

**Field Test Program to Develop Comprehensive
Design, Operating and Cost Data for
Mercury Control Systems on
Non-Scrubbed Coal-Fired Boilers**

**Quarterly Technical Report
Reporting Period: April 1, 2003 – June 30, 2003**

**Principal Authors
Richard Schlager
Tom Millar
ADA Environmental Solutions, LLC
8100 SouthPark Way, Unit B
Littleton, Colorado 80120**

Submitted: July 1, 2003

DOE Cooperative Agreement No.: DE-FC26-00NT41005

Report No. 41005R13

DISCLAIMER

This technical report was prepared with the support of the U.S. Department of Energy, under Award No. DE-FC26-00NT41005. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the DOE.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ABSTRACT

With the Nation's coal-burning utilities facing the possibility of tighter controls on mercury pollutants, the U.S. Department of Energy is funding projects that could offer power plant operators better ways to reduce these emissions at much lower costs.

Mercury is known to have toxic effects on the nervous system of humans and wildlife. Although it exists only in trace amounts in coal, mercury is released when coal burns and can accumulate on land and in water. In water, bacteria transform the metal into methylmercury, the most hazardous form of the metal. Methylmercury can collect in fish and marine mammals in concentrations hundreds of thousands times higher than the levels in surrounding waters.

One of the goals of DOE is to develop technologies by 2005 that will be capable of cutting mercury emissions 50 to 70 percent at well under one-half of today's costs. ADA Environmental Solutions (ADA-ES) is managing a project to test mercury control technologies at full scale at four different power plants from 2000 – 2003. The ADA-ES project is focused on those power plants that are not equipped with wet flue gas desulfurization systems.

ADA-ES has developed a portable system that will be tested at four different utility power plants. Each of the plants is equipped with either electrostatic precipitators or fabric filters to remove solid particles from the plant's flue gas.

ADA-ES's technology will inject a dry sorbent, such as activated carbon, which removes the mercury and makes it more susceptible to capture by the particulate control devices. A fine water mist may be sprayed into the flue gas to cool its temperature to the range where the dry sorbent is most effective.

PG&E National Energy Group is providing two test sites that fire bituminous coals and both are equipped with electrostatic precipitators and carbon/ash separation systems. Wisconsin Electric Power Company is providing a third test site that burns Powder River Basin (PRB) coal and has an electrostatic precipitator for particulate control. Alabama Power Company will host a fourth test at its Plant Gaston, which is equipped with a hot-side electrostatic precipitator and a downstream fabric filter.

During the eleventh reporting quarter, progress was made on the project in the following areas:

All Test Sites

- Final reports for Gaston and Pleasant Prairie are complete and have been issued.
- Ongoing data and sample analysis is nearly complete as well as work on the final reports.

Technology Transfer

- A number of technical presentations and briefings were made during the quarter. Several papers were presented at the MEGA Symposium in Washington D.C.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
INTRODUCTION	5
EXPERIMENTAL	6
RESULTS AND DISCUSSION	7
CONCLUSION	7
REFERENCES	7
LIST OF ACRONYMS AND ABBREVIATIONS	7

LIST OF GRAPHICAL MATERIALS

There are no graphical materials included in the main body of this report. There may be graphical materials within attachments included in Appendix B.

EXECUTIVE SUMMARY

ADA-ES began work on a Cooperative Agreement with the Department of Energy in October 2000 to demonstrate full-scale mercury control systems at coal-fired power plants. The project is the next step in the process of obtaining performance and cost data on full-scale utility plants for mercury control systems. Power generating companies that have entered into contracts with ADA-ES are PG&E National Energy Group, Wisconsin Electric Power Company and Alabama Power Company. During the three-year, \$6.8 million project, integrated control systems will be installed and tested at four power plants. ADA-ES is responsible for managing the project including engineering, testing, economic analysis, and information dissemination functions.

As of the ninth reporting quarter, progress on the project has been made in the following areas:

- Alabama Power Company Plant Gaston – Field-testing has been completed.
- Wisconsin Electric Pleasant Prairie Power Plant – Field-testing has been completed.
- PG&E NEG Brayton Point Station – Field-testing has been completed.
- PG&E NEG Salem Harbor Station – Field-testing has been completed.

Several technical papers were presented on the project during the ninth reporting quarter at Power-Gen and one at the Annual Coal Marketing Strategies Conference.

INTRODUCTION

Cooperative Agreement No. DE-FC26-00NT41005 was awarded to ADA-ES to demonstrate mercury control technologies on non-scrubbed coal-fired boilers. Under the contract, ADA-ES is working in partnership with PG&E National Energy Group, Wisconsin Electric Power Company, Alabama Power, and EPRI to design and engineer systems to maximize effectiveness and minimize costs to curtail mercury emissions from power plant flue gases. Reports estimate that mercury control could cost the industry from \$2 to \$5 billion per year. Much of these costs will be associated with power plants that do not have wet scrubbers as part of their air pollution control configurations. The four plants that are being evaluated during the program are typical of this type of application, which is found at 75% of the nearly 1100 units that would be impacted by new regulations.

Detailed topical reports will be prepared for each site that is tested under the program. Quarterly reports will be used to provide project overviews and technology transfer information.

EXPERIMENTAL

- Continued data and sample analysis for the project was conducted during the eleventh reporting quarter. Detailed results of the testing at each power plant will be provided in separate topical reports.

