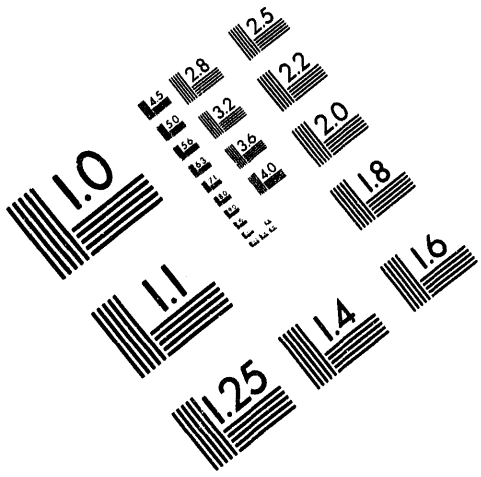

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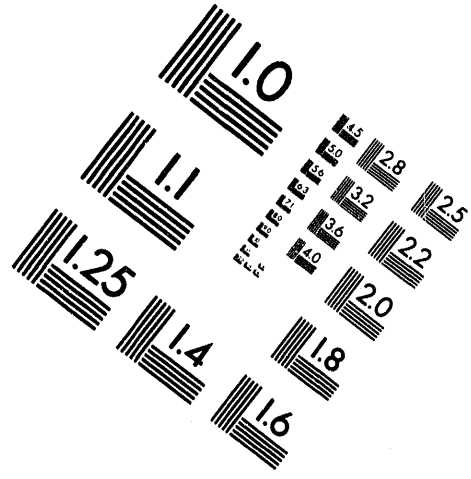

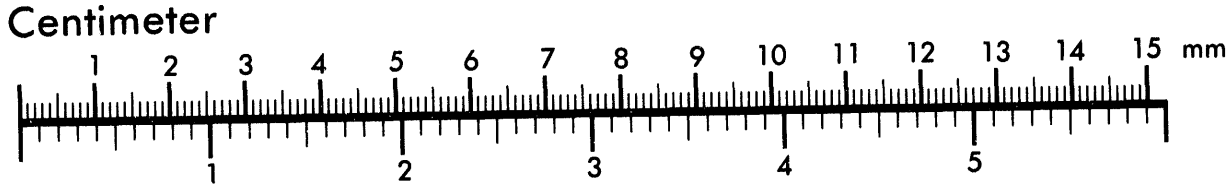

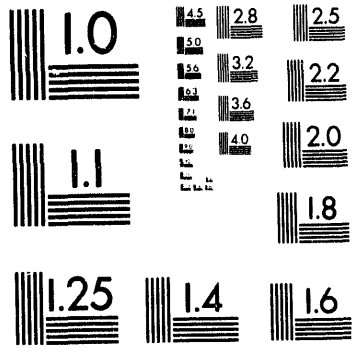

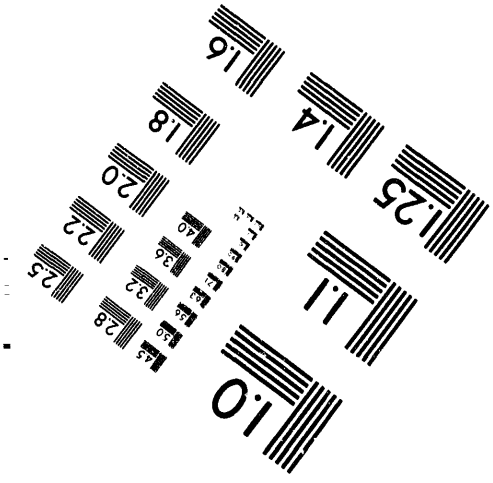

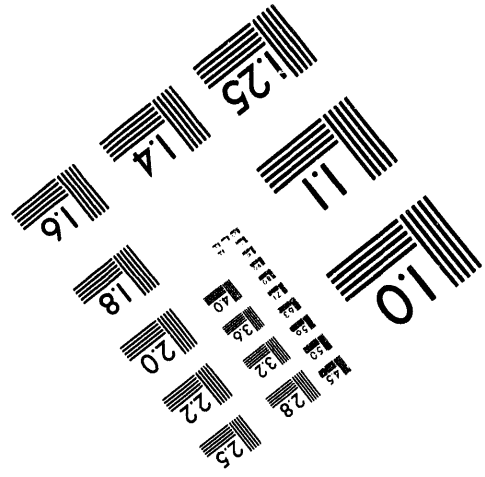

1 of 1

SRT-ATS-930121

SCIENTIFIC COMPUTATIONS SECTION MONTHLY REPORT NOVEMBER 1993 (U)

by

M. R. Buckner

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

DOE Contract No. DE-AC09-89SR18035

DISCLAIMER

Applied Technology Section

Monthly Report

November 1993

Westinghouse Savannah River Company
Inter-Office Memorandum

December 30, 1993

TO: FRED BERANEK, 773-A

FROM: M. R. BUCKNER, 773-42A
(5-3149)

MRB

Applied Technology Section

Monthly Report

November 1993

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Travel

Nov. 14 — M. R. Buckner, D. Biswas, K. A. Niemer, E. F. Trumble, R. E. Pevey, R. E. Grove, and T. G. Williamson attended the American Nuclear Society Winter Meeting in San Francisco, CA.

