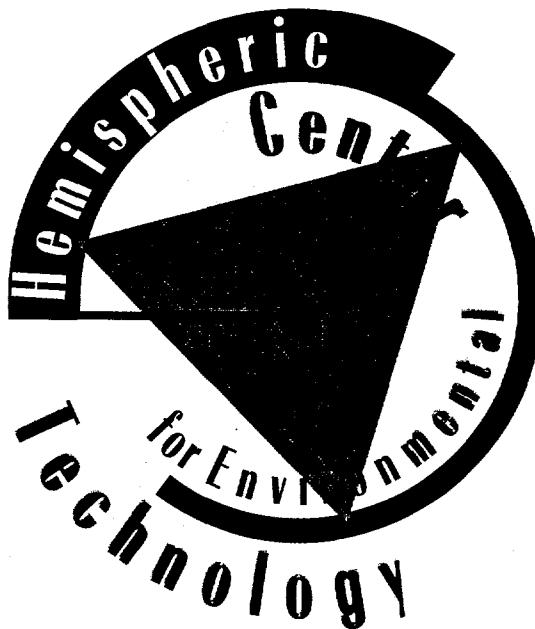


## HEMISPERIC CENTER FOR ENVIRONMENTAL TECHNOLOGY

## MONTHLY PROGRESS REPORT

FISCAL YEAR 1999

DE-FG21-95EW55094-43



FEBRUARY 1999

**FIU Principal Investigator  
Focus Area Technical Lead  
Program Officers**

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Karl-Heinz Frohne**

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FEBRUARY 1999  
MONTHLY PROGRESS REPORT  
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## SUMMARY

- Search for decontamination technologies to be assessed at FIU-HCET continues. Bartlett Nuclear Inc. returned to FIU-HCET on February 15-19, 1999, to complete the demonstration of coating removal from concrete ceiling and aggressive contamination removal on uncoated concrete wall using their Robotic Climber.
- The design of test beds for large-scale technology demonstration of blockage locating and pipe unplugging has undergone major revision. The lab-scale test loop is also under modification. A new sampling system using isokinetic principles and consisting of thermistors, flow controller, and Wheatstone bridge will be installed on the flow loop.
- FIU-HCET International Coordinator attended the VII Steering Committee meeting in Lima, Peru, on February 11-12, 1999, and successfully introduced the Interactive Communication Website. Additional agenda items on the Website were proposed by the Steering Committee for upcoming committee meetings and working groups.

## TABLE OF CONTENTS

<b>I. DEACTIVATION AND DECOMMISSIONING (D&amp;D) FOCUS AREA.....</b>	<b>5</b>
Deactivation and Decommissioning Technology Assessment Program .....	7
Integrated Vertical and Overhead Decontamination System .....	11
Large-Scale Demonstration and Deployment Project— Technology Information System (LSDDP-TIS).....	14
Ex-Situ Large-Bore Pipe Decontamination and Characterization System.....	17
In-Situ Pipe Decontamination System.....	22
Deactivation and Decommissioning Technology Opportunities for Non-Power NRC-Licensed Sites.....	24
Life-Cycle Cost Analysis for Radioactively Contaminated Scrap Metal.....	26
Legacy Waste Disposition for the Oak Ridge Reservation.....	30
<b>II. TANKS FOCUS AREA (TFA) .....</b>	<b>33</b>
Waste Conditioning for Tank Slurry Transfer .....	35
Plugging and Unplugging of Waste Transfer Pipelines .....	41
Investigation of Waste Glass Pouring Process Over a Knife Edge .....	50
<b>III. CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY .....</b>	<b>55</b>
Online Measurement of the Progress of Decontamination.....	57
Remote Surveillance of Facilities Awaiting Deactivation and Decommissioning.....	59
Measurement of Alpha Contamination on Contaminated Surfaces Using an Electret Ion Chamber .....	62
Review of Current Characterization and Monitoring Practices at DOE Sites .....	66
Demonstration and Deployment of CMST-CP Technologies .....	68
Identification of DOE's Post-Closure Monitoring Needs and Requirements.....	70
<b>IV. INTERNATIONAL TECHNOLOGY INTEGRATION (ITI).....</b>	<b>73</b>
Opportunities to Market U.S. Technologies Throughout the Western Hemisphere....	75

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## **I. DEACTIVATION AND DECOMMISSIONING (D&D) FOCUS AREA**

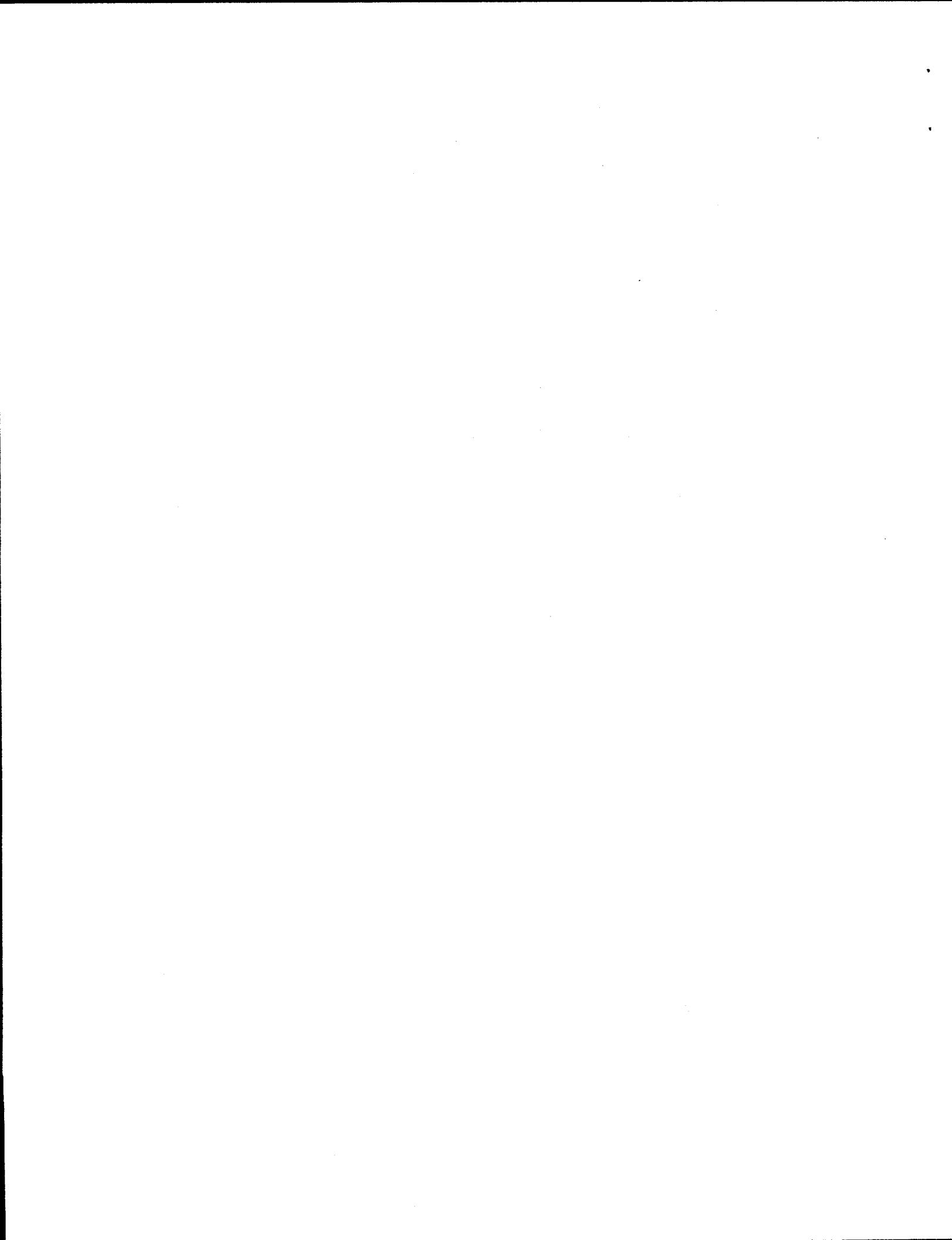
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### **MONTHLY PROGRESS REPORT**

