CLEAN COAL TECHNOLOGY III (CCT III)

10 MW DEMONSTRATION OF GAS SUSPENSION ABSORPTION

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TECHNICAL PROGRESS REPORT
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Cleared by Office of Patent Counsel
Chicago Operations Office
U.S. Department of Energy

Prepared by:
AirPol Inc.
32 Henry Street
Teterboro, N.J. 07608

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EXECUTIVE SUMMARY

The 10 MW Demonstration of Gas Suspension Absorption program is designed to demonstrate the performance of the Gas Suspension Absorption System in treating the flue gas from a boiler burning high sulfur coal.

The demonstration project is divided into three major phases:

Phase I - Engineering and Design
Phase II - Procurement and Construction
Phase III - Operation and Testing

During the reporting quarter the project did not progress as planned due to a temporary hold resulting from uncertainty of host site availability.
ACKNOWLEDGEMENT

The planning, execution, and reporting of this project were a combined effort of many people and organizations. We wish to acknowledge the following for their outstanding effort.


Tennessee Valley Authority: Dr. H.B. Flora, Thomas A. Burnett, Bruce A. Gold

FLS miljo: Jorgen Bigum, Jorn Touborg

AirPol Inc.: Willard L. Goss, Shyam K. Nadkarni, Richard A. Rubio, Stuart L. Turgel, Paul Sisler, Chuck S. Marchese
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INTRODUCTION

The Clean Coal Technology Demonstration Program (CCT Program) is a government and industry co-funded technology development effort to demonstrate a new generation of innovative coal utilization processes in a series of full-scale, "showcase" facilities built across the country. These demonstrations will be on a scale large enough to generate all the data, from design, construction, and operation, for technical/economic evaluation and future commercialization of the process.

The goal of the program is to furnish the U.S. Energy marketplace with a number of advanced, more efficient, and environmentally responsive coal-using technologies. These technologies will reduce and/or eliminate the economic and environmental impediments that limit the full consideration of coal as a viable future energy resource.

To achieve this goal, a multiphased effort consisting of five separate solicitations is administered by the U.S. Department of Energy. Projects selected through these solicitations will demonstrate technology options with the potential to meet the needs of energy markets and respond to relevant environmental considerations.

The third solicitation (CCT-III), issued in 1989, targeted those technologies capable of achieving significant reductions in the emission of \( \text{SO}_2 \) and/or \( \text{NO}_x \) from existing facilities to minimize environmental impacts, such as transboundary and interstate pollution, and/or provide for future energy needs in an environmentally acceptable manner.

In response to the third solicitation, AirPol Inc. submitted a proposal for the design, installation and testing of the Gas Suspension Absorption system at TVA’s Shawnee Test Facility. On July 25, 1990, a Cooperative Agreement was signed by AirPol for the project entitled "10 MW Demonstration of Gas Suspension Absorption". The project was approved by Congress in October of 1990, and the Cooperative Agreement of this project was awarded by DOE on October 11, 1990.

This low-cost retrofit project will demonstrate the Gas Suspension Absorption which is expected to remove more than 90% of the \( \text{SO}_2 \) from coal-fired flue gas, while achieving a high utilization of reagent lime. The host site facility will be the Shawnee Test Facility (STF), located at the Tennessee Valley Authority’s Shawnee Fossil Plant in West Paducah, Kentucky.
Over the past 15 years the Shawnee Test Facility has served as a testground for flue gas desulfurization (FGD) systems. At the present time a semi-dry process employing 10 MW capacity spray dryer is being tested at the facility. Upon completion of the current spray dryer test, the GSA system will be tested for a period of eleven (11) months.