Nov. 15-19 — J. C. Whitehouse attended the short course "Fuzzy Logic Interference" in Arlington, VA.

Nov. 16 — H. N. Guerrero attended DOE/OCRWM Workshop on Multi-Purpose Canisters.

Nov. 17 — A. G. Eggers, a member, and M. Van Alstine, an alternate member, participated in the November 1993 meeting of the ASME Subgroup on Design Analysis (SGDA) held in Atlanta, GA. They had submitted preliminary rules for allowable local thin areas in Section VIII-1 vessels. Based on meeting discussion, they will perform additional work on this issue. The next SGDA meeting is February 1994.

Nov. 18 — M. A. Shadday Jr. presented a paper "A Model of the Control Rod Housing Overflow Incident in a Savannah River Production Reactor"at the American Nuclear Society (ANS) Winter Annual Meeting held in San Francisco, CA.

Nov. 28-
Dec. 3 — P. Lam presented a paper "Acceptance Criteria for In-Service Inspection of Heat Exchanger Head and Shell Components"at the ASME Winter Annual Meeting held in New Orleans, LA. The papers was published in ASME AD-Vol. 36 "Fatigue and Fracture of Aerospace Structural Materials" by the Aerospace Division, ASME.

Publications

K. L. Shanahan's paper "Discrete event simulation of an analytical laboratory" was published in Analytica Chimica Acta, 282 (1993) 679-685 by Elsevier Science Publishers B. V., Amsterdam.

M. C. Morrison, J. S. Brenizer, and T. G. Williamson, "An Epithermal Technique to Resolve Activation Interferences," Journal of Radioanalytical and Nuclear Chemistry, 167 (1) 45-54, (1993).

Presentations

Nov. 10 — J. C. Whitehouse presented a paper entitled "Performance Degradation of a Large Production Reactor Recirculation Pump During Off-Design Conditions" at the ASME Rotating Machinery Conference held in Somerset, NJ.

Nov. 14-18 — Presentations at the American Nuclear Society Winter Meeting held in San Francisco, CA:

K. A. Niemer, "Development of a New Physics Data Library for the SRS Reactors."

M. R. Buckner, "Ability of SRS to Support Plutonium Disposition Options."

T. G. Williamson and J. F. Mincey, "Criticality Safety Engineer Training at WSRC."

D. Biswas, "Characteristics of a 100% MOX Fueled PWR Design for Weapons Plutonium Disposition."

R. E. Grove, "Axial Distribution of Fuel and Target Materials in SRS Mark 22 Assemblies."

R. E. Pevey, "GRIMH3: A New Reactor Calculation Code at Savannah River Site."

Nov. 19 — E. F. Trumble gave a presentation at the 5th meeting of the Nuclear Criticality Safety Benchmark Evaluation Working Group on the Plutonium Button Benchmark Evaluation held in San Francisco, CA.

COMPUTATIONAL MODELING
(J. R. Pelfrey, Manager)

Engineering Modeling

Thermal Evaluation of the 9965, 9966, 9967, and 9968 Shipping Packages - J. W. Jerrell

Customer: Packaging and Transportation Group

Abstract: Thermal analyses have shown that a single mass source in a shipping drum will produce a higher maximum temperature for the cane fiberboard than will a source that is evenly distributed throughout the primary containment vessel. Revised analyses for the 9965, 9968, and 9972 through 9975 drums are being completed.

Previous analyses of the 9965 through 9968 and 9972 through 9975 shipping packages have assumed that the heat source was equally divided into two separate sources located in both the upper and lower cans. It is possible, however, that the source may be a single mass. Furthermore, the mass may be located at the top of the primary containment vessel (PCV) close to the seal. Heat transfer from the single mass will be more concentrated to a localized region. Since the maximum permissible cane fiberboard temperature is 250° F, the single mass may require using a smaller heat loading than is currently accepted. A series of analyses has been completed for the 9965 drum to determine the effect of the source distribution on the temperature profile of the cane fiberboard insulation. Four geometries for the source loading condition have been evaluated: (1) Single mass within an inverted drum; (2) Powder uniformly distributed in the PCV; (3) Two tuna cans in an inverted drum; (4) Two tuna cans in a right-side up drum.

The worst possible shipping arrangement from a thermal standpoint is found with an inverted drum and a point source located at the top of the PCV. This arrangement maximizes the PCV seal temperature and temperature of the nearby cane fiberboard. Therefore, this arrangement must be analyzed for the 9965, 9968 and 9972 through 9975 shipping packages.

Structural Analysis of Closure Cap Barriers - A Pre-test Study for the Bentonite Mat Demonstration Project - Chung Gong

Customer: Environmental Restoration Department

Abstract: The Pre-Test numerical modeling of the Bentonite Mat Demonstration Project (BMDP) has been completed. A technical report on the numerical modeling of the BMDP composite clay cap is now in the review process.