**FIU Principal Investigator  
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Focus Area Technical Lead  
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## Deactivation and Decommissioning Technology Assessment Program

**Project Number: HCET-1995-D038**

### **Project objectives**

The Deactivation and Decommissioning (D&D) Technology Assessment Program (TAP) was developed to provide detailed, comparable data for environmental technologies and to disseminate this data to D&D professionals in a manner that will facilitate the review and selection of technologies to perform decontamination and decommissioning. The objectives for this project include the following:

- Determine technology needs through review of the Site Technology Coordination Group (STCG) information and other applicable web sites and needs databases.
- Perform a detailed review of industries that perform similar activities as those required in D&D operations to identify additional technologies.
- Define the technology assessment program for characterization and waste management problem sets.
- Define the data management program for characterization, dismantlement, and waste management problem sets.
- Evaluate baseline and innovative technologies under standard test conditions at Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) and other locations and to collect data in the areas of performance, cost, health and safety, operations and maintenance, and primary and secondary waste generation.
- Continue to locate, verify, and incorporate technology performance data from other sources into the multimedia information system.
- Develop the conceptual design for a dismantlement technology decision analysis tool for dismantlement technologies.

### **Major milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
D038-M1	Publication of the Technology Assessment Reports	Completion of 16 technology demonstrations and each summarized in monthly reports within 60 days after the demonstration.	Two technologies evaluated for various applications for a total of three demonstrations.
D038-M2	Test Plan for Characterization Technologies Assessment Program	Characterization Technology Test Plan Approved	Under development. Scheduled completion 4/30/99.

Milestone No.	Milestone Description	Completion Criteria	Status
D038-M3	Test Plan for Waste Management Technologies Assessment Program	Waste Management Technology Test Plan Approved	Scheduled start 3/2/99. Scheduled completion 6/30/99.
D038-M4	Access to the multimedia information system web-based user interface for dismantlement	Assignment of user name and passwords to DDFA provided distribution list.	Design started 12/7/98. Scheduled completion 10/1/99.
D038-M5	Access to the information system characterization database	Assignment of user name and passwords to DDFA provided distribution list.	Scheduled start 7/6/99. Scheduled completion 10/29/99.
D038-M6	Report on the information system waste management design	Final copy of report sent to DDFA.	Scheduled start 10/1/99. Scheduled completion 10/29/99.
D038-M7	Report on the decision analysis tool for dismantlement design	Final copy of report sent to DDFA.	Scheduled start 7/6/99. Scheduled completion 10/29/99.

### Significant events

- Bids are in for the PPPL demonstration of diamond wire cutting of the Tokamak Fusion Test Reactor. Two bids have been received and will be evaluated by a team made up of members from HCET, PPPL, and AEA Technology. Contract award is expected in mid-March. The demonstration is scheduled for the June-July 1999 timeframe.
- Bartlett returned to HCET on February 15th to complete the demonstration of their Robotic Climber. During the original demonstration in December 1998, the technology had difficulties in performing coating removal from a concrete ceiling and aggressive concrete removal from a wall. Modifications have been made to the climber, and different support equipment is being used for this new demonstration.
- The Technology Assessment Program is being expanded to include additional D&D activities. The following assessments are currently in the design phase with technology assessments scheduled to begin in Summer 1999:
  - \* Facility (concrete walls, floors, ceiling) dismantlement
  - \* Facility characterization
  - \* Pipe characterization and decontamination
  - \* Glovebox, Kynar (Rashing Ring) Tanks, and Annular Tanks dismantlement
- Final arrangements have been made to transfer five (5) non-contaminated gloveboxes and thirteen (13) Kynar and annular tanks from Rocky Flats to FIU-HCET for the dismantlement technology assessments. Procurement is in process to expand the current HCET PermaCon to accommodate these demonstrations. The use of the PermaCon will allow air and fume measurements (Chromium, Nickel, and particle size) to be collected during the demonstrations. Evaluations are expected to begin by the end of May 1999.

- A Commerce Business Daily (CBD) Advertisement has been placed to identify potential technologies and vendors for the Glovebox/Tank dismantlement assessments. Responses are due by 3/31/99.
- The search for new technologies to demonstrate for HCET's existing technology assessment projects is continuing. Several vendors have been extended an invitation to demonstrate; however, the response has been slow as illustrated by the table below.

Technology Assessment Project	Number of New Technologies Found	Number of Vendors Approached	Response
Metal and masonry decontamination	7	8	<p>One draft proposal submitted (ElectroStrip Corporation). Equipment will be ready to demonstrate in April/May.</p> <p>F2 and Exitech scheduled to demonstrate in FY99 (no firm dates set by vendors).</p> <p>Remaining companies have not submitted proposals.<sup>1</sup></p>
Equipment dismantlement (I-beams, pipes, etc.)	7	24	<p>Four vendors declined the request for demonstration.</p> <p>Three technologies are not portable for demonstrating.</p> <p>Four vendors are non-responses.</p> <p>Two requested additional time for submitting proposal.</p>

### Accomplishments and technical progress

- Under this grant project, which began in FY96, and earlier technology assessment projects funded from other sources, FIU-HCET assessed over 60 innovative/improved and baseline technologies for decontamination and equipment dismantlement under standardized, non-nuclear testing conditions. Many of the technologies identified for demonstration at FIU-HCET are selected to address the needs identified in the EM-50 Needs Management System (<http://EM-Needs.em.doe.gov/Home/>). As a result of these assessments, directly comparable performance data related to operations and maintenance, primary and secondary waste generation, and health and safety have been compiled. This data has been valuable in assessing if a technology meets the screening criteria for those DDFA LSDDPs where these technologies are being considered, as well as assisting EM-40 project managers in making decisions on the deployment of

<sup>1</sup> Several of these companies have expressed an interest in demonstrating; however, their equipment is either not ready for demonstration or is occupied with other jobs most of the year.

innovative technologies. Technology assessment data are managed using a Microsoft Windows-based multimedia information system.

- To date, two technologies have been demonstrated in multiple applications for a total of three assessments in FY99.

### **Assessment of current status**

This project is on schedule. Two technologies have completed assessment.

### **Plans for the next two months**

Activities for the next two months include

- Continue technology search for FY99 demos. Demonstrate two technologies by the end of April 1999.
- Contract the vendor for the PPPL demonstration and finalize the test plan for the diamond wire technology assessment.
- Complete the test plans for Facility Characterization, Glovebox/Tank Dismantlement, and Facility Dismantlement. Begin identifying technologies for demonstration.
- Begin drafting the test plan for Waste Management technology assessments.
- Complete the design of the multimedia information system for dismantlement and beginning programming.
- Complete the report for the Mississippi State University – DIAL FTP characterization technology assessment.

