3601-18 | Type K | 0-100°C | | | | | 16 | 129 | |
| 36-D-310F | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 4



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-19 | LJR-3601-19 | Taylor | 0-355.6cm | | | 10cm | 184cm | 5 | 45 | |
| | DJR-3601-19 | Taylor | 30.48-43.18 | | 25.58cm | | | 5 | 44 | |
| PuNitrate Storage Tank | TJR-3601-19 | Type K | 0-100°C | | | | | 16 | 130 | |
| 36-D-311A | | | | | | | | | | |
| 3-20 | LJR-3601-20 | Taylor | 0-355.6cm | | | 10cm | 184cm | 5 | 47 | |
| | DJR-3601-20 | Taylor | 30.48-43.18 | | 25.12cm | | | 5 | 46 | |
| | TJR-3601-20 | Type K | 0-100°C | | | | | 16 | 131 | |
| 36-D-311B | | | | | | | | | | |
| 3-21 | LJR-3601-21 | Taylor | 0-355.6cm | | | 10cm | 184cm | 6 | 49 | |
| | DJR-3601-21 | Taylor | 30.48-43.18 | | 25.16cm | | | 6 | 48 | |
| | TJR-3601-21 | Type K | 0-100°C | | | | | 16 | 132 | |
| 36-D-311C | | | | | | | | | | |
| 3-22 | LJR-3601-22 | Taylor | 0-355.6cm | | | 10cm | 184cm | 6 | 51 | |
| | DJR-3601-22 | Taylor | 30.48-43.18 | | ~25.16cm | | | 6 | 50 | Confirm probe sep. |
| | TJR-3601-22 | Type K | 0-100°C | | | | | 16 | 133 | |
| 36-D-311D | | | | | | | | | | |
| 3-23 | LJR-3601-23 | Taylor | 0-355.6cm | | | 10cm | 184cm | 6 | 53 | |
| | DJR-3601-23 | Taylor | 30.48-43.18 | | 25.22cm | | | 6 | 52 | |
| | TJR-3601-23 | Type K | 0-100°C | | | | | 16 | 134 | |
| 36-D-311E | | | | | | | | | | |
| 3-24 | LJR-3601-24 | Taylor | 0-355.6cm | | | 10cm | 184cm | 6 | 55 | |
| | DJR-3601-24 | Taylor | 30.48-43.18 | | 25.17cm | | | 6 | 54 | |
| | TJR-3601-24 | Type K | 0-100°C | | | | | 16 | 135 | |
| 36-D-311F | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 5



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-25 | LJR-3602-1 | Taylor | 0-355.6cm | | | 10cm | 184cm | 7 | 57 | |
| | DJR-3602-1 | Taylor | 30.48-43.18 | | 25.44cm | | | 7 | 56 | |
| PuNitrate Storage Tank | TJR-3602-1 | Type K | 0-100°C | | | | | 17 | 136 | 0-4.095ml |
| | LJR-3602-1R | Ruska* | 0-10psi | | | | | | | RTP-04 ( ) |
| | DJR-3602-1R | Ruska* | 0-10psi | | 25.44 | | | | | RTP-04 ( ) |
| 36-D-312A | | | | | | | | | | |
| 3-26 | LJR-3602-2 | Taylor | 0-355.6cm | | | 10cm | 184cm | 7 | 59 | |
| | DJR-3602-2 | Taylor | 30.48-43.18 | | 24.96cm | | | 7 | 58 | |
| | TJR-3602-2 | Type K | 0-100°C | | | | | 17 | 137 | |
| 36-D-312B | | | | | | | | | | |
| 3-27 | LJR-3602-3 | Taylor | 0-355.6cm | | | 10cm | 184cm | 7 | 61 | |
| | DJR-3602-3 | Taylor | 30.48-43.18 | | 25.22cm | | | 7 | 60 | |
| | TJR-3602-3 | Type K | 0-100°C | | | | | 17 | 138 | |
| 36-D-312C | | | | | | | | | | |
| 3-28 | LJR-3602-4 | Taylor | 0-355.6cm | | | 10cm | 184cm | 7 | 63 | |
| | DJR-3602-4 | Taylor | 30.48-43.18 | | 25.58cm | | | 7 | 62 | |
| | TJR-3602-4 | Type K | 0-100°C | | | | | 17 | 139 | |
| 36-D-312D | | | | | | | | | | |
| 3-29 | LJR-3602-5 | Taylor | 0-355.6cm | | | 10cm | 184cm | 8 | 65 | Confirm probe sep. |
| | DJR-3602-5 | Taylor | 30.48-43.18 | | 25.14cm | | | 8 | 64 | |
| | TJR-3602-5 | Type K | 0-100°C | | | | | 17 | 140 | |
| 36-D-312E | | | | | | | | | | |
| 3-30 | LJR-3602-6 | Taylor | 0-355.6cm | | | 10cm | 184cm | 8 | 67 | |
| | DJR-3602-6 | Taylor | 30.48-43.18 | | 25.30cm | | | 8 | 66 | |
| | TJR-3602-6 | Type K | 0-100°C | | | | | 17 | 141 | |
| 36-D-312F | | | | | | | | | | |

