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Fluor MPR-77-04

COAL LIQUEFACTION PILOT PLANT

CRESAP, WEST VIRGINIA

MONTHLY TECHNICAL PROGRESS REPORT

APRIL, 1977

Fluor Engineers and Constructors, Inc.

3333 Michelson Drive

Irvine, California 92711

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PREPARED FOR THE UNITED STATES

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Under Contract No. EX-76-C-01-1517

NOTIFICATION OF TRIPS

Name	Duration	Destination	Purpose
E. J. Flavin	4/1-4/15,4/26-5/4	Cresap, West Va.	ERDA Meeting
R. H. Pulliam	4/3-4/6	" " "	Develop Startup Schedules
	4/12-4/15	" " "	ERDA Meeting
	4/19-4/23	" " "	Operations Cost Control Program
	4/26-4/29	" " "	ERDA Meeting
G. O. Fredrickson	4/4-5/4	" " "	ERDA Meeting & LCDC Support
A. A. Keens	4/12-4/15	" " "	CCDC Meeting &
		Library, Pa.	Process Checkout
R. V. Cates	4/24-4/28	Cresap, West Va.	Filter Systems Checkout
L. C. Lewton	4/24-4/28	" " "	Filter Systems Checkout
M. Llanos	4/4-4/15,4/25-4/27	" " "	Develop Startup Schedules
T. Schweitzer	4/4-4/15	" " "	Develop Startup Schedules
M. A. Jung	4/14-4/18	" " "	Pension Fund Contrib. Audit
M. Mendon	4/18-4/22	" " "	OSHA Structural Review
P. Michalski	4/18-4/21	" " "	Extractor Checkout
E. A. Reed	4/19-4/22	" " "	Operations Cost Control Program
D. A. Barlow	4/25-5/20	" " "	Schedule Support for LCDC
M. Mallannao	4/6-5/13	" " "	Control Systems Checkout
K. Foster	4/11-5/13	" " "	" " "
T. Esswein	4/18-5/6	" " "	" " "
E. Daughters	4/25-5/27	" " "	" " "
J. Cotton	4/25-5/27	" " "	" " "

I. SUMMARY

The estimated project progress as of April 24, 1977 is:

Engineering and Design - Refurbishing.....99%

Engineering and Design - Testing.....83%

Procurement (Commitments and Expenditures) - Refurbishing.....99%

Procurement (Commitments and Expenditures) - Test Program.....90%

Construction and Subcontract - Refurbishing.....99%

Construction and Subcontract - Test Program (Phase I).....99%

Construction and Subcontract - Test Program (Phase II).....99%

II. OPERATIONS

A. Summary

During this period, process startup operations in Section 1140 - Flare/Relief, Section 900G - Hydrogen Generation, Section 500 - Solvent Recovery and Section 1130 - Seal Oil are essentially complete. In addition, Section 200 - Extraction, Section 700 - Fractionation, Section 800 - Low Temperature Carbonization and Section 1230 - Waste Water Treatment are all well advanced into their startup schedules. Process startup of the latter three is expected to complete within two weeks. Sections 1210 - Sour Water Stripper and 1220 - Gas Treatment are mechanically complete; the latter is charged with process chemicals. Further preoperational testing is awaiting definition of pertinent tests. Section 300 - Solids Separation is being prepared for operation with pre-startup fluids.

Plans are being formulated for integrated startup of the front end of the process (Sections 100, 200, 300, 500 and 800) on solvent and coal.

In Section 100 - Coal Feed Preparation - minor modifications have been made to provide the necessary degree of operability. Operator checkout is being conducted to maintain familiarity with the operation.

In Section 200 - Extraction - operational checkout of equipment has started with pre-startup fluids.

In Section 300 - Solids Separation - inspection of mechanical equipment is complete and reinstallation is in progress. Refractory curing is complete in two of the three heaters. This section will be checked out with pre-startup fluids. Plans are in preparation for closed-loop operation on a cold solvent-char slurry.

Section 500 - Solvent Recovery - has been checked out with fuel oil.

Section 700 - Fractionation - has been operated on a gasoline-fuel oil mixture. Further checkout of this section is required.

In Section 600 - Extract Hydrogenation - construction effort to correct punchlist items will commence on April 25 and is expected to complete in late May. Refractory curing of heaters is in progress.

In Section 900C - Hydrogen Compression - chemical cleaning of compressor piping is scheduled to start April 26.

Test engineering efforts have included pump inspection, preparation for evaluation of test heater performance, a checkout of filtration equipment (Test 1500), participation in test valve/piping inspection, and followup on corrosion/erosion requirements.

II. OPERATIONS

A. Summary (Continued)

In recruiting, two test engineer positions remain to be filled. As the result of resignations, the mechanical engineer position and two operating technician positions need to be filled.

One lost-time injury during the period reemphasizes the need for a continuing effort to increase safety awareness.