### **FIU-HCET collaborator**

Susan C. Madaris, (305) 348-3727

## Integrated Vertical and Overhead Decontamination System

Project Number: HCET-1998-D023

### Project objectives

The overall objective of this subtask is to fabricate and test an innovative technology for the purpose of characterizing and decontaminating vertical and overhead structures and to transfer this technology to industry for use in reducing the cost to perform decontamination operations. The sub-objectives required to meet the overall objective include the following:

- Design and fabricate a characterization system for overhead and vertical applications.
- Design and fabricate a decontamination system for overhead and vertical applications.
- Integrate and assess the system for commercial application.
- Transfer the system to industry for use throughout the DOE complex.

### Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D023-M1	Selection of Industrial Partner	Selection of a responsible and qualified vendor	In progress. Will be delayed by approximately 3-4 weeks to allow vendors sufficient time to respond to request for proposal.
D023-M2	Approved Design Specifications for the Decontamination System	Approval of final design specifications for the decontamination system	Scheduled completion 4/6/99.
D023-M3	Fabrication of Decontamination System	Complete fabrication of decontamination system unit	Scheduled completion 7/30/99
D023-M4	Field Testing of Decontamination System	Completion of testing of decontamination unit at FIU-HCET Test Site	Scheduled completion 8/16/99.
D023-M5	Design Drawings for the Characterization System	Approval of final design specifications for the characterization system	Scheduled completion 6/1/99
D023-M6	Fabrication of Characterization System	Complete fabrication of characterization system	Scheduled completion 9/30/99.
D023-M7	Testing the Characterization System	Completion of characterization system testing at FIU-HCET	Scheduled completion 10/15/99
D023-M8	Final report on the Decontamination and Characterization System.	Deliver final report to DDFA-determined distribution list	Scheduled completion 11/30/99

## Significant events

- A Performance Specification document has been generated. This document details the requirements of the integrated decontamination, deployment mechanism, and waste collection system. This document is intended to help vendors in the development of their proposals. Several conceptual configuration AutoCad figures are provided in this document. After internal review this document will be provided to a list of already identified technology vendors capable of developing responsive and competitive proposals.
- D023-M1 has been deferred and delayed resulting in schedule impacts to milestones. Comments to the Performance Specification document were received and incorporated into the document; this review process delayed the completion of this milestone. This document, along with necessary documentation, was given to FIU-Purchasing to carry out a Bid process for vendor selection.

## Accomplishments and technical progress

- Performance Specification document and conceptual design has been completed.
- Vendor selection process is currently being carried out.
- During FY98 an extensive search for decontamination technologies was conducted. Several sources were utilized, including Remedial Action Program Information Center (RAPIC), FIU-HCET databases for decontamination technologies, and others. Eight technologies were shortlisted for comprehensive analysis to determine the optimum technology to deploy. The criteria for final selection were
  - \* Removal capabilities
  - \* Production rates
  - \* Cost information
  - \* Waste generation
  - \* Health and safety.
- Based on the comprehensive technology analysis, the Marcrist Diamond Wheel Shaving Technology was selected for deployment.
- In addition to the selection of the optimum decontamination technology, the characterization technology and deployment platform selection criteria were determined, and screening of potential technologies to integrate with the selected decontamination technology was commenced.
- For additional details on accomplishments and technical progress, refer to the Integrated Vertical and Overhead Decontamination System FY98 Year-End Report.

### **Assessment of current status**

The performance specification document was distributed for internal comments. All necessary documentation was provided to FIU-Purchasing Department for Bid process. It is expected that D023-M1 will be completed by early March.

The delay in the completion of M1 may have an impact in M2, M3, and M4. A better assessment for the completion of these milestones will be made once a contract is put in place with the selected vendor. There is a certain level of confidence that these milestones will be met on time.

A draft Test Plan for the development of the mock-up area for testing of the radiological sensors has been developed. This draft copy will be distributed internally for review, comment, and approval.

### **Plans for the next two months**

Activities for the next two months include the following:

- Opening of Bid and selection of vendor.
- Obtain approval for Test Plan document for the development of a test site for the characterization system.
- Start test site development and construction.
- Receive preliminary Title I Design documentation from selected vendor.

### **FIU-HCET collaborators**

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Man Young Cheung, (305) 348-6653

Richard Musgrove, (305) 348-6622

**Large-Scale Demonstration and Deployment Project—  
Technology Information System (LSDDP-TIS)**

**Project Number: HCET-1998-D039**

**Project objectives**

Within the DOE complex, there are some 10,000 buildings that require deactivation and decommissioning (D&D). These facilities present an immense array of problems and challenges for D&D project managers who must investigate and screen scores of candidate technologies to select the most appropriate one(s) for their specific remediation problems. The search for candidate technologies can be arduous and involve several sources of varying reliability. The Large-Scale Technology Demonstration and Deployment Project Technology Information System (LSDDP-TIS) will facilitate the search and selection process by providing D&D managers with ready access to an extensive information base of DOE-screened environmental technologies.

The objectives of this subtask include the following:

- Collect technology information from LSDDP technology screenings and other reliable sources
- Compile a searchable database to serve as an aid to decision-makers for identifying candidate technologies for future LSDDPs or for addressing specific problems.

**Major milestones**

Milestone No.	Milestone Description	Completion Criteria	Status
D039-M1	Release 1 of the TIS	User Access to the functional LSDDP-TIS via the Internet	Completed on schedule 1/4/99.
D039-M2	Information from new LSDDPs incorporated	Screening data from new LSDDPs accessible through TIS	Ongoing. Scheduled for completion 3/1/99
D039-M3	Information on DOE's baseline technologies and FIU-HCET's Technology Assessment Program incorporated	Information on DOE baseline and FIU-HCET-assessed technologies accessible through TIS	Ongoing. Scheduled for completion 3/1/99
D039-M4	Information from DOE databases incorporated	Data from DOE designated databases accessible through TIS	Ongoing. Scheduled for completion 4/30/99
D039-M5	TIS linked to other D&D Technology Web Sites	Users of TIS provided with hyperlinks to other technology web sites	Scheduled for completion 6/30/99
D039-M6	Final Report	Final report on results of the project delivered to DOE.	Scheduled for completion 10/31/99
D039-M7	Feasibility study on other media for accessing TIS information	Users able to access TIS information via other media such as telephone and return fax.	If approved, scheduled for FY00.

## Accomplishments and technical progress

- All 131 CP-5 LSDDP technology screening datasheets have now been received, verified, and entered into the database.
- 181 of 183 FEMP LSDDP technology screening datasheets have been received, verified, and entered into the database. The 2 remaining datasheets are being provided by Mr. Mark Peters, Project Manager at FEMP.
- Datasheets on all 41 technologies that were screened in connection with the Hanford C-Reactor LSDDP have been received and are being verified and entered into the database.
- Technology screening datasheets from four new LSDDPs have been collected. Summarized below are the number that have been received to date.

LSDDP Site	# of Technologies Screened To Date at LSDDP Site	# of Datasheets Received To Date
Mound Environmental Management Project (MEMP)	62	62
Savannah River Site (SRS)	27	27
Idaho National Environmental Engineering Laboratory (INEEL)	123	48
Los Alamos National Laboratory (LANL)	29	29

## Assessment of current status

The system development and data acquisition phases of the project are proceeding on schedule, and no major problems are foreseen. Collection of vendor information for DOE's baseline technologies is not proceeding as quickly as expected because this information is not contained in the DOE's Preferred Alternative Matrices (PAM), requiring unplanned research activities.

## Plans for the next two months

- Useful recommendations from DOE's DDFA and other TIS beta testers that were not received in time to be included in the January 1999 release are currently being implemented. These include:
  - \* Reorganizing and regrouping the information presented in the fact sheets to improve readability
  - \* Including the FETC logo on the main TIS home page
  - \* Redefining function buttons on user screens to enhance navigation.
- Research will continue on collecting information on DOE's baseline technologies and entering the information into the TIS database.
- Data from DOE's DDFA technology databases and FIU-HCET's Technology Assessment Program are being converted for entry into the TIS database.

