Base Program On Energy Related Research

**Quarterly Report
August 1 - October 31, 1993**

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For
U.S. Department of Energy
Office of Fossil Energy
Federal Energy Technology Center
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1.0 OIL AND GAS

TASK 1.1

CROWTM Process Modeling

Reporting Period: August - October 1993

Principal Investigators: Lyle A. Johnson and Francis M. Carlson

Task Objectives: This task is to incorporate new physical relationships peculiar to the CROWTM process into the existing thermal simulator and to validate the simulator based on controlled laboratory simulations.

Quarter Objectives: The objectives for this quarter were to validate the operability of the experimental system and begin the testing protocol.

Accomplishments: The experimental plan for the physical simulations, model development, and validation portions of the task that was submitted last quarter has been approved.

A two-dimensional testing apparatus has been fabricated and fully instrumented as described in the experimental plan. Shakedown testing of the system was essentially completed.

Procedures: The primary steps being taken in this task are (1) model development, (2) physical simulations, and (3) model verification. Step 1 will be used initially to identify the parameters for step 2 and will also include the incorporation of new physical relationships determined during the conduct of step 2. Upon completion of step 1, the data from step 2 will be used to validate the model in step 3.

To conduct the two-dimensional tests, a vessel has been constructed out of 0.25 in. Plexiglas. The Plexiglas provides visual observation of the displacement process, particularly during ambient temperature tests. The Plexiglas should have sufficient strength at all test temperatures; however, if a problem is noted at the higher temperatures, the side panels will be replaced with tempered glass. The vessel is 3 ft long, 2 ft high and 2 in. thick. Slotted and screened pipes of varying lengths are installed at one end of the vessel from the top to simulate the injection well. Similar slotted and screened pipes are installed on the other end of the vessel from the bottom to simulate the extraction well. A throttle valve controls the extracted fluid flow rate.

For each test, the vessel will be filled with both organic material and water saturated, fine-grained, uniform sand such as a 20-40 frac sand. This type of material has been chosen because it is similar to material found at a large number of contaminated sites. After the vessel is completely filled with sand and liquids, the vessel will be sealed to establish a no-flow boundary condition as used by the simulator.

The apparatus for measuring relative permeability consists of a test cell, an injection system, and a production collection system. The test cell consists of a cylindrical, stainless steel vessel that will contain the packed, unconsolidated sand. The test cell is surrounded by guard heaters and insulated to produce isothermal conditions during the elevated temperature tests.

The fluid injection system consists of three positive displacement pumps for fluid or chemical injection, and an injected fluid heater. The positive displacement pumps are precalibrated to deliver the specified injection rates of organic material and water. The fluid heater has sufficient capacity to heat the injected fluids to the temperatures necessary for the experiments.

The collection system for the produced fluids includes a regulating valve to maintain back pressure on the system and a series of graduated collection vessels. The series of collection vessels permits the determination of individual component production rates versus time.

The entire reactor system is equipped with pressure gauges, pressure transmitters, and thermocouples to monitor the pressure and temperature of the system. All pressure transmitter and thermocouple signals are collected, analyzed, and stored by a data acquisition and control system. The guard heaters for the test cell are also controlled by this system.

Organic samples to be used in the physical simulations have been combined with the mineral material to ensure that any interactions between the two have stabilized before the testing occurs.

Activities Scheduled for Next Quarter: Tests using the two-dimensional test apparatus, as outlined in the experimental plan, will be completed. Also, the relative permeability testing with the three selected organic contaminants will be completed.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 1.1 CROW Process Modeling
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	: \$375,984.00	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notfid'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-1.1.1 Model Development					
Task Mgr:	Johnson Jr, Lyle	93-1.1.2 Physical Simulations					
Sub Task Mgr:		93-1.1.3 Model Verification					
Proj Admin:		93-1.1A Experimental Plan					
		93-1.1B Progress Report					
	Date						
Contract Start	02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Aug 93	Sep 93	Oct 93
Budget	222810.53	259954.56	304036.73
Cost	87563.38	88144.74	92865.46
Variance	135247.15	171809.82	211171.27

F-Formal
I-Informal

Approved _____

Project Manager

Vice President

TASK 1.2

Miscible-Immiscible Gas Injection Processes

Reporting Period: August - October 1993

Principal Investigators: Francis M. Carlson and Lyle A. Johnson

Task Objectives: This task is to modify an existing compositional simulator and test the simulator for predicting miscible-immiscible flooding.

