

CAPTURE AND USE OF COAL MINE VENTILATION AIR METHANE

Semi-Annual Technical Progress Report
October 1, 2002 through March 31, 2003

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ABSTRACT

This is the first semi-annual Technical Progress report under the subject agreement. During the first six months of the project the following items were accomplished: 1) the major subcontract with MEGTEC Systems was signed, 2) an exemption for a Plan Approval/Operating Permit from the Pennsylvania Department of Environmental Protection was obtained, and 3) a 101(c) Petition for Modification of Application of Mandatory Safety Standard was filed with the Mine Safety and Health Administration. These aspects of the project, as well as progress on public communications are discussed in detail in this report.

TABLE OF CONTENTS

	<u>Page</u>
Disclaimer	i
Abstract	ii
Introduction	1
Experimental	1
Results and Discussion	2
Conclusion	3
References	3

ATTACHMENTS

<u>Attachment</u>		<u>Page</u>
A	PA DEP Notification	A-1
B	Abstract Submitted for Conferences	B-1

INTRODUCTION

Methane is the second most important non-water greenhouse gas (GHG). Coal mining, and particularly coal mine ventilation air, is a major source of anthropogenic methane emissions. For example, the ventilation air methane (VAM) coming from mine ventilation fans accounted for 89 billion cubic feet (bcf) of the 151 bcf of coal mine methane (CMM) emitted in the United States in the year 2000. The capture and use of VAM is problematic because of the large volumes of mine ventilation air and its low methane concentration, typically 0.3% to 1.5%.

A thermal flow reversal reactor (TFRR) system (specifically, the MEGTEC VOCSIDIZER™ oxidation system) is equipment that can oxidize the dilute methane in the mine ventilation air. The equipment is self-sustaining at low methane concentrations (0.2%-1.2%), without reliance on another source of combustion. The system will convert the methane to carbon dioxide and produce essentially no SO_x, NO_x, or particulate, and only very minor quantities of CO. Because methane has a 21-times greater radiative forcing factor than carbon dioxide, this will substantially reduce the effective greenhouse gas emissions to the atmosphere. In addition, with the integration of a heat recovery system, the TFRR can be used to recover useful energy, thus avoiding the GHG emissions associated with the avoided fuel. Even though a commercial-size unit has not been applied to a U.S. coal mine, the oxidation technology is a proven system for destroying volatile organic compounds in over 600 applications around the world.

The purpose of this project is to demonstrate the operation of a full-scale commercial TFRR system on a U.S. coal mine. Three critical issues will be resolved by this demonstration: 1) A safe, effective interface between the TFRR and the mine will be designed and proven in use, 2) The ability of the TFRR to oxidize the low and variable concentrations of methane, effectively, economically, and in long-term operation, will be verified, 3) An engineering/economic evaluation of the technology as applied to both methane oxidation and to energy recovery will be conducted.

EXPERIMENTAL

The oxidization system will not be operational until the first quarter of calendar year 2004. There is no operational data at this time.

RESULTS AND DISCUSSION

STATUS OF COOPERATIVE AGREEMENT

The cooperative agreement between DOE and CONSOL Energy was initiated on October 1, 2002. The Hazardous Substance Plan and the report on ES&H approvals were submitted to DOE.

PROGRESS ON MINE SAFETY AND HEALTH ADMINISTRATION APPROVAL

The Mine Safety and Health Administration (MSHA) have ruled it has jurisdiction over the project (design, installation, and operation of the VOCSIDIZER system). Technical exchange of information has occurred between MSHA's Technical Support Group, MSHA's Enforcement Group that controls the region where the unit will be potentially located (i.e., Morris Township, Greene County, PA), MEGTEC Systems, and CONSOL Energy. On March 21, 2003 a 101(c) Petition for Modification of Application of Mandatory Safety Standard was filed with MSHA's Office of Regulations, Variances and Standards in Arlington, VA. As stated in the petition, all equipment will be located on the surface of the mine and will comply with 30 CFR Part 77 – Mandatory Safety Standards, Surface Coal Mines and Surface Work Areas of Underground Coal Mines, and specifically the electrical equipment will comply with §77.516 – Electric wiring and equipment; installation and maintenance, except for an electric heating element used for start-up. The safety systems of the unit will provide the same measure of protection as would be provided by strictly following 30 CFR §77.516. The petition is being submitted to permit the use of the electric heater.

PROGRESS ON ENVIRONMENTAL ASSESSMENT

It has not been determined by DOE if an environmental assessment will be required for this project.

STATUS OF MAJOR SUBCONTRACTS WITH PROJECT PARTICIPANTS

The subcontract agreement between CONSOL Energy and MEGTEC Systems was signed on March 31, 2003. MEGTEC Systems will provide the TFRR system including the VOCSIDIZER module, fan and inverter drive, electrical cabinet and controls, and ductwork. They will fabricate and construct the VOCSIDIZER, purchase all supporting equipment and controls, ship all components, and install the complete system at the selected Pennsylvania site.