**FIU-HCET collaborator**

Mabel Acosta, (305) 348-6650

## Ex-Situ Large-Bore Pipe Decontamination and Characterization System

Project Number: HCET-1997-D017

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### Project objectives

The deactivation and decommissioning of 10,000 buildings in the U.S. Department of Energy (DOE) complex will require the disposition of miles of pipe. In particular, the disposition of large-bore pipe presents difficulties in the areas of decontamination and characterization. This pipe is potentially contaminated internally as well as externally. This situation requires a system capable of decontaminating and characterizing both the internal and external surfaces of the pipe. Current decontamination and characterization systems are not designed for application to this geometry, necessitating, in many cases, direct disposal of the piping systems. Once disposed of, the pipe often creates voids in the disposal cell, requiring the pipe to be cut in half or filled with a grout material. These methods are labor-intensive and costly to perform on large volumes of pipe. Direct disposal does not take advantage of recycling, which would provide monetary dividends as a result of the disposition of large-bore pipe.

To facilitate the decontamination and characterization of large-bore piping and thereby reduce the volume of piping required for disposal, the following objectives have been established:

- A detailed analysis will be conducted to document the pipe remediation problem set. (completed FY97)
- Determine potential technologies to solve this remediation problem set. (completed FY97)
- Design and laboratory test potential decontamination and characterization technologies. (completed FY97)
- Fabricate a prototype system. (FY98 and FY99)
- Provide a cost-benefit analysis of the proposed system. (preliminary completed FY98)
- Deploy the system. (FY99 and beyond)

## Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D017-M1	Title III of the decontamination system complete	The completion of Title III provides for a complete decontamination system ready for a field assessment.	Ongoing. Scheduled completion 3/31/99. Delivery schedule for container will impact completion date. Revised completion date will be established when container schedule is received. This delay does not place this item on the critical path.
D017-M2	Field testing of the decontamination system	The decontamination system will be tested to ensure the performance specifications are met. This will be accomplished by witnessing the cleaning of five tons of pipe of various diameters.	Ongoing. Scheduled completion 4/20/99
D017-M3	Close-out of decontamination system	This milestone requires the completion of all required activities, including operation/maintenance procedures. Five people from FIU-HCET will be trained on the operation and maintenance of the system. The completed system will be turned over to FIU-HCET for operation and integration with the characterization system.	Ongoing. Scheduled completion 5/26/99
D017-M4	Title I of the characterization system complete	FIU-HCET will approve initial design details of the characterization system and the costs associated with the characterization system.	Completed 11/30/98
D017-M5	Title II of the characterization system complete	FIU-HCET will approve initial design details of the characterization system and the costs associated with the characterization system.	Scheduled completion 2/16/99*. Actual completion date 2/18/99.
D017-M6	Title III of the characterization system complete	The completion of Title III provides for a complete characterization system ready for a field assessment.	Scheduled completion 7/28/99*
D017-M7	Field testing the characterization system	The characterization system will be tested to verify that it meets performance requirements by characterizing five tons of pipe of various sizes and contaminant types.	Scheduled completion 9/14/99*

Milestone No.	Milestone Description	Completion Criteria	Status
D017-M8	Close-out of characterization system	This milestone requires the completion of all required activities, including operation/maintenance procedures. Five people from FIU-HCET will be trained on the operation and maintenance of the system. The completed system will be turned over to FIU-HCET for operation and integration with the decontamination system.	Scheduled completion 11/30/99**
D017-M9	Final Report on the decontamination and characterization system	Final report detailing the technology assessment process and the design, fabrication, and testing of the system will be completed and issued. The final report will be distributed through the Remedial Action Program Information Center (RAPIC) and the DDFA mailing list database and will be available on the FIU-HCET Home Page.	Scheduled completion 11/30/99
D017-M10	Large-scale field deployment of ex-situ large-bore pipe characterization and decontamination system.	The integrated characterization and decontamination system will be deployed at an environmental restoration site.	Scheduled completion 1/19/00

\* This date has slipped 18 days due to problem with procurement of conveyor.

\*\* This date has been moved back to allow for a more extensive demonstration to be completed at a commercial site.

## Significant events

- The blast cabinet and conveyor system for the decontamination system has been fabricated. The major system component fabrication was completed in January 1999. The initial run-off of the system was a success, and the system was able to clean the internal and external surfaces of a 10-inch pipe. Final system fabrication is underway with the second run-off scheduled for the third week of March 1999.
- All modifications to the ventilation container are complete. The revised delivery schedule is February 23, 1999.
- The initial procurement of the decontamination container yielded no acceptable bids. The potential bidders were contacted, and based on responses from the bidders, the procurement of the decontamination container is being rebid. This schedule delay will not place the decontamination system completion on the critical path; however, there will be a schedule impact. A revised completion date for the decontamination module will be established when the schedule is received for the construction of the decontamination container.
- The Title II design documents were received on January 29, 1999. The Title II design review meeting was held at Canberra on February 10, 1999. Comments were incorporated, and the FIU acceptance letter was sent to Canberra on February 18, 1999.
- A presentation was made to representatives of FETC-DDFA and Consumers Energy on the potential demonstration of the system at the Big Rock Point Decommissioning Project. Schedule acceleration opportunities are being pursued to perform the demonstration and initial deployment at Big Rock Point in September 1999.

## Accomplishments and technical progress

### *Literature Search to Determine Pipe Remediation Problem Set*

Rough order-of-magnitude quantities were obtained from Hanford and Fernald, including 150,000 m<sup>3</sup> of pipe at Hanford and 5,880 m<sup>3</sup> of pipe at Fernald. Obtaining quantities from other DOE operations offices would require a significant level of effort; therefore, FIU-HCET and the Deactivation and Decommissioning Focus Area (DDFA) decided that acquiring the additional information would not be cost-effective and concluded that significant volumes of pipe exist to warrant the continuation of the project.

### *Determine Applicable Regulatory Policies and Procedures*

The list of regulations that govern the fabrication and operation of the pipe decontamination and characterization system was compiled. This list was given to the potential technology vendors to aid in proposal development, design, equipment fabrication, and system evaluation.

### *Review of Decontamination and Characterization Technologies*

The review and collection of data for possible decontamination and characterization options for large-bore pipe are complete. Based on the information reviewed, an initial screening method used for pipe decontamination technologies was developed and implemented. The initial criteria include the technology's ability to meet the required clean, near-white metal surface finish<sup>2</sup> on the interior or exterior of a pipe and the system's potential to be developed into a field mobile system. Seventeen decontamination technologies were evaluated as part of the initial screening process. Of the technologies screened, six technologies were selected for further evaluation; these six were then narrowed to one technology: grit blasting.

The literature survey of technologies capable of characterizing the interior and exterior of large-bore pipe is complete, and the resulting list detailing 21 technologies was prepared.

### *Design and Fabricate Decontamination System*

Delong Equipment Company was selected to design, fabricate, and perform proof of principle testing of the decontamination module. The primary design difficulties involve laying out the system to fit into transportation containers. All critical issues have been resolved, and the system design indicates the performance specifications will be met.

Title I and Title II design are complete. Title III design is currently being performed.

### *Design and Fabricate Characterization System*

Canberra, Inc., was selected as contractor to supply the characterization module. A kick-off meeting was held on August 28, 1998. Title I design was completed on November 30, 1998. Title II design was completed on February 18, 1999.