*To be installed for PM/PS demo - FY 1979

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 6



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-31 | LJR-3602-7 | Taylor | 0-355.6cm | | | 10cm | 184cm | 8 | 69 | |
| | DJR-3602-7 | Taylor | 30.48-43.18 | | 25.13cm | | | 8 | 68 | |
| PuNitrate Storage Tank | TJR-3602-7 | Type K | 0-100°C | | | | | 17 | 142 | |
| 36-D-313A | | | | | | | | | | |
| 3-32 | LJR-3602-8 | Taylor | 0-355.6cm | | | 10cm | 184cm | 8 | 71 | |
| | DJR-3602-8 | Taylor | 30.48-43.18 | | 25.11cm | | | 8 | 70 | |
| | TJR-3602-8 | Type K | 0-100°C | | | | | 17 | 143 | |
| 36-D-313B | | | | | | | | | | |
| 3-33 | LJR-3602-9 | Taylor | 0-355.6cm | | | 10cm | 184cm | 9 | 73 | |
| | DJR-3602-9 | Taylor | 30.48-43.18 | | 25.16cm | | | 9 | 72 | |
| | TJR-3602-9 | Type K | 0-100°C | | | | | 18 | 144 | |
| 36-D-313C | | | | | | | | | | |
| 3-34 | LJR-3602-10 | Taylor | 0-355.6cm | | | 10cm | 184cm | 9 | 75 | |
| | DJR-3602-10 | Taylor | 30.48-43.18 | | 25.28cm | | | 9 | 74 | |
| | TJR-3602-10 | Type K | 0-100°C | | | | | 18 | 145 | |
| 36-D-313D | | | | | | | | | | |
| 3-35 | LJR-3602-11 | Taylor | 0-355.6 | | | 10cm | 184cm | 9 | 77 | Confirm probe sep. |
| | DJR-3602-11 | Taylor | 30.48-43.18 | ~ | 25.10cm | | | 9 | 76 | |
| | TJR-3602-11 | Type K | 0-100°C | | | | | 18 | 146 | |
| 36-D-313E | | | | | | | | | | |
| 3-36 | LJR-3602-12 | Taylor | 0-355.6cm | | | 10cm | 184cm | 9 | 79 | |
| | DJR-3602-12 | Taylor | 30.48-43.18 | | 25.06cm | | | 9 | 78 | |
| | TJR-3602-12 | Type K | 0-100°C | | | | | 18 | 147 | |
| 36-D-313F | | | | | | | | | | |

TABLE 0-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 7



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-37 | LJR-3602-13 | Taylor | 0-355.6cm | | | 10cm | 184cm | 10 | 81 | |
| | DJR-3602-13 | Taylor | 30.48-43.18 | | 25.22cm | | | 10 | 80 | |
| PuNitrate Storage | TJR-3602-13 | Type K | 0-100°C | | | | | 18 | 148 | |
| Tank | LJR-3602-13R | Ruska* | 0-10psi | | | | | | | RTP-04 ( ) |
| | DJR-3602-13R | Ruska* | 0-10psi | | 25.22 | | | | | RTP-04 ( ) |
| 36-D-314A | | | | | | | | | | |
| 3-38 | LJR-3602-14 | Taylor | 0-355.6cm | | | 10cm | 184cm | 10 | 83 | |
| | DJR-3602-14 | Taylor | 30.48-43.18 | | 25.08cm | | | 10 | 82 | |
| | TJR-3602-14 | Type K | 0-100°C | | | | | 18 | 149 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 36-D-314B | | | | | | | | | | |
| 3-39 | LJR-3602-15 | Taylor | 0-355.6cm | | | 10cm | 184cm | 10 | 85 | |
| | DJR-3602-15 | Taylor | 30.48-43.18 | | 24.56cm | | | 10 | 84 | |
| | TJR-3602-15 | Type K | 0-100°C | | | | | 18 | 150 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 36-D-314C | | | | | | | | | | |
| 3-40 | LJR-3602-16 | Taylor | 0-355.6cm | | | 10cm | 184cm | 10 | 87 | |
| | DJR-3602-16 | Taylor | 30.48-43.18 | | 25.34cm | | | 10 | 86 | |
| | TJR-3602-16 | Type K | 0-100°C | | | | | 18 | 151 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 36-D-314D | | | | | | | | | | |
| 3-41 | LJR-3602-17 | Taylor | 0-355.6cm | | | 10cm | 184cm | 11 | 89 | |
| | DJR-3602-17 | Taylor | 30.48-43.18 | | 25.27cm | | | 11 | 88 | |
| | TJR-3602-17 | Type K | 0-100°C | | | | | 19 | 152 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 36-D-314E | | | | | | | | | | |
| 3-42 | LJR-3602-18 | Taylor | 0-355.6cm | | | 10cm | 184cm | 11 | 91 | |
| | DJR-3602-18 | Taylor | 30.48-43.18 | | 25.30cm | | | 11 | 90 | |
| | TJR-3602-18 | Type K | 0-100°C | | | | | 19 | 153 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 36-D-314F | | | | | | | | | | |

