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IMPROVEMENT OF STORAGE, HANDLING, AND

TRANSPORTABILITY OF FINE COAL

QUARTERLY TECHNICAL PROGRESS REPORT NO. 1

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IMPROVEMENT OF STORAGE, HANDLING, AND TRANSPORTABILITY OF FINE COAL

PROJECT SUMMARY

Background and Objectives

Fine coal production is on the rise in the U.S., and it will continue to increase as underground mining companies invest in more productive equipment. Fine coal cleaning technologies have been developed to efficiently and economically separate coal from clay and other mineral matter in the fine size fractions, but they have not gained universal acceptance in the coal industry because their products are too wet for current market conditions.

Historically coal producers take one of two approaches in dealing with fine coal production. On the one hand, they may wash it and recover it as a wet cake, which must be thermally dried prior to shipment. On the other hand, many operators make no attempt to recover fine coal, and dispose of it as a wet cake or slurry in refuse piles, slurry impoundments and abandoned deep mines. There are environmental problems related to both of these practices.

The Mulled Coal Process was developed as a means of overcoming the adverse handling characteristics of wet fine coal without thermal drying. The process involves the addition of a low cost, harmless reagent to wet fine coal using off-the-shelf mixing equipment. Based on laboratory- and bench-scale testing, Mulled Coal can be stored, shipped and burned without causing any of the plugging, sticking, carryback and freezing problems normally associated with wet coal. On the other hand, Mulled Coal does not cause the fugitive and airborne dust problems normally associated with thermally dried coal.

The objectives of this project are to demonstrate that:

- The Mulled Coal Process, which has been proven to work on a wide range of wet fine coals at bench scale, will work equally well on a continuous basis, producing consistent quality, and at a convincing rate of production at a commercial coal preparation plant.
- The wet product from a fine coal cleaning circuit can be converted to a solid fuel form for ease of handling and cost savings in storage and rail car transportation.
- A wet fine coal product thus converted to a solid fuel form, can be stored, shipped, and burned with conventional fuel handling, transportation, and combustions systems.

Project Overview

It is useful to describe the project in groups of activities and their interactions to better understand the information flow and decision making in the project. The project is organized around two major demonstra-

tions: (1) the production of Mulled Coal in a commercial operating setting, and (2) the delivery of the Mulled Coal product through existing commercial storage, transport, and handling systems. An Information Flow Diagram is presented in Figure 1.

The initial project activities are performed largely at the EI facilities and will produce the formulations, test procedures, and design packages required to procure and install the Mulled Coal circuit at the Drummond Company, Inc. Chetopa Preparation Plant in Graysville, Alabama. The installed circuit will be used for the demonstration of Mulled Coal production. The second set of demonstrations will be the shipment and handling of Mulled Coal in existing coal transportation systems available to Drummond and ER&L, a subsidiary of CSX Transportation. Data collected from all phases of production and delivery will then be analyzed, evaluated and reported.

The Mulled Coal circuit will be installed in the operating preparation plant located at the Chetopa Mine site. The Chetopa plant processes approximately 360 to 450 tonnes/hr (400 to 500 tons/hr) of raw coal to produce about 250 to 320 tonnes/hr (275 to 350 tons/hr) of clean coal for shipment to the steam coal market. Approximately 45 to 55 tonnes/hr (50 to 60 tons/hr) of fine coal is cleaned in froth cells to produce 40 to 45 tonnes/hr (45 to 50 tons/hr) of a fine clean coal that is 10-14 percent ash. Froth concentrate reports to a vacuum filter where a 24-27 percent moisture filter cake is discharged to a collecting belt. In current operations, the wet filter cake is combined with the coarser size fractions of clean coal for storage and delivery to market. The wet filter cake comprises about 15 to 18 percent of the total clean coal product from the plant.

The proof-of-concept (or POC) circuit will process a nominal 2.7 tonnes/hr (3 tons/hr) slipstream of wet filter cake into a free-flowing granular material and direct it to an open storage pile of about 450 tonnes (500 tons). The POC unit will be of a design that can be scaled up to about 135 tonnes/hr (150 tons/hr). Figure 2 shows the key components of the Chetopa Plant cleaning circuit and the Mulled Coal circuit that will be installed.

The Mulled Coal circuit will be installed in an empty bay at the Chetopa Plant. This area is immediately adjacent to the vacuum filter and at a lower elevation. The use of gravity feeds will minimize field fabrication. Equipment will be installed to divert a 2.7 tonnes/hr (3 tons/hr) slipstream of the wet cake from the filter directly to a short transfer conveyor and then on to the Mulled Coal circuit. The Mulled Coal product will be gravity discharged from the circuit to a truck, which will haul the product to a stockpile located at the edge of the active clean coal stockpile area.