The Bentonite Mat Demonstration Project (BMDP) is a field demonstration study to determine the construction / installation requirements, permeability, and subsidence performance characteristics of a composite barrier. The composite barrier will consist of on-site sandy-clay blanketed by a bentonite mat and a flexible High Density Polyethylene (HDPE) liner (also called flexible membrane liner). Construction of one control test pad and three bentonite test pads are planned. The control test pad will be used to establish baseline data. Underneath the composite clay cap is a four-foot loose sand layer in which cavities will be created by evacuation of sand.

The present work provides a mathematical model for the BMDP. The mathematical model will be used to simulate the mechanical and structural responses of the composite clay cap during the testing processes. Based upon engineering experience and technical references, a set of nominal soil parameters have been selected. Currently, detailed soil test data and cavity configuration data are not available to validate the mathematical model. Since the configuration of the cavities created in the testing

process is irregular and unpredictable, two extreme configurations are considered in this mathematical model, viz., the circular cavity and the infinitely long trench in the sand underneath the cap. This approach will provide bounds for the testing results.

In the literature, soil structures particularly clay caps are usually analyzed with linear elasticity theory. The composite clay caps constructed in the BMDP with various compositions of soils and loose sands are more plastic than elastic in mechanical responses. Large irrecoverable deformation is expected in the cap system with the soils experiencing tremendous distortion. The different responses of soil in tension and compression contribute to the deformation pattern of the cap system. Therefore incremental plasticity theory as well as pressure and tension-compression dependent yielding criteria must be applied to this analysis.

This problem possesses both geometrical and constitutional nonlinearities. The finite element analysis technique is applied to solve this type of problem. A commercial code, ABAQUS® that is formulated with the incremental plasticity theory and the Drucker-Prager / Cap plasticity model, is used to perform the numerical computations.

An axially symmetric model is constructed for the cap covering circular cavities, whereas a plane strain model is used for the cap bridging the trenches. The two dimensional finite element mesh for both models is identical. Each solid element is about six-inch square for the soils. The flexible membrane liner is meshed with shell elements. The total number of elements is about 1000 that varies with the size of the cavities in the sand. The responses of the cap are calculated for a wide range of cavity sizes of both models. The diameter of circular cavities ranges from 3-feet to 12-feet and the width of the trenches from 3-feet to 10-feet.

The loads upon the cap system are gravity and a 2 psi pressure on the top surface of the cap.

Process Simulation

High Level Waste Simulation Package - M.V. Gregory

Customer: High Level Waste Management Division

Abstract: The effort to expand the "skeleton" SPEEDUP® *High Level Waste Flowsheet Model is solidly underway. The next major deliverable to the customer is expected in June 1994.*

With the completion of the "skeleton" High Level Waste Flowsheet Model reported last month, efforts immediately turned to adding more flesh to the bones. The Flowsheet Model Team, following the lead of the customer's representatives, reviewed and commented on the Software Requirements Specification (SRS) which defines the model enhancements to be implemented in the next phase. A standard stream component structure was defined which simultaneously provides the level of detail required by the customer and takes advantage of SPEEDUP® features which allow easy model upgrades in the future. Some model details required by the SRS but not in the skeleton model were added: batched slurry transfer from Extended Sludge Processing tanks to the Defense Waste Processing Facility, slurry pump seal leak modeling capabilities, and a time-dependent sludge settling model.

Work was initiated to upgrade the entire skeleton model from eight to 26 chemical components. Other Flowsheet Model Team members took responsibility to fill in specific blackboxes in the skeleton model. The final product will be the Phase 1 model specified by the customer's SRS. Integration of all the new model pieces will occur by March 1994, with an initial running version of the full Phase 1 Flowsheet Model to be delivered to the customer for early testing in June 1994. Turnover to the customer of the completed Phase 1 model, with full documentation, is expected by September 1994.

Integrated High Level Waste System Flowsheet Model (HLWSF) Support - K. L. Shanahan

Customer: High Level Waste Management Division

Abstract: During November, a Purchase Requisition was assembled and walked through for the purchase of an RS/Series products license package for the two RS/6000 cluster used in the HLWSF Modeling effort.

The HLWSF modeling team has agreed initially to use RS/1 and related products as the software product of choice for constructing simulation control files. These ASCII files are constructed from RS/1 tables that hold all necessary information required by the simulation code. That information is gathered from the user via a series of questions and/or table editing sessions. The RPL language is used to construct the procedures for collecting the information and writing it to files.

A Purchase Requisition was delivered to Brookhaven on 11/23. The PR consolidates two existing RS/Series products licenses into one, and converts to BBN's new concurrent-user based licensing strategy. By reducing the number of concurrent users down from the maximum allowed by the conversion, a cost savings on annual maintenance fees will be realized.

The final configuration to be installed on the RS/6000 cluster is: 4 concurrent RS/1 users allowed (reduced from 6), 2 RS/Explore users (reduced from 6), 2 RS/Decision users (increased from 1), 1 RS/Discover user, 1 RS/1 Contourplots user, 1 QCAII user, and 1 RPL Toolkit user.

The annual maintenance fee on this license will be $3800, down from an estimated maintenance fee of $11,000 annually for the two separate original licenses. Maintenance costs are being paid for by IWT section, and license conversion/added user costs by AT section.