Accomplishments: Work on this task was not initiated. A request has been submitted to redirect this effort to a new task.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	Base Program	Description: Task 1.2 Misible-Immisible Gas Injection Processes
Contract No	DE-FC21-93MC30126	
Client	DOE	
Contract Type	Cooperative Agreement	
Account Value	\$182,691.00	
Proposal No		
Account No		

Essential Elements of Information	Yes	No	Customer Notfid'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	
Proj Mgr:	Smith, Verne	Planned	Actual
Task Mgr:	Johnson Jr, Lyle	Progress	Scheduled
Sub Task Mgr:		Delivered	
Proj Admin:			
	Date		
Contract Start	02/02/93		
Contract Complete	02/01/98		
Plan Approved	02/02/93		
Last Review			
Next Review			

Mar 93 Jun 93 Sep 93 Dec 93 Mar 94

PROGRAM HIGHLIGHTS Request submitted to redirect this effort to a new task.	Budget vs Actual Table			
		Aug 93	Sep 93	Oct 93
	Budget	27851.04	50739.63	76061.48
	Cost	0.00	0.00	0.00
	Variance	27851.04	50739.63	76061.48

F-Formal	Approved _____	Project Manager
I-Informal		Vice President

2.0 ADVANCED SYSTEMS APPLICATIONS

TASK 2.1

Development and Optimization of a Process for the Production of a Premium Solid Fuel from Western U.S. Coals

Reporting Period: August - October 1993

Principal Investigator: Norm Merriam

Task Objectives: The long-term objective of this task is to develop a technically and economically feasible process for producing a low-sulfur, high-Btu, fuel from western coals. The objectives for 1993 were (1) to develop an economical method to control spontaneous combustion in pyrolyzed coal and (2) to demonstrate the removal of mercury from the coal by thermal treatment.

Quarter Objective: The objective for this quarter was to receive approval on the submitted topical reports.

Accomplishments: The topical reports describing the test results (Merriam 1993; Merriam and Turner 1993) that had been submitted in the previous quarter were approved by DOE.

Activities Scheduled for Next Quarter: Work on this task is completed for this year. Follow-on work is proposed in next year's research plan.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 2.1 Development and Optimization of a Process for the Production of a Premium Solid Fuel from Western U.S. Coals
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	: \$97,500.00	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notfld*	Appvd*
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-2.1.1 Experimental Design					
Task Mgr:	Merriam, Norman	93-2.1.2 Modification of Integrated B					
Sub Task Mgr:		93-2.1.3 Trace Elements Evaluation					
Proj Admin:		93-2.1.4 Report Preparation					
		93-2.1A Experimental Plan					
		93-2.1B Topical Report					
Contract Start	02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS
Topical report approved. First year work completed.

Budget vs Actual Table			
	Aug 93	Sep 93	Oct 93
Budget	97499.75	97499.75	97499.75
Cost	95214.97	96386.43	97559.69
Variance	2284.78	1113.32	-59.94

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 2.2

Development of an On-line Alkali Monitoring Probe

Reporting Period: August - October 1993

Principal Investigator: Vijay Sethi

Task Objective: The main objective of this task is to develop an on-line alkali monitor for use in advanced coal utilization technologies.

Quarter Objective: The objective for the quarter was to prepare a progress report on the completed research.

Accomplishments: A progress report was submitted in the last (May-July) quarterly report. The results were also presented at the METC Coal-Fired Systems 93 -- Advances in IGCC and PFBC Review Meeting held in Morgantown, West Virginia.

