DOE/MC/31175-- 5453
Distribution Category UC-132

Treatment of Metal-Laden Hazardous Wastes with Advanced Clean Coal Technology By-Products

Quarterly Report
March 30 - June 30, 1996

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Work Performed Under Contract No.: DE-FC21-94MC31175

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EXECUTIVE SUMMARY

During the third quarter of Phase 2, work continued on evaluating Phase 1 samples (including evaluation of a seventh waste), conducting scholarly work, preparing for field work, preparing and delivering presentations, and making additional outside contacts.

Laboratory Analyses

Mercury analyses were completed for the extracts of the three by-products, the unused fourth by-product, and eleven treated waste mixtures. All were well below both current and potential future standards.

The seventh waste, a sandblast residue, was analyzed and found to yield hazardous levels of lead when extracted. Six other metals were found to be present in sufficient quantities in the waste to be potentially a problem if completely leached, but were not present in significant amounts in the standard leachate. The lead in this waste was found to be stabilized by a 30% dosage of CONSOL by-product and a 50% dosage of the Tidd by-product. The Ebensburg by-product was not effective for this waste.

Scholarly Work

The two graduate students assigned to this project have both modified their plans somewhat during the quarter.

Preparation for Field Work

The decision by METC to conduct an environmental evaluation of the work of Phase 2 to be conducted at the Yukon plant of Mill Service, Inc. (MSI) led that firm to withdraw from Phase 2. A search began for a new subcontractor. The Bedford, Ohio plant of Republic Environmental Systems was approached first, but they declined the invitation. As the quarter ended, a second candidate, the Canton, Ohio plant of Envirite Corporation, was considering an invitation.

Reports and Presentations

A poster entitled "Hazardous Waste Stabilization with Clean-Coal Technology Ash Residuals" was presented at the 18th Biennial IAWQ Conference in Singapore on June 23-28, 1996. A seven-page paper describing the poster was submitted in April 1996 for publication in Water Science and Technology.

The paper entitled "Stabilization of Metal-Laden Hazardous Wastes Using Lime-Containing Ash from Two FBC's and a Spray-Drier," originally presented at the 211th American Chemical Society National Meeting and Exposition in New Orleans, Louisiana in March, was

presented again at the graduate seminar of the Chemical Engineering Department of Iowa State University, Ames, Iowa on May 3, 1996.

A summary of the project was included in a poster describing work being conducted in the Environmental Engineering Program at the University of Pittsburgh (Pitt) at a Research Fair, hosted by Pitt's School of Engineering on the Pitt campus on May 22, 1996.

Outside Contacts

Discussions were held with Thermal-Clean Service Corporation of Washington, Pennsylvania, concerning the project and the possibility of collaboration.

Discussions were held with MSI and the Center for Hazardous Materials Research concerning approaches to take when discussing aspects of projects like this one with state regulatory agencies.

A proposal on "Stabilization of DOE Hazardous [Mixed] Wastes with Clean-Coal Technology By-Products" was made in response to Program Notice 96-10 from the U.S. Department of Energy.

Discussions were held with Professor Daniel Bergeson of the Civil Engineering Department of Iowa State University on the effect of boiler operating parameters on ash properties.

The principal investigator attended the Coal Combustion Byproduct (CCB) Managers Program on June 10-13, 1996 at West Virginia University.

Plans for the Next Quarter

During the quarter from June 30 through September 30, 1996, work will continue on Tasks 3 through 5 of Phase 1. The search for a fourth by-product will continue, focussing next upon coal-fired FBC residue. Mill Service, Inc. will watch for additional wastes to add to the list.

Work on Task 1 of Phase 2 will continue. Because of the delay in initiating the commercial tests of Phase 2, caused by the withdrawal of MSI from Phase 2 and the extended search for a new subcontractor, the project team will request a one-year no-cost extension to the contract to September 30, 1997. When the new subcontractor is identified and aboard, the test plan for Phase 2 will be prepared. It will include the detailed plan for the field work and related laboratory activities.

The two graduate students assigned to this project will conduct a significant portion of their scholarly work during this quarter.

INTRODUCTION

This seventh quarterly report describes work done during the seventh three-month period of the University of Pittsburgh's project on the "Treatment of Metal-Laden Hazardous Wastes with Advanced Clean Coal Technology By-Products."

Participating with the university on this project is Mill Service, Inc. (MSI)

This report describes the activities of the project team during the reporting period. The principal work has focussed upon final laboratory evaluation of samples produced during Phase 1, examining with MSI the treatability of a seventh waste, seeking a subcontractor to replace MSI for the field work of Phase 2, preparing and giving presentations, and making and responding to several major outside contacts.

LABORATORY AND FIELD WORK

Laboratory Analyses

Phase 1 laboratory work at the University of Pittsburgh (Pitt) was continued through the quarter. The work completed consisted of analyses of mercury for certain of the previous extracts (which had incorrectly been noted as fully analyzed on Page 4 of the last quarterly technical report) and evaluation of a seventh hazardous waste — a sandblast residue from paint removal in a building. Work continued on identifying the fourth by-product and on the scholarly activities of the graduate students.