Dynamic Batch Model of the DWPF - R. A. Dimenna and F. G. Smith, III

Customer: DWPT

Abstract: A dynamic model of mass transfers among some of the major tanks in the DWPF was developed to characterize the performance of the facility as a function of input conditions, output requirements, process controls, and time. The model was developed with SPEEDUP® and provides a framework within which continued development of a detailed DWPF model will proceed.

A dynamic model of some of the major tanks in the DWPF was developed to characterize the performance of the facility as a function of input conditions, output requirements, process controls, and time. The model was developed with SPEEDUP®, an equation solving program which accepts user input in the form of the mathematical relationships describing the system, converts the input to FORTRAN, and solves the system of equations.

Work during the past month focused on extending the model to incorporate additional tanks. A significant part of this extension was to review the control logic to ensure it was both accurate and robust. It was found to be unacceptably sensitive to changing model configurations to the extent that computational failures were common. A review of the control logic resulted in reformulating the batch controls to provide a simulation that was both accurate and robust. This effort is still in progress.

APPLIED STATISTICS
(R. C. Tuckfield, Manager)

Statistical Analysis of WP-19 Sampler Data - C. P. Reeve

Customer: DWPT/DWPF

Abstract: The statistical analysis of the WP-19 sampler test on four DWPF tanks has been completed. The greatest disparity between samplers occurred in the SME where elemental differences as high as 11% were observed.

The WP-19 sampler test called for samples to be drawn from four DWPF tanks during Cold Chemical Runs -- the PRBT, SRAT, SME, and MFT. The primary goals of the test were to estimate the precision and accuracy of the Hydragard prototypic liquid sampler with respect to grab samples taken at a low elevation, and to estimate tank homogeneity by contrasting grab samples taken at a high elevation with those taken at a low elevation.

The PRBT and SRAT data showed little significant difference between sampler methods. The SME data showed that, relative to the low grab sampler, the Hydragard was about 11% higher in concentration of sludge elements and about 3% lower in concentration of frit elements. The high grab sampler showed the same pattern with respect to the low grab sampler, but the magnitudes of the differences were only about 40% as much. The MFT data showed about the same pattern as the SME data except the magnitudes were only about 60% as great.

APPLIED PHYSICS
(C. E. Apperson, Manager)

Criticality Methods and Analysis

Criticality Code Validation - E. F. Trumble and J. B. Justice

Customer: C. E. Apperson, APG

Abstract: Work on Phase I of the Lawrence Livermore Plutonium Button experiments, which was reported earlier, was defended at the 5th meeting of the Criticality Safety Benchmark Evaluation Working Group meeting in San Francisco in November.

Specific comments pertaining to the draft evaluation will be incorporated and the evaluation re-issued. Upon completion, this evaluation will be included with others generated from around the DOE complex in a DOE Handbook on Nuclear Criticality Safety Benchmarks.

Work is continuing on the development of a second evaluation dealing with Phase II and III of these experiments. The current emphasis is to determine the calculational uncertainty associated with assumptions made in developing the benchmark description.

J80 Criticality Codes Certification - D. Biswas, S. Y. Lee, C. E. Boman, R. E. Grove, J. H. Hightower, and R. L. Reed

Customer: C. E. Apperson, APG

Abstract: Work is continuing on the J80 Criticality Code User's Manual and J80

The incomplete sections of the J80 User's Manual on ANISN and KOKO-KATISHA-POOHBAH have been completed as Rev 0. KENO and TWOTRAN sections are still incomplete. Work is continuing to add additional example problems in some sections as per reviewer's comments. Independent review of the J80 Criticality Code Manual has been initiated. Extensive comments about the section on MGBS have been provided. Many comments on MGBS have centered around effectiveness of the Manual sections as an aid to users of the code. These comments are being incorporated in the manual.

Conversion of the J70 KENO code to the J80 JOSHUA operating system has been completed and the J80 version is protected in SCMS TEST status for formal certification testing. Test results indicate that the conversion process was successful. Documentation of the test results in the 'KENO Test Report' is in progress.

A version of TWOTRAN that was imported from RSIC, has been converted to Fortran 77 and reprogrammed to accept input from J80 JOSHUA records so that it functionally resemble the J70 version. Work is continuing on testing this J80 version of TWOTRAN.

100 Area Fuel Consolidation Support Activities - R. L. Reed and S. Y. Lee

Customer: Marc Rosser (RRD/RED)

Abstract: Preliminary calculations for increased storage in Horizontal Storage racks in Disassembly indicate that rack storage can be increased 50% with the addition of a grating over the racks. Final calculations have been initiated.

Proposals have been made (and are being studied) to increase the fuel storage capability in both Assembly Area and Disassembly Area of 105-K. SRT-CMA-930062 examined aspects of criticality

potential for Mark 22 assemblies following damage to borated concrete fuel storage racks in Assembly (See September Monthly).