Technology Transfer

Technology transfer activities continued during the eleventh reporting quarter of the project. Reference citations of the formal presentations are provided below:

April 2003 Technology Transfer Activities

Durham, M.D. (2003). "Potential Impacts of Mercury Control Regulations on Coal Purchasing," presentation to National Coal Transportation Association, Napa, CA., April 22, 2003

May 2003 Technology Transfer Activities

Starns, T., J. Bustard, M. Durham, C. Martin, R. Schlager, S. Sjostrom, C. Lindsey, B. Donnelly, R. Afonso; R. Chang, and S. Renninger (2003). "Results of Activated Carbon Injection Upstream of Electrostatic Precipitators for Mercury Control"; The Mega Meeting: Power Plant Air Pollution Control Symposium, Washington D.C., May 19-22.

Bustard, J., M. Durham, C. Lindsey, T. Starns, C. Martin, R. Schlager, S. Sjostrom, S. Renninger, T. McMahon, L. Monroe, J. M. Goodman, R. Miller (2003). "Results of Activated Carbon Injection for Mercury Control Upstream of a COHPAC Fabric Filter" The Mega Meeting: Power Plant Air Pollution Control Symposium, Washington D.C., May 19-22.

Senior, C., J. Bustard, K. Baldrey, T. Starns, and M. Durham (2003). "Leaching Studies of Fly Ash from Full-Scale Demonstration of Sorbent Injection for Mercury Control on Coal-Fired Power Plants"; The Mega Meeting: Power Plant Air Pollution Control Symposium, Washington D.C., May 19-22.

Durham, M. (2003). "Tools for Planning & Implementing Mercury Control Technology"; *American Coal Council*. Volume 1. May 2003.

June 2003 Technology Transfer Activities

Durham, M. (2003). "Control of Mercury Emissions from Power Plants Burning Western Coals"; Colorado Air Quality Commission, Denver, CO, June 19.

Sjostrom, S. (2003). "TOXECON™ Retrofit for Mercury and Multi-Pollutant Control" AWMA Annual Meeting, San Diego, CA June 23.

Schlager, R. (2003). "Mercury Removal Trends and Options for Coal-Fired Power Plants Burning Low-Rank Fuels"; Low Rank Fuels Symposium, Billings, MT, June 25.

Durham, M. (2003). "Control of Mercury Emissions from Power Plants Burning Western Coals"; Rocky Mountain Electrical League, Denver, CO, June 27.

RESULTS AND DISCUSSION

The major efforts during the eleventh reporting quarter focused on completion and submission of the final reports for Gaston and Pleasant Prairie power plants. Detailed results of the testing at the two remaining power plants will be provided in separate topical reports.

CONCLUSION

Work began on Cooperative Agreement No. DE-FC26-00NT41005 in October 2000. Initial activities include holding a project kickoff meeting, securing the fourth test site (Alabama Power Company Plant Gaston), and performing various planning and administrative functions. Field-testing began during the second reporting period at Plant Gaston, and test planning for the remaining sites began. Test work was completed at the Gaston site during the third reporting period. Site preparations were completed and field-testing began at Wisconsin Electric during the fourth reporting period and all site work was completed during the fifth reporting quarter. Sorbent screening activities were completed at Brayton Point during the sixth reporting quarter. Baseline testing was initiated at Brayton Point in the seventh quarter and parametric testing began. Work at Brayton Point was completed in the eighth quarter. Field-testing at Salem Harbor, as well as all field-testing for the program, was completed during the ninth quarter.

REFERENCES

None this reporting period.

LIST OF ACRONYMS AND ABBREVIATIONS

A&WMA	Air & Waste Management Association
DOE	Department of Energy
NETL	National Energy Technology Laboratory
PRB	Powder River Basin

ATTACHMENT A

Accomplishments and Status Assessment January 1, 2003 – March 31, 2003

- **General**
The project is progressing on schedule without any major deviations from plan.
- **Alabama Power Company's Plant Gaston**
This facility was the first to be tested in the program. Prebaseline testing was completed in February, 2001 and the parametric test series was performed in March, 2001. The long-term test series was completed during April, 2001. The test facility was decommissioned during May. Economic analysis and topical report were started in June and are continuing. Ontario Hydro test results have been completed. The final report for this site was completed and submitted in May 2003.
- **WEPCO Pleasant Prairie Power Plant**
Sorbent screening testing was completed at Pleasant Prairie in June, 2001. Equipment installations were completed in August, 2001. WEPCO hosted a public site tour of the mercury control system at the end of August as part of the A&WMA Specialty Conference on Mercury Emissions. Equipment check-out was completed in September and Baseline and Parametric testing began during September 2001. Long-term testing was completed in November, and the mercury control equipment was removed during December and moved to PG&E NEG Brayton Point. The final report for this site was completed and submitted in May 2003.
- **PG&E NEG Brayton Point Station**
Prebaseline testing was performed at Brayton Point during June 2001. Mercury emissions measurements were made at the station during the summer of 2001 as required by the state of Massachusetts. The site was visited in July 2001 to evaluate the ductwork, port locations, equipment locations and platform needs. Some site preparation work was done during September 2001. The mercury control equipment was received by the station in December 2001. Sorbent screening testing was performed at the site in February 2002, baseline testing was completed in June 2002 and parametric and long-term testing was completed during July 2002. Equipment decommissioning was completed by mid August 2002.
- **PG&E NEG Salem Harbor Station**
Prebaseline measurements were made at Salem Harbor during February 2001. Mercury emissions measurements were made at the station during July 2001 as required by the state of Massachusetts. Injection equipment arrived at the site in late August and installation was completed in early September 2002. Boiler tuning and baseline testing was completed in September 2002. Parametric testing was performed during October 2002, and long-term testing was completed during November 2002. Equipment decommissioning was completed in early December 2002.
- **Technology Transfer**
A number of technology transfer activities have taken place since the project began in October 2000. More activities are planned for future conferences, symposia and technical publications. Presentations were made during the quarter at an American Coal Council meeting. Presentations were also made to several architect/engineering firms.