Activities Scheduled for Next Quarter: The first-year funds for this task have been expended, and thus, no further activities are planned for the remainder of the first year.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	Base Program	Description: Task 2.2 Development of an On-line Alkali Monitoring Probe
Contract No	DE-FC21-93MC30126	
Client	DOE	
Contract Type	Cooperative Agreement	
Account Value	\$107,250.00	
Proposal No		
Account No		

Essential Elements of Information	Yes	No	Customer Notfid'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-2.2.1 Compilation of Properties Data					
Task Mgr:	Sethi, Vijay	93-2.2.2 Phase Equilibria Calculation					
Sub Task Mgr:		93-2.2.3 Laboratory Verification					
Proj Admin:		93-2.2.4 Selection of Probe Materials					
		93-2.2.5 Single Element Probe Construction					
		93-2.2.6 Conceptual Design of Alkali					
Contract Start	02/02/93	93-2.2A Experimental Plan					
Contract Complete	02/01/98	93-2.2B Progress Report					
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS	Budget vs Actual Table			
		Aug 93	Sep 93	Oct 93
Task completed.	Budget	100722.40	107249.63	107249.63
	Cost	99265.55	100851.10	104535.59
	Variance	1456.85	6398.53	2714.04

F-Formal		Project Manager
I-Informal	Approved _____	Vice President

TASK 2.3

Optimization of the Recycle Oil Process for Eastern Oil Shale

Reporting Period: August - October 1993

Principal Investigator: Fred Turner

Task Objectives: The objective of this task is to determine key processing parameters for production of oil from eastern oil shale using recycled oil extraction processes.

Quarter Objective: The objective this quarter was to evaluate the data from the preliminary experiments performed in the previous quarter.

Accomplishments: The data from preliminary experiments with Sunbury oil shale and tetralin were examined and changes have been made in procedures and equipment.

Procedures: Experiments were performed by loading 20 g of Sunbury shale and 20 g of tetralin into a tared reactor. The reactor was then attached to the head assembly which provides gas ports and a magnetically-driven stirring system. The nitrogen pressure in the reactor was cycled to 500 psig four times to remove traces of oxygen. The stirrer was typically set at 435 rpm. An experiment was started by lowering the reactor into a preheated laboratory sand bath. As the temperature in the reactor rose, the pressure was held constant by the release of gas through a back-pressure regulator into an evacuated gas collection system. At the end of the experiment (duration is typically 30 minutes), the reactor was removed from the sand bath and cooled by immersion in water. The reactor was weighed to determine the final weight of coal, tetralin, and products, and the weight of volatile products was calculated by difference. A Balston filter was used to trap produced oils. The majority of the volume in the gas collection system was in two 4800-cc containers. These were evacuated and weighed before an experiment and weighed again after the experiment. The difference is the sum of nitrogen charged and product gas less the gas and nitrogen in the connecting lines. Gas composition was determined using two gas chromatographs, one for hydrogen and the other for carbon oxides, hydrogen sulfide, and hydrocarbons. A calcium carbide precolumn converted water vapor to acetylene for analysis by flame ionization detection.

Results: Problems were encountered in determining the material balances. Accurate gas weights were not possible with the balance used. This balance was replaced with one of higher sensitivity.

Activities Scheduled for Next Quarter: The potential significance of this research effort was evaluated in relation to the opportunity to develop other capabilities that are in demand in industry. It was decided to request the discontinuation of this task, as well as task 1.2, and redirect these efforts to a new task. A progress report on the effort will be prepared.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 2.3 Optimization of the Recycle Oil Process for Eastern Oil Shale
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	: \$253,500.00	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notifd'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-2.3.1 Experimental Design					
Task Mgr:	Mones, Charles	93-2.3.2 Reactor System Setup					
Sub Task Mgr:		93-2.3.3 Materials Analyses					
Proj Admin:		93-2.3.4 Hydrotreatment Sensitivity					
		93-2.3.5 Solvent/Oil Ratio					
		93-2.3.6 Solvent Activity					
		93-2.3.7 Oil-Spent Shale Disengager					
		93-2.3.8 Related Effects					
		93-2.3.9 Management and Reporting					
		93-2.3A Experimental Plan					
		93-2.3B Topical Report					

Contract Start: 02/02/93
Contract Complete: 02/01/98
Plan Approved: 02/02/93
Last Review:
Next Review:

PROGRAM HIGHLIGHTS
Request submitted to redirect this effort to a new task.