Mercury Analyses

During the quarter, a number of samples were analyzed in order to determine the concentration of mercury present. These samples included TCLP extracts of a number of by-product samples and treated wastes. The method used to analyze for mercury was based on EPA SW-846 Method 7470A - Mercury in Liquid Waste (Manual Cold-Vapor Technique). The method stated in the test plan was Method 7470. Method 7470A is simply a more recent revision of Method 7470. Method 7470A was modified to use a Varian VGA-76 Vapor Generation Accessory in place of the cold-vapor generator described in the procedure. This modification was used in order to simplify the analysis.

The results of the mercury analysis performed on the by-product samples and the treated wastes is shown in Table 1. All of the samples analyzed were below the current standard of 200 μg/L, as well as the UTS level of 25 μg/L.

Analysis of Sandblast Waste

During the quarter MSI received a sandblast waste for evaluation. It analyzed many of the total metals in a digestate of the untreated waste and in a TCLP extract of the waste. The latter are shown in the first column of Table 2. MSI also sent the digestate and the extract to Pitt where the final four metals were measured (see Table 3). These results led MSI to determine that the treated sandblast waste had to be analyzed for the following parameters — As, Ba, Cd, Cr, Pb, Hg and Ni — but in fact, for the purposes of this project, all metals would be evaluated.

In addition to the digestate and extract, an analytical sample of the waste itself was provided to Pitt for XRD and SEM analyses (to be completed during the next quarter).

TABLE 1: Mercury Concentration in By-Products and Treated Wastes

Sample	Mercury Conc. (µg/L)	Sample	Mercury Conc. (µg/L)
CONSOL #5	1.2	Battery Sludge w/ 33% CONSOL	3.1
CONSOL #7	0.8	Battery Sludge w/ 72% Tidd	0.2
Tidd #8	1.0	Munitions Soil w/ 100% Ebensburg	0.6
Tidd #10	0.6	Munitions Soil w/ 50% CONSOL	3.9
Ebensburg #2	1.0	Munitions Soil w/ 50% Tidd	0.8
Ebensburg #4	0.2	Industrial Soil w/ 50% Tidd	1.7
Ebensburg #5	0.8	WWTP Soil w/ 50% Tidd	1.4
Thames River #2	0.8	WWTP Soil w/ 50% Ebensburg	0.6
Thames River #7	0.4	Munitions Soil w/ 50% Tidd (28-Days, Proctor Method)	0.8
WWTP Soil w/ 50% Ebensburg (28-Days, Proctor Method)	1.0	Munitions Soil w/ 50% Tidd (90-Days, Proctor Method)	0.4
WWTP Soil w/ 50% Ebensburg (90-Days, Proctor Method)	0.2	Industrial Soil w/ 100% CONSOL (28-Days, Proctor Method)	11.4

TABLE 2

METC PROJECT TREATABILITY TEST RESULTS
SANDBLAST WASTE

By-Product		UNTREATED	CONSOL #1	CONSOL #1	CONSOL #1	EPC #3	EPC #3	EPC #3	Tidd #2	Tidd #2	Tidd #2
Dosage			10%	30%	50%	10%	30%	50%	10%	30%	50%
						IMMEDIATE					
Parameter	Units										
Antimony	mg/l	0.051	< 0.02	< 0.02	< 0.02	0.023	< 0.02	0.028	< 0.02	< 0.02	< 0.02
Arsenic	mg/l	< 0.10	0.19	0.37	0.39	0.11	< 0.1	< 0.1	< 0.1	0.11	0.12
Barium	mg/l	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Beryllium	mg/l	< 0.001	< 0.001	0.0033	0.0042	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Copper	mg/l	0.28	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lead	mg/l	350	0.38	0.15	0.13	290	250	210	8.1	14	0.96
Mercury	mg/l	< 0.010	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Selenium	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Silver	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/l	< 0.01	0.033	0.1	0.134	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	mg/l	1.7	1.4	1.4	1.1	1.9	1.6	1.6	< 1	< 1	< 1
Extraction Fluid											
Initial pH	SU										
Final pH	SU										

By-Product		UNTREATED	CONSOL #1	CONSOL #1	CONSOL #1	EPC #3	EPC #3	EPC #3	Tidd #2	Tidd #2	Tidd #2
Dosage			10%	30%	50%	10%	30%	50%	10%	30%	50%
						AFTER 24 HOURS					
Parameter	Units										
Antimony	mg/l	0.051	< 0.02	< 0.02	< 0.02	0.027	< 0.02	< 0.02	0.03	< 0.02	< 0.02
Arsenic	mg/l	< 0.10	0.18	0.41	0.41	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Barium	mg/l	< 5.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Beryllium	mg/l	< 0.001	< 0.001	0.0029	0.0039	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chromium	mg/l	< 0.10	< 0.1	0.14	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Copper	mg/l	0.28	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Lead	mg/l	350	0.44	0.13	0.11	130	87	28	210	24	0.49
Mercury	mg/l	< 0.010	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Selenium	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Silver	mg/l	< 0.10	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	mg/l	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/l	< 0.01	0.029	0.099	0.119	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	mg/l	1.7	1.4	1.4	1	1.9	1.2	< 1	1.7	1.6	< 1
Extraction Fluid											
Initial pH	SU										
Final pH	SU										

TABLE 3: Metals Analysis of Sandblast Waste

Parameter	Total Metals (mg/kg)	TCLP (mg/L)
Antimony	5.1	0.0051
Beryllium	<0.089	<0.001
Thallium	<0.045	<0.005
Vanadium	1.29	<0.01

Treatment of Sandblast Waste

The sandblast waste was treated at MSI's Yukon Plant at laboratory scale with each of the three by-products at dosages of 10, 30 and 50%. The results of metals analyses of TCLP extracts of the treated wastes are shown in Table 2 (for those metals evaluated by MSI) and Table 4 (for those metals evaluated by Pitt).

