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TECHNICAL PROGRESS REPORT
FOR
UTSI/CFFF MHD PROGRAM COMPLETION
AND RELATED ACTIVITY

For The Period
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MASTER

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EXECUTIVE SUMMARY

Actions taken to maintain the DOE Coal Fired Flow Facility in standby condition are reported. Plans are discussed to upgrade the facility coal processing system and data acquisition and control system with funds from another DOE program (HIPPS).

The final technical report scheduled on the MHD POC program was forwarded to DOE in draft form for review.

The major actions in site environmental remediation were continuation of sampling and analysis from the eight existing groundwater wells and the completion of drilling of seven additional wells. The drilling methodology and soil sampling techniques are described.

Work on preparation of the overall plan for the development of coated conductors continued with coordination and discussion of the plan with a large number of interested personnel from national laboratories, universities and commercial companies working in the field. Preliminary work in studying processes for application of superconductor and buffer layers is reported. Visits to UTSI by Dr. Judy Wu from the University of Kansas and Dr. Paul Berdahl of LBNL for presentations and discussions on HTS technology were completed.

TASK 1 - FACILITY AND PROPERTY MANAGEMENT

Activities this quarter were concentrated on the facility preventive maintenance / repairs required to maintain the Coal Fired Flow Facility in a standby condition. Weekly and monthly equipment maintenance procedures were performed for facility air compressor systems, cooling water pumps, coal processing system motors, steam boiler systems, ID and FD fans, and fire water system equipment.

The cooling tower pumphouse 1000 KVA transformer was repaired and returned to service this quarter. In addition, complete inspection, maintenance, and repairs were performed on the facility main substation by a power engineering subcontractor. Work to repair winter freeze damage to the water chemistry system in the cooling tower pumphouse was also completed. Reinstalled cooling tower electrical controls and utilities. Installed new cooling tower water circulating pump and filled tower with water in preparation for startup of process cooling water system next quarter.

One of the two fire system diesel pumps overheated during a routine maintenance procedure damaging the starter motor and a heater in the engine coolant system. The diesel pump repairs were completed this quarter.

Coal feed operations during the HIPPS program will require a higher system operating pressure (450-500 psig) and flowrate (1.7 lbs/sec) than previous CFFF tests. The HIPPS requirements and the deterioration of existing coal system components make an upgrade of the coal system a necessity. Therefore, funding to upgrade the CFFF coal feed and processing system was included in the HIPPS proposal. A survey was made to determine unreliable coal system components and to identify components that have deteriorated during the standby period. It was decided that replacing and repairing the coal system control valves and solenoid valves would provide the greatest overall improvement in coal system reliability. In addition, it was decided that the coal data/control equipment should be upgraded to a distributed control configuration.

Data Acquisition

Maintained the CFFF data acquisition and control computers in an operational state. Performed instrument calibrations and data system repairs on an as needed basis. Developed specifications for a Distributed Control System to replace the aging minicomputer based data acquisition system and the PC-based control system.

TASK 2 - REPORTING AND ARCHIVING

The final technical report on the MHD POC Program on the Western Coal 1000 Hour POC and Final Program Summary Report, was submitted in draft form to DOE/PETC.

No work was done on archiving during the quarter, pending determination by DOE of the site and format for the MHD Program archives.

All major pieces of equipment, mechanical and utility systems, and test hardware items in the CFFF have been documented with drawings and specifications. All hardware and systems added to the CFFF or modified since 1985 have been documented in AutoCAD format. Original drawings, microfilm copies and computer disks are maintained for archival purposes as well as daily use in maintaining the CFFF. The Design Engineering Department continues to support the collection, filing and updating of CFFF mechanical system design documentation.

TASK 3 - SITE ENVIRONMENTAL COMPLIANCE AND REMEDIATION

As reported in the monthly reports the initial groundwater samples were collected and analysis completed for four of the eight existing wells suspected of contamination. In addition, seven new wells were drilled, visual data recorded and soil sent for chemical analysis. These new wells were in the process of being "developed" in June, and should be ready for water sampling in July. However, bids must be submitted for analyses of these samples and this could postpone the sampling until August.

Most of the chemical analysis data has been received, except for the groundwater analyses of the seven new wells. This data and flow data needs to be gathered in order to have a complete verification of the "horizontal and vertical extent of the contamination". When this has been accomplished, this site should provide an ideal setting for demonstrating a DOE/MSE innovative groundwater remediation technique.

In photo #1 a typical well was being drilled using a hollow stem auger. The hollow stem is used in order that "split spoon" samples, and Shelby tube samples can be taken. Split spoons are similar to a core drill in that as the auger rotates, the spoon gathers a relatively undisturbed core sample of the soil as the drill progresses downward. As seen in photo 2 of the spoon after it has been split open, an approximate five feet of the soil is exposed. This particular photo is typical of the first five feet of soil around UTSI. Split spoons are typically used for collecting soil analysis at the different soil stratification layers. Some information based upon visual observation of the spoon soil is taken as to the soil type and depth of the individual layers.

Photo #1

Photo #2

A Shelby tube is typically used for physical information of the soil such as hydraulic conductivity, or the ability of the soil to transmit water, and therefore, has units of velocity. These tubes are driven or pushed into the soil, and are taken to the lab for analysis. Driving these tubes was not successful because of the rock/chert in the soil make-up especially, at the 10-20 foot level (See Photo 3). Slug tests will be performed (if funds are available) and are a field test, and therefore provide better and more reliable groundwater flow data.