B. Progress by Plant Sections

Section 100 - Coal Feed Preparation

Previous operation had demonstrated the operability of this section with special operator attention. A number of actions have been completed or are in progress to provide the necessary degree of reliability and operability. These include:

a. Completed installation of the automatic actuator and solenoid for the butterfly valve on the combustion air inlet to the L-A103D heater to block air feed when the heater is not activated.

b. Preparation of an RFA to improve the control of inert gas supply and consumption.

c. Completed recommendations to mechanically modify the rotary feeder L-A103A to increase the rate of coal feed.

d. Completion of recommendation to improve lubrication on the roller mill and initiation of action to implement.

Section 200 - Extraction

The refractory cure of the B-A201 preheater has been completed. Water has been circulated through the entire system. The J-A205 and J-A206 centrifugal and J-A202A/B positive displacement slurry pumps have been commissioned with water.

An internal inspection of the two slurry pumps, J-A205 and J-A206, revealed minor coating (PTI-54) defects on the impeller wear ring surface of J-A205; but, more extensive defects were found on the case, impeller and wear ring areas of J-A206. A complete review was made with SCD and it was agreed to reassemble both pumps for service.

Work is in progress to install the carbon throttle bushings on the seals of the extractor mixer, L-B205; expected completion is April 25.

An NDE inspection was made of the heater tubes in the slurry preheater, B-A201, and no evidence of tube wall thinning was found. The one heater tube that was leaking around a thermocouple pad was repaired by construction.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 200 - Extraction (Continued)

The piping to the three-way control valves, VS-224 and VS-226 on the outlet of the B-A201 heater and L-B205 extractor, respectively, was modified to conform to the correct design arrangements. The valves have been satisfactorily checked out electrically.

Electrical supply problems still remain with the spray solvent heater, C-A204, although repairs to the shorted-out heating elements were completed. A change request to correct remaining deficiencies is in progress.

The B-A201 heater was fired and associated instrumentation was fine-tuned for stable operation; related deficiencies were corrected.

The weigh readouts on the slurry mix tanks, F-A203A/B, have been repaired and the equipment representative is scheduled for the week of April 25 to calibrate the weigh system with dead weights.

An RFA was submitted to revise the suction and discharge piping on the J-B202 slurry charge pump to prevent solids deposition.

Process testing of this section, including cold slurry circulation, will follow installation of the throttle bushings on the extractor mixer.

A computer program to calculate batch feed compositions and rates directly from the log sheets was written. The program output summarizes the total feed, feed rates and solvent/coal ratios on a daily basis, as well as providing the backup detail for material balancing.

Section 300 - Solids Separation

Closed-loop circulation of water is being established as pumps and other mechanical equipment become available. Refractory cure is complete in the B-A301 hot flush solvent heater and the B-A304 secondary slurry heater.

The major effort to inspect the internal hard coatings on the numerous (17) pumps in this section is essentially complete except for the J-C303 underflow pump, which requires coating thickness measurements.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 300 - Solids Separation (Continued)

The results of inspection are as follows:

a. Three pumps have been sent to the vendor, Pacific Pumps, for repairs as follows:

1. J-A313C - Repair back cover plate.
2. J-A314D - Repair pump case.
3. J-A342A - Repair impeller.

b. Three pumps have been identified with extensive coating defects and efforts are in progress to ship the parts to a local area shop for repair. These are:

1. J-A313B - Repair case.
2. J-B342B - Repair impeller.
3. J-A208 - Repair case (warehouse spare).

Although a number of pumps require repair, by the use of spare parts and/or swapping, at least one pump has been provided for each service as required for plant startup.

There are a total of eight pumps released for reassembly, mechanically checked out, and ready for operation. The associated seal flush system has been cleaned and is ready for use.

Repairs to the bearing housing for the hydroclone feed pump, J-A314D, were completed and this marked the completion of all repairs of this nature that were the result of cold weather freeze-ups.

The outstanding punchlist and change request items were identified and an action list was submitted to construction.

A procedure is being prepared to hand-calculate a material balance, using the programmable calculator to perform conversions from log sheet data to values in engineering units. A modification of the startup manual was prepared to allow for a preoperational checkout with either a solvent/coal or fuel oil/coal slurry.

Section 500 - Solvent Recovery

This unit was started up on April 4. It presently is being operated at near-process conditions on closed-loop, using No. 2 fuel oil. Vacuum column overheads and bottoms are being recombined and flash still bottoms are being drummed off as necessary.

The replacement casing for the J-A501 flash still feed pump was received from Pacific Pumps. The casing will be installed on the J-A706B fractionator bottoms pump which had provided the "swap" casing for J-A501.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 500 - Solvent Recovery (Continued)

A change request was issued to change the upside-down gate valves on the bottom of the F-A501 extract disposal tank to ball valves in order to eliminate problems with valve operation due to plugging. Another change request that was issued was for the installation of double mechanical seals on the J-A502A/B flash still bottoms pumps for pump operability.