Based upon these results, MSI recommended that solidification testing be conducted with two by-products. Here is their specific analysis:

CONSOL. All of the tests performed with the CONSOL by-product generated a non-hazardous waste that met the current LDR treatment standards and the 30% and 50% dosages achieved the UTS levels. It was suggested that Pitt perform a solidification test at the 30% dosage.

Ebensburg. None of the tests performed with the Ebensburg by-product were successful. TCLP-lead levels exceeded the current LDR treatment standards and the UTS levels at all dosages. No solidification tests were recommended.

Tidd. The test performed with 50% Tidd by-product was the only test that was successful in generating a non-hazardous waste and one that met the current LDR treatment standards. None of the tests achieved the UTS levels. It was suggested that Pitt perform a solidification test at the 50% dosage.

The results of the two suggested solidification tests will be reported in the next quarterly report.

Fourth By-Product

As a result of contacts made at the Coal Combustion By-Products (CCB) Managers Workshop in mid-June (see "Outside Contacts" below), Pitt has reopened discussions with JTM Industries, Inc., seeking a fourth by-product. This time the contact is with JTM's Northeastern Region Office in Allentown, Pennsylvania.

TABLE 4: Metals Analysis of Sandblast Waste/By-Product Combinations

Immediate TCLP

By-Product	Consol			Tidd			EPC		
Dosage	10%	30%	50%	10%	30%	50%	10%	30%	50%
Antimony (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.023	<0.02	0.028
Beryllium (mg/L)	<0.001	0.0033	0.0042	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium (mg/L)	0.033	0.100	0.134	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

24 Hour TCLP

By-Product	Consol			Tidd			EPC		
Dosage	10%	30%	50%	10%	30%	50%	10%	30%	50%
Antimony (mg/L)	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.027	<0.02	<0.02
Beryllium (mg/L)	<0.001	0.0029	0.0039	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium (mg/L)	0.029	0.099	0.119	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Scholarly Activity

It was previously stated in the last quarterly report that Ms. Clifford would perform TCLP metals analysis and XRD and SEM analysis on three different treated wastes after curing times of 3 and 28 days. The wastes utilized were to be from among those received at the Yukon plant of MSI at the time. Currently, only one new hazardous waste, the sandblast waste with a lead concentration well above the current standard of 5 mg/L, is available. Hence, Ms. Clifford now proposes to perform TCLP metals analysis and XRD and SEM analysis on the treated sandblast waste samples prepared for solidification testing after curing times of 1, 3, 7, 14, and 28 days. As mentioned above, it was recommended that solidification tests be

performed on the sandblast waste treated with 30% CONSOL and the sandblast waste treated with 50% Tidd. The results of the analyses performed on these samples will be reported in the next quarterly report.

For Mr. Pritt's treatability studies to be carried out as planned, modest amounts of hazardous waste must be acquired by Pitt. In April a strategy was developed for this process:

> The hazardous wastes (about 50 pounds of each) would be picked up by Pitt staff at MSI's Yukon plant and transported by land vehicle to Benedum Hall of Engineering on the Pitt campus. The wastes would be sealed in 5 gallon plastic pails. From the time that the pails would be sealed until delivery to Pitt, the pails would remain unopened. The pails of waste would be unloaded at the loading dock in back of Benedum Hall and immediately taken to Room SB86, where the waste would be stored.
>
> A log would be kept by project staff of all movement and use of the hazardous waste. From the time the waste would leave MSI until any remainder would be returned to MSI, the log would show who had taken a sample of the waste, when, how much, where, and for what purpose. Any unused sample would be taken back to SB86 for storage. Under no circumstances would the wastes be given to any personnel other than those specifically working on this project for the purposes stated in the contract.
>
> Any unused wastes from this project would be returned to MSI for final disposal.

However, when attempting to implement this procedure in mid-June, the project team learned that having an EPA hazardous waste identification number was not sufficient to meet the regulations of the Pennsylvania Department of Environmental Protection (PADEP) for a study such as Mr. Pritts'. PADEP must also issue a hazardous waste identification number before either a waste generator or a waste treater can release modest amounts of hazardous wastes for treatability studies. To issue that number PADEP must receive notification of the intent to undertake the studies. Therefore, on June 27, 1996, Mr. L. W. Keller, Director of Pitt's Environmental Health & Safety Department, wrote to PADEP notifying them of this new work. A copy of this letter is given in Appendix A.

