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INSTALLATION OF A STOKER-COAL PREPARATION PLANT

IN

KRAKOW, POLAND

Quarterly Technical Progress Report 2

August - October, 1994

Work Performed Under Cooperative Agreement DE-FC22-94PC94114

EFH Coal Company

Mars, PA

QUARTERLY TECHNICAL PROGRESS REPORT 2

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IN
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Cooperative Agreement No.
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INSTALLATION OF A STOKER COAL PREPARATION PLANT IN KRAKOW, POLAND

EXECUTIVE SUMMARY

This report describes the progress made during the second Quarter of a two year project to demonstrate that the air pollution from a traveling grate stoker being used to heat water at a central heating plant in Krakow Poland can be reduced significantly by replacing the unwashed, unsized coal now being used with a mechanically cleaned, double sized stoker fuel and by optimizing the operating parameters of the stoker. It is anticipated that these improvements will prove to be cost effective and hence be adopted in the other central heating plants in Krakow and indeed throughout Eastern European cities where coal is the primary source of heating fuel.

EFH Coal Company has formed a partnership with two Polish institutions -- MPEC a central heating company in Krakow and Naftokrak-Naftobudowa, preparation plant designers and fabricators for this effort.

The washability data from a 20mm x 0.5mm size fraction of raw coal from the Staszic Mine were evaluated. The data show that the ash content of this coal can be reduced from 24.4 percent to 6.24 percent by washing in a heavy media cyclone at 1.825 sp.gr.; the actual yield of clean coal would be 76.1 percent.

The quest for long-term sources of raw coal to feed the proposed 300 tph stoker coal preparation plant continued throughout the reporting period. Several candidate sources have been located and contracts for coal deliveries should be executed early next quarter. Those contracts will be performance based in that remuneration will be based on the actual yield of stoker-quality coal produced by the new plant.

Delays in formalizing the EFH/Polish Partners agreement delayed finalizing the coal supply contracts which, in turn, precluded collecting the Polish coal samples for characterization and combustion performance.

Meetings were held with Polish coal preparation equipment suppliers to obtain price and delivery quotations for long lead-time process equipment.

Preliminary cost evaluations were the topic of several meetings with financial institutions regarding the cost of producing a quality stoker coal in Poland and for identifying sources of private capital to help cost share the project.

The search for markets for surplus production from the new plant continued.

INTRODUCTION

The work being performed under this Cooperative Agreement between the United States Department of Energy (DOE) and EFH Coal Company (Participant) is one part of the assessment program in the Support for Eastern European Democracy (SEED) Act of 1989 (P.L. 101-179).

In October 1991, a Memorandum of Understanding (MOU) titled "Collaboration on the Krakow Clean Fossil Fuels and Energy Efficiency Program, A Project of Elimination of Low Emission Sources in Krakow" was signed by the DOE and the Ministry of Environmental Protection, Natural Resources and Forestry of the Republic of Poland, which describes the cooperation that is being undertaken by the respective governments to accomplish this program.

The DOE has selected nine U.S. companies to work with Poland to improve the country's air quality, especially around the historic city of Krakow. Although the program is focused on Krakow, it is intended to serve as a model for similar pollution control programs throughout Poland and much of Eastern Europe. The total cost of this program is \$31 million with DOE funding about half that amount.

It is estimated that Krakow currently has 23 district heating plants, 3,000 small boilers, and 125,000 home stoves -- all coal fired.

PURPOSE

The purpose of the U.S./Polish Memorandum of Understanding is to encourage the formation of commercial ventures by providing project development support, for providing employment, and/or services to reduce low emission sources in Krakow, Poland.

These commercial ventures are in the form of contracts, joint ventures, partnerships, and other commercially-feasible arrangements that can achieve the purposes of this statute.

OBJECTIVE

The specific objective of the work to be performed by EFH Coal under the terms of this Cooperative Agreement is to improve the quality of stack gas emissions in low stack boilers in the Krakow area of Poland.

This objective will be accomplished by designing, constructing, and operating a beneficiation facility that will produce a low ash, double-sized stoker coal for burning in the typical traveling grate stokers commonly in use throughout this area. The low-ash, uniformly sized, quality stoker coal when burned properly in existing boilers will increase combustion efficiency, reduce stoker maintenance, and reduce significantly carbon monoxide, sulfur dioxide, and particulate levels in the stack gases.