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<sup>2</sup> "A cleaned, near-white surface, when viewed without magnifications, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint and oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of the surface area and may consist of light shadows, slight streaks, or minor discolorations caused by rust stains, mill scale stains, or previously applied paint stains." (Structural Steel Painting Council, 1991, *Surface Preparation Specifications*, Structural Steel Painting Council, Pittsburgh, PA, pp. 53-56.)

### **Assessment of current status**

- The operations and maintenance procedures for the decontamination system are delayed due to revisions to the blast lance for pipe internal blasting. These procedures are not on a critical path for the completion of the decontamination system and will be available prior to the required date for use in the completion of milestone D017-M3.
- The procurement of the transportation container for the decontamination system will have a revised delivery date. This delivery schedule will impact the completion of the decontamination system. The decontamination system is not on the critical path to meet the system deployment date; therefore, the schedule impact is minimal.
- Title II design for the characterization system was completed on February 18, 1999.

### **Plans for the next two months**

- The transportation container for the decontamination system will be designed and fabricated.
- The ventilation container will be delivered and components will be installed.
- The final material run-off for the decontamination system will be complete prior to installing the components in the container.
- The procurement for the material off-loading system will be completed.
- The air cooler/dryer will be purchased.
- A draft of the ventilation procedure will be complete.
- The transportation trailers for all system components will be designed and fabricated. The procurement began on January 15, 1999, with delivery scheduled for March 31, 1999.

### **FIU-HCET collaborator**

Joe Boudreaux, (423) 220-8844

**In-Situ Pipe Decontamination System****Project Number: HCET-1999-D041****Project objectives**

The deactivation of radiologically contaminated facilities in many cases requires the characterization and decontamination of piping systems. There exists within the Department of Energy (DOE) inventory several thousand miles of piping and ductwork from facilities throughout the United States. The pipelines were used to move several types of contaminated fluids from one area to another within these facilities. The ductwork moved air within the facilities through ventilation systems. In-situ pipe decontamination options are limited; most commercial systems use high-pressure water to clean the pipe internals. High-pressure water generates large volumes of wastewater, which requires treatment, and in many cases is not aggressive enough to remove heavy scale and contaminants.

The goal of this subtask is to develop a low-cost and efficient system for in-situ decontamination of pipes, which does not release contaminants into the environment or generate secondary waste.

The objectives of the project are the following:

- Determine performance factors for the decontamination system.
- Select the most capable technology for decontaminating in-situ pipes.
- Incorporate an efficient filtration system to prevent release of contaminants or generation of waste.
- Perform technology enhancement/integration to accommodate horizontal, straight, circular, and rectangular piping and ducting sections.
- Perform a cost-benefit analysis.
- Fabricate a prototype system and assess its performance.

**Major milestones**

Milestone No.	Milestone Description	Completion Criteria	Status
D041-M1	Technology selection complete	Determine optimum technology to deploy considering production rate, decontamination factor, and safety factors	Scheduled completion 1/29/99 Actual completion date 2/1/99
D041-M2	Design plan complete	Peer review of design plan complete and approved	Scheduled completion 2/5/99 Actual completion date 2/23/99*
D041-M3	Approved design drawings and cost-benefit analysis	Peer review of final design drawings and the cost to complete approved	Scheduled completion 6/11/99
D041-M4	Prototype system complete and demonstration test plan written	Fabricated prototype system ready for tests and demonstration test plan approved	Scheduled completion 10/15/99

\* This date has slipped 18 days due to extensive document review process.

### **Significant events**

- Completed review of the candidate technologies and selected technology to deploy on integrated system.
- First draft of the design plan submitted for FIU-HCET peer review.
- Design plan comments of peer review committee resolved.

### **Accomplishments and technical progress**

- Candidate technologies for in-situ decontamination of pipes were screened and a list completed (See Appendix A December MPR).
- From a list of 16 technologies grit blasting was selected as the candidate technology to deploy.

### **Assessment of current status**

This is the first year of a two-year project. The project is currently on schedule and no issues impacting design or deployment have been identified to date.

### **Plans for the next two months**

- Finalize In-Situ Pipe Decontamination System (IPDS) conceptual design drawings.
- Contact commercial partners for their participation in the project.

### **FIU-HCET collaborators**

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## Deactivation and Decommissioning Technology Opportunities for Non-Power NRC-Licensed Sites

Project Number: HCET-1999-D042

### Project objectives

The Nuclear Regulatory Commission's (NRC) Operator Licensing Tracking System (OLTS) lists approximately 5,000 NRC-licensed operators of nuclear facilities in the United States. At the end of their useful life, power and non-power nuclear facilities must be deactivated and decommissioned. The use of appropriate deactivation and decommissioning (D&D) technologies can enhance the safety, efficiency, and cost-effectiveness of cleanup operations.

Over the next 10 years, approximately 34 NRC-licensed non-power reactors (NPR) will begin the process of deactivation and decommissioning. Project managers at these sites will be faced with the challenge of selecting safe, cost-effective environmental technologies for achieving their remediation goals. Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET), with its knowledge and expertise in environmental technologies and the D&D process, will accomplish the following:

- Assess the needs of these NRC-licensed non-power reactor sites.
- Identify opportunities for the fielding of technologies that have been proven safe and effective through research, development, and testing sponsored by the DOE's Office of Science and Technology.

### Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D042-M1	Report on site licensing, decommissioning, and participation information	List of NPRs indicating nature of operation, license expiration date, decommissioning schedule, and willingness of the site to participate in the study.	On schedule for completion by February 28, 1999.
D042-M2	DOE-FIU-HCET decision to proceed and NPR sites to be studied	Based on level of participation, a decision by DOE and FIU-HCET on whether to proceed with the project.	Scheduled for May 15, 1999.
D042-M3	Site needs assessment	Identification of key problem sets facing each NPR scheduled for decommissioning.	Scheduled to begin April 1999.
D042-M4	Technological solutions	Identification of candidate technologies for addressing problem sets identified in milestone 3.	Scheduled to begin July 1999.
D042-M5	Final report production and distribution	Report summarizing problem sets and potential technological solutions submitted to DOE and upon approval distributed to NPR sites and candidate technology providers.	To be completed before October 31, 1999.

### **Significant events**

- Contact information for managers at all 43 NPRs in the survey has been obtained either from the Internet web sites of the facilities or through direct telephone contact. Survey information is being collected via telephone interviews.

### **Accomplishments and technical progress**

- To date, 17 NPR managers have been contacted, and 11 have committed to participating in the survey and providing site assessment and decommissioning information on their facilities.

### **Assessment of current status**

- The project is proceeding on schedule, and planned milestones will be met.

### **Plans for the next two months**

- The remaining site managers at candidate NPRs will be contacted and informed of the purpose of this subtask and the potential benefits of the results of the study to their decommissioning efforts. They will also be asked to indicate their interest in participating in the study and be apprised of the information they will be required to provide if they wish to participate.

### **FIU-HCET collaborator**

Robert Tucker, (305) 348-6181

## Life-Cycle Cost Analysis for Radioactively Contaminated Scrap Metal

Project Number: HCET-1999-D043

### Project objectives

In September 1996, the Assistant Secretary of the U.S. Department of Energy's Office of Environmental Management (U.S. DOE-EM) issued a challenge to the DOE community that, to the degree that recycling is economically advantageous and protective of worker and public health, radioactively contaminated scrap metal (RSM) presently in storage, or projected to be generated by future EM activities, should be recycled.

