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TECHNICAL PROGRESS REPORT NO. 28

FEBRUARY 1993

ENGINEERING DESIGN AND ANALYSIS OF ADVANCED PHYSICAL
FINE COAL CLEANING TECHNOLOGIES

for

U.S. DEPARTMENT OF ENERGY
PITTSBURGH ENERGY TECHNOLOGY CENTER
PITTSBURGH, PA

CONTRACT NO. DE-AC22-89PC89908

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MARCH 20, 1993

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I. SUMMARY OF IMPORTANT RESULTS FROM PREVIOUS REPORTING PERIOD

The following items were reported as significant findings for the January 1993 reporting period:

- In Task 2, revisions to the dewatering topical report were started.
- In the Task 6 froth flotation work, Pittsburgh seam minus 28 mesh size and specific gravity analyses are complete, and analysis for the 100 mesh tests continued. Illinois No. 6 testing continues.
- In the Task 6 Coal Liberation work, ash analysis of 134 different composition/size fractions produced by the crushing of the 6M x 8M sample were completed.
- Another item reported which significantly impacts the project was the submission of a project cost increase by ICF KE and of the subsequent proposal by AspenTech of rate adjustments. The cost increases are due to DCAA rate adjustments and when added to total expenditures, show the project to be already over original funding amounts. Work was slowed down until these issues are resolved.

II. SUMMARY OF WORK PLAN FOR THIS PERIOD

For the reasons mentioned above, work was slowed down on the project until the budget issues are clarified. Nevertheless, areas in which progress continued are reported in the next section.

III. SUMMARY OF RESULTS FOR CURRENT PERIOD

Task 6 Work Progress--Coal Liberation Modeling

Algorithm Development. Work continued on the fitting of the M-curve with a general conic section equation, using the derivative of the equation to represent the $M(c;ikl)$ vs. c function. Using 100M x 200M Illinois No. 6 data from the EPRI Coal Quality Information Book (EPRI CS-5421), a fit of the data to the equation

$$A(c;ikl) = \frac{b_0 + b_1 M(c;ikl)}{[1 - b_2 M(c;ikl)]}$$

produced a poor fit of the derivative

$$C = \frac{b_0 b_2 + b_1}{[1 - b_2 M(c; ikl)]^2}$$

to the elementary ash data. However, by fitting a subset of the data points; i.e., dropping the end members of the data set, a good fit of the derivative was achieved, better than the function

$$C = \frac{1}{1 + e^{[1 - (M(c; ikl)/\mu)^3]}}$$

The fit of seven other data sets, following this procedure, is now being investigated.

A comparison between calculating $A(c; ikl)$ from the M-curve and from

$$\int c dM(c; ikl)$$

i.e., taking the derivative of the derivative and integrating, is underway.

Experimental Development. The sink-float/sizing analysis of the 1/4" x 4M, 1.36 x 1.45 sample, crushed at 4.74 mm, was completed. The sample was crushed at 3.34 mm and the sink-float/sizing analysis completed. The 1/4" x 4M, 1.6 x 1.8 sample was crushed at 4.74 mm and the sink-float/sizing analysis completed.

Following the completion of mass balances, the $m_{j:ikl}$ tables are now being developed.

Coal Cleaning Simulator Enhancements

In the original simulator design only two components, coal and water, were to be allowed in a simulation. The expansion of the number of allowed components to include multiple conventional components, such as solvents, was found to be necessary. Changes were made to the existing simulator models to allow the addition of such components in a simulation.

Another change made was the addition of a built-in mechanism for the calculation of pyritic sulfur content. This information is not available for the databank coals. The necessary code modifications were made to the washability handling system to calculate pyritic sulfur content according to

$$PYRS = TOTS - FOSA * (1 - ASH/100)$$

with

$$FOSA = (TSUL - PSUL) / (1 - MOIST/100) / (1 - ASHD/100)$$

where

PYRS is the calculated pyritic sulfur value for the size/gravity interval

TOTS is the total sulfur value on a wet basis for the size/gravity interval

ASH is the ash value on a wet basis for the size/gravity interval

TSUL is the sulfur content from the feed ultimate analysis

PSUL is the pyritic sulfur content from the feed ultimate analysis

ASHD is the ash content from the feed ultimate analysis

MOIST is the moisture content from the feed proximate analysis

Administrative Issues

As a result of finding "booked" expenditures which were over the project's authorized funding, AspenTech began making plans to close the project early. It appears that future work by AspenTech will be at its own expense, since no increase in funding has been approved. The policy adopted, therefore, to plan future work has been to complete work in progress so as to deliver a good working version of CCS to PETC. The delivery will include the proper documentation (CCS User Guide), and will coincide with a training session. Work on tasks 4 and 5, for sensitivity and optimization studies, and advanced processes configuration with scale-up, cannot be completed under this plan.

IV. COMPARISON OF RESULTS WITH PLAN

The necessary steps are being taken to deliver the Coal Cleaning Simulator with a full range of capabilities as soon as possible. The key items required for the completion of the project have been identified and incorporated into a project completion plan. Meanwhile, subcontractors have been instructed to reduce the amount of effort put into the project until the budget issues have been addressed.

V. SUMMARY OF SIGNIFICANT FINDINGS AND RESULTS FOR CURRENT PERIOD

- Due to the fact that work was halted on the project, there are no major items to be reported.

VI. WORK PLAN FOR NEXT REPORTING PERIOD

- Continue progress towards the completion of the project as deemed necessary.

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