Means of increasing the Disassembly capacity for fuel storage include increasing the number of assemblies stored in a slot in the horizontal storage racks. Under task plan TP 93-006-I-E-1, APG has examined the changes in subcriticality margin from current storage configurations and the means proposed to ensure maintenance of a minimum margin of safety. RED has proposed that a grating be placed above the horizontal storage racks to prevent a dropped fuel bundle from increasing the reactivity of the filled storage racks. Preliminary calculations (HRXN-KENO and MGBS-TGAL) indicate that a grating that will maintain a spacing of one foot or more between the storage array and a dropped fuel bundle is adequate to maintain subcriticality. Final MGBS-TGAL and HRXN-KENO calculations are being initiated. Drafting of the report has been initiated.

Technical Review: Disassembly Basin Sludge Cleanup in K Area - R. L. Reed

Customer: M. A. Rosser (RED)

Abstract: Review of the RED evaluation (WSRC-TR-93-613) of the criticality potential associated with sludge removal activities in the K Disassembly basin has been initiated.

The sludge sample results for K Disassembly Basin were evaluated by RED with the same methodology previously employed in RRD-RED-930306 to show that sludge removal in K Disassembly is critically safe. Sufficient fissile mass is in K Disassembly Basin sludge to support a critical situation, but the evaluation shows that probable concentrations of fissile material are insufficient to support criticality and that the neutron absorptive characteristics of other materials in the sludge provide further margins of safety. The APG review of the RED documentation has been initiated.

Technical Review: Criticality Aspects of Sand Filter and Associated Settler Tank - R. L. Reed

Customer: M. A. Rosser (RED)

Abstract: Review of the RED evaluation (WSRC-TR-93-614) of the criticality potential associated with operation of the sand filter and associated settler tank for the K Disassembly basin has been initiated.

Questions were recently raised about the criticality safety of the sand filter and settler tank system used to clean up particulates from the Disassembly basin water, especially in consideration of the sludge sample analyses that indicate total fissile masses in the sludge exceed critical mass limits. APG has consulted with RED personnel about conditions to consider in the evaluation. The APG review of the RED documentation has been initiated.

Technical Review: NCSE for 320-M Laboratory Enriched Uranium Operations

Customer: R. H. Ross (NMP)

Abstract: Review of NCSE # 251 (WSRC-RP-93-320-251) has been initiated with comments to the author.

During 300 CAC reviews of 320-M Laborator operations, questions about conflicts and inconsistency between Technical Standards, procedural requirements, and practices were raised.

The NCSE was written to provide a basis for the limits that are to be employed. Preliminary comments have been forwarded to the author for resolution.

Westinghouse Nuclear Fuels Facility - S. K. Skiles, C. E. Boman, P. J. Vescovi, and J. F. Mincey

Customer: Westinghouse Commercial Nuclear Fuels

Abstract: The sales contract to authorize criticality safety work in support of the Westinghouse Columbia S.C. Nuclear Fuels Facility was approved. Work was started to develop a double contingency policy for the Columbia facility and train three APG engineers. These engineers will report for work at Columbia on a full-time basis starting 1/4/94.

Formal approval to begin criticality safety work in support of the Westinghouse Nuclear Fuel Fabrication Facility near Columbia S.C. was received 11/23/93.

Work currently in progress includes development of a double contingency policy that will be the basis for formal safety analyses at that facility. Also started was the training of three APG engineers to assist in performing criticality safety analyses to this policy. These three engineers will be loaned to Columbia for at least 8 months and report to work at that facility starting 1/4/94.

Work In Support Of The E-Vault SAR - J. F. Mincey, R. L. Reed, and T. G. Williamson

Customer: Solid Waste Division

Abstract: The E-Vault SAR review indicated work was needed before that facility was operated to address double contingency in a credible manner and to develop critical mass equivalence relations with U-235 for isotopes other than Pu-239.

The E-Vault SAR review indicated work was needed before that facility was operated to address double contingency in a credible manner and to develop critical mass equivalence relations with U-235 for isotopes other than Pu-239.

Planning for both these efforts with Solid Waste is in the final stages.

DWPF Nuclear Criticality Safety Analyses and Evaluations - R. W. Rathbun and T. G. Williamson

Customer: Savannah River Technology Center

Abstract: A draft Nuclear Criticality Safety Analysis (WSRC-RP-93-692) was reviewed against the criteria in WSRC-IM-93-13 and comments returned to the author. In addition, the supporting Nuclear Criticality Safety Evaluations (NCSEs) are being reviewed. The NCSEs had to be revised as a result of changes to the DWPF process.

A draft Nuclear Criticality Safety Analysis (WSRC-RP-93-692) was reviewed against the criteria in WSRC-IM-93-13 and comments returned to the author. In addition, the supporting Nuclear Criticality Safety Evaluations (NCSEs) are being reviewed. The NCSEs had to be revised as a result of changes to the DWPF process.

The review of the revised draft NCSEs indicated some calculational input errors. These comments have been resolved with the author and corrected.

Plutonium Disposition Study

Plutonium Burner Support - R. W. Rathbun and D. Biswas

Customer: Westinghouse Electric Corporation, NATD

Abstract: WSRC is supporting WEC with PDR600 core physics predictions for the Phase I-C effort. Compatibility of increased enrichment loadings (6.6% Pu) was demonstrated. Tritium production capability was also predicted. Documentation of core physics efforts is being generated to meet mid-December report milestone to WEC.