*To be installed for PM/PS demo - FY 1979

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 8



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-43 | LJR-3602-19 | Taylor | 0-355.6cm | | | 10cm | 184cm | 11 | 93 | |
| | DJR-3602-19 | Taylor | 30.48-43.18 | | 6.78cm | | | 11 | 92 | |
| PuNitrate Storage Tank | TJR-3602-19 | Type K | 0-100°C | | | | | 19 | 154 | |
| 36-D-315A | | | | | | | | | | |
| 3-44 | LJR-3602-20 | Taylor | 0-355.6cm | | | 10cm | 184cm | 11 | 95 | |
| | DJR-3602-20 | Taylor | 30.48-43.18 | | 25.23cm | | | 11 | 94 | |
| | TJR-3602-20 | Type K | 0-100°C | | | | | 19 | 155 | |
| 36-D-315B | | | | | | | | | | |
| 3-45 | LJR-3602-21 | Taylor | 0-355.6cm | | | 10cm | 184cm | 12 | 97 | |
| | DJR-3602-21 | Taylor | 30.48-43.18 | | 25.15cm | | | 12 | 96 | |
| | TJR-3602-21 | Type K | 0-100°C | | | | | 19 | 156 | |
| 36-D-315C | | | | | | | | | | |
| 3-46 | LJR-3602-22 | Taylor | 0-355.6cm | | | 10cm | 184cm | 12 | 99 | |
| | DJR-3602-22 | Taylor | 30.48-43.18 | | 25.42cm | | | 12 | 98 | |
| | TJR-3602-22 | Type K | 0-100°C | | | | | 19 | 157 | |
| 36-D-315D | | | | | | | | | | |
| 3-47 | LJR-3602-23 | Taylor | 0-355.6cm | | | 10cm | 184cm | 12 | 101 | |
| | DJR-3602-23 | Taylor | 30.48-43.18 | | 25.41cm | | | 12 | 100 | |
| | TJR-3602-23 | Type K | 0-100°C | | | | | 19 | 158 | |
| 36-D-315E | | | | | | | | | | |
| 3-48 | LJR-3602-24 | Taylor | 0-355.6cm | | | 10cm | 184cm | 12 | 103 | |
| | DJR-3602-24 | Taylor | 30.48-43.18 | | 25.16cm | | | 12 | 102 | |
| | TJR-3602-24 | Type K | 0-100°C | | | | | 19 | 159 | |
| 36-D-315F | | | | | | | | | | |

TABLE O-1 (CONTINUED)

RTP DATA ACQUISITION SYSTEM
RTP-INSTRUMENT IDENTIFICATION AND PARAMETER DATA
PLUTONIUM NITRATE STORAGE AREA -- MODULE 9



| MEAS. PT. NO./NAME TANK EQUIP. NO. | INSTR. NUMBER | INSTR. TYPE | INSTR. RANGE | SCAN MODE | PROBE SEP. | LOW ALARM | HIGH ALARM | RTP-02 TB NO. | RTP-02 CH NO. | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 3-49 Sample Glove Box | | | | | | | | | | |
| 3-50 50 liter Sample Tk. 36-D-316 | LR-3611 | Taylor | 0-406.4cm | | | 20.3cm | 365.8cm | 13 | 104 | |
| | DR-3627 | Taylor | 30.48-43.18 | | | | | 13 | 105 | |
| | TR-3603 | Type K | 0-120°C | | | | | 13 | 106 | |
| 3-51 10 liter Meas. Tk. 36-D-317 | LR-3613 | Taylor | 0-198.12cm | | | NA | NA | 13 | 107 | |
| 3-52 P & PMGB Sump | LR-3616 | Taylor | 0-137.16cm | | | 5cm | NA | 13 | 108 | |
| 3-53 P & PMGB Sump | LR-3617 | Taylor | 0-137.16cm | | | 5cm | NA | 13 | 109 | |
| | | | | | THERMOCOUPLE REFERENCE CHANNELS | | | 13 | 110 | |
| | | | | | | | | 13 | 111 | |
| | | | | | PROGRAMMABLE VOLTAGE CALIBRATION CARD CHANNELS 0-7 | | | | | |