Budget vs Actual Table			
	Aug 93	Sep 93	Oct 93
Budget	231171.23	253499.64	253499.64
Cost	112138.71	119349.65	134243.39
Variance	119032.52	134149.99	119256.25

F-Formal
I-Informal

Approved _____

Project Manager

Vice President

TASK 2.4

Process Support and Development

Reporting Period: August - October 1993

Principal Investigator: David Sheesley

Task Objective: The objective of this task is to obtain support leading to development of a COMPCOALTM pilot plant.

Quarter Objectives: The objectives for this quarter were to present briefing materials to potential sponsors and contact potential funding sources to develop initial engineering plans for the pilot plant.

Accomplishments: A presentation, 'Coal Drying: Trials and Triumphs', and materials for distribution were prepared. The presentation was made, comparing the COMPCOAL process with competing processes, at the Eleventh Annual Coal Market Strategies Conference (Merriam 1993). Attendance at this meeting included the potential utilities and production companies that would use the process when developed. Briefing materials in the form of a foldout brochure were distributed. The reports on the process and mercury removal were distributed. Fifteen contacts showing genuine interest were made, and one company has asked for additional information to begin internal engineering studies.

Procedures: The COMPCOAL process consists of four steps:

- Initial Drying
- Partial Decarboxylation
- Mild Pyrolysis
- Stabilization

The process is shown in Figure 1.

Results: The process reduces the weight of coal by about 40%, thus reducing transportation costs and improving coal marketability (Table 1). Companion projects with this process have produced stabilized coal particles resistant to oxidation and readsorption of moisture (Merriam and Turner 1993).

Figure 1. Process Flow Diagram for the COMPCOAL Process

Table 1. Characteristics of the COMPCOAL Product

Test	11	10	12	6
Temperature, °F	565	691	697	708
Volatiles, wt %	40.2	36.7	35.4	34.5
Heating Value, Btu/lb	12,009	12,439	12,600	12,725

Activities Scheduled for Next Quarter: Follow-up contacts will be made with parties showing an interest in the process. A topical report including the presentation materials will be completed.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 2.4 Process Support and Development
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	: \$146,250.00	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notfid	Appvd
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	
Proj Mgr:	Smith, Verne	Planned	Actual
Task Mgr:	Sheesley, David	Progress	Scheduled
Sub Task Mgr:		Delivered	
Proj Admin:			
Date			
Contract Start	02/02/93		
Contract Complete	02/01/98		
Plan Approved	02/02/93		
Last Review			
Next Review			

PROGRAM HIGHLIGHTS	Budget vs Actual Table			
		Aug 93	Sep 93	Oct 93
	Budget	146249.97	146249.97	146249.97
	Cost	131742.69	146070.15	152055.43
	Variance	14507.28	179.82	-5805.46

F-Formal	Approved _____	Project Manager
I-Informal		Vice President

3.0 ENVIRONMENTAL TECHNOLOGIES

TASK 3.1

Solid Waste Management

Reporting Period: August - October 1993

Principal Investigator: Alan Bland

Task Objective: The objective of this task is to develop options and technologies, specifically designed to enhance the conditioning, handling, storage, disposal, and use of solid waste from emerging, as well as conventional fossil fuel technologies.

Quarter Objectives: The objectives for the quarter were: (1) to conduct preliminary pelletization shakedown testing for study of the potential of producing aggregates from ashes, (2) to complete conditioning studies to evaluate the effect of level of conditioning on the geotechnical properties of the ash, (3) to continue to make contacts for the acquisition of ash from Clean Coal Technology (CCT) facilities for screening of ash management properties for these ashes, and (4) to make preliminary thermal treatment tests of ash from the Ontario Hydro Lennox plant for stabilization of hazardous oil-fired ashes.