In light of this delay in receiving hazardous waste, Mr. Pritts is reevaluating his workplan for his thesis. Any changes will be reported in the next quarterly report.

Preparation for Field Work

In further anticipation of the decision by the Morgantown Energy Technology Center on whether an environmental assessment (EA) would be necessary or a categorical exclusion would be granted under NEPA, MSI in early April prepared a plan to handle the collection of the CONSOL and Ebensburg by-products. This plan involved engaging another company to haul each by-product to MSI's Yukon plant from its point of availability. The Ebensburg material would have been delivered directly to the plant, while the CONSOL material would have been

stored in one of the silos owned by the hauling company. A cost estimate for this service was prepared.

Unfortunately, this by-product handling plan, as well as the elementary plan for conducting the field tests that MSI had prepared late in the previous quarter, became moot as a result of the decision, announced by telephone to the project team on April 1, 1996 by the project's Contracting Officer's Representative, that METC would perform an EA of Phase 2 of the project, if it were conducted at MSI's Yukon Plant.

After much consideration of this decision, MSI on April 26, 1996 formally withdrew from Phase 2. A copy of its letter is given in Appendix B. Had the categorical exclusion been invoked, MSI would have been able to have continued to participate in Phase 2. MSI's reason for withdrawing centers on that aspect of an EA which provides an opportunity for public input. The project team understands that it is MSI's position that it (MSI) would likely have been required to devote considerable resources — in time spent by its professionals, staff and officers; in direct funds expended; and in undefinable costs to meet unnecessary, increased regulations which frequently result from overreaction by the PADEP to uninformed, emotional testimony — to participate in a public review of the project. The project's budget does not include reimbursement of these ill-defined expenses. These unreimbursable, somewhat undefinable, increased expenses caused MSI to withdraw from the project.

Following MSI's withdrawal, a search began for an alternative site and partner for the field tests of Phase 2. In late May discussions were held with the Bedford, Ohio plant of Republic Environmental Systems, the closest hazardous waste treatment facility (geographically) to Pittsburgh — other than the Yukon plant of MSI, of course. Although the technical director of the facility at first was very interested in the technical aspects of the project, its general managers declined to participate, citing concerns for the intrusiveness and magnitude of an EA of the project.

At this time — May 31, 1996 — the project team anticipated that an EA would be required of any site agreeing to participate in Phase 2. During discussions with METC immediately following the decision by Republic Environment's Bedford plant not to participate, the project team learned that the decision to perform an EA at MSI's Yukon plant had been based apparently solely upon the substantial, acrimonious public scrutiny which that plant has received over the years. If that scrutiny had not been so vigorous, the categorical exclusion under NEPA would likely have been granted. Subsequent contacts with other potential participants have been and continue to be made with the advice to them out front that an EA is unlikely if little public scrutiny has been applied to the plant being considered.

With this in mind, discussions were opened in mid-June with the Canton, Ohio plant of Envirite Corporation. This plant is a treatment facility only — no material is stored there. The flow of hazardous waste to the plant is relatively constant year-round. Occasionally, the plant has been open to public review when permit modifications have been sought. No members of the public have come forward at these times, the permits have been granted and no controversy has ever been present. The plant currently is nearing the conclusion of the process of obtaining a Part B permit. When this permit is received, Envirite would be very interested in the possibility of using advanced clean coal technology by-products as treatment chemicals. However, they wish absolutely nothing to interfere with their Part B application. The project

team has indicated that the circumstances of the plant are such that an EA is not anticipated. On this basis the plant has asked for documentation describing the project, an idea of the role Envirite would play in it, and the format of the NEPA Checklist in order that they can consider whether to join the project team for Phase 2. This material will be sent the Envirite during the first days of the next quarter. The indication at this point is that they will join immediately , if an EA is not required. They appear willing to join after the Part B permit is received, even if an EA is conducted.

REPORTS AND PRESENTATIONS

The project's co-principal investigator, Professor Ronald D. Neufeld, presented a poster entitled "Hazardous Waste Stabilization with Clean-Coal Technology Ash Residuals" at the 18th Biennial IAWQ Conference in Singapore on June 23-28, 1996. A seven-page paper describing the poster, was submitted in April for publication in Water Science and Technology. This paper is reproduced in Appendix C.

On May 3, 1996 the project's principal investigator, Dr. James T. Cobb, Jr., represented the paper entitled "Stabilization of Metal-Laden Hazardous Wastes Using Lime-Containing Ash from Two FBC's and a Spray-Drier" to the graduate seminar of the Department of Chemical Engineering at Iowa State University in Ames, Iowa. This paper had originally been presented at the 211th American Chemical Society National Meeting and exposition in New Orleans, Louisiana on March 25, 1996. A preprint of the paper was given in Appendix B of the previous quarterly technical report on this project.

On the evening of May 22, 1996, the project was described in a portion of a poster on the Environmental Engineering Program, which was presented at Pitt's School of Engineering's Research Fair. This event was organized by the school to provide high-profile exposure to its research projects. Held in the Assembly Room of the William Pitt Union, it was attended by over eighty research leaders of the Pittsburgh area. The featured speaker at the event was the Honorable Tom Murphy, Mayor of the City of Pittsburgh, who surveyed new business opportunities for the city and the role which researchers attending the fair can play in developing them.