An internal inspection of the J-A503B extract disposal pump revealed no defects in the Stellite coating; the pump was released for reassembly. The only other internally coated pump in this section, J-A503A, was found to have significant defects in the PTI-54 coating and is presently under repair by Pacific.

Repairs to the improperly-machined mechanical seal on the J-A504A recycle solvent pump were completed and the pump has been reinstalled.

Resolution of the vacuum control problems associated with the B-A502 reboiler remains under review.

Calibration of the differential pressure transmitters is essentially complete.

The burned out motor for J-A506 condensate disposal pump is out for repair.

As testing of electrical heat tracing continues throughout the plant, typical deficiencies have been identified: low meggar readings, shorted out tracing and overheating of the feeder cables. Repairs are being made by construction as required.

Laboratory-generated data were used to develop set points and expected operating conditions for the preoperational checkout with fuel oil. Instructions for operating the vacuum column under these conditions were also prepared. The vacuum control system was demonstrated to be inadequate for standby or other non-normal operations. Through an RFA, appropriate modifications were suggested for SCD approval.

Section 600 - Extract Hydrogenation

Approximately 50 percent of the process vessels have been flushed. The remaining vessels will be cleaned prior to startup on water.

Refractory drying in the four unit heaters has begun. No heaters are yet completely dried, however. This activity should complete in early May.

Projected activities include water circulation as equipment is checked out by maintenance and construction work on punchlist items completes.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 600 - Extract Hydrogenation (Continued)

Electrical preoperational checks have progressed to 65 percent completion. All flow elements have been installed. Motor deficiencies which include incomplete wiring or shorted out power cables are being corrected during the checkout phase.

Several meetings were held with factory representatives and SCD personnel to identify the cause for low pressure leakage on numerous control valves, as well as to identify appropriate repair measures. In general, the problems relate to improper valve handling and installation. A change request has been submitted to repair approximately 19 valves by either lapping the valve seats or tightening of the packing with a special wrench. Also, the necessary spare parts and maintenance tools to repair these valves have been ordered.

Section 700 - Fractionation

The hydro fractionation section is being operated at near process conditions on closed-loop. A mixture of gasoline and fuel oil is being used to simulate process material based on process recommendations for closely simulating actual operating conditions.

The vacuum distillation section has been filled with fuel oil and will be activiated following completion of construction work in that area.

Repairs have been made to the B-A704 reboiler which included modification of the wiring on the heater inlet head and redistribution of the heater loads to prevent fuse blowing. In addition, a change request was issued to correct deficiencies with the purge air system to the heater control cabinet.

The level instrument, LI-714 (bubbler-tube-type) on the B-A704 reboiler, was found to be missing the dip tube element. Numerous (17) other similar instruments were found to have identical deficiencies; a change request was issued to correct these problems.

The results of the internal coating inspection of the J-A711A/B vacuum distillation feed pumps were satisfactory. The pumps were released for reassembly to complete all coating inspection work in this section.

Repairs to the cracked bearing housings on J-A701B stabilizer charge pump and J-A704B vacuum bottoms pump were completed and the pumps are reinstalled.

All safety relief valves were reset and have been reinstalled.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 800 - Low Temperature Carbonization

Fuel oil has been charged to the tar and solvent quench systems. The unit is operating on closed-loop circulation, with recycle gas flowing through the heater.

Reliable operation of the B-A801 startup heater has been established with oxygen levels in the recycle gas at less than 3 percent.

Efforts to raise the carbonizer temperatures to normal operating levels will continue, by loading of char. Subsequent activities will involve fluidization and ignition of the char bed.

The char disposal system has been activated on water only, in a loop, from Section 800 to the pond and back. Operation is routine.

In order to establish operability of the B-A801 startup heater, various instruments associated with the heater were removed for calibration. Also, installation of the Maxon valve on the combustion air was completed by construction.

Refractory repairs to the top head and along the bottom of the D-A801 carbonizer drum were completed.

The shaft sleeves for the seals on the J-A803B char slurry pump were received and installed.

No significant defects were found on the internal hard coating (PTI-54) of the J-A803A char slurry pump and the J-A806A tar quench pump. Both pumps have been reinstalled.

A heat balance was made on the carbonizer during cure. Set points for the preoperational checkout have been prepared. New rotameters have been installed on the glass model and demonstrations have begun for the operators.

Section 900G - Hydrogen Generation

This section was started up on March 31.

It produced high quality hydrogen at full design rates for two weeks before being shut down for a scheduled power outage. Restart is scheduled for mid-May.

Significant electrical and instrument support was provided during unit startup. Instruments were recalibrated and control loops were modified for a smoother unit startup.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Section 900G - Hydrogen Generation (Continued)

Fine tuning of instruments continues, as well as other minor modifications such as sloping of instrument impulse lines.

Technical assistance during the startup was provided for sampling, analysis and the interpretation of results. A process report summarizing the generally satisfactory performance of this section will be prepared next month.

Section 900C - Hydrogen Compression

The acceptance inspection, both mechanical and electrical/instrument, is essentially complete and a report will be issued the week of April 25.