Accomplishments: For the ash use options portion of the study, preliminary geotechnical testing of ashes from the Tri-State Generation and Transmission Craig Station was completed. Additional ash for the pelletizing trials was obtained.

For the effect of conditioning on CCT solid waste portion of the study, geotechnical testing of the effect of prehydration level on the geotechnical properties of the conditioned and compacted ashes was completed. An additional set of mixes that represent a wider range of unhydrated lime content were prepared.

For the screening of the CCT ashes portion of the study, the non-availability of ashes and the potential duplication with on-going METC studies have led to consideration of deferring this subtask effort and transferring the effort to increased pelletization tests under the ash use testing of off-spec ashes.

For the stabilization of hazardous oil-fired ashes portion of the study, preliminary testing of the Lennox ash in the temperature range of 392 to 842°F (200 to 450°C) was conducted. The leaching characteristics are being assessed.

Procedures: Standard ASTM procedures for geotechnical testing were used, including ASTM D-698 and 1557 for moisture-density relationships, ASTM C-109 (modified) for unconfined compressive strength, and ASTM C-157 for dimensional stability (expansion/shrinkage) testing. Chemical characterization used ASTM wet chemical methods, as well as ICAP, XRF, and XRD techniques.

Results: Geotechnical testing of ashes from the Laramie River Units 1 & 2 and Unit 3 in Wheatland, Wyoming and the Craig Units 1 & 2 and 3 were completed. Additional ash was collected from the Craig Station of Tri-State Generation and Transmission for the pelletizing trials. These trials have been delayed and are now scheduled to be conducted in the next quarter. Consideration is being given to increasing the number of pelletizing trials due to the lack of appropriate ashes at this time for the screening of ash management properties of CCT ashes portion of the study (see below).

On the effect of conditioning on clean coal technology solid waste portion of the study, the Ute bed ash was prehydrated at three different levels to assess the impact of hydration on the geotechnical properties of the resultant ash. This related to a controversy on the need for essentially complete hydration of the lime to attain stable ashes for disposal or use. The preparation of test specimens for the geotechnical testing matrix was for three levels of prehydration (0%, 3%, and 6% prehydration) and at a high-energy and a low-energy mixing. The preparation of specimens have been completed and the geotechnical testing of the specimens was 80% completed. A schematic summary of the strength development results are presented in Figure 2. The expansion data are being compiled and will be available during the next reporting period.

Figure 2. Schematic Summary of Strength Development Results

A second set of mixes representing a larger range of unconverted lime are being prepared for geotechnical testing.

For the screening of ash management properties of CCT ashes portion of the study, ash from the AEP Tidd plant is presently available. Using this ash would result in duplication with other METC funded studies, which would not be a prudent use of limited resources. Ash from the LIFAC process at Richmond Power and Light and the SasPower Shand plant will not be available until the end of 1993 or early 1994. Ashes are being collected from the PSC Arapahoe No. 4 plant for a JSR project. These ashes represent: (1) baseline, (2) urea injection, (3) sodium injection, (4) calcium injection, and (5) high-sulfur coal produced using the best of the earlier technologies. Consideration is being given to deferring this effort until appropriate materials are available. In any event, ash from the next operation of the Tidd plant has been requested for possible future work.

The first set of tests were conducted under the stabilization of hazardous oil-fired ashes portion of the study. These tests examined the effect of thermal treatment on the stabilization of metals. Materials produced under previous testing were subjected to a range of temperatures from 392 to 842°F (200 to 450°C). Due to the relatively low amounts of metals, XRD determinations were not considered appropriate. Instead, an indirect leaching attenuation method will be used to determine the degree of stabilization of the metals. These heat treated samples are in the process of being tested.

Activities Scheduled for Next Quarter: For the ash use options portion of the study, pelletizing trials will be conducted on materials from the Laramie River and Craig Stations. Geotechnical testing of the Ute ash at prehydration levels that result in higher lime contents will be conducted. Thermal treatment of the Lennox ash with lime will be done and the leachate characteristics assessed.