TABLE O-2

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: LR

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| LR-101 | 2-44 | 9 | 3-1-9 | LR-326 | 2-10 | 161 | 11-3-3 |
| LR-102 | 2-45 | 86 | 4-1-2 | LR-401 | 2-21 | 212 | 12-1-4 |
| LR-103 | 2-46 | 73 | 4-1-6 | LR-402 | 2-22 | 207 | 12-1-5 |
| LR-105 | 2-48 | 12 | 3-1-8 | LR-403 | 2-57 | 208 | 12-3-5 |
| LR-109 | 2-49 | 72 | 4-1-1 | LR-405 | 2-36 | 345 | 16-1-3 |
| LR-113 | 2-50 | 88 | 4-1-5 | LR-406 | 2-29 | 346 | 16-1-4 |
| LR-121 | 2-01 | 81 | 5-1-1 | LR-411 | 2-125 | 328 | 16-1-7 |
| LR-125 | 2-03 | 66 | 5-2-1 | LR-412 | 2-28 | 340 | 16-3-7 |
| LR-128 | 2-02 | 78 | 5-1-2 | LR-413 | 2-58 | 338 | 16-1-8 |
| LR-129 | 2-05 | 76 | 5-2-2 | LR-414 | 2-123 | 250 | 14-1-3 |
| LR-130 | 2-06 | 65 | 5-3-2 | LR-417 | 2-34 | 238 | 14-1-4 |
| LR-201 | 2-52 | 64 | 5-1-5 | LR-418 | 2-56 | 256 | 14-1-5 |
| LR-205 | 2-103 | 34 | 6-1-1 | LR-419 | 2-23 | 262 | 14-1-6 |
| LR-212 | 2-106 | 47 | 6-1-8 | LR-420 | 2-04 | 261 | 14-1-7 |
| LR-216 | 2-104 | 42 | 6-1-9 | LR-422 | 2-114 | 271 | 14-1-10 |
| LR-219 | 2-105 | 106 | 7-2-1 | LR-425 | 2-35 | 274 | 14-3-10 |
| LR-222 | 2-120 | 102 | 7-1-5 | LR-426 | 2-124 | 269 | 15-1-2 |
| LR-225 | 2-107 | 100 | 7-1-8 | LR-427 | 2-24 | 281 | 15-1-3 |
| LR-228 | 2-108 | 105 | 7-1-10 | LR-428 | 2-26 | 321 | 17-2-1 |
| LR-235 | 2-09 | 117 | 8-1-6 | LR-430 | 2-126 | 325 | 17-1-3 |
| LR-238 | 2-53 | 132 | 8-2-6 | LR-465 | 2-37 | 292 | 17-3-8 |
| LR-239 | 2-07 | 129 | 8-1-7 | LR-467 | 2-129 | 297 | 17-1-9 |
| LR-240 | 2-121 | 118 | 8-1-5 | LR-470 | 2-38 | 386 | 18-4-2 |
| LR-301 | 2-11 | 165 | 11-1-4 | LR-503 | 2-118 | 206 | 12-1-8 |
| LR-302 | 2-12 | 164 | 11-3-4 | LR-504 | 2-61 | 218 | 11-1-9 |
| LR-303 | 2-13 | 198 | 11-1-5 | LR-506 | 2-119 | 202 | 12-1-2 |
| LR-305 | 2-17 | 131 | 12-2-4 | LR-507 | 2-16 | 200 | 12-1-3 |
| LR-308 | 2-109 | 149 | 9-1-7 | LR-513 | 2-115 | 194 | 12-1-9 |
| LR-309 | 2-08 | 140 | 9-1-8 | LR-514 | 2-60 | 232 | 13-1-1 |
| LR-313 | 2-110 | 151 | 9-1-9 | LR-516 | 2-20 | 227 | 13-1-3 |
| LR-316 | 2-111 | 168 | 10-1-1 | LR-518 | 2-116 | 234 | 13-1-4 |
| LR-320 | 2-112 | 186 | 10-1-4 | LR-520 | 2-177 | 228 | 13-1-6 |
| LR-323 | 2-113 | 163 | 10-1-8 | LR-522 | 2-15 | 248 | 13-1-7 |
| LR-324 | 2-122 | 173 | 11-1-2 | LR-528 | 2-130 | 277 | 15-1-5 |
| LR-325 | 2-54 | 169 | 11-1-3 | LR-530 | 2-39 | 344 | 16-3-1 |