To facilitate the achievement of the stated objective, EFH Coal has executed an agreement with MPEC (a district heating company in Krakow) and Naftokrak/Naftobudowa (a construction and maintenance enterprise) to design, construct and operate a 300 tph coal cleaning facility; EFH Coal has also subcontracted the Pennsylvania State University to characterize two candidate Polish coals and to perform combustion tests on washed sublots of these Polish coals in their combustion simulator facility.

WORK STATEMENT

It is projected that a two year effort will be needed to accomplish the objectives of this Cooperative Agreement, consisting of two budget periods and including the following ten tasks:

Budget Period I

- Task 1 - Polish Coal Washability and Combustion Performance Evaluation
- Task 2 - Raw Coal Supply Contracts
- Task 3 - Specification of Major Preparation Plant Components
- Task 4 - Preparation Flowsheet Design
- Task 5 - Cost Evaluations
- Task 6 - Securing Stoker Coal Supply Contracts
- Task 7- Final Economic Evaluation and Risk Assessment

Budget Period II

- Task 8 - Plant Construction
- Task 9 - Plant Startup and Demonstration

The start/complete dates by the Quarter for the above tasks are shown on the Gantt Chart (Figure 1) .

PROGRESS DURING THIS PERIOD

Task 1.0 - Polish Coal Washability and Combustion Performance Evaluation
No Activity.

Task 2.0 Raw Coal Supply Contracts

As a bankable, stable raw coal supply is essential to the performance of this project, EFH personnel continued their search for potential suppliers throughout the reporting period with the goal of obtaining at least two secure, long-term, coal-supply contracts. In addition to the quality of raw coals available, other supply considerations include the amount of reserves available and the proximity of the mine to the proposed site of the new stoker-coal preparation plant.

In order to gain additional insight on the amenability of Polish raw coals to the production of "compliance-quality" (emission rates of less than 640 g of SO₂/GJ), the washability data from a 20mm x 0.5mm size fraction of raw coal from the Staszik Mine were evaluated. As shown in Table 1, this raw coal had an ash content of 24.40 percent.

The predicted yields and ash contents that could be achieved by washing this coal in both heavy media cyclones and jigs over a range of partition densities were calculated with the results summarized in Table 2. These data show that a 6.24 percent ash product could be produced by washing the coal in a heavy media cyclone at 1.825 Sp.gr. with a yield of 76.1 percent. To produce the equivalent quality product (6.24 percent ash) with a jig would require washing at 1.625 sp.gr. with a yield of only 65.37 percent -- a loss in yield of 10.73 percent.

Nineteen additional meetings were held with ECOCOAL and the following coal producers: the Staszik mine; the Katowice Coal Holding Company (KWH); the Bytom mine; the Walbazich mine; the Rudzika mine; and the Jankowski mine.

After a total of some forty meetings with a variety of coal suppliers who represent about 80 percent (100 Mtpy) of Poland's coal production, it safe to assume that a supply of raw coal of the quantity and quality that meet the requirements of the project is available.

All coal supply negotiations to date are considered tentative in that the final selection of a raw coal supply will be based on the characteristics (size distribution and washability analyses) and combustion performance of samples of raw Polish coals that will be evaluated next Quarter under Tasks 1.1 and 1.2.

Task 3.0 - Specification of Major Preparation Plant Components

Activities initiated during last Quarter were continued throughout this reporting period. Three additional meetings were held with preparation plant equipment manufacturers preparatory to placing orders for long-lead items as soon as the preliminary flowsheet is identified.

Task 4.0 - Preparation Plant Flowsheet Design

Size distributions and washability analyses of a number of typical Silesian coals were evaluated as a guide to the type of washing equipment that likely would be required to produce a quality stoker coal. But the lack of size distribution and washability analyses specifically on the raw coals that will, in fact, be processed in the new preparation plant precluded the initiation of a specific design.

Task 5.0 - Cost Evaluations

Activities related to the technical and economic performance of the proposed plant which were initiated last Quarter were continued throughout this reporting period.

On the assumption that the new preparation plant will use heavy media cyclones as the primary washer, sources of domestic magnetite were sought. One potential source of inexpensive heavy media was located at the Central Metallurgical Supply Co. near the town of Jaworzno where a waste product (mill scale) appears to have the physical and magnetic properties, required for coal washing in cyclones.