Chemical cleaning of compressor piping is scheduled to start April 26.

Series 1000 Units - Utilities

Actions to control iron oxide scale buildup on steam boiler tubes is in progress. The iron oxide appears to result from the corrosive effects of free carbon dioxide in the steam system. After installation of corrosion coupons, neutralizing amine treatment will be started which will halt corrosion and slowly remove buildup. This treatment will be followed by ongoing addition of a filming amine which will protect the system from further carbon dioxide attack.

The plant air compressor, JC-A1030B, was disassembled for repair, following a failure of the air intake filter. There was no apparent damage to the cylinder bores; however, new valves were installed and the suction piping was cleaned. New replacement filters have been installed and a change request has been issued to revise the suction and discharge piping to prevent recurrence.

Series 1100 Units - Offsites

After sandblasting the internals of the seal oil drum, the associated piping systems were thoroughly chemically cleaned and flushed. Jumper connections were installed across the numerous seal oil users and fuel oil was circulated through the system for further cleaning. The system was placed into service on April 16.

Series 1200 Units - Environmental

The Sour Water Stripper and Gas Treatment Sections are being prepared for commissioning. This will follow the startup of the Waste Water Treatment System.

II. OPERATIONS

B. Progress by Plant Sections (Continued)

Series 1200 Units - Environmental (Continued)

Delays in startup of the latter unit were caused by an apparent design error on the part of the vendor which required replacement of all retaining screens in the resin and carbon beds. This work is nearing completion and startup is scheduled for the week of April 25.

Procedures to test the Sour Water/Gas Treating Systems with hydrogen sulfide-containing gases are under consideration.

Laboratory studies have indicated that the absorption capacity of the primary waste water treating resins are consistent with design values.

C. Test Programs

Test Program 1600 - Valves and Piping

In conjunction with the SCD test coordinating engineer, two detailed inspections of test valves were completed. The nine test installations were punchlisted and a list of LCDC/SCD action items was assembled.

Test Program 1800 - Extraction

Delivery of the vibration probes remains scheduled for May 6. All of the electronic equipment is onsite and some installation work is in progress.

Test Program 1900 - Corrosion/Erosion

The NDE scope of work was received and reviewed.

Corrosion coupons and erosion stick handling and storage requirements were worked out with the SCD test coordinating engineer. Additional information was supplied for the RFA pertaining to accessibility of Tests 1931 and 1932.

D. Environmental

Attached are the monitoring data for the month. These data show compliance with all limits except for excursions of pH and oil/grease which have been corrected. The Waste Water Treatment startup should prevent future problems of this nature.

The high biochemical oxygen demand for the sample of April 17 resulted from taking a sample immediately following a planned power outage on April 16, during which the aerators for the treating unit were inoperable.

II. OPERATIONS

E. Laboratory

Analytical support continues to the startup efforts. A method to measure solvent to extract ratios by liquid chromatography is firm. The Carle gas chromatograph is being serviced by the vendor. Servicing of the Varian gas chromatograph is scheduled for next month.

During the next month, procedures for performing ultimate analyses (C, H, N, O) on volatile liquids will be evaluated. Special analyses required for fuel oil operations will be developed as required. When the glassware arrives, training for routine distillations by ASTM D-1120 will begin.

F. Safety and Health

Fire brigade training continues on a weekly basis to ensure adequate protection for the plant.

A sound level study of the utility area control room has been completed and recommendations have been made to reduce excessive sound levels.

We incurred another lost-time accident during the reporting period and additional training is being conducted with supervisory personnel to cut down on our accident frequency.

The Parsons' fire preventive recommendations have been reviewed internally and efforts will be made to comply with the intent of the recommendations.

Inventory and labor problems have led to curtailed uniform deliveries during the past month. The labor problems have been resolved and efforts are underway to bring the inventory situation under control.

A Central Safety Committee meeting was held with emphasis on establishing the Employee-Management Committee, educational meetings with supervisors, etc.

Orientation meetings are also being conducted with the maintenance and engineering group.

G. Departments

Operations

Critical path diagrams covering startup of Sections 200, 300 and 600-900C have been prepared with the help of SCD Cost/Scheduling. These are being statused weekly. Also, progress on action lists being prepared by J. D. Strasser working with G. O. Fredrickson is being reported to ERDA weekly.

II. OPERATIONS

G. Departments (Continued)

Maintenance and Engineering

There presently are 1,293 work orders in the work order file system.

Efforts are in progress to provide SCD with lube oil recommendations for the J-A608C/D Chempumps.

Lubrication data for Section 700 has been entered into the computer system; Sections 800 and 300 will follow shortly.

All electrical and instrument work order history statements have been submitted for computer entry; this effort is now current.

Preparatory work for licensing W. H. Wood, Instrument Supervisor, as plant radiation officer, is in progress.

Calculations and related instructions are being prepared for field calibration of level instruments throughout the plant.

A survey of orifice plate installations throughout the plant is complete.