TABLE O-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: LR

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| LR-531 | 2-131 | 327 | 10-1-2 | LR-617 | 2-25 | 1 | 1-1-7 |
| LR-604 | 2-41 | 17 | 3-1-6 | LR-623 | 2-42 | 5 | 2-3-4 |
| LR-607 | 2-40 | 14 | 3-3-7 | LR-412-W | 2-28 | 61 | 16-3-7 |
| LR-611 | 2-43 | 16 | 3-1-1 | LR-419-W | 2-23 | 59 | 14-1-4 |
| LR-612 | 2-64 | 19 | 3-1-1 | | | | |

INSTRUMENT TYPE: LT

| | | |
|---|---|---|
| LT-129S1 | 2-05 | 126 |
| LT-129S2 | 2-05 | 155 |
| LT-130S1 | 2-06 | 159 |
| LT-130S2 | 2-06 | 188 |
| LT-201S | 2-32 | 124 |
| LT-238S | 2-53 | 91 |
| LT-239S | 2-09 | 157 |
| LT-405S | 2-36 | 93 |
| LT-406S | 2-29 | 95 |

TABLE O-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: LI

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| LI-131 | 2-127 | 77 | 5-2-3 | LI-421 | 2-114 | 272 | 14-2-8 |
| LI-203 | 2-66 | 53 | 5-2-9 | LI-431 | 2-27 | 331 | 17-3-4 |
| LI-206 | 2-103 | 51 | 5-3-10 | LI-464 | 2-37 | 299 | 17-3-7 |
| LI-209 | 2-32 | 39 | 6-1-4 | LI-466 | 2-59 | 295 | 17-1-7 |
| LI-210 | 2-33 | 33 | 6-1-5 | LI-468 | 2-86 | 289 | 18-1-1 |
| LI-221 | 2-67 | 119 | 7-1-1 | LI-469 | 2-38 | 290 | 18-3-1 |
| LI-224 | 2-107 | 101 | 7-3-8 | LI-502 | 2-118 | 209 | 11-2-7 |
| LI-230 | 2-68 | 115 | 8-1-2 | LI-505 | 2-111 | 213 | 12-3-2 |
| LI-241 | 2-78 | 48 | 6-3-6 | LI-510 | 2-94 | 211 | 12-2-3 |
| LI-307 | 2-109 | 150 | 9-3-7 | LI-511 | 2-115 | 196 | 12-2-8 |
| LI-314 | 2-110 | NA | NA | LI-515 | 2-70 | 240 | 13-2-2 |
| LI-315 | 2-111 | 185 | 10-1-2 | LI-517 | 2-116 | 242 | 13-3-4 |
| LI-322 | 2-113 | 176 | 10-3-8 | LI-519 | 2-117 | 236 | 13-3-6 |
| LI-327 | 2-112 | 183 | 10-3-4 | LI-523 | 2-88 | 249 | 13-2-8 |
| LI-409 | 2-69 | 339 | 10-2-5 | LI-529 | 2-62 | 273 | 15-1-9 |
| | | | | LI-490 | 2-201 | | |