Photo #3

Photo 4 is a typical example of soil stratification in the subsurface in the area surrounding the CFFF. The dark black layers seen are probably manganese leached naturally from the soils, and illustrates visually the horizontal groundwater flows at this particular site.

TASK 4 - SITE REACTIVATION

No work was scheduled or performed.

Photo #4

TASK 5 - DISASSEMBLY AND DISMANTLEMENT (D&D) OF THE CFFF

No work was scheduled or performed.

TASK 6 - OTHER GOVERNMENT

Subtask 6.1 High Temperature Superconductivity (HTS) Plans

As noted last quarter, this effort was reoriented to prepare an overall plan for development of coated conductors. This effort was pursued vigorously during the quarter. Frequent consultations were conducted with national laboratory and commercial companies working in the field. Drafts of the plan were prepared and offered for review by interested personnel. A recommended draft of the plan was presented at DOE headquarters. Additional actions are required on the plan, including subcontracting to Energetics, Inc., to integrate the plan with other DOE planning documents, but approval was given to proceed with planning some research work in support of the national laboratories or commercial companies under this task.

The comparative study of non-vacuum processes for deposition of superconducting and buffer layers continued in coordination with ORNL. Known references were reviewed and a description of each process completed. Chemicals used in all processes were identified and environmental data sheets compiled where available. A chemical engineering graduate student will join this effort next quarter.

An existing university owned vacuum chamber was set up for pulsed laser deposition of superconductor and buffer layers. An initial run depositing alumina was completed. Although it is not anticipated that UTSI will conduct research on PLD, this facility is needed to make samples and to use for diagnostic experiments. In addition, a laser ignited argon torch was assembled to evaluate this method of application of superconductor and buffer layers as powder.

Work continued in defining the best way to upgrade the x-ray diffraction capability to provide the needed capability to evaluate the misorientation angle between crystalline structure in buffer layers and superconductors.

Subtask 6.2 Staff Exchange & Training

Dr. Judy Wu from the University of Kansas visited UTSI, presented a synopsis of her work in Metal Organic Chemical Vapor Deposition (MOVCVD) and diagnostics for that process and presented a workshop on both topics.

Dr. Paul Berdahl, LBNL, visited UTSI for discussions on aspects of the development plan for coated conductors.

OPEN ITEMS

A. UTSI: The following reporting actions were in process or preparation as of June 30, 1996.

Western Coal 1000 Hour POC & Final Summary Report Draft mailed 6/28/96

SUMMARY STATUS ASSESSMENT AND FORECAST

The CFFF continues in a standby condition as preventive maintenance and repairs are accomplished.

Subtask 6.1 - High Temperature Superconductivity (HTS). Work on the plan for development of coated conductors is essentially complete although additional work in support of DOE is anticipated. Next quarter, the plan for UTSI research in support of

the national laboratories and commercial companies will be submitted and work will begin on this work element.

Subtask 6.2 - Staff Exchange and Training. Staff exchange and training under this subtask is continuing. There will be frequent need to coordinate with national laboratories and appropriate commercial companies. It is anticipated that UTSI personnel will need to work in the national laboratories for extended periods in some cases.

TASK AND COST VARIANCES

- Due to the fiscal year close-out of University ledgers, this quarter actually reports four months (March - June) labor costs.
- Expenditures lag plan since the funding authorized is less than the planned budget.
- Funding for work on Tasks 4 and 5 has not been authorized. Therefore, no work has been performed on these tasks.
- Funding for work on Task 6 was received in December, 3 months later than original planned start date.
- Expenditures for Tasks 1, 2, 3 and 6 have been restricted by management because of inadequate contract funding from DOE.
- Corrective Actions - Corrective actions in the form of rebudgeting will take place as soon as the Federal Budget for FY 96 stabilizes and annual funding authorizations are issued.

April 1, 1996 - June 30, 1996 QUARTERLY VARIANCE REPORT

Planned vs. Actual Expenditures
(thousands of dollars)

TASK	PLANNED	ACTUALS	VARIANCE
1	175.8	197.5	(21.7)
2	139.2	64.0	75.2
3	82.2	79.1	3.1
4	38.4	0.0	38.4
5	29.4	0.0	29.4
6	293.4	263.5	29.9
TOTALS	758.4	604.1	154.3
COST ELEMENT			
DIRECT LABOR	304.8	301.1	3.7
FRINGE	76.5	69.2	7.3
EQUIPMENT	84.0	0.0	84.0
EXPENDABLE MATERIAL	44.4	5.4	39.0
OUTSIDE CONTRACTS	13.5	21.5	(8.0)
TRAVEL	10.5	5.9	4.6
TOTAL DIRECT COSTS	533.7	403.1	130.6
INDIRECT COSTS	224.7	201.0	23.7
TOTAL	758.4	604.1	154.3

Planned vs. Authorized Funding
Cumulative

TASK	PLANNED	AUTHORIZED FUNDING
1	527.2	
2	417.8	
3	246.8	
4	114.6	
5	88.6	
SUBTOTAL	1395.0	573.4
6	880.6	306.0
TOTAL	2275.6	879.4