

QUARTERLY TECHNICAL PROGRESS REPORT

CALDERON COKEMAKING PROCESS/DEMONSTRATION PROJECT CALDERON ENERGY COMPANY

COOPERATIVE AGREEMENT NO. DE-FC22-95PC92638--05

Reporting Period: 5-26-96 to 8-25-96

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Total Project: \$ 7,354,195.00 Total DOE Share: \$3,039,389.00

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Abstract

This project which deals with the demonstration of a full size commercial coking retort using Calderon's proprietary technology for making metallurgical coke ran into a commercialization problem by virtue that the designed retort for two (2) tons of coke/hour necessitates thirty-two (32) retorts to produce the 500,000 tons of coke per year for a commercial plant. Bechtel Mining and Metals prepared a cost estimate of the commercial plant which indicated the commercial plant would not be economically feasible. The activity during this reporting period was directed to making changes to the design of the coking retort in order to reduce the number of retorts required for a 500,000 ton/year commercial coke facility. The result of this activity resulted in the drastic reduction of the number of retorts to eight (8) with each retort projected to produce 8.17 tons of coke/hour. Such decrease in number of retorts makes the Calderon technology quite competitive and therefore commercially feasible.

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TABLE OF CONTENTS

Executive Summary	Page 1
Introduction	Page 2
Results and Discussion	Page 3
Conclusion	Page 4

Executive Summary

The coking retort as originally designed utilized Haynes alloy HR-120 to form the coking chamber within which the coal would be carbonized. This alloy, besides costing about \$6/lb before fabrication, imposed the limitation of coking at a low wall temperature. This operating temperature extended the coking time, and therefore, necessitating the use of thirty-two (32) retorts for a commercial coking plant to produce 500,000 tons of coke/year, commercially not feasible according to Bechtel's estimate. The capital costs for the thirty-two retorts would make the commercial plant uneconomical.

The design of the coking retort was altered to eliminate the use of the alloy in order to make it possible to operate at a high coking wall temperature. This change in design resulted in making the proposed plant for the supply of coke to LTV commercially feasible by virtue of increasing the productivity from each retort to result in the use of only eight (8) retorts. This approach drastically reduced the capital cost of the commercial plant and decreased the cost of the coking retorts themselves.

Introduction

The U.S. DOE has entered into a cooperative agreement with Calderon Energy Company to demonstrate a novel approach for making metallurgical coke by constructing and operating a full size commercial coking retort at Calderon's Alliance, Ohio test facility. This novel approach involves a technology developed by Calderon. LTV Steel, Bechtel and Alliance have agreed to cooperate in this demonstration. LTV Steel has also issued a Letter of Intent indicating that if the demonstration is successful, LTV would buy the entire output of coke (500,000 tons/year) for a period of 20 years from a commercial facility which will be built on LTV's premises. LTV Steel will supply cokemaking expertise, coking coal and some cash; Bechtel will furnish engineering, procurement and construction expertise, and some cash; and, Alliance Machine will provide shop drawings, fabrication and some cash.

Before the three parties (LTV Steel, Bechtel and Alliance Machine Company) commit to the project, Bechtel agreed to conduct a cost estimate of the commercial facility based on engineering studies performed by the Calderon Energy Company. Bechtel completed the estimate and concluded that the use of the Haynes alloy for the retorts imposed two limitations on the Calderon process. The first was the penalty of coking at low temperature which would require too many retorts and the second was the prohibitive cost of the alloy which when fabricated would cost more than \$16/lb not including field installation.

Results and Discussion

It was prudent to look into the commercial feasibility of making coke via the Calderon process while doing engineering design for the demonstration project because if the technology is not commercially viable, the successful demonstration of the single retort is no guarantee that the technology would be acceptable by the industry, since technical feasibility and economic feasibility form the two sides of the same coin.

In view of Bechtel's conclusion that the commercial facility as originally conceived was not economically feasible, Calderon redesigned the coking retort. The Haynes alloy was eliminated and the size of the retort was increased. This made possible the increase of the coking wall temperature which reduces coking time. Also, by increasing the bulk density of the coal by drying it prior to coking, the productivity per retort was projected to increase from two (2) tons/hour to 8.17 tons/hour. Such an increase will require only eight (8) retorts instead of thirty-two (32) and the capital cost of the commercial facility is greatly reduced, thus making the Calderon cokemaking process very competitive.

As a consequence of the increase of the projected productivity, the size of the retort was increased, and necessitating a coal dryer; larger coal handling equipment; larger lockhopper; larger coal pushing machinery; bigger burners; heavier steel structure and foundations, etc. These additions have increased the cost of the project from an estimated cost of \$7.35 million to an estimated cost of \$11.83 million.

Calderon has requested LTV Steel, Bechtel and Alliance for a contribution in cash and in-kind to make up the shortfall without the need of requesting the U.S. DOE for an increase in its contribution. The project is advancing with the U.S. DOE contribution remaining at \$3.04 million

as originally committed. Calderon has completed the preliminary engineering design for the entire demonstration unit utilizing the full-size retort.

Conclusion

The last analysis from Bechtel confirms both the technical and the commercial feasibility of the Calderon cokemaking technology. During the forthcoming reporting period, it is expected that LTV Steel, Bechtel and Alliance Machine would be fully committed to the project, that Bechtel would have commenced the detail design of the facility, that all bids would be received, and long delivery items ordered.