SUB-TASK STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 3.1 Solid Waste Management
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Sub-Task Value	: \$231,458	
Proposal No	:	
Sub-Task No	:	

Essential Elements of Information	Yes	No	Customer Notfid	Appvd
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Veme	93-3.1.1 Equipment Acquisition and I					
Task Mgr:	Bland, Alan	93-3.1.2 Off Spec' Ash Use					
Sub Task Mgr:		93-3.1.3 CCT Conditioning					
Proj Admin:		93-3.1.4 CCT Ash Management Opti					
		93-3.1.5 Oil Fired Ash Stabilization					
		93-3.1.6 Management and Reporting					
		93-3.1A Topical Report					
Contract Start	Date: 02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Aug 93	Sep 93	Oct 93
Budget	197419.89	213981.40	227293.94
Cost	197881.62	212343.62	218281.81
Variance	-461.73	1637.78	9012.13

F-Formal
I-Informal

Approved

Project Manager

Vice President

TASK 3.2

Remediation of Contaminated Soils

Reporting Period: August - October 1993

Principal Investigators: Alan Bland and Terry Brown

Task Objective: The objective of this task is to develop physical, chemical, and thermal treatments to remediate inorganic and organic toxics from contaminated materials.

Quarter Objectives: The objectives for the quarter were to acquire mercury contaminated samples from a pipeline site located in Canada and to complete the shakedown of the attrition scrubbing/flotation system that will be used to remediate soil materials.

Accomplishments: Problems associated with the acquisition of the mercury contaminated samples have occurred. The samples collected were inadvertently disposed in a landfill by the transport company.

Shakedown testing of the attrition scrubbing/flotation system continued. Problems associated with the air sparger system are being addressed.

Preliminary testing associated with froth stability has been completed using three collectors and two frothers.

Procedures: The collection of mercury from solution systems was evaluated using collectors containing alkenes.

Results: Preliminary data on the collection of mercury indicate limited success for this test.

Activities Scheduled for Next Quarter: The attrition/flotation system will be made operational. Arrangements will continue for the acquisition of mercury contaminated samples. Samples are scheduled to be collected on December 6, 1993 and transported to Western Research Institute (WRI) soon thereafter. Complete characterization of the mercury material will be performed when it arrives. Testing of the remediation of petroleum contaminated materials will be initiated.

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	: Base Program	Description: Task 3.2 Remediation of Contaminated Soils
Contract No	: DE-FC21-93MC30126	
Client	: DOE	
Contract Type	: Cooperative Agreement	
Account Value	: \$182,917.00	
Proposal No	:	
Account No	:	

Essential Elements of Information	Yes	No	Customer Notified	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-3.2.1 Equipment Acquisition and I					
Task Mgr:	Bland, Alan	93-3.2.2 Mercury Remediation					
Sub Task Mgr:		93-3.2.3 Metal Remediation					
Proj Admin:		93-3.2.4 Management and Reportin					
		93-3.2A Topical Report					
Contract Start	Date 02/02/93						
Contract Complete	02/01/98						
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS

Budget vs Actual Table

	Aug 93	Sep 93	Oct 93
Budget	141624.16	153349.55	163218.95
Cost	87400.04	99905.55	114403.74
Variance	54224.12	53444.00	48815.21

F-Formal
I-Informal

Approved _____

Project Manager

Vice President

4.0 APPLIED ENERGY SCIENCE

TASK 4.1

Heavy Oil/Plastics Co-Processing

Reporting Period: August - October 1993

Principal Investigator: Frank D. Guffey

Task Objective: The objective of this research is to evaluate catalytic activity responsible for the decrease in thermal decomposition temperature observed when a mixture of plastic resin types are co-processed with heavy oil.

Quarter Objectives: The objectives for this quarter were to modify the reactor in accordance with review comments received from DOE on the experimental plan and to begin work on the identification of the catalyst precursor.

Accomplishments: A new reactor was designed, constructed, and tested. In addition, the experimental series to identify the catalyst precursor was initiated.