OUTSIDE CONTACTS

Thermal-Clean Services Corporation

Last fall, the project team had an introductory conversation with William Spencer of Thermal-Clean Services Corporation of Washington, Pennsylvania. Mr. Spencer had expressed an interest in the project and in the possibility of applying its results in his business. Several major documents were sent to him at that time describing the project in detail.

In early May, a second conversation took place in which Mr. Spencer told the project team of his current interest in the phosphate bonded ceramic waste forms being developed by Argonne National Laboratory in Project TTP No. CH2-4-MW-44, funded by EM-50. He also has expressed interest in the proprietary powder, similar to apatite, which is being used at the Cold Spring, New York cadmium-laden Superfund site by a contractor to Gould Electronics of Eastlake, Ohio. It was agreed that Mr. Spencer's interest is diverging from that of the project team and further conversations are not anticipated.

Unintended Outcome of Environmental Report

While preparing the environmental report for Phase 2 of this project, the Center for Hazardous Materials Research (CHMR) entered into two telephone conversations with air pollution control officers of the Pennsylvania Department of Environmental Protection (PADEP). One conversation was to obtain clarification on the size of batches of hazardous wastes that would be considered as major ones under Title 5. The other was a review of the perimeter monitoring equipment which PADEP has used at MSI's Yukon plant and the results being obtained. In at least one of these cases, CHMR may have entered into conversation with PADEP without a comprehensive prior discussion with MSI. MSI has the impression that since these conversations PADEP is asking more questions of MSI about the potential for dust emissions within the Yukon plant and is indicating a desire for closer observation when new, potentially dustier treatment chemicals are used for the first time there, even though MSI's operation will not be substantially different using these new chemicals and will remain well within permitted limits. As a result of this experience, MSI recommends that dialogue between third-party entities, who are working with hazardous waste treaters, and state regulators, concerning operations at a plant of that treatment company, include personnel from the treater and be undertaken only after the treater has had the opportunity to discuss the matter fully with the third-party entity.

Proposals to U.S.DOE

Ronald D. Neufeld's preproposal on "Stabilization of DOE Hazardous [Mixed] Wastes with Clean-Coal Technology By-Products," sent to U.S.DOE, Germantown, Maryland, in response to Program Notice 96-10, elicited encouragement from the department to submit a full proposal. Professor Neufeld submitted a proposal on May 3, 1996.

The project team has noted the research opportunity announcement in volume 61, number 87, page 19918 of the Federal Register (May 3, 1996), in which U.S.DOE is soliciting proposals in support of the Office of Science and Technology's applied research efforts for the development of technologies having potential applications in the Environmental Restoration and Waste Management (EM) program. Consideration is being given to this solicitation.

Effect of Boiler Operating Parameters

During his visit to Iowa State University, James T. Cobb, Jr., spoke with Professor Daniel Bergeson of the Civil Engineering Department. Professor Bergeson has found recently that what appears to be a small change in boiler operation can have a significant effect on ash properties. A large increase in the glassiness of ash was observed when small amounts of sodium carbonate were added to the coal being fed to a boiler, which was nearing the end of an operating cycle, in order to maintain the performance of the electrostatic precipitator during the latter portion of the cycle.

Coal Combustion By-Product (CCB) Managers Program

James T. Cobb, Jr., attended the Clean Coal By-Product (CCB) Managers Program on June 10-13, 1996 at West Virginia University (WVU), sponsored by the American Coal Ash Association and WVU's National Research Center for Coal and Energy. At the program he reopened dialogue with several staff members of JTM Industries, Inc., who were also in attendance, about the fourth by-product for Phase 1 (a coal-fired FBC residue) and the possibility of seeking the participation of a Laidlaw plant in Phase 2.

ADMINISTRATIVE ASPECTS

This section reports on two special administrative actions, provides the monthly highlights, and closes by comparing progress with the milestone chart.

Special Actions

The withdrawal of Mill Service, Inc., from Phase 2 required a search to begin for a replacement. The project team has assigned a new responsibility to Mr. Carl F. Bender, the independent consultant who currently serves as manager of MSI's Phase 1 activities. The University of Pittsburgh has appointed Mr. Bender as a consultant to assist in finding MSI's replacement for Phase 2. During this quarter Mr. Bender initiated the dialogues with the Bedford plant of Republic Environmental Systems and with the Canton plant of Envirite Corporation.

Three other individuals should be introduced.

- Professor Jean R. Blachere is responsible for the operation of the SEM and XRD instruments of the Materials Science and Engineering Department. He will supervise Ms. Clifford's work on these two devices.

- Ms. Jennifer L. Kurn, like Ms. Agostini, has been an undergraduate in the Chemical and Petroleum Engineering Department for the past four years. She joined the project team in January for four months to gain experience with academic research, helping with some of the analyses and with the maintenance of the computerized database. She graduated at the end of April 1996.

- Ms. Sarah V. Spencer, an undergraduate in the pre-engineering (3/2) program at Clark Atlanta University, has joined the Chemical and Petroleum Engineering Department as a participant in the NSF-sponsored Research Experience for Undergraduates (REU) Program for the summer. She also is assisting with analyses. Her report on her experiences will be included in the next quarterly technical report.