Technical

In Data Processing, installation of a larger air conditioning system is expected to eliminate the need for almost daily shutdown of the computer. Also, increased maintenance coverage is being recommended to provide greater on-stream time.

Calibration of the pneumatic and thermocouple signals to the Scanivalve is complete. A checkout of the process value printout reveals the presence of software problems.

The final tape required to update the material balance program was received. Runs 1-4 will be processed as soon as possible with copies sent to SCD for review.

Completed log sheets and instrument charts are being received on a regular basis and filed.

The work order system data entry continues to utilize 90 percent of DEC Writer time. Keypunching of warehouse inventory was begun; approximately 700 of 30,000 cards have been punched and verified to date. The effort will continue as time permits.

Administrative

Staffing: An offer was extended to a test engineer, but it was rejected.

II. OPERATIONS

G. Departments (Continued)

Administrative (Continued)

Two vacancies remain in the test engineering group. Two interviews for these positions are scheduled for the week of April 25. Both vacancies in the laboratory have been filled with the last technician scheduled to start work May 2. In Operations, two of the four vacancies which were caused by resignations have been filled. Interviews have been conducted to fill the final two positions. In Maintenance and Engineering, Steve Burkle, Plant Inspector, reported to work on March 28.

Personnel: M. D. Jones, G. N. Beacham and an Equitable representative were at the plant the week of April 11 to explain the new hospitalization program which will be effective May 1.

Procedures have been issued covering various aspects of personal hygiene such as facial hair, long hair, etc.

Work is underway to revamp the locker room to provide adequate locker facilities for all personnel.

Purchasing and Accounting

P. J. Corrigan, SCD subcontracts, has spent the last week at the plant in an effort to finalize all remaining subcontracts. Particular progress has been made in resolving the building maintenance subcontract.

III. TEST PROGRAM

A. General

1.0 General test plan definition continued this past month, but at a low level of activity as many of the test engineers were assisting in the plant checkout and startup. See Part II, Section C for additional details.

B. Tasks

1.0 Solvent Deashing

1.1 Objective:

To determine the process design for solids-liquids separation using the solvent deashing concept developed by CCDC, with verification of the design on both the bench scale and pilot plant scale bases.

1.2 Work Accomplished for the Month:

A progress meeting was held with Conoco Coal Development Company (CCDC) on April 15.

All runs of the SRC continuous extraction/settling program have been completed. Runs HE-17 to 24 were made with an 8 inch diameter settler. Runs HE-17 to 20 were conducted to define the effect of antisolvent contamination on settling. Runs HE-17 and HE-18 used the antisolvent cut (185 x 207°C) recovered by distilling material recovered from previous runs made using fresh Soltrol 130 as antisolvent. Even at 0.45 antisolvent/liquefaction solvent ratio, ash contents on Run HE-18 varied from 0.11 to 0.22 wt%. Runs HE-19 and 20 used a 35/65 mix of the recovered antisolvent and fresh Soltrol 130. At a 0.45 antisolvent ratio, the ash on HE-20 ranged from 0.14 to 0.22 wt%. These data show that maintaining antisolvent purity is vital for solvent deashing. The antisolvent performance varies inversely with kauri-butanol number. Tests on the three antisolvents used in the continuous Pamco program gave the following kauri-butanol numbers:

Soltrol 130	22.3
35/65 Recovered Antisolvent/Soltrol 130	26.1
Recovered Antisolvent	33.3

CCDC will attempt to define the degree of contamination of the antisolvent. Earlier runs had indicated that 0.1 wt% ash product could be made using 0.3 Soltrol 130 antisolvent ratio. Runs HE-21 and 22 were conducted at 0.25 and 0.35 ratios, respectively, to provide additional data on this

III. TEST PROGRAM

B. Tasks (Continued)

1.2 (Continued)

variable. At 0.25 ratio, ash content varied from 0.09 to 0.12 wt%. This demonstrates the degree of sensitivity of the process.

Run HE-23 was made at 550°F settler temperature compared to 600°F used in all other runs. Ash content varied from 0.09 to 0.37 wt%.

The last run, HE-24, was made by feeding Ft. Lewis filter feed to the continuous unit. In this run, the extractor is used only for heating purposes. Ash content ranged from 2.5 to 7.6 wt% at the 0.3 Soltrol 130 antisolvent ratio. This run shows that results obtained from filter feed differ markedly from those with freshly produced material. The analyses for the batch autoclave SRC runs made last year have been included in the March Status Report No. 12.

With completion of the testing program, CCDC will now proceed with the process engineering studies and preparation of the final report.

2.0 Liquid-Solids Mechanical Separation

2.1 Objective - The overall objectives are:

2.1.1 To determine maximum filtration rates with various attractive candidate filtration equipment.

2.1.2 To evaluate mechanical design, configuration and reliability.

2.1.3 To analyze the operation economics of the various filtration schemes with various coal liquefaction process streams.