TABLE 0-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: DR/DI

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| DR-101 | 2-44 | 8 | 3-1-9 | DR-351 | 2-112 | 184 | 10-1-4 |
| DR-102 | 2-45 | 85 | 4-1-2 | DR-357 | 2-113 | 179 | 10-1-10 |
| DR-103 | 2-46 | 89 | 4-1-6 | DR-368 | 2-122 | 167 | 11-1-2 |
| DR-160 | 2-48 | 11 | 3-1-8 | DR-372 | 2-54 | 178 | 11-7-3 |
| DR-161 | 2-49 | 84 | 4-1-1 | DR-374 | 2-10 | 162 | 11-3-3 |
| DR-162 | 2-50 | 87 | 4-1-5 | DR-401 | 2-21 | 201 | 12-1-4 |
| DR-164 | 2-01 | 90 | 5-1-1 | DR-402 | 2-22 | 204 | 12-1-5 |
| DR-166 | 2-03 | 82 | 5-2-1 | DR-403 | 2-57 | 195 | 12-3-5 |
| DR-167 | 2-02 | 83 | 5-1-2 | DR-410 | 2-36 | 343 | 16-1-3 |
| DR-168 | 2-05 | 74 | 5-2-2 | DR-411 | 2-29 | 337 | 16-1-4 |
| DR-169 | 2-06 | 68 | 5-3-2 | DI-412 | 2-69 | 335 | 16-1-5 |
| DR-201 | 2-52 | 69 | 5-1-5 | DR-414 | 2-125 | 329 | 16-1-7 |
| DR-206 | 2-66 | 58 | 5-1-9 | DR-416 | 2-28 | 336 | 16-3-7 |
| DR-207 | 2-76 | 57 | 5-1-9 | DR-424 | 2-123 | 234 | 14-1-3 |
| DR-209 | 2-103 | 37 | 6-3-1 | DR-426 | 2-34 | 237 | 14-1-4 |
| DR-220 | 2-106 | 51 | 6-1-8 | DR-428 | 2-56 | 268 | 14-1-5 |
| DR-223 | 2-104 | 44 | 6-1-9 | DR-430 | 2-23 | 263 | 14-1-6 |
| DR-226 | 2-105 | 108 | 7-2-1 | DR-439 | 2-04 | 258 | 14-1-7 |
| DR-230 | 2-67 | 113 | 7-1-3 | DR-441 | 2-114 | 278 | 14-1-8 |
| DR-249 | 2-120 | 109 | 7-1-5 | DR-445 | 2-35 | 264 | 14-3-10 |
| DR-251 | 2-107 | 107 | 7-1-7 | DR-446 | 2-124 | 267 | 15-1-2 |
| DR-257 | 2-108 | 114 | 7-1-10 | DR-448 | 2-24 | 276 | 15-1-3 |
| DR-260 | 2-68 | 112 | 8-1-3 | DR-458 | 2-126 | 332 | 17-1-3 |
| DR-267 | 2-121 | 121 | 8-1-5 | DR-502 | 2-118 | 214 | 12-1-3 |
| DR-269 | 2-07 | 120 | 8-1-6 | DR-509 | 2-119 | 205 | 12-1-2 |
| DR-272 | 2-53 | 133 | 8-2-6 | DR-510 | 2-16 | 214 | 12-1-3 |
| DR-273 | 2-09 | 130 | 8-1-7 | DR-518 | 2-115 | 210 | 12-1-8 |
| DR-304 | 2-11 | 160 | 11-1-4 | DR-523 | 2-20 | 233 | 13-1-3 |
| DR-312 | 2-12 | 171 | 11-3-9 | DR-525 | 2-116 | 239 | 13-1-4 |
| DR-321 | 2-13 | 199 | 11-1-5 | DR-526 | 2-177 | 226 | 13-1-5 |
| DR-329 | 2-17 | 144 | 9-1-4 | DR-530 | 2-15 | 245 | 13-1-7 |
| DR-333 | 2-109 | 146 | 9-4-7 | DR-551 | 2-130 | 280 | 15-1-5 |
| DR-335 | 2-08 | 143 | 9-1-8 | DI-552 | 2-70 | 244 | 13-1-2 |
| DR-340 | 2-110 | 141 | 9-1-9 | DR-615 | 2-40 | 13 | 3-3-7 |
| DR-346 | 2-111 | 181 | 10-3-1 | DR-646 | 2-25 | 0 | 1-1-7 |

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RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: DR/DI

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| DR-678 | 2-42 | 4 | 2-3-4 | DR-4142 | 2-38 | 294 | 18-4-2 |
| DR-4137 | 2-37 | 288 | 17-3-8 | DR-416-W | 2-28 | 62 | 16-3-7 |
| DR-4140 | 2-129 | 293 | 17-1-9 | DR-430-W | 2-23 | 60 | 14-1-6 |
| | | | | DR-4343 | 2-202 | | |

INSTRUMENT TYPE: DT

| | | |
|---|---|---|
| DT-168S1 | 2-05 | 127 |
| DT-168S2 | 2-05 | 156 |
| DT-169S2 | 2-06 | 189 |
| DT-201S | 2-52 | 125 |
| DT-272S | 2-53 | 92 |
| DT-273S | 2-09 | 158 |
| DT-410S | 2-36 | 94 |
| DT-411S | 2-29 | 123 |
| DT-166S1 | 2-03 | 187 |

