MERCURY AND AIR TOXIC ELEMENT IMPACTS OF COAL COMBUSTION BY-PRODUCT DISPOSAL AND UTILIZATION

Quarterly Technical Report

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ABSTRACT

On April 3, 2003, a project kickoff meeting was held at the U.S. Department of Energy National Energy Technology Laboratory. As a result of this meeting and follow-up communications, a final work plan was developed, and a schedule of laboratory tasks was developed. Work for the remainder of the second quarter of this project focused on sample collection, initiating laboratory tests, and performing literature searchers. The final project partner, the North Dakota Industrial Commission, signed its contract for participation in the project.

TABLE OF CONTENTS

MERCURY AND AIR TOXIC ELEMENT IMPACTS OF COAL COMBUSTION BY-PRODUCT DISPOSAL AND UTILIZATION

EXECUTIVE SUMMARY

Work for this quarter included conducting a project kickoff meeting, finalizing the project work plan, developing a schedule of laboratory tasks, collecting samples, initiating laboratory tests, and performing literature searches. The final project partner, the North Dakota Industrial Commission, signed its contract for participation in the project.

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INTRODUCTION

This effort will focus on the evaluation of coal combustion by-products (CCBs) for their potential to release mercury and other air toxic elements under different controlled laboratory conditions and will investigate the release of these same air toxic elements in select disposal and utilization field settings to understand the impact of various emission control technologies. The information collected will be evaluated and interpreted together with past Energy & Environmental Research Center (EERC) data and similar data from other studies. Results will be used to determine if mercury release from CCBs, both as currently produced and produced with mercury and other emission controls in place, is a realistic environmental issue. The proposed work will evaluate the impact of mercury and other air toxics on the disposal and/or utilization of CCBs. The project will provide data on the environmental acceptability of CCBs expected to be produced in systems with emission controls for typical disposal and utilization scenarios. The project will develop baseline information on release mechanisms of select elements in both conventional CCBs and modified or experimental CCBs. The modified or experimental CCBs will be selected to represent CCBs from systems that have improved emission controls. Controlling these emissions has high potential to change the chemical characteristics and environmental performance of CCBs. Development of reliable methods to determine the release of mercury from CCBs will provide a means of evaluating the environmental risk associated with CCB management practices. Using appropriate methods to develop a data set of currently produced CCBs and CCBs produced under experimental/ simulated conditions will provide a baseline for the CCB industry to understand the impact of various emission control technologies.

EXPERIMENTAL

Technical work during the quarter included initiation of one microbiologically mediated mercury release experiment and experimental development work on speciation of methyl mercuric chloride from the microbiologically mediated experiments. A method for speciation of organic and inorganic mercury in the gas phase has been tested and verified for use in the biologically mediated mercury release experiments. Experiments were initiated to determine if thermal desorption can determine mercury speciation. Three ashes of varying carbon content were analyzed.

Literature searches on microbial metabolism and Se, As, and Cr were initiated to acquire a background on the known transformations of these metals and factors that affect them. This information was used in continued protocol development for the microbiologically mediated release experiments.

A review of leaching procedures was initiated, and available information on leaching of mercury from CCBs was collected. This information was evaluated and used to further develop the technical work plan.

A U.S. Department of Energy (DOE) list of National Energy Technology Laboratory (NETL)-funded mercury-related projects was provided by the Science Applications International Corporation, and utility project sponsors provided information on their facility configurations including disposal methods and on upcoming mercury emission testing. Discussions were held with the EPRI representative in an effort to initiate collaborative work with another DOE NETL-funded study related to arsenic and selenium releases from coal ash.

RESULTS AND DISCUSSION

The NETL Project Manager, Swenam Lee, and the EERC Project Manager conducted a project kickoff meeting on April 3, 2003, at NETL in Pittsburgh. Additional discussions with project sponsors and the project research team followed. A revised detailed work plan and associated documentation were distributed to project sponsors, including revisions to the sample selection plan and a revised plan for samples to be evaluated under individual laboratory tasks. Samples were collected, and a schedule of laboratory testing was developed. A project summary was prepared for an upcoming Center for Air Toxic Metals℠ newsletter.

CONCLUSIONS

Samples collection will continue during the next quarter along with laboratory tests initiated during this quarter.

REFERENCES

None.

LIST OF ACRONYMS

CCB	coal combustion by-products
DOE	U.S. Department of Energy
EERC	Energy & Environmental Research Center
NETL	National Energy Technology Laboratory