In late May it was felt that a brief letter updating CONSOL Inc., about the delay in Phase 2 was appropriate. This letter and the response from Dr. Flynt Kennedy, Vice President for Research and Development, are shown in Appendix D.

Monthly Highlights

Here are the highlights of the third three months of the second phase of the project.

March 30 - April 30, 1996

- Mill Service, Inc., receives a sandblast waste and begins to evaluate its potential as the seventh hazardous waste.

- MSI prepares a plan to manage the CONSOL and Ebensburg by-products in Phase 2.

- METC announces that an environmental assessment must be conducted for Phase 2 at MSI, resulting in withdrawal of MSI from participation in Phase 2.

- Seven-page paper describing Phase 1 is submitted to the 18th Biennial IAWQ Conference to be held in Singapore in June 1996.

April 30 - May 30, 1996

- Discussions are initiated with the Bedford, Ohio plant of Republic Environmental Systems about the possibility of their participation in Phase 2.

- Paper is presented on "Stabilization of Metal-Laden Hazardous Wastes Using Lime-Containing Ash from Two FBC's and a Spray-Drier" to the graduate seminar of the Chemical Engineering Department of Iowa State University, Ames, Iowa.

- Proposal is submitted to the U.S.DOE on "Stabilization of DOE Hazardous [Mixed] Wastes with Clean-Coal Technology By-Products" in response to an invitation under Program Notice 96-10.

- Project is described in a portion of a poster on the Environmental Engineering Program at the Research Fair of the University of Pittsburgh's School of Engineering.

May 30 - June 30, 1996

- Results of benchscale treatment studies of the sand-blast waste with the three by-products are reported by MSI, showing that a 30% dosage of the CONSOL by-product and a 50% dosage of the Tidd by-product both stabilized this waste.

- Republic Environmental Systems declines the invitation to participate in Phase 2.

- Discussions are initiated with the Canton, Ohio plant of Envirite Corporation about the possibility of their participation in Phase 2.

- Principal investigator attends the Coal Combustion By-Product Managers Program, conducted by the American Coal Ash Association and the National Research Center for Coal and Energy of West Virginia University.

Comparison of Progress with Milestone Chart

The following task for Phase 2 had been scheduled for completion during the first quarter of Phase 2:

- Task 1 - Test Plan for Phase 2

Task 1 still was not completed during the third period of this phase. The decision in early April by METC that an environmental assessment of the Phase 2 project at the Yukon plant of Mill Service, Inc., would have to be conducted and the subsequent withdrawal in late April by MSI from Phase 2 has necessitated a search for a new subcontractor to host and participate in the commercial test of Phase 2. The test plan for Phase 2 cannot be specified in sufficient detail for presentation until the new subcontractor is identified and can participate in its preparation.

Submission of the sixth quarterly technical report was delayed beyond the end of the seventh quarter and will be provided early in the eighth quarter.

Work continued on three tasks from Phase 1:

- Task 3 - Sample Collection and Characterization
- Task 4 - Treatment of Metal-Laden Waste with CCT Solid By-Product
- Task 5 - Data Analysis

Work on Tasks 3, 4 and 5 of Phase 1 will continue into the fourth quarter of Phase 2. The fourth by-product and the final three wastes are still being sought. As they are identified, they will be evaluated and the resulting data will be analyzed.

PLAN FOR THE NEXT QUARTER

During the quarter from June 30 through September 30, 1996, work will continue on Tasks 3 through 5 of Phase 1. The search for a fourth by-product will continue, focussing next upon coal-fired FBC residue. Mill Service, Inc. will watch for additional wastes to add to the list.

Work on Task 1 of Phase 2 will continue. Because of the delay in initiating the commercial tests of Phase 2, caused by the withdrawal of MSI from Phase 2 and the extended search for a new subcontractor, the project team will request a one-year no-cost extension to the contract to September 30, 1997. When the new subcontractor is identified and aboard, the test plan for Phase 2 will be prepared. It will include the detailed plan for the field work and related laboratory activities.

The two graduate students assigned to this project will conduct a significant portion of their scholarly work during this quarter.

APPENDIX A

LETTER TO THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION ON THE INTENT OF THE UNIVERSITY OF PITTSBURGH TO CONDUCT TREATABILITY STUDIES

University of Pittsburgh

Pittsburgh, Pennsylvania 15261

June 27, 1996

Mr. Robert Popichak
Hazardous Waste Coordinator-Waste Management
Department of Environmental Protection - SW Region
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Dear Mr. Popichak:

This is a follow-up to the June 10, 1996, telephone conversation you had with Dr. Ronald D. Neufeld, Professor of Civil & Environmental Engineering regarding the conduct of treatability research studies within the School of Engineering, University of Pittsburgh. The Environmental Engineering program within the School of Engineering has a long history of conducting experimental fundamental and applied research in the area of municipal and industrial liquid and hazardous/solid waste treatment. While much research is conducted under the sponsorship of external funding agencies, some research is not externally supported and is conducted solely to support graduate education and the advancement of knowledge in the environmental engineering area. Examples of sponsoring agencies include, but are not limited to: U.S. EPA, U.S. DOE, NSF, AISI, Ben Franklin Technology Center, U.S. DOD, Allegheny County, other state and local agencies, engineering companies and private industry.