Procedures: The research proposed is divided into six subtasks. Subtask 4.1.1 is the experimental design. Subtask 4.1.2 will address the identification of the polymer type (catalyst precursor) in the mixture of plastic resins that promotes the catalytic activity. It is anticipated that the actual catalyst is not the polymer, but some decomposition product of one of the polymer types. This subtask will also identify the resin type that produces the active catalyst.

Subtask 4.1.3 will address the catalyst sensitivity (concentration level required for catalytic activity). This will be done by lowering the concentration of the catalyst until it is not effective at providing a measurable level of catalytic activity. Subtask 4.1.4 will address the identification of the actual catalytic agent. This will be accomplished by using sources of the catalytic agent other than the catalyst precursor identified in subtask 4.1.2.

Subtask 4.1.5 will evaluate the catalyst selectivity. This will be done by analyzing selected distillate samples by gas chromatography/mass spectrometry to identify specific compound distributions and comparing the distributions among the samples analyzed to determine if there is a specific slate of compounds that the catalytic activity generates. Subtask 4.1.6 will address evaluation of the data, repeating experiments that provide spurious results, and preparation of a topical report.

Results: Preliminary results of the completed experiments (subtask 4.1.2) indicate that polyvinyl chloride can function as a catalyst precursor during the thermal decomposition of mixed plastics.

Activities Scheduled for Next Quarter: Work will continue to confirm that polyvinyl chloride is the catalyst precursor involved during the thermal decomposition of mixed plastics. In addition, work will commence on the determination of the sensitivity of the catalyst (subtask 4.1.3) and identifying the actual agent that is responsible for the catalytic activity (subtask 4.1.4).

ACCOUNT STATUS REPORT

Month/Year
OCTOBER 1993

Title	Base Program	Description: Task 4.1 Heavy Oil/Plastics Co-Processing
Contract No	DE-FC21-93MC30126	
Client	DOE	
Contract Type	Cooperative Agreement	
Account Value	\$113,782.00	
Proposal No		
Account No		

Essential Elements of Information	Yes	No	Customer Notfid'	Appvd'
I. Meeting Performance Requirements				
II. On Schedule				
III. Within Contractual Cost				
A. Overrun \$				
B. Scope Change \$				
1. Funds Authorized				
2. Work Started				
IV. Adequate Funding

Key Personnel		Milestones	Planned	Actual	Progress	Scheduled	Delivered
Proj Mgr:	Smith, Verne	93-4.1.1 Experimental Design					
Task Mgr:	Thomas, Kenneth	93-4.1.2 Identification of Catalyst Pre					
Sub Task Mgr:		93-4.1.3 Determination of Reaction S					
Proj Admin:		93-4.1.4 Identification of Catalytic Ag					
		93-4.1.5 Evaluation of Catalyst Selec					
		93-4.1.6 Data Evaluation and Reporti					
Contract Start	02/02/93	93-4.1A Experimental Plan					
Contract Complete	02/01/98	93-4.1B Topical Report					
Plan Approved	02/02/93						
Last Review							
Next Review							

PROGRAM HIGHLIGHTS	Budget vs Actual Table			
		Aug 93	Sep 93	Oct 93
	Budget	45393.95	54877.47	65208.86
	Cost	28109.61	34284.41	38562.47
	Variance	17284.34	20593.06	26646.39

F-Formal
I-Informal

Approved

Project Manager

Vice President

DISCLAIMER

Mention of specific brand names or models of equipment is for information only and does not imply endorsement of any particular brand.

REFERENCES

- Merriam, N.W., 1993, Removal of Mercury for Powder River Basin Coal by Low-Temperature Thermal Treatment. Laramie, WY, WRI Report to DOE, WRI-93-R021.
- Merriam, N.W., 1993, COAL DRYING: TRIALS AND TRIUMPHS, Eleventh Annual Coal Market Strategies Conference St. Louis, Missouri October 1993
- Merriam, N.W., and T.F. Turner, 1993, COMPCOALTM: A Profitable Process for Production of a Stable High-Btu Fuel from Powder Basin Coal. Laramie, WY, WRI Report to DOE, WRI-93-R008.