Phase I-C core physics efforts for the Pu Disposition Study continued with PDR600 (AP600 with weapons grade MOX fuel) optimization studies. Emphasis was places on maximizing enrichment and minimizing fuel exposure to a level that provides a denaturing of 20% Pu-240 (weapons grade plutonium loaded contains 6% Pu-240). Predictions with the WEC neutronics codes indicate that such a core design is compatible with the Westinghouse Advanced Light Water Reactor plant core design and safety limits. This fact enables a single site with twin PDR600 units to disposition the entire 100 MT of expected excess weapons plutonium, provided the entire life of the plants are utilized. The baseline program guideline of disposition in 25 years, which may be expanded to useful plant lifetime in the future, would require 6 individual PDR600 units.

Planning for demonstration fuel assemblies was pursued with the intent of fabricating MOX fuel with IFBA at the BNFL facility in Great Britain. WSRC core physics has been interacting with WEC in planning the test assembly configuration. Additionally, PDR600 tritium production capability was predicted on the WSRC classified IBM mainframe with the GLASS code. Results indicate that a single PDR600 unit is capable of meeting the desired tritium production goal.

WSRC is committed to delivering documented results to WEC by mid- December for the overall Phase I-C report to DOE.

EXPERIMENTAL THERMAL HYDRAULICS
(D. R. Muhlbaier, Manager)

Enhanced Waste-Tank Level Model - M. R. Duignan

Customer: High Level Waste Engineering

Abstract: Modeling of environmental effects on the waste level in the waste tank located in H-area continued.

With the increased sensitivity of waste level measurements in the waste tanks, located in H-Area, level changes have been recorded which are unexplained. An unexplained change of one (1) inch in the waste level is a reportable event. Qualitative observations indicate that much of the unexplained level change may be explained by environmental effects, i.e., changes in level due to changes in atmospheric pressure, temperature, and relative humidity. Quantitatively, some of the level changes have been explained by using a model that indicates the thermal expansion of the tanks' contents (but the contents are assumed to consist of only supernate). Unfortunately, that model does not work for all tanks. The model is limited in scope, but can be made more effective by incorporating other changes which occur because of environmental changes.

Current work has identified three other possible mechanisms that can significantly change the waste level. The evaporation/condensation of water in the tank either at the purge-gas condenser or at the supernate/purge-gas interface, the expansion/contraction of the salt cake due to temperature changes, and the dissolution/precipitation of the chemical components of the supernate in equilibrium with the corresponding solids in the salt cake. Simple models for the first two of these three scenarios have been developed. An empirical model is under development for the third effect, ie., dissolution/precipitation. The projected completion of this work is Feb. 2, 1994.

ITP Mixing Study - D. A. Eghbali

Customer: In-Tank Precipitation Technology Development

Abstract: A number of Computational Fluid Dynamic Codes, including FIDAP, have been utilized for better understanding of the mixing characteristics during waste storage and treatment. Tank 51 is a waste storage tank which utilizes four submerged mixing pumps, located at the bottom of the tank, to sustain uniform mixing of the slurry inside the tank. The objective of this work is to develop a computational model which can simulate the mixing characteristics inside Tank 51.

A mixing model is currently being developed using the Finite Element Computer Code, FIDAP, which has limited capability to model the submerged rotating pumps. This computational mixing model should be able to provide a crude simulation of mixing characteristics inside Tank 51 using one or any combination of four mixing pumps.

Spent Fuel Dry Storage Development, Rig Design - M. D. Fowley

Customer: Transition and Reconfiguration Program Integration.

Abstract: Preliminary design has begun of the test section for the single fuel element tests. This test will develop some basic data for detailed modeling of the fuel element.

Two methods of regulating the temperature of the sleeve surrounding the fuel element heater model are being investigated. The first method utilizes heated oil flowing through copper tubes attached to the outside of each sleeve wall. An insulating material would be placed between the sleeve and the tubes to provide a measurable temperature difference for heat flux calculations, if necessary. The second method utilizes heated air flowing over the entire sleeve. The velocity of the air would be relatively high to provide a uniform temperature distribution along the length of the sleeve and to ensure turbulent flow over the sleeve for preliminary heat transfer calculations. The purpose of the investigation is to determine the feasibility of each method as well as the cost and time required to complete the construction of the test section and associated hardware.

Preliminary results show that both methods are feasible and cost effective, although a few question remain concerning temperature control. The heated air method appears to be the simplest to construct. However, the ability to control individual sleeve wall temperature for the heated oil method is appealing if the power output of the heater, from side to side, is not uniform. The pros and cons of each method will be presented to the task leader for his decision.

Pilot-Scale Demonstration of HEME Dissolution Process - Z. H. Qureshi

Customer: Defense Waste Processing Technology

Abstract: The High Efficiency Mist Eliminators (HEME) used in the melter feed preparation processes will be dissolved in a caustic solution for their ultimate disposal. A pilot-scale demonstration of this dissolution process will be conducted in the Thermal-Fluids Lab. This task is scheduled to be complete by June 94.