TABLE 1 - WASHABILITY DATA, STASZIC MINE
(20 mm x 0.5 mm Size Fraction)

Specific Gravity	Direct Percent		Cumulative Percent	
	Weight	Ash	Weight	Ash
Fl-1.30	64.99	3.51	64.99	3.51
1.30-1.40	3.93	9.77	68.92	3.87
1.40-1.50	3.05	17.58	71.97	4.45
1.50-1.60	1.65	28.05	73.62	4.98
1.60-1.70	1.07	33.83	74.69	5.39
1.70-1.80	1.20	50.82	75.89	6.11
1.80-1.90	0.96	53.75	76.85	6.70
1.90-2.00	0.84	60.19	77.69	7.28
2.00-Sk	22.31	84.02	100.0	24.40

TABLE 2 - PREDICTED WASHERY RESULTS, STASZIC MINE
(20 mm x 0.5 mm Size Fraction)

WASHER (1)	PARTITION Sp. Gr.	Percent	
		YIELD	ASH
HMC	1.625	73.83	5.07
HMC	1.65	77.14	5.19
HMC	1.675	74.43	5.31
HMC	1.775	75.58	5.93
HMC	1.80	75.80	6.09
HMC	1.825	76.10	6.24
JIG	1.45	54.12	5.04
JIG	1.475	56.15	5.18
JIG	1.50	58.02	5.32
JIG	1.60	64.11	6.02
JIG	1.625	65.37	6.24

(1) Based on: heavy media cyclone Imperfection = 0.019
jig Imperfection = 0.12

Task 6.0 - Securing Stoker Coal Supply Contracts

Twelve additional meetings were held with ECOCOAL and the following entities: VEBA, Nova Huta; Bytom District Heating Co. (PEC); and PEC/Katowice.

Task 7.0 - Final Economic Evaluation and Risk Assessment

The search for an acceptable site for the new preparation plant which was begun last Quarter continued throughout this reporting period. Twenty two additional meetings were held in and around the cities of Krakow, Katowice, Walbrzych, and Jaworzno.

One of the more interesting sites is the Staszic mine/preparation plant complex located near Katowice which is owned and operated by the Katowice Coal Holding Company (KWH). This facility currently produces 4 million tons of coal per year and employs some 7,500 persons; they plan to increase this level of production to 12 million tons per year.

The Staszic plant, like most other Polish preparation plants mechanically clean only the raw coal larger than 20 mm with the minus 20 mm raw coal sold to the electric utility, steam generating and water heating plants (See Task 2.0).

An abandoned district heating plant owned by MPEC (the local district heating company) was also visited as a potential site for locating the new stoker-coal preparation plant. This site has the advantage of being located adjacent to KWH's mining facility which could supply raw coal to the plant. The mined product is low in sulfur and in ash content.

The Niwka-Modrzejow mine near Sosnowiec was also visited as a potential site for the new plant.

The Gantt chart (Figure 1) summarizes progress to date.

DIFFICULTIES ENCOUNTERED

The protracted delays in formalizing the EFH Coal/Polish Partners (MPEC and Naftkrak-Naftobudowa) agreement during the first Quarter delayed the initiation of the search for Polish coal sources (Task 2.0) to feed the new preparation plant. This, in turn, delayed the collection of the two Polish coal samples that are to be tested for size distribution, washability characteristics, and combustion performance. The end result was that work on Task 1.0 could not be started during this Quarter as planned.

Because the basic inputs to Task 4.0 (Preparation Plant Flowsheet Design) are the analytical results of Tasks 1.0 and 2.0, failure to complete these tasks as planned precluded all but a conceptual plant design which allowed only for the identification of long-lead major items of process equipment.

FUTURE WORK

The following activities are planned for the third Quarter:

- Collect and ship to Penn State samples of two polish coals for evaluation (Task 1.0).
- Initiate work on Task 1.1, Coal Characterization.
- Initiate work on Task 1.2, Combustion Performance.
- Initiate work on Task 1.3, Training Program.
- Complete work on Task 2.0, Raw Coal Supply Contracts.
- Complete work on Task 3.0, Specification of Major Preparation Plant Components.
- Initiate work on Task 4.0, Preparation Plant Flowsheet Design.
- Continue work on Task 5.0, Cost Evaluations.
- Continue work on Task 6.0, Securing Stoker Coal Supply Contracts.
- Continue work on Task 7.0, Final Economic Evaluation and Risk Assessment.

Figure 1 - GANTT CHART

KRAKOW CLEAN FOSSIL FUELS AND ENERGY EFFICIENCY PROGRAM

INSTALLATION OF A STOKER - COAL PREPARATION PLANT

Report Legend:

MS - Federal Assistance Management Summary
 TPR - Technical Progress Report
 RD&D - Notice of Energy RD&D Project
 FTR - Final Technical Report

Performance Legend:

PLANNED
 ACTUAL