TABLE 0-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: TR/DI

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| TR-105 | 2-44 | 416 | 3-3-10 | TI-109 | 2-03 | 419 | 5-3-1 |
| TR-106 | 2-45 | 417 | 4-3-3 | TI-203 | 2-142 | 420 | 7-1-9 |
| TR-107 | 2-46 | 418 | 4-3-7 | TI-302 | 2-156 | 424 | 9-1-10 |
| TR-202 | 2-134 | 420 | 5-1-10 | TI-304 | 2-137 | 426 | 9-1-5 |
| TR-204 | 2-120 | 103 | 7-3-4 | TI-407 | 2-170 | 428 | 17-1-5 |
| TR-205 | 2-121 | 111 | 8-3-4 | TI-507 | 2-181 | 430 | 15-1-6 |
| TR-303 | 2-122 | 425 | 11-3-1 | TI-508 | 2-182 | 431 | 15-1-7 |
| TR-405 | 2-123 | 427 | 14-1-2 | | | | |
| TR-505 | 2-178 | 429 | -- | | | | |

CONTROL ROOM UTRA #2

Ra - 432
Rc - 433

UTRA #2 DATA

0°C - 99.89 ohms
55°C - 121.88 ohms

TABLE O-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: TJR

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| TJR-108-1 | 2-48 | 353 | 6 | TJR-414-6 | 2-166 | 396 | 15 |
| TJR-108-2 | 2-49 | 354 | 6 | TJR-414-7 | 2-35 | 397 | 15 |
| TJR-108-3 | 2-50 | 355 | 6 | TJR-414-8 | 2-124 | 398 | 15 |
| TJR-108-9 | 2-01 | 356 | 6 | TJR-414-9 | 2-124 | 399 | 15 |
| TJR-108-10 | 2-03 | 357 | 6 | TJR-414-10 | 2-24 | 400 | 15 |
| TJR-108-11 | 2-02 | 358 | 6 | TJR-414-12 | 2-130 | 401 | 15 |
| TJR-108-12 | 2-05 | 359 | 6 | TJR-414-13 | 2-62 | 402 | 15 |
| TJR-108-13 | 2-06 | 360 | 6 | TJR-415-2 | 2-36 | 404 | 16 |
| TJR-206-1 | 2-52 | 361 | 7 | TJR-415-3 | 2-38 | 405 | 16 |
| TJR-206-2 | 2-133 | 362 | 7 | TJR-415-4 | 2-29 | 406 | 16 |
| TJR-206-3 | 2-135 | 363 | 7 | TJR-415-5 | 2-69 | 407 | 16 |
| TJR-206-4 | 2-134 | 364 | 7 | TJR-415-6 | 2-125 | 408 | 16 |
| TJR-206-5 | 2-136 | 365 | 7 | TJR-415-7 | 2-28 | 409 | 16 |
| TJR-206-6 | 2-33 | 366 | 7 | TJR-415-8 | 2-167 | 410 | 16 |
| TJR-206-11 | 2-140 | 367 | 7 | TJR-415-9 | 2-37 | 411 | 16 |
| TJR-206-14 | 2-147 | 368 | 7 | TJR-415-10 | 2-129 | 412 | 16 |
| TJR-206-16 | 2-53 | 369 | 7 | TJR-415-12 | 2-171 | 413 | 16 |
| TJR-206-17 | 2-09 | 370 | 7 | TJR-415-21 | 2-126 | 414 | 16 |
| TJR-305-1 | 2-17 | 382 | 10 | TJR-415-22 | 2-27 | 415 | 16 |
| TJR-305-2 | 2-150 | 383 | 10 | TJR-509-1 | 2-172 | 371 | 12 |
| TJR-305-3 | 2-08 | 384 | 10 | TJR-509-2 | 2-20 | 372 | 12 |
| TJR-305-4 | 2-153 | 385 | 10 | TJR-509-3 | 2-173 | 373 | 12 |
| TJR-305-5 | 2-111 | 386 | 10 | TJR-509-4 | 2-175 | 374 | 12 |
| TJR-305-6 | 2-84 | 387 | 10 | TJR-509-5 | 2-15 | 375 | 12 |
| TJR-305-7 | 2-54 | 388 | 10 | TJR-509-6 | 2-178 | 376 | 12 |
| TJR-305-8 | 2-10 | 389 | 10 | TJR-509-7 | 2-180 | 377 | 12 |
| TJR-305-9 | 2-11 | 390 | 10 | TJR-509-8 | 2-16 | 378 | 12 |
| TJR-305-10 | 2-12 | 391 | 10 | TJR-509-9 | 2-21 | 379 | 12 |
| TJR-305-11 | 2-13 | 392 | 10 | TJR-509-10 | 2-57 | 380 | 12 |
| TJR-414-3 | 2-34 | 393 | 15 | TJR-509-11 | 2-57 | 403 | 12 |
| TJR-414-4 | 2-56 | 394 | 15 | TJR-509-12 | 2-22 | 381 | 12 |
| TJR-414-5 | 2-23 | 395 | 15 | TJR-607-1 | 2-25 | 352 | 2 |

