

ANNUAL PROJECT REPORT AS OF DECEMBER 1998

1. Project Sponsor:
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2. Project Manager:
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3. OCDO GRANT NUMBER: CDO/D-922-13
4. PROJECT UPDATE (1998)
5. PROJECT TITLE: Advanced Emissions Control Development Program
6. PROJECT TERM: November 1, 1993 to December 31, 1998
7. PROJECT CO-SPONSORS:

<u>NAME</u>	<u>COST-SHARE</u>
OCDO	\$ 4,500,000
Babcock & Wilcox	\$ 1,750,000
U. S. DOE-FETC	\$ 5,000,000
 TOTAL	 \$11,250,000

I. ABSTRACT

8. OBJECTIVES:

McDermott Technology, Inc. (MTI) and Babcock & Wilcox (B&W) are developing practical, cost-effective strategies for reducing the emissions of hazardous air pollutants (commonly called *air toxics*) from coal-fired electric utility plants. Promulgation of air toxics emissions regulations for electric utility plants could dramatically impact utilities burning Ohio coals. The overall objective for the project is to develop the technical and economic information needed by utilities to respond to potential air toxics regulations in such a way as to *maintain or increase the use of Ohio coals*. The work is being carried out in B&W's new \$21 million, state-of-the art Clean Environment Development Facility (CEDF) wherein air toxics emissions control strategies can be developed under controlled conditions, and with proven predictability to commercial systems. The program is primarily aimed at accomplishing air toxics emissions control through the modification of conventional flue gas treatment equipment, since these systems provide the largest potential impact on Ohio coal users. The specific objectives of the program are to:

- Provide a representative test bed for conducting air toxics emissions control development work.
- Measure and understand production and partitioning of air toxics species for a variety of Ohio and comparison coals.
- Optimize the air toxics removal performance of conventional flue gas cleanup systems.
- Quantify the impacts of coal properties on air toxics emissions.
- Develop advanced air toxics emissions control concepts.
- Develop and validate air toxics emissions measurement and monitoring techniques.
- Establish an air toxics data library to facilitate studies of the impacts of coal selection, coal cleaning, and emissions control strategies on the emissions of Ohio coal-fired utility plants.

9. WORK DONE AND CONCLUSIONS:

During 1995 Phase I (Facility Modification and Benchmarking) of the project was completed. Phase I, which began in November of 1993, consisted of installation, shakedown, validation, and benchmarking of the test equipment added to B&W's CEDF. These systems comprised an electrostatic precipitator (ESP), fabric filter, and wet SO₂ scrubber. Baseline air toxics emissions and capture efficiency were subsequently established for each of the major flue gas cleanup devices. All tests were conducted with a high sulfur Ohio steam coal. Through comparison with commercial data, it was established that the CEDF can be used to conduct representative air toxics emissions control development work.

In March 1996, Phase II (Optimization of Conventional Systems) of the project was begun. Phase II testing involved the development of air toxic strategies based on conventional particulate and SO₂ control equipment. During the first test series, trace metal and particulate emissions from the particulate control devices were characterized as a function of operating temperature, ESP electrical conditions, and baghouse fabric. Testing emphasis was placed on mercury speciation and control. Since particulate control devices typically precede SO₂ control equipment at utility power plants, the first test series also targeted trace metal emissions for control by flue gas desulfurization systems. The second test series focused on the characterization of mercury emissions control achievable with wet scrubbers for operating conditions representative of commercial scrubber design and operation. A major focus of the last test series was on coal properties and coal cleaning, and their impact on mercury emissions and control. Phase II results were included in the project data library, or database, and made available for use by the project participants and others.

Phase III work began in the fall of 1997, and continued throughout 1998. Phase III (Advanced Concepts and Comparison Coals) testing was directed at the development of new air toxics emissions control strategies to further reduce the emissions of mercury. In addition, two additional Ohio bituminous coals were tested to provide information over a broader range of coals. Enhanced methods were successfully demonstrated for improved mercury capture in both an ESP (unscrubbed systems), and across a wet scrubber. All of the enhancements utilize existing equipment, and commercial applications should be relatively low cost.

10. PLANS FOR COMING YEAR:

There are no plans for the coming year; phase III marks the end of the project.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. Highlights of the 1998 work included:

- Phase III testing was successfully completed including continued evaluation of coal properties and coal cleaning on mercury emissions, as well as evaluation of enhancements for improved mercury control.
- Methods for enhanced control of mercury in systems equipped with an ESP/wet scrubber combination for particulate and SO₂ control were developed and successfully demonstrated.
- Demonstration of enhanced mercury control for unscrubbed systems also was completed.
- A Technology Transfer Open-House was held for the Advanced Emissions Control Development Program in September at the Alliance Research Center of McDermott Technology, Inc.. The open-house went well and very positive feedback was received.

III. ARTICLES/PRESENTATIONS

12. The following papers were published:

- "Mercury Emissions Control Strategies for Coal-Fired Power Plants", presented at the 23rd International Technical Conference on Coal Utilization & Fuel Systems, March 9-13, 1998.
- *@Advanced Emissions Control Development Program*", Presented at the DOE-FETC Advanced Coal-Based Power and Environmental Systems >98 Conference, July 21-23, 1998.
- *@Technology Transfer Open-House of the Advanced Emissions Control Development Program*", Presented at the Alliance Research Center of McDermott Technology, Inc., September 25 & 28, 1998.
- "Mercury Emissions Control Strategies for Coal-Fired Power Plants", presented at the 1998 American Japanese Flame Research Committees International Symposium, October 11-15, 1998.
- "Mercury Emissions Control Strategies for Coal-Fired Power Plants", presented at the Air Quality Conference, December 1-4, 1998.