2.2 Work Accomplished for the Month:

2.2.1 Completed second punch out of the entire 1500 Area.

2.2.2 Approximately 90 percent of the 1500 Area is completely installed except for insulation.

2.3 Problems Encountered and Solutions:

In reviewing the final vessel drawings, it appears that some welds in the L-B341 vessel do not have sufficient thickness per ASME code after deduction of the 1/4 inch corrosion allowance, but will meet 1/8 inch corrosion allowance. The problem can be solved if during the testing phase the welds

III. TEST PROGRAM

B. Tasks (Continued)

2.3 (Continued)

are measured for thickness periodically to insure that the 1/8 inch corrosion allowance is not exceeded. This problem is still under study.

2.4 Work Forecast for the Coming Month:

2.4.1 Complete L-B341 vessel calculation.

2.4.2 Complete first draft of operational mechanical test of L-B342 horizontal leaf filter.

3.0 Pumps

3.1 Objective:

To develop pump and seal design configuration and material for coal liquefaction process application with emphasis on durability in slurry service.

3.2 Work Accomplished for the Month:

3.2.1 Revised dimensional drawings for test procedures.

3.2.2 Trip was made to Chemetal Corporation, Pacoima, California to evaluate possible coating application by chemical vapor deposition method on centrifugal pumps.

3.2.3 Reviewed and made comments in response to Parson's letter on pumps.

3.2.4 Reviewed test program requirements for Pumps J-A202A/B.

3.2.5 Revised the test procedures.

3.3 Problems Encountered and Solutions:

None

3.4 Work Forecast for the Coming Month:

Continue to follow up on design requirements for the test program.

4.0 CSF Process Extractor Improvement

4.1 Objectives:

4.1.1 Evaluate process variables inherent to the CSF Process Extractor Mixer.

III. TEST PROGRAM

B. Tasks (Continued)

4.1.2 Determine the performance capabilities of mixer mechanical components.

4.1.3 Evaluate mechanical and nonmechanical extractor design configurations with respect to mechanical reliability, process acceptability and scale-up potential.

4.2 Work Accomplished for the Month:

4.2.1 Coordinated installation of the D-A201/L-B205 Extractor-Mixer throttle bushings.

4.2.2 Performed first preliminary inspection of the mechanical vibration probes.

4.2.3 Continued efforts to expedite fabrication and shipment of mechanical vibration probes.

4.2.4 Continued to provide assistance to LCDC during Extractor-Mixer mechanical and process checkout.

4.2.5 Reviewed spare parts inventory for Test 1800 equipment at site.

4.2.6 Began coordination of Machine Surveillance System construction and installation.

4.3 Problems Encountered and Solutions:

None

4.4 Work Forecast for the Coming Month:

4.4.1 Perform additional preliminary and final inspections of mechanical vibration probe components and assemblies.

4.4.2 Incorporate all remaining operation manuals into Test 1800 General Manual.

4.4.3 Coordinate preoperational suitability checks of Extractor-Mixer components.

4.4.4 Check installation of Machine Surveillance System; conduct preliminary operational tests.

III. TEST PROGRAM

B. Tasks (Continued)

5.0 Flow Meters

5.1 Objective:

Development of flow meters for hot slurry service and high viscosity low Reynolds numbers streams and devices that will meet the requirements of mechanical reliability, process acceptability, and scale-up potential.

5.2 Work Accomplished for the Month:

5.2.1 Test engineer involved in plant startup assistance; no progress for test accomplished.

5.3 Problems Encountered and Solutions:

None

5.4 Work Forecast for the Coming Month:

5.4.1 Continue to provide instrumentation support to other test elements.

5.4.2 To continue the preparation of test procedures for plant test runs Numbers 3, 4, 5, 6 and 7.

6.0 Control, Letdown Valves and Expansion Chambers

6.1 Objective:

Development of control, letdown and expansion chamber configuration and trim materials that will maintain their dimensional integrity and design performance in coal liquefaction service.

6.2 Work Accomplished for the Month:

6.2.1 Test engineer involved in plant startup assistance; no progress for test accomplished.

6.3 Problems Encountered and Solutions:

None

6.4 Work Forecast for the Coming Month:

6.4.1 To continue the preparation of test procedures for plant test runs, Numbers 3, 4, 5, 6 and 7.

III. TEST PROGRAM

B. Tasks (Continued)

7.0 Valves and Piping

7.1 Objectives:

7.1.1 Performance evaluation of pipeline valves used in coal liquefaction slurry service. Body material and trim selection that will minimize changes in the internal configuration which will give superior flow characteristics and minimal solids buildup.

7.1.2 Design modifications of high-pressure pipe connectors to investigate their reliability when exposed to thermal shock.

7.2 Work Accomplished for the Month:

7.2.1 No further work in the Home Office is planned in this area until field test operations begin.

8.0 Corrosion and Erosion

8.1 Objective:

To determine the corrosion and erosion rates of various materials in coal liquefaction service.