During the 3-month operating period, the facility should produce roughly 910 tonnes (1000 tons) of the Mulled Coal for evaluation in various rail transport configurations. Figure 3 provides a Project Flow Diagram for the Off Site Facilities. Bottom dump and bathtub type open top hopper cars will be loaded with straight Mulled Coal and blends of Mulled Coal with washed Chetopa coarse coal. The loaded cars will be shipped to various locations representing:

Rail/river barge terminals
Transshipment terminals
Industrial users
Utility users

The cars will be monitored and sampled during transit and dumping. Videotapes will be made during unloading and transfer operations to observe any differences between the test shipments and other coals being handled at the same facility.

PROJECT TECHNICAL WORK PLANS

Technical Approach and Work Plan Overview

This project focuses on achieving two demonstrations of the Milled Coal technology: (1) production in a commercial operating environment, and (2) delivery of product through a representative cross-section of existing storage, transportation, and handling systems. To successfully complete these demonstrations, the project has been organized into a series of task activities that lead to the demonstrations, support the engineering and management needs of the project, and assess and report the activities and results. Further, the technical approach to structuring and accomplishing these work activities enables the key information and data base to be generated and used in support of the overall project work plans. The development of the design basis and assessment of Milled Coal technology application are direct parallels to activities that would be needed in any specific individual commercial application.

The technical approach as depicted in the Information Flow Diagram (Figure 1) is comprised of the following:

1. Prepare work plans at the beginning of the project with mechanisms for adding detail and updating the plans as new information is generated.
2. Collect and evaluate information specific to the coal and plant operations at the host site that is needed to complete the circuit design, equipment selections, installation plans, and production scheduling and plans.
3. Use the evaluation results to complete the design, equipment selection, and production planning.
4. Procure, install, and start-up the Milled Coal circuit at the host site.
5. Conduct the demonstration of production operations.
6. Select delivery destinations and develop specific plans for monitoring dumping, fuel handling, etc. at each unique destination. Final decisions and detailed plans will be made when coal deliveries are ready to be scheduled, which in commercial practice is several months from the expected availability of product for shipment.

7. Conduct the demonstration of Mulled Coal technology in existing storage, transportation, and handling operations.
8. Prepare technical and economic assessments of the technology based on the data generated in the demonstration operations.

The key features to this approach include defined work plans, generation of information that enables specific decisions and contingencies to be addressed, and the utilization of experience to adjust the operations and data collection processes.

The work plans are consistent with the detail needed to direct and monitor the activities. This includes tasks in which the information that is specific to the coal and operations of the Drummond Chetopa facility will be used to update the work elements, make key decisions, or make revisions to the work plans as appropriate.

The evaluations and tests conducted in the early bench scale engineering activities will provide information needed to make key decisions. If we find that results fall outside the expected range, then the plans and the capabilities of the facilities and personnel are sufficiently versatile to revise the work plans.

Work Plan Assumptions

Developing the work plans has required making key assumptions which are:

1. The fine wet clean coal produced at the Chetopa Plant can be mulled using the experience base of reagent formulations and dosage rates.
2. The dilute froth concentrate will be a suitable alternative feedstock should the vacuum filter cake not be suitable.
3. The slipstream from the vacuum filter can be taken without disruption of the existing plant operations.
4. The storage, transportation, handling, and stability characteristics of Mulled Coal will be similar to the those properties as evaluated in the bench-scale engineering evaluations and testing.

TECHNICAL PROGRESS

1. Technical Approach: No major change has been made to the technical approach. An adjustment has been made in acknowledgement of the need to accelerate the schedule to enable a delivery of Mulled Coal during the winter freezing period in early 1995. To do so has required moving ahead with the Task 2.2 Bench-Scale Engineering to enable earlier design and procurement decisions.

2. Technical Progress in the Task Activities

Summary: During this 1st month of the contract period, activities were underway under Tasks 1 and 2.

Task 1 - Project Planning

Sub-Task 1.1 - Project Planning Management. Planning, administration, and coordination activities have been conducted in support of the project planning activities.

Sub-Task 1.2 - Preliminary Host Site Survey. Information collected from plant management in March 1994 included available plant drawings, a plant schematic flow diagram, and background information about the sources of plant feed, the quality of fine clean coal, and overall plant operating procedures. The plant, stockpile, and rail car loading facilities were examined and candidate locations were selected for the various Host Site project activities.

Sub-Task 1.3 - Detailed Project Planning. Development of detailed plans for the project were underway and near completion at the end of this period. Adjustment to the plans were made to accommodate the accelerated schedule to meet the winter delivery period.

Task 2 - Engineering & Design

Sub-Task 2.2 - Bench Scale Engineering. This task was initiated to accelerate the information available for the early decisions needed with regard to the source of the project feed and the major components of the circuit conceptual design to meet the accelerated schedule need. The first round of samples of vacuum filter cake and froth concentrate were collected at the Chetopa Plant and brought to Energy International laboratories for analysis. During March, the samples were analyzed for ash content, moisture, and particle size distribution. Development of that data was nearly complete at the end of the reporting period.

All Other Tasks. No other task activities were initiated during this reporting period.

Figure 1
INFORMATION FLOW DIAGRAM

Figure 2
Key Component Circuit Diagram

Figure 3

PROJECT FLOW DIAGRAM • OFF SITE FACILITIES

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