The Gas Suspension Absorber was initially developed as a calciner for limestone used for cement production. It has been used successfully to clean the gases from commercial waste to energy plants in Denmark where it has also captured chloride emissions. The GSA system brings coal combustion gases into contact with a suspended mixture of solids, including sulfur-absorbing lime. After the lime absorbs the sulfur pollutants, the solids are separated from the gases in a cyclone device and recirculated back into the system where they capture additional sulfur pollutant. The cleaned flue gases are sent through a dust collector before being released into the atmosphere. The key to the system's superior economic performance with high sulfur coals is the recirculation of solids. Typically, a solid particle will pass through the system about one hundred times before leaving the system. Another advantage of the GSA system is that a single spray nozzle is used to inject fresh lime slurry.

The GSA system is expected to be the answer to the need of the U.S. industry for an effective, economic and space efficient solution to the SO₂ pollution problem.
PROJECT DESCRIPTION

This project will be the first North American demonstration of the Gas Suspension Absorption (GSA) system in its application for flue gas desulfurization. The purpose of this project is to demonstrate the high sulfur dioxide (SO₂) removal efficiency as well as the cost effectiveness of the GSA system. GSA is a novel concept for flue gas desulfurization developed by F. L. Smidth miljo (FLS miljo). The GSA system is distinguished in the European market by its low capital cost, high SO₂ removal efficiency and low operating cost.

A 10 MW GSA demonstration system shall be installed and tested at the Tennessee Valley Authority (TVA) Shawnee Fossil Plant at West Paducah, Kentucky. The new GSA system will replace the existing Spray Dryer that was installed previously as a test unit. The experience gained in designing, manufacturing and constructing the GSA equipments through executing this project will be used for future commercialization of the GSA system. Results of the operation and experimental testing will be used to further improve the GSA design and operation.

The specific technical objectives of the GSA demonstration project are to:

- Effectively demonstrate SO₂ removal in excess of 90% using high sulfur U.S. coal.
- Optimize recycle and design parameters to increase efficiencies of lime reagent utilization and SO₂ removal.
- Compare removal efficiency and cost with existing Spray Dryer/Electrostatic Precipitator technology.

In order to accomplish these objectives, the demonstration project is divided into phases and tasks as shown in the Work Breakdown Structure (WBS) below:

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Phase III - Operation and Testing

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Pending resolution of the timing of site availability, the overall project schedule will be redefined.
PROJECT STATUS

In a letter to AirPol dated February 28, 1991, TVA indicated that, as necessitated by the internal priorities within the TVA power system, the start-up of the GSA pilot plant will be postponed until October 1, 1992. The project was temporarily on hold pending resolution and DOE approval of the schedule change. The overall schedule and progress of the project is substantially impacted by proposed delay.

A. Task I - Project and Contract Management

Project Management - AirPol continued to provide overall project management by interfacing with DOE on all aspects of the project, and coordinating the site-related activities with TVA.

AirPol has submitted project reports as specified in the Federal Assistance Reporting Checklist as attached to the Cooperative Agreement. A computerized spread sheet has been used to track the cost and progress of the project.

Schedule Update - A copy of TVA's letter of February 28, 1991 was sent to DOE. A tentative schedule revision reflecting the anticipated delay was compiled.

B. Task II - Process and Technology Design

No significant progress was made in this area during the reporting period.

C. Task III - Environmental Analysis

No significant progress was made in this area during the reporting period.

D. Task IV - Engineering Design

No significant progress was made in this area during the reporting period.
PLAN FOR NEXT QUARTER

A. Task I - Project and Contract Management

Project Management - Finalize the revision of the project schedule and obtain approval from DOE.

Continue monitoring project cost and produce reports according to the Federal Assistance Reporting Checklist.

Continue monitoring the progress of the project and update the project schedule accordingly.

B. Task II - Process and Technology Design

Process Engineering Design - AirPol Process Department to start with GSA process calculation.

C. Task III - Environmental Analysis

Environmental Monitoring Plan - An Environmental Monitoring Plan (EMP) will be prepared to describe the collection and dissemination of significant technology, project, and site-specific environmental data.

D. Task IV - Engineering Design

General Arrangement - AirPol Engineering Department will complete the preliminary general arrangement drawings and release the arrangement drawings to both TVA and FLS miljo for review and comment.
END

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