8.2 Work Accomplished for the Month:

8.2.1 All test spools including spools for receiving coupons, sticks, and probes have been installed.

8.2.2 Twelve desiccators have been ordered for transporting coupons, sticks and probes between test runs.

8.3 Problems Encountered and Solutions:

A test element (coupons and sticks) holder inside the desiccators has to be designed and built.

8.4 Work Forecast for the Coming Month:

8.4.1 Start the design of test elements holder to fit inside the desiccators.

8.4.2 Find an outlet to build item in 8.4.1.

8.4.3 Continue the effort with LCDC to install the test elements.

8.4.4 Write test elements handling, cleaning and weighing procedures.

III. TEST PROGRAM

B. Tasks (Continued)

8.4.5 Continue the effort to incorporate comments and finalize test procedures.

8.4.6 Continue the search for better techniques to apply hard-facing coatings in order to extend the service life of our equipment when needed.

9.0 Pipe System Erosion/Hydraulics

9.1 Objective:

To test the erosive quality of some of the slurry streams which are characteristic of coal liquefaction plants.

9.2 Work Accomplished for the Month:

No further work in the Home Office is planned in this area until field test and operation begin.

10.0 High-Pressure Closures

10.1 Objectives:

10.1.1 Confirm the existing high-pressure reactor closure and flange assemblies for 5000 psi, 900°F operation.

10.1.2 Evaluate the performance of two additional 4-inch flanges in the aforementioned high-pressure temperature environmental under cyclic operation and external pipe-imposed load.

10.2 Work Accomplished for the Month:

No further work in the Home Office is planned in this area until field test and operations begin.

11.0 Vessels

11.1 Objective:

Develop information for improved vessel design.

11.2 Work Accomplished for the Month:

No further work in the Home Office is planned in this area until field test and operations begin.

III. TEST PROGRAM

B. Tasks (Continued)

12.0 Heaters

12.1 Objective:

To obtain quantitative data on heater design parameters including:

12.1.1 Tube fouling caused by coke laydown.

12.1.2 Pressure drop characteristics.

12.1.3 Heat transfer characteristics.

12.2 Work Accomplished for the Month:

12.2.1 Continued definition of test equipment requirements.

12.2.2 Continued refinement of test planning.

12.2.3 Continued definition of test procedures.

12.3 Problems Encountered and Solutions:

No problems are anticipated at this time.

12.4 Work Forecast for the Coming Month:

12.4.1 Finalize test procedures.

12.4.2 Review and refine computer data reduction program.

13.0 Heat Exchangers

13.1 Objective:

To obtain quantitative data on heat exchanger design parameters, including:

13.1.1 Heat transfer coefficients of coal derived fluids.

13.1.2 Fouling characteristics of coal derived fluids.

13.1.3 Erosion and corrosion studies of coal derived fluids.

13.1.4 Viscosity studies for coal derived fluids.

13.2 Work Accomplished for the Month:

13.2.1 Continued definition of data reduction program.

III. TEST PROGRAM

B. Tasks (Continued)

13.3 Problems Encountered and Solutions:

No problems at this time.

13.4 Work Forecast for the Coming Month:

13.4.1 Continue definition of data evaluation program.

14.0 Process Definition and Development

14.1 Objective:

Development of process information required to improve the knowledge of the CSF process including data useful for commercial design.

14.2 Work Accomplished for the Month:

14.2.1 Reviews of the detailed test procedures to incorporate process information continues.

14.3 Problems Encountered and Solutions:

None

14.4 Work Planned for the Coming Month:

14.4.1 Continue to work with all aspects of the test program and laboratory scope to incorporate process definition comments as appropriate.

IV. REFURBISHING (Including Installation of Test Elements)

Summary

Major activity was in support of LCDC efforts to achieve plant startup. This involved accomplishment of numerous change requests, OSHA related changes, and punchlist items.

The subcontracts for final painting and paving were issued.

INDUSTRIAL WASTEWATER EFFLUENT

MONITORING DATA FOR MONTH OF April, 1977

PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FLOW (cal/day)	Daily Flow	Monitor					
TSS (mg/l)	Measurement	60 mg/l	18	11	38		
	Av. to Date	30 mg/l	18	14	22		
TDS (mg/l)	Measurement	Monitor	3164		4362		
	Av. to Date	Monitor	3164	3164	3763		
COD (mg/l)	Measurement	Monitor	544		218		
OIL & GREASE (mg/l)	Measurement	15 mg/l	9	34	6		
	Av. to Date	10 mg/l	9	22	16		
PHENOL (mg/l)	Measurement	1.0 mg/l	0.2	0	0		
	Av. to Date	0.05 mg/l	0.2	0.1	0.07		
NH_3 (mg/l)	Measurement	30 mg/l	<1	0	0		
	Av. to Date	15 mg/l	<1	<1	<1		
CYANIDE (mg/l)	Measurement	0.2 mg/l	0	0	0		
	Av. to Date	Monitor	0	0	0		
PHOSPHATES (mg/l)	Measurement	Monitor	0		0		
pH	Measurement	$6.0 \leq pH \leq 9.0$	8.5	8.3	9.2		
TOT. RES. Cl (mg/l)	Measurement	Monitor			0.35		
	Av. to Date	Monitor			.0.35		
ARSENIC (mg/l)	Measurement	Monitor	0	0	0		
LEAD (mg/l)	Measurement	Monitor	0.050	0.092	0.123		
CADMIUM (mg/l)	Measurement	Monitor	0.013	0.016	0.026		
MERCURY (mg/l)	Measurement	Monitor	0.000059	0.00023	0.00012		
TOTAL IRON (mg/l)	Measurement	Monitor	0.489				
TOTAL COPPER (mg/l)	Measurement	Monitor	0.017				
ALUMINUM (mg/l)	Measurement	Monitor	0.284				
HEX. CHROMIUM (mg/l)	Measurement	0.05 mg/l					
ZINC							