MEGTEC will also supply engineering services which include: 1) detailed engineering design of the unit and supporting equipment and controls including participation in a process safety hazard analysis, 2) provide assistance during startup and commissioning, 3) provide quarterly routine maintenance checks of the equipment during operation, 4) assist with the system analysis, and 5) assist with report writing and presentation of technical papers.

STATUS OF ES&H APPROVALS

The Pennsylvania Department of Environmental Protection determined that this project is exempt from Plan Approval/Operating Permit requirements. An exemption was obtained on the basis of the allowable emission limits for research and development activities. The letter of exemption is provided in Attachment A. The exemption will expire on July 31, 2004, which was the expected shutdown date of the equipment in the original schedule. This may need to be modified when the Go/No Go decision is made.

PROGRESS ON PUBLIC COMMUNICATIONS

An abstract for a presentation entitled "Capture and Use of Coal Mine Ventilation Air Methane" (Attachment B) describing this project was accepted for the Second Annual Conference on Carbon Sequestration, which will be held in May 2003 in Alexandria, VA. A full paper is being prepared for publication and presentation.

The same abstract was submitted to the Twentieth Annual International Pittsburgh Coal Conference, which will be held in September 2003.

CONCLUSION

During the first six months of the project the following items were accomplished: 1) the major subcontract with MEGTEC Systems was signed, 2) an exemption for a Plan Approval/Operating Permit from the Pennsylvania Department of Environmental Protection was obtained, 3) a 101(c) Petition for Modification of Application of Mandatory Safety Standard was filed with the Mine Safety and Health Administration, 4) the Hazardous Substance Plan was submitted to DOE, and 5) a list of Environmental, Safety, and Health approvals was submitted to DOE.

With the signing of the contract with MEGTEC Systems, the detailed design is authorized to begin. There is a Go/No Go decision point in this project that is dependent upon the outcome of MSHA's regulatory requirements on the design. MSHA will review the submitted 101(c) Petition for Modification of Application of Mandatory Safety Standard and make its recommendations. This will be followed by a review of the operational and economic impacts associated with scope and schedule of the project work. The review will include the DOE Contracting Officer's Representative, CONSOL Energy, and MEGTEC Systems.

REFERENCES

None

ATTACHMENT A

Pennsylvania Department of Environmental Protection Notification
that Project is Exempt from Plan Approval/Operating Permit Requirements

FEB 13 2002 RAW



Pennsylvania Department of Environmental Protection

400 Waterfront Drive
Pittsburgh, PA 15222-4745
February 12, 2003

Original → FPB, 1621-86 A/B
Xc → RAU, DCK, R. Deering

Southwest Regional Office

412-442-4000
FAX 412-442-4194

Richard A. Winschel
Director – Coal Utilization
CONSOL Energy Inc.
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RE: Determination of Requirement for Plan
Approval

Dear Mr. Winschel:

After reviewing, it has been determined that the capture and oxidation of coal mine ventilation air at the Enlow Fork Mine in Morris Township, Greene County, is exempt from the Plan Approval/Operating Permit requirements under 25 PA Code § 127.14(8). This exemption is temporary and shall expire on July 31, 2004. Please also bear in mind that this exemption is based on the R&D nature of this project, and that the permanent installation may require a Plan Approval.

This exemption does not affect your obligations to meet all applicable Pennsylvania Air Quality Regulations for this source.

If you have any questions, or require additional information, please contact this office.

Sincerely,

Thomas Joseph, P.E.
Air Pollution Control Engineer III
Air Quality Control

TJ/tj



ATTACHMENT B

Abstract Submitted for Conferences

Second Annual Conference on Carbon Sequestration
Alexandria, VA
May 5-8, 2003

Twentieth Annual International Pittsburgh Coal Conference
Pittsburgh, PA
September 15-19, 2003

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Presenter: Deborah A. Kosmack

ABSTRACT

CONSOL Energy Inc., Research & Development, in conjunction with MEGTEC Systems and the U.S. Department of Energy, will design, build, and operate for 12 months a commercial-size thermal flow reversal reactor (TFRR) interfaced to a working coal mine ventilation fan to reduce emissions of methane, a powerful greenhouse gas. Coal mining, and particularly coal mine ventilation air, is a major source of anthropogenic methane emissions. Until now, it has not been reasonably possible to either reduce or use ventilation air methane (VAM) because of its large volumes and low concentrations. The TFRR will oxidize $\geq 95\%$ of the methane in the input VAM to carbon dioxide. Three critical issues will be resolved by this demonstration: 1) A safe, effective interface between the TFRR and the mine will be designed and proven in use, 2) The ability of the TFRR to oxidize the low and variable concentrations of methane, effectively, economically, and in long-term operation, will be verified, 3) An engineering/economic evaluation of the technology as applied to both methane oxidation and to energy recovery will be conducted.