The purpose of this letter is to gain approval from DEP for the University to continue to conduct hazardous and chemical waste treatment research, and to have such wastes and shipment of such wastes excluded from regulation in accord with 25 PA Code 261.4(c)(2). In support of this request, please consider the following:

- There is no intent on the part of the University to conduct treatability studies as a guise or mechanism for the disposal hazardous wastes.

  1. At no time will a quantity of >1,000 kilograms of hazardous wastes be used for any one "study scope". Changes in independent research variable will constitute changes in scope. We do not expect to store quantities of hazardous wastes in excess of 1,000 kilograms for any one study scope.

  2. Mr. Steve Nehus, The University Environmental Health and Safety Office, (412/624-6774) is the primary on-site contact person knowledgeable and responsible for hazardous waste reporting. He will be assisted by Dr. E. Schreiber (412/624-9575), Environmental Engineering Laboratory Manager, who is knowledgeable as to all on-going treatability studies and associated environmental research being conducted by faculty and graduate students within the Department of Civil & Environmental Engineering.

3. Prior and current research involves the study and treatment of liquid wastes and solid wastes at bench scale within the School of Engineering.

   The impetus for this letter is specific research involving metal laden soil-like hazardous wastes collected from Mill Service Company which is stabilized using Clean-Coal Technology by-products. Approximately 200 pounds of each material are required for each scope of study. All samples are contained in sealed containers with appropriate labels. Samples are not flammable; and spills that may occur will be readily collected and placed back into sample containers. All experiments will be conducted at bench scale within the School of Engineering.

4. Materials will be stored within laboratories of the School of Engineering.

5. Response to emergency occurrences will be conducted under the direction of Dr. Schreiber, laboratory manager, and the University Environmental Health and Safety Office.

6. Clean-up of equipment will be conducted under the direction of Dr. Schreiber, laboratory manager, in accord with usual practices and protocols developed by the University Health & Safety Office.

7. All local ordinances and laws will be complied with.

8. Environmental Health and Safety will prepare a report to DEP summarizing the annual pounds of hazardous waste samples received. Such reporting will be submitted to your office by March 15 of each year.

Yours truly,

Lawrence W. Keller, Director
Environmental Health & Safety

LWK/gs

cc: Dr. Ronald D. Neufeld
Dr. Emanuel Schreiber
Dr. Reidar Bjorhoude

APPENDIX B

LETTER FROM MILL SERVICE, INC., WITHDRAWING FROM PHASE 2

MILL SERVICE, Inc.
SINCE 1957

1815 WASHINGTON ROAD • PITTSBURGH, PA 15241-1498 • (412) 343-4900
FAX: (412) 854-5307

April 26, 1996

University of Pittsburgh
Terrence R. Coyne
Grants and Contracts Specialists
350 Thackeray Hall
Pittsburgh, PA 15260

Re: Subcontract Agreement No. 7836-1 with University of Pittsburgh under Department of Energy Cooperative Agreement No. DE-FC21-94MC31175

Dear Mr. Coyne:

We are sorry to say that Mill Service is exercising its option to terminate the subcontract agreement noted above due to uncontrollable circumstances. Article 5 Section 5.3 permits 30 day written notification for the termination of the agreement.

We are notifying the University of Pittsburgh of our withdrawal from the project after successfully completing phase 1. The data obtained, the research completed and the resultant findings of the project reflect a job well done by all that have been connected with the phase 1 of the "Treatment of Metal-Laden Hazardous Wastes with Advanced Clean Coal Technology By-Products" project.

Again we wish we were able to continue with phase 2 and wish you well with the continuation of the project. We will finish up the remaining work of phase 1 that is still ongoing including any reports required and then submit our last reimbursable activity at the conclusion of phase 1.

It has been both a pleasure and a learning experience and we appreciate the chance to work with the University of Pittsburgh and be a vital participant in such a worthwhile research and development project.

We would welcome the opportunity to participate in any other R&D project that the University feels would suit our expertise.

Very truly yours,

Philip R. Costantini
Executive Vice President

cc: James Cobb

preprint removed.

APPENDIX D

EXCHANGE OF LETTERS BETWEEN CONSOL INC. AND THE UNIVERSITY OF PITTSBURGH ON PHASE 2

University of Pittsburgh
SCHOOL OF ENGINEERING
Center for Energy Research

May 24, 1996

Dr. Flynt Kennedy
Vice President, Research & Development
CONSOL Inc.
Research & Development
4000 Brownsville Road
Library, PA 15129

Dear Dr. Kennedy:

The University of Pittsburgh is extremely grateful to CONSOL Inc for its assistance during Phase One of our project on "Treatment of Metal-Laden Hazardous Wastes with Clean Coal Technology By-Products," being supported by the Morgantown Energy Technology Center (METC), U.S. Department of Energy. Frank Theodore and Milton Wu have provided us with ten samples of the spray-drier residue from the Carneys Point Cogeneration Plant. The university and its partners in Phase One, Dravo Lime Company and Mill Service Inc, have thoroughly analyzed this by-product and used it to stabilize and solidify six characteristic metal-laden hazardous wastes. We have shown that the spray-drier residue is an excellent stabilization agent. Unfortunately, our first efforts at using it as a solidification agent were disappointing, but we are initiating studies to understand how to improve its performance in this service. We will work closely with Dr. Wu as we proceed in our laboratory evaluation, in order to take advantage of his experience in successfully preparing aggregate from this material.