TABLE 9-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: MISCELLANEOUS

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| | | | - AR - | | | | |
| AR-101 | 2-127 | 75 | 5-3-3 | AR-305 | 2-160 | 174 | 10-1-5 |
| AR-201 | 2-137 | 43 | 6-1-2 | AR-306 | 2-84 | 177 | 10-1-5 |
| AR-205 | 2-143 | 71 | 5-1-4 | AR-307 | 2-162 | 154 | 9-4-10 |
| AR-208 | 2-103 | 32 | 6-1-2 | AR-401 | 2-04 | 259 | 14-3-7 |
| AR-209 | 2-106 | 54 | 6-1-10 | AR-402 | 2-04 | 260 | 14-4-7 |
| AR-302 | 2-152 | 137 | 9-2-6 | AR-403 | 2-168 | 257 | 14-3-7 |
| AR-303 | 2-110 | 148 | 9-2-6 | AR-605 | 2-40 | 18 | 3-3-5 |
| AR-304 | 2-157 | 152 | 9-4-10 | AR-606 | 2-40 | 15 | 3-3-5 |
| | | | - AI - | | | | |
| AI-207 | 2-139 | 55 | 6-3-10 | | | | |
| | | | - CR - | | | | |
| CR-666 | 2-158 | 2 | 2-1-4 | CR-667 | 2-154 | 3 | 2-4-4 |
| | | | - FR - | | | | |
| FR-205 | 2-79 | 41 | 6-1-7 | FR-404 | 2-167 | 323 | 16-4-9 |
| FR-222 | 2-139 | 110 | 7-1-4 | FR-405 | 2-167 | 324 | 16-1-9 |
| FR-229 | 2-140 | 104 | 8-1-4 | FR-531 | 2-182 | 341 | 16-1-1 |
| FR-241 | 2-78 | 38 | 5-1-8 | FR-532 | 2-182 | 343 | 16-1-1 |
| FR-242 | 2-134 | 49 | 5-1-8 | | | | |
| | | | - PR - | | | | |
| PR-462 | 2-87 | 302 | 17-1-6 | | | | |
| | | | - RR - | | | | |
| RR-242 | 2-136 | 36 | 6-1-3 | RR-456 | 2-26 | 322 | 17-1-1 |
| RR-255 | 2-146 | 98 | 6-1-3 | RR-555 | 2-62 | 279 | 15-3-6 |
| RR-270 | 2-149 | 99 | 7 | RR-601 | 2-176 | 7 | 2-1-10 |
| RR-364 | 2-161 | 175 | 10-3-10 | RR-620 | 2-43 | 6 | 12-1-10 |
| RR-423 | 2-58 | 282 | 15-3-6 | | | | |

TABLE O-2 (CONTINUED)

RTP CORRELATION TABLE
INSTRUMENT NUMBER, MEASUREMENT POINT NUMBER, RTP CHANNEL NUMBER
INSTRUMENT TYPE: MISCELLANEOUS

| INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION | INSTRU. NO. | MEAS. PT. NO. | RTP CH. NO. | INSTRU. LOCATION |
|---|---|---|---|---|---|---|---|
| | | | - WR - | | | | |
| WR-208 | 2-103 | 35 | 6-1-1 | WR-358 | 2-113 | 182 | 10-1-8 |
| WR-215 | 2-106 | 45 | 6-2-3 | WR-442 | 2-114 | 265 | 14-1-10 |
| WR-224 | 2-104 | 40 | 6-2-10 | WR-504 | 2-118 | 216 | 11-1-8 |
| WR-227 | 2-105 | 46 | 6-4-10 | WR-508 | 2-119 | 217 | 12-1-1 |
| WR-252 | 2-107 | 96 | 7-1-7 | WR-520 | 2-115 | 193 | 12-1-9 |
| WR-256 | 2-108 | 122 | 8-3-2 | WR-524 | 2-116 | 246 | 13-3-3 |
| WR-334 | 2-109 | 153 | 9-4-7 | WR-527 | 2-117 | 225 | 13-1-6 |
| WR-341 | 2-110 | 147 | 9-4-9 | | | | |
| WR-347 | 2-111 | 180 | 10-1-1 | | | | |
| WR-352 | 2-112 | 170 | 10-1-7 | | | | |

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