Future deactivation and decommissioning (D&D) of the DOE's surplus facilities is expected to generate more than 600,000 tons of metal and 23 million cubic meters of concrete. Already there are more than 400,000 tons of RSM from past D&D activities temporarily stockpiled at DOE sites and pending disposition. There are also large quantities of RSM permanently buried at commercial and DOE-managed low-level waste (LLW) disposal facilities across the country. In total, it is estimated that more than 2,000,000 tons of RSM will be generated from the deactivation and decommissioning of radioactively contaminated facilities at the DOE and in the private sector.

Current waste disposal costing methodologies at DOE-managed waste disposal sites favor direct disposal of RSM in landfills over recycling. Studies commissioned by the DOE have shown that current rates for direct disposal of RSM are understated because they do not fully reflect all the costs associated with the full life-cycle of waste disposal, specifically the long-term maintenance and surveillance of disposal sites after they have been closed. A more accurate life-cycle cost analysis (LCCA) would certainly reflect higher costs for direct disposal and would lead to increased material recycling, resource recovery, and waste minimization – key goals of the DOE.

The objective of the subtask is the following:

- Update the methodology(s) currently used at DOE-managed waste disposal facilities for determining disposal costs for RSM to take into account all costs incurred over the entire life-cycle of the waste in order to demonstrate that recycling is a cost-competitive means for disposition of RSM.

### Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D043-M1	RSM inventory	A summary of estimated current and future RSM generated from D&D activities.	The scheduled completion date of 2/1/99 is revised to 3/30/99.
D043-M2	List of committed waste site managers	A list of waste site managers willing to provide information necessary for developing LCCAs.	The scheduled completion date of 2/1/99 is revised to 3/30/99.

Milestone No.	Milestone Description	Completion Criteria	Status
D043-M3	Report to DOE on Phase 1 (milestones 1 and 2)	Summary of results of milestones 1 and 2 and recommendation to DOE whether to proceed.	The scheduled completion date of 3/1/99 is revised to 3/30/99.
D043-M4	Decision on RSM disposal sites and options to be assessed	List of waste disposal sites that will be surveyed and disposal options for which LCCAs will be developed.	The scheduled completion date of 3/15/99 is revised to 4/15/99.
D043-M5	Documentation of NRC and commercial means of costing RSM disposition	Comparative analysis of costing methodology and factors used by selected sites.	Scheduled to begin 3/99.
D043-M6	Documentation of DOE means of costing RSM disposition	Procedural outline of DOE's costing methodology, indicating variances with other sites surveyed.	Scheduled to begin 4/99.
D043-M7	Life-Cycle Cost Analyses	Revised LCCAs submitted to DOE considering variances identified in milestone 6 as well as ORNL's <i>Life Cycle Decision Methodology for RSM</i> .	Scheduled to begin 3/99.
D043-M8	Finalize LCCAs and update DOE handbook	Revised LCCAs incorporating DOE's comments and procedures for LCCA incorporated in DOE handbook.	Scheduled to begin 6/99.
D043-M9	Final report	Final report documenting results of project submitted to DOE.	Due 10/31/99.

## Significant events

Progress toward completion of milestones 1 through 4 has been slowed by the delay in obtaining data on existing RSM inventories. Alternative arrangements have been made to obtain this information from other sources, such as the Association of Radioactive Metal Recyclers in Knoxville, Tennessee. Completion of this phase of the project will be delayed by approximately one month. In February 1999, FIU-HCET fielded an employee to work full-time in Oak Ridge to facilitate data collection and analysis and to collaborate with staff of the National Center of Excellence for Metals Recycle in Oak Ridge. Increased levels of effort will ensure that final deliverables for this project are met on time.

## Accomplishments and technical progress

In consultation with Dr. Katherine Yuracko, an expert in life-cycle analysis at the Oak Ridge National Laboratory, FIU-HCET has formulated a strategy for developing a life-cycle cost analysis tool for RSM that will complement the life-cycle decision methodology developed by Dr. Yuracko. In addition to providing decision-makers with RSM disposal options, the integrated decision tool will provide a clear indication as to which option is the most cost-effective. Other key issues that are being addressed by the LCCA decision methodology are

- A clear and common understanding of the meaning of each factor that is taken into account in current LCCAs. Therefore, one of the tasks that FIU-HCET will undertake is to compile a taxonomy of the factors and their definitions.
- A more accurate means of estimating future costs of maintaining waste disposal sites including facility surveillance and maintenance. Most importantly, current methodologies do not account for potential future liability in the event of accidental occurrences such as exposure or leakage at these facilities.
- Disposal Facility Summaries and/or Waste Disposition Maps indicating quantities of RSM and possible TSD alternatives have been obtained for the Fernald Environmental Management Project, Hanford Operations Site Environmental Restoration Disposal Facility, Idaho National Environmental Engineering Laboratory, Nevada Test Site, Oak Ridge Reservation, Savannah River Site, Rocky Flats Environmental Test Site, and Los Alamos National Laboratory. Together these facilities have a current stockpile of over one million tons of RSM.

### **Assessment of current status**

Due to delays in obtaining RSM inventory information, a comparative analysis and reconciliation of existing inventories have not been completed. Alternative arrangements have been made to obtain this information, and FIU-HCET has deployed additional resources to this project to minimize delays and ensure that subsequent critical deadlines are met.

Once the data from existing RSM inventories have been analyzed and reconciled by FIU-HCET, the results will be reviewed with DOE-EM's National Center of Excellence for Metals Recycle (NMR) at Oak Ridge and correlated to NMR's current estimates in order to derive a realistic estimate of DOE's present and future RSM inventories.

### **Plans for the next two months**

During the next two months, the following will be accomplished:

- FIU-HCET will complete the inventory of the quantities and characteristics of RSM currently stockpiled at DOE facilities as well as RSM expected to be generated from future D&D activities.
- FIU-HCET shall contact DOE waste site managers and other appropriate personnel to discuss this scope of work for assessment of life-cycle costs for disposal of RSM. FIU-HCET shall ascertain the level of cooperation expected from these managers in providing full information needed for the assessment and to develop LCCAs. A list of site managers surveyed indicating their willingness to participate will be submitted to DOE.
- A teleconference meeting is being scheduled for March 1999 between Mr. Vince Adams, DOE Director, Facilities and Materials Reuse Division; Ms. Jane Powell, DOE Program Manager, NMR; Mr. Michael Gresalfi, Technical Support Contractor to the NMR; and FIU-HCET project collaborators to assess and coordinate the efforts of the NMR and FIU-HCET in support of the goals of this project.

**FIU-HCET collaborators**

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Nicholas Hefty, (423) 220-8844

## Legacy Waste Disposition for the Oak Ridge Reservation

**Project Number: HCET-1999-D044**

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### **Project objectives**

Deactivation and decommissioning (D&D) of the surplus facilities at the Oak Ridge Reservation (ORR) will result in millions of cubic meters of waste of varying degrees of hazard and toxicity, requiring treatment, storage, and disposal (TSD). A large portion of the waste consists of low-level, uncharacterized, heterogeneous mixed waste streams. Currently, disposition paths do not exist at ORR for much of the mixed low-level waste (MLLW), which has to be sent to commercial waste facilities for disposition.

There are over 60 storage facilities on the ORR where MLLW is stockpiled. It is the goal of the U.S. Department of Energy (DOE) to eliminate this stockpile of legacy MLLW by the year 2006.

Several options exist for the TSD of contaminated waste streams at the ORR. These include neutralization, separation, vitrification, volume reduction by incineration or evaporation, packaging and direct disposal, and decontamination for reuse/recycling. In disposing of waste, the key objectives of the DOE's waste management program include safety, pollution prevention, waste minimization, and resource recovery. A clear understanding of proven TSD alternatives (disposition paths) for particular waste streams is therefore critical to achieving waste management goals and objectives. By their very nature, MLLW streams could potentially require an infinite number of disposition options for characterization, treatment, storage, and disposal, which could prove to be prohibitively costly. The need exists for a systematic means of evaluating MLLW streams and selecting the most appropriate disposition path for each stream from a limited number of options. This would minimize the number of disposition processes that would have to be set up to characterize, treat, store, and dispose of MLLW streams and would reduce costs for waste management.