SANITARY WASTEWATER EFFLUENT

			MONITORING DATA FOR MONTH OF April, 1977				
PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FLOW (gal/day)	Daily Flow	Monitor					
TSS (mg/l)	Measurement	45 mg/l	29	8	10		
	Av. to Date	30 mg/l	29	18	16		
BODs (mg/l)	Measurement	45 mg/l			165		
	Av. to Date	30 mg/l			165		
FECAL COLIFORM (No./100 ml)	Measurement	400			20		
	Av. to Date	200			(3/7/77)		
pH	Measurement	$6.0 \leq pH \leq 8.5$	7.6	7.5	7.6		
Est Resid Cl	Measurement	>0.5 mg/l	7.4	10.6	2.2		

POTABLE WATER

			MONITORING DATA FOR MONTH OF April, 1977				
PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FREE Cl RESIDUAL (mg/l)	Measurement	0.35	0.61	0.54	0.60		

INDUSTRIAL WASTEWATER EFFLUENT

MONITORING DATA FOR MONTH OF April, 1977

PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FLOW (gal/day)	Daily Flow	Monitor					
TSS (mg/l)	Measurement	60 mg/l	18	11	38		
	Av. to Date	30 mg/l	18	14	22		
TDS (mg/l)	Measurement	Monitor	3164		4362		
	Av. to Date	Monitor	3164	3164	3763		
COD (mg/l)	Measurement	Monitor	544		218		
OIL & GREASE (mg/l)	Measurement	15 mg/l	9	34	6		
	Av. to Date	10 mg/l	9	22	16		
PHENOL (mg/l)	Measurement	1.0 mg/l	0.2	0	0		
	Av. to Date	0.05 mg/l	0.2	0.1	0.07		
NH_3 (mg/l)	Measurement	30 mg/l	<1	0	0		
	Av. to Date	15 mg/l	<1	<1	<1		
CYANIDE (mg/l)	Measurement	0.2 mg/l	0	0	0		
	Av. to Date	Monitor	0	0	0		
PHOSPHATES (mg/l)	Measurement	Monitor	0		0		
pH	Measurement	$6.0 \leq pH \leq 9.0$	8.5	8.3	9.2		
TOT. RES. Cl (mg/l)	Measurement	Monitor			0.35		
	Av. to Date	Monitor			.0.35		
ARSENIC (mg/l)	Measurement	Monitor	0	0	0		
LEAD (mg/l)	Measurement	Monitor	0.050	0.092	0.123		
CADMIUM (mg/l)	Measurement	Monitor	0.013	0.016	0.026		
MERCURY (mg/l)	Measurement	Monitor	0.000059	0.00023	0.00012		
TOTAL IRON (mg/l)	Measurement	Monitor	0.489				
TOTAL COPPER (mg/l)	Measurement	Monitor	0.017				
ALUMINUM (mg/l)	Measurement	Monitor	0.284				
HEX. CHROMIUM (mg/l)	Measurement	0.05 mg/l					
ZINC mg/l)	Measurement	Monitor	0.065				

SANITARY WASTEWATER EFFLUENT

			MONITORING DATA FOR MONTH OF April, 1977				
PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FLOW (gal/day)	Daily Flow	Monitor					
TSS (mg/l)	Measurement	45 mg/l	29	8	10		
	Av. to Date	30 mg/l	29	18	16		
BOD_5 (mg/l)	Measurement	45 mg/l			22		
	Av. to Date	30 mg/l			(3/6/77)		
FECAL COLIFORM (No./100 ml)	Measurement	400			20		
	Av. to Date	200			(3/7/77)		
pH	Measurement	$6.0 \leq pH \leq 8.5$	7.6	7.5	7.6		
Tot Resid Cl	Measurement	>0.5 mg/l	7.4	10.6	2.2		

POTABLE WATER

			MONITORING DATA FOR MONTH OF April, 1977				
PARAMETER	VALUE REPORTED	DATE / STANDARD	4/3/77	4/10/77	4/17/77		
FREE Cl RESIDUAL (mg/l)	Measurement	0.35	0.61	0.54	0.60		