In our original proposal to METC we outlined a second phase for the project in which we suggested that up to ten commercial treatments of metal-laden hazardous wastes with clean coal technology by-products would be conducted at Mill Service's Yukon (PA) Plant. For Phase Two we estimated (and still do) a requirement of 50 tons of each of the by-products used in the project. At the time of the proposal, we did not request that CONSOL include reference to Phase Two in the letter you provided on July 22, 1993, in which you committed your company to Phase One.

In accordance with our contract, we prepared last summer a continuation plan for Phase Two. We also submitted environmental information about Phase Two in late September. In early October we received approval to proceed to Phase Two, but implementation was delayed until the environmental information could be reviewed. While awaiting this review, Mill Service obtained a variance from its Pennsylvania hazardous waste and air emission permits to conduct Phase Two. It was a surprise, then, when in April METC determined that they would have to conduct an environmental assessment (EA) of Phase Two before it could be implemented. An EA requires public notification and an opportunity for a public hearing concerning the project. After due

1140 BENEDUM HALL, PITTSBURGH, PA 15261 (412) 624-7440/FAX: (412) 624-9639

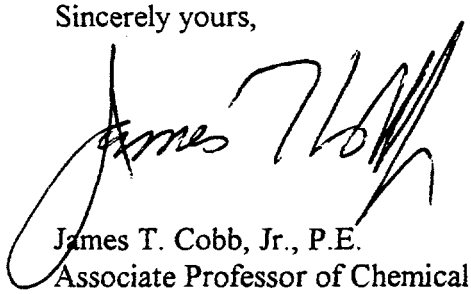
consideration, Mill Service reluctantly withdrew from the project because it did not wish to be subjected, even potentially, to a public review of its site and operation at the federal level. They have gone through public review at the state level and, while successful, have found it a painful experience. They would have proceeded with the project if review were limited to state scrutiny, but the greater pain they would have experienced under federal scrutiny, even though expecting of success, caused them to exercise their escape clause in late April.

Since then, we have been organizing a search for a new commercial partner. This morning we made an initial positive contact with Republic Environmental System, a TSD (treatment, storage and disposal) site near Cleveland, Ohio. While still preliminary in nature, their response gives us encouragement that we will be able to proceed with Phase Two by this fall. We still must bring this new company aboard, prepare another environmental report, await a decision on an EA for this site, have the EA conducted (if it is initiated), and prepare a test plan before commercial testing can begin.

Therefore, as principal investigator for this project, I request a letter of commitment of CONSOL Inc as provider of approximately 50 tons of spray-drier residue from the Carneys Point Cogeneration Plant. It would be greatly appreciated if this material could be delivered at your expense to the commercial treater whom we obtain as our new partner in this project; however, as you pointed out in your letter in 1993, it is important to establish applications for the beneficial utilization of solid by-products from clean coal technologies and this modest expense can be borne by the project if that is necessary to its fulfillment.

Thank you for your consideration. As always, I remain

Sincerely yours,



James T. Cobb, Jr., P.E.
Associate Professor of Chemical Engineering
Director, Energy Resources Program
Co-Chair, Program Committee, Pittsburgh Coal Conference

cc. Ronald Neufeld, Co-Principal Investigator
Scott Renninger, Contracting Officer's Representative
Frank W. Theodore

Flynt Kennedy
Vice President
Research & Development

CONSOL Inc.
Research & Development
4000 Brownsville Road
Library, PA 15129
412-854-6626
FAX: 412-854-6613

May 28, 1996

Dr. James T. Cobb
Energy Resources Program
University of Pittsburgh
1140 Benedum Hall
Pittsburgh, PA 15261

Dear Dr. Cobb:

RE: Letter - J. T. Cobb to F. Kennedy, May 24, 1996
Phase II - "Treatment of Metal-Laden Hazardous Wastes with Clean Coal Technology By-Products" Project

It is premature for me to provide a letter of commitment from CONSOL Inc. (CONSOL) to provide a 50-ton quantity of spray-dryer residue from the Carneys Point Cogeneration Plant for the following reasons:

- The commercial waste treatment partner is not identified,
- The components in the metal-laden material to be tested have not been identified--or for that matter characterized and,
- The location and date of the test have not been specified.

Please contact CONSOL R&D when Phase II has progressed to a point that the above concerns can be properly addressed, especially with respect to the results of the environmental assessment. Your request for a letter from CONSOL regarding supplying a sample of spray-dryer residue from the Carneys Point Cogeneration Plant will then be re-evaluated.

Sincerely,

F. Kennedy

mh

cc: F. W. Theodore
Tech. Records