Under this subtask, Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) will

- Perform a series of technical reviews for the DOE to aid in determining TSD options for MLLW streams at the ORR and to support the DOE's goal of eliminating the MLLW inventory by the year 2006.
- Investigate feasible TSD options and technologies for legacy MLLW streams at the ORR for which no disposition paths currently exist.

## Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D044-M1	Report on TSD options for residue from MLLW metal feeds to the TSCA incinerator	A set of feasible disposition paths for the MLLW metal feeds to the TSCA incinerator.	Scheduled for completion 4/30/99
D044-M2	Report on TSD options for contaminated accelerator lead shielding.	At least 2 feasible options for disposing of the contaminated lead shielding.	Scheduled to begin 2/99.
D044-M3	Report on TSD options for contaminated cadmium plates.	At least 2 feasible options for disposing of the contaminated cadmium plates.	Scheduled to begin 3/99.
D044-M4	Report on wastewater residue TSD options at Y-12.	A set of feasible disposition paths for the Y-12 wastewater residues.	Scheduled to begin 4/99
D044-M5	Report on performance of PM-CEMs in meeting EPA monitoring guidelines.	A statistical correlation of the performances of the two tested CEMs.	Scheduled to begin 5/99.
D044-M6	Final report summarizing research findings and disposal maps for various MLLW streams.	Final report submitted to Bechtel Jacobs, LLC.	Due 10/31/99.

## Significant events

- FIU-HCET is currently working with a waste management team led by Mr. Chuck Estes at Bechtel Jacobs, LLC, to assess and optimize the current process for characterizing, transporting, treating, and disposing of stored quantities of legacy waste at ORR, specifically 17,000 drums of MLLW for which disposition paths need to be developed. Using the services of characterization contractors, the Bechtel Jacobs, LLC, team has defined approximately 40 feasible waste disposition options for the MLLW inventory. This is a preliminary plan based on the experiences of the contractors but does not take into account the actual characteristics of the MLLW inventory.
- In February 1999, FIU-HCET fielded a full-time employee to work in Oak Ridge with Bechtel Jacobs, LLC, to facilitate day-to-day contact and communication and to ensure that project deliverables and schedules are met.

## Accomplishments and technical progress

The following issues have been identified by FIU-HCET and are being addressed in completing the objectives for this task:

- There are approximately 17,000 drums of MLLW for which FIU-HCET will assist Bechtel Jacobs to develop disposition paths.
- Most of the waste in these drums can be characterized based on the accompanying Requests for Disposal (RFDs), of which there are approximately 10,000.
- A large portion of the waste was characterized before waste acceptance criteria (WAC) were developed for the waste disposal sites where they are to be dispositioned.

- Based on existing RFDs, FIU-HCET will perform an assessment of the MLLW inventory to assess whether the Broad Spectrum Treatment Plan developed by Bechtel Jacobs is applicable to the inventory. If not, FIU-HCET will make recommendations for amending the Plan, including definition/redefinition of disposition options and paths.

### **Assessment of current status**

With the deployment of a full-time project manager to Oak Ridge, FIU-HCET expects to maintain this project on schedule. This on-site presence will facilitate coordination of efforts between FIU-HCET and Bechtel Jacobs and promote rapid response to identified project needs and changes.

### **Plans for the next two months**

The scope of FIU-HCET's effort on this subtask is summarized below and scheduled for completion by April 30, 1999. FIU-HCET will assess the MLLW Broad Spectrum Treatment Plan developed by Bechtel Jacobs, LLC, and conduct an engineering study of the current TSD process for MLLW. Specifically, FIU-HCET will

- Obtain from Bechtel Jacobs a sample of 500 RFDs.
- Work with Bechtel Jacobs to assess and document the current process and options for characterizing, transporting/handling, treating, and disposing of the sample MLLW streams.
- Review the MLLW Broad Spectrum Treatment Plan and assess whether the plan adequately addresses all the paths necessary to disposition the sample waste streams. This will also involve reviewing external factors such as WACs and Department of Transportation regulations which may affect the logical grouping of drums into a particular path.
- Develop an optimized disposition process and options for MLLW.

### **FIU-HCET collaborators**

Robert Tucker, (305) 348-6181

Marshall Allen (423) 220-8844

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## **II. TANKS FOCUS AREA (TFA)**

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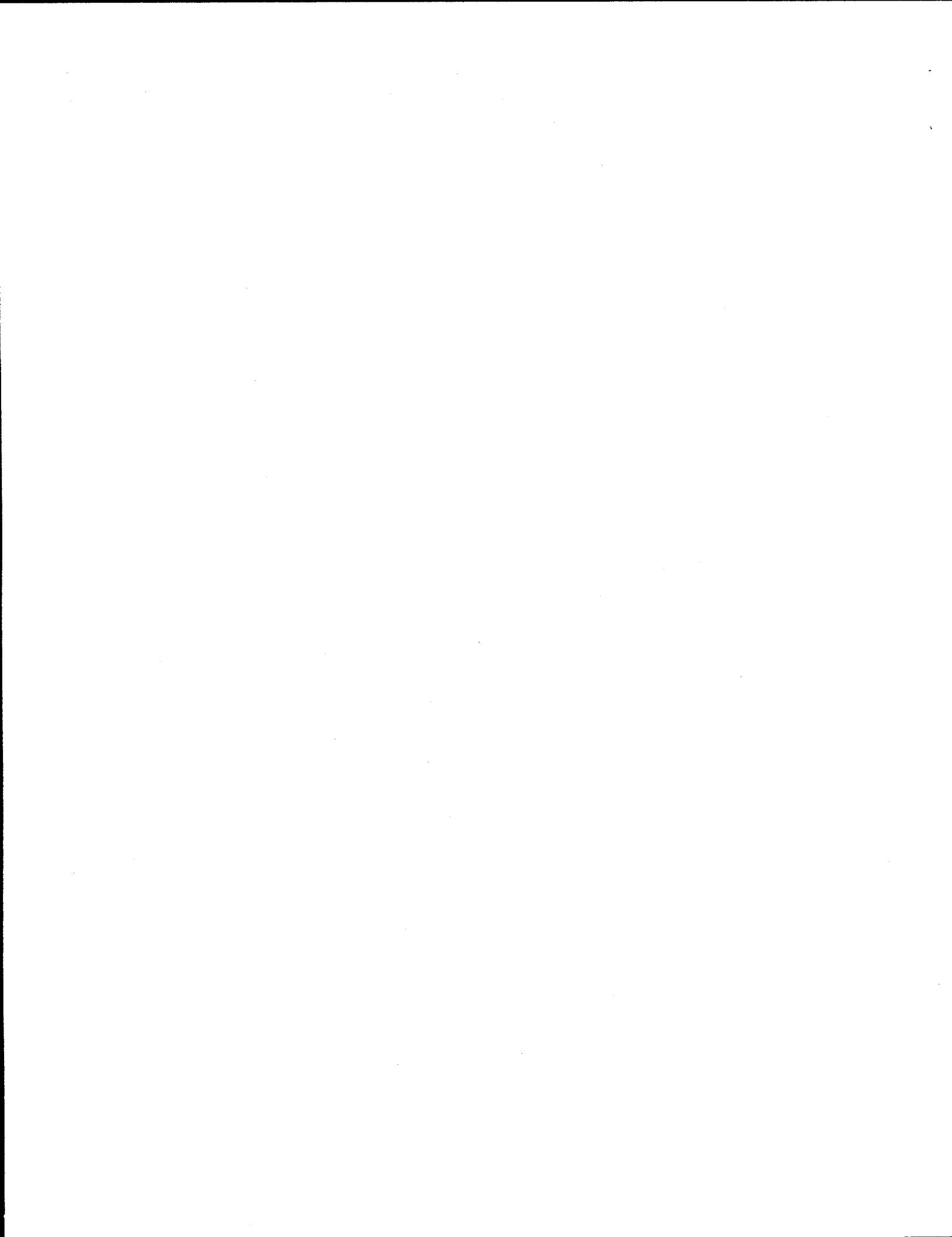
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### **MONTHLY PROGRESS REPORT**