The Technical Assistance Request (TAR) for this test program has been received from the customer in accordance with E7 Manual Procedure 3.12. For the preliminary disposition of the request, the Experimental Thermal-Fluids Group prepared a Development Plan that outlines the approach to meet the objectives of the request. After completing the internal technical and QA review of the plan it was forwarded to the customer for approval.

A significant literature search was made on the dissolution process of fiberglass in aqueous solutions in order to identify the controlling mechanisms of the dissolution process. The most critical parameters are the total amount of fiberglass, the solution pH value, temperature, total amount of solution volume, the surface area of glass exposed to the solution, and physical conditions such as the solution velocity levels that provide replenishment of the solution. The proposed tests will preserve all the pertinent scaling parameters on full scale basis. The most important aspect of the test program is to obtain basic data on the effect of solution velocity level through the filter medium and its ultimate dissolution.

The Environmental Evaluation Checklist (EEC) was prepared since the proposed program will deal with hazardous materials and will generate hazardous waste. The EEC has been reviewed and approved by the SRTC ALARA Coordinator.

The detailed design of the 1/5th scale tank is complete and is being reviewed. Originally, it was planned that a similar but somewhat smaller tank available in the lab will be used. However, this tank needs some modifications and thorough cleaning which would have resulted in equivalent effort of building a new one.

The steam coils and the air sparger mockup design is near completion.

ITP Filter Replacement Activity - A. C. Smith

Customer: ITP

Abstract: This task will establish the capability to replace the ITP filter and dispose of the unuseable filter.

The SWDF safety assessment for disposal of the filter box in the burial ground has been completed. The assessment shows that storage of the box will result in no increase in hazard for SWDF.

The filter box design review committee will receive the packages of review materials on 12/3. Fabrication of the filter box is in progress.

The Preoperational PHR for the filter removal activity is in progress.

Investigating Level Indicating Devices - T. L. Spatz

Customer: L. F. Landon, DWPT

Abstract: The density and height of constituents in the mixing tanks are currently measured with a diaphragmed bubbler device known as a Holledge probe. During testing with simulant sludge traditional bubblers encountered plugging problems. The purpose of this task is to search the available literature for the state-of-the-art in level indicators. This literature search will incorporate Holledge probes, modifying traditional Bubblers, and more.

A literature search has been ongoing to determine the state of the art in level indicators. The constraints of the application have eliminated most commercially available level indicating devices on the market today. A serious attempt is being made to complete this task before the end of this year.

Literature Search in Support of Foaming Concerns - T. L. Spatz

Customer: L. F. Landon, DWPT

Abstract: Tests of waste simulants in the SRAT and SME tanks have shown that boiling off water to concentrate the contents causes excessive foaming. The purpose of this task is to search the available literature for anti-foaming agents, or solutions to the foaming problem in general. The hope is that within the nuclear or chemical industries someone has encountered a similar foaming problem and published their findings.

Literature is being acquired for this study by the SRTC library from various sources. This effort has just begun but is expected to be completed by the end of January, 1994.

Cross-Flow Filter Test - J. L. Steimke and C. M. Hart

Customer Lew Landon, DWPT

Abstract: In preparation for delivery to the Defense Waste Processing Facility, slurry from Tank 49 will be washed in a process that uses a cross-flow filter in a vertical orientation. Most of the flow passes through the porous tubes of the filter in the axial direction. A small part of the flow is driven through the porous membrane of the tubes by a pressure difference. Filtrate collects in the shell around the porous tubes and is collected.

To provide technical support, the Thermal Fluids Laboratory (TFL) is testing a cross-flow filter in a flow loop that allows flow in either the forward direction (tube side to shell side) or reverse direction. Brief flow in the reverse direction, back-pulsing, is useful for dislodging filter cake, which increases production of filtrate. The ten foot long Du Pont filter at the TFL has been tested with clean water. Flow resistance was measured, defined as the trans-membrane pressure drop divided by the trans-membrane flux. For most of the TFL tests of the ten foot long filter the reverse resistance was half of the forward resistance. This difference was not expected because the flow through the porous membrane should be a Darcy flow. For a Darcy flow the pressure drop is directly proportional to flowrate and inversely proportional to liquid viscosity. There was concern that the dependence of resistance on

flow direction indicated a flaw in the TFL flow loop, the instrumentation or the filter. It was decided to resolve the unexpected measurement before proceeding with testing with simulated slurry.

The resistance to forward flow for the ten foot long filter at the TFL was somewhat higher than the forward flow resistance measured by the Du Pont Company for the same model filter with clean water and also somewhat higher than the forward and reverse (backpulse) resistances for a much smaller (one tube 18" long) Du Pont filter tested at the TFL. Reverse resistance was not measured at Seneca. Bio-fouling was suspected to be a cause of increased flow resistance in the forward direction. Cleaning the ten foot long TFL filter with a one percent solution of oxalic acid followed by a one percent solution of sodium hydroxide decreased the resistance to forward flow such that all filters had about the same forward flow resistance but the directional difference in resistance persisted for the ten foot long TFL filter. The TFL flow loop was rigorously checked and no flaw was found to explain the discrepancy. The TFL is now investigating the possibility of a crack inside the filter that would widen when the flow was in one direction and close when the flow was in the other direction. Data support the hypothesis of a crack but thus far no crack has been found.

PACKAGING AND TRANSPORTATION
(E. K. Opperman, Manager)

Type A Packaging For Sample Liquids (Door Stop) - D. S. Hoang and R. S. Maurer

Customer: Dana Lott, Waste Management

Abstract: The preliminary package design drawings of the Type A Doorstop Packaging were completed. The Functional Design Criteria (FDC) and Task Plan were completed and sent to the ITP customer.

The ITP Facility Manager has requested the P&T group to do procurement and certification of a DOT 7A (type A) Packaging to carry high level radioactive liquid samples from ITP/ESP waste tanks to the SRTC laboratory. The P&T group established a preliminary design according to the customer requirements. The packaging will be designed to accommodate a doorstop containing a radioactive liquid sample vial. The design consists of a stainless steel containment vessel packed in Celotex confined in a 17C 30-gal stainless steel drum. The Functional Design Criteria (FDC) implemented based on E7 manual and Task Plan documents for the type A Doorstop Packaging were completed and sent to the ITP customer.

ITP Filter Box Safety Assessment - A. G. Eggers and P. S. Blanton

Customer: ITP Project

Abstract: P&TG has completed a first draft of the report titled "Safety Assessment-Onsite Transfer of the ITP Failed Filter Containment Box", WSRC-TR-93-653. This report meets the requirements of the 19Q Manual, Procedure 1.04 which became effective 9/30/93, and demonstrates that safety equivalent to DOT will be provided for this movement.

It may be necessary to remove a highly radioactive plugged (failed) filter from the ITP Facility. The ITP project authorized E&PD to develop a containment box for movement of the filter from the facility to a storage location for up to 45 years (until benzene and hydrogen gas generation in the box cease) and then to the waste disposal vault. P&TG provided input to the filter box FDC for the onsite movement (transportation) of the box. They also worked closely with the designers to ensure the adequacy of the final design. In May of this year P&TG initiated this safety assessment knowing that the onsite transport requirements of radioactive material were being finalized as part of the 19Q Manual.

The safety assessment documents the filter box design, structural, thermal, containment, shielding, criticality, operations, maintenance and QA evaluations. The box design with key containment and shielding features is described in careful detail, the materials and fabrication procedures meet accepted RAM packaging practice, the NDE is documented, and all applicable analyses that demonstrate the performance are included in the assessment. The filter box will meet all of the DOT performance requirements for Normal Conditions of Transport as defined by 10 CFR 71. It will not withstand a roll over accident or the extreme 30 foot free drop and 1475 F (engulfing) fire Hypothetical Accident test conditions from that CFR. To ensure safety for off-normal events, special precautions must by taken through the use of onsite procedural controls to avoid high kinetic energy impact events (limiting lift height, route and vehicle selection, prohibiting 2 way traffic, limiting vehicle speed, etc.) and serious fires (route selection to avoid fuel storage facilities and limit fuel carried on transporter).

9965/68 Certificate Renewal Process - G. Cadelli

Customer: A. J. Staph

Abstract: In response to DOE-HQ (EH 33.2) review of the 9965-68 Safety Analysis Report for Packaging (SARP), the Packaging & Transportation Group is involved in package testing and computer analysis to answer the 150 questions received. The responses and SARP revision will be part of the application for recertification of six radioactive material shipping packages.

Responses to the questions are being generated in several technical areas, including structural analysis, thermal analysis, shielding-dose rate, and nuclear sub-criticality. Drop tests, computer thermal analysis, and computer evaluation of shielding and criticality are in progress.

5320 Operation & Fabrication - M. A. Whitney and A. G. Eggers

Customer: HB-Line, Jim Barber & Rena Jacobson

Abstract: As Cognizant Technical Function (CTF) and Design Agency for radioactive material transport packaging that have originated from SRS, it is the responsibility of the Packaging & Transportation Group (P&T) to give ongoing technical support to all users of these packagings. The 5320 packing is a plutonium shipping container that is used throughout the DOE complex.

The P&T Group has continually and successfully supported HB Line as Cognizant Technical Function for the 5320 shipping container by dispositioning 11 Non-Conformance Reports (NCRs) and reviewed and approved 32 procedures in the last year. Because of the P&T Group's initiative, it was discovered that the EP-61 (primary Containment Vessel of the 5320) plug was being incorrectly lubricated during assembly and a replacement lubricant was reconsidered. The group dispositioned 7 SDDRs (Documented Deviation Reports for fabrication) that related to the fabrication of EP-61s by an outside vendor. The P&T Group was the driving force in establishing a more cost effective method of inspecting and approving the purchase of new EP-61s. This new method will produce a higher quality product at a reduced cost.

As design agency for the 5320 shipping container, the P&T Group has obtained special approvals and given technical direction to other DOE sites. This included the shipment of product that was outside the normal transportation parameters, i.e., had been stored too long before shipment.

L1100, Applied Technology

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