**FIU Principal Investigator  
FIU TFA Program Manager  
Focus Area Technical Leads**  
  
**Program Officers**

**M.A. Ebadian  
F. Mao  
Kurt Gerdes  
William Holtzscheiter  
Peter Gibbons  
John Wengle  
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## Waste Conditioning for Tank Slurry Transfer

**Project Number: HCET-1998-T004**

### **Project objectives**

There are millions of gallons of radioactive waste slurries stored in underground tanks located at different U.S. Department of Energy (DOE)'s sites. DOE needs information and technologies to treat the wastes and close the tanks. Treatment of these wastes into safe waste forms and closure of these tanks require information of chemical and physical properties of the waste and fundamental data related to tank slurry conditioning, mixing, transport, and processing.

Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) is conducting research and examination on waste conditioning for tank slurry transfer. In this project, FIU-HCET is performing experimental tests to obtain reliable data in order to understand problems encountered in tank slurry mixing and transfer processes. Based on the data and results obtained from the experiments, FIU-HCET is investigating possible solutions to prevent pipeline plugging during slurry transfer and the problems that occur in slurry mixing. Additionally, this project has reviewed and compared the actual slurry natures at different DOE sites and facilities, such as Fluor Daniel Fernald (FDF), Oak Ridge National Laboratory (ORNL), Savannah River Sites (SRS), and Hanford, and identified the requirements for slurry transfer.

This project should accomplish the following:

- Determine the effect of chemical and physical properties on the tank slurry transfer process.
- Provide information for the transfer equipment design and operation.
- Identify and evaluate the most sensitive parameters that influence the waste conditioning and transfer operations.

### **Major milestones**

<b>Milestone No.</b>	<b>Task Description</b>	<b>Completion Criteria</b>	<b>Status</b>
T004-M1	Review previous work and adjust experimental setup	Experimental facility must fulfill M2-6 test requirements	Completed by 02/14/99. Due date: 02/26/99
T004-M2	Measure surrogates particle size distribution	Perform six different particle size distribution tests as described in Table 1 in the PTP	On schedule. Due date: 04/12/99
T004-M3	Determine surrogates particle shapes	Perform six particle geometry tests as described in Table 2 in the PTP	Due date: 05/17/99
T004-M4	Characterize solid particle solubility and crystallization behavior	Perform nine solubility and crystallization tests as described in Table 3 in the PTP	Due date: 07/05/99
T004-M5	Measure particle settling velocity.	Perform 27 settling tests as described in Table 4 in the PTP	Due date: 08/15/99

Milestone No.	Task Description	Completion Criteria	Status
T004-M6	Measure slurry viscosity	Perform 26 viscosity tests as described in Table 5 in the PTP	Due date: 09/30/99
T004-M7	Perform data correlation and documentation	Write a project final report	Due date: 10/30/99

## Significant events

- A three-day informative meeting was held on February 1-3, 1999, to discuss both the Waste Conditioning and the Plugging-Unplugging project status and work to be performed in the near future. Dr. Erian, Mike Rinker (PNNL), and Pete Gibbons (NHC) attended this meeting at FIU-HCET.
- A paper was written describing the findings on rheological properties performed last year. The title of the paper is: *Rheological Property Measurements and Data Correlation of a Nuclear Waste Slurry Simulant*. The paper is now being revised for submission to a scientific journal for publication in the next reporting period.
- Milestone 2 has been started. Project managers were trained on the laser particle size analyzer, which will be used for simulants particle size distribution analyses. This activity was performed in conjunction with the analytical lab staff.

## Accomplishments and technical progress

- The February 1-3, 1999, meeting with DOE personnel was critical to clarifying many project aspects, especially waste slurry simulant development and characterization.
- It was agreed that, in addition to the work described in the PTP, this project should serve as a guideline for simulant development for the plugging-unplugging project.
- Simulant samples were prepared for particle size distribution analysis. SRS and Hanford simulants will be analyzed at different conditions with the laser particle size analyzer.
- SRS simulant rheological data were included in the paper mentioned before. These experimental data are in concordance with historical DOE experience, which concludes that the waste slurry follows a Bingham plastic rheological model. The simulant utilized for such analyses was provided by the Savannah River Technology Center (SRTC).
- The effect of slurry conditions, such as concentration, pH, and temperature, on the rheological properties are shown in Figures 1 to 6.

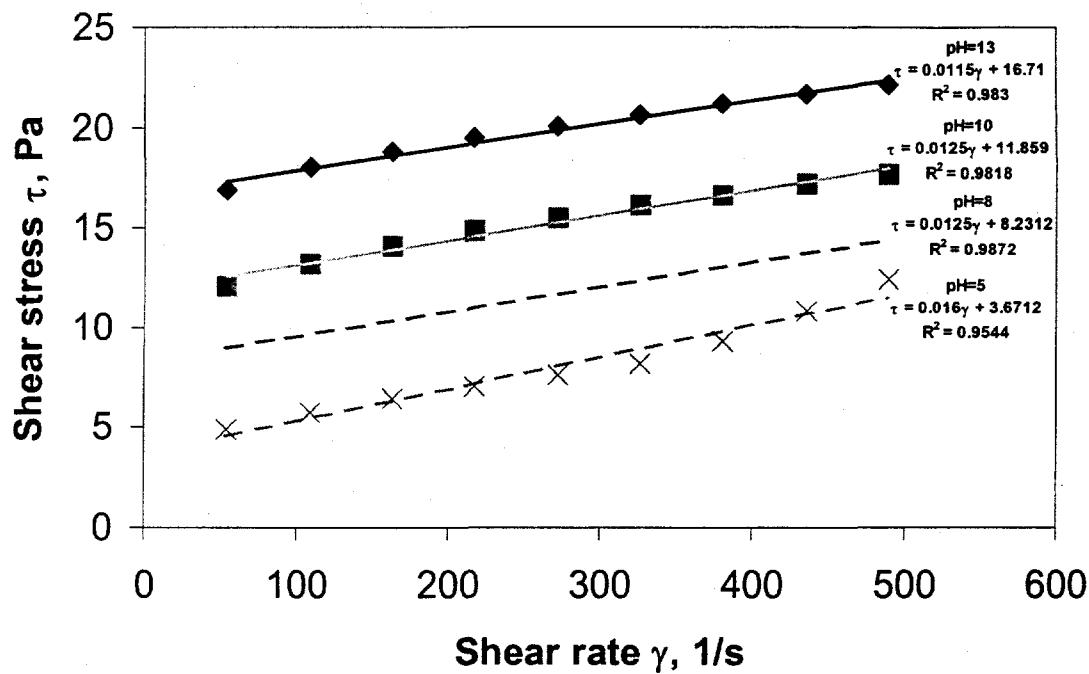


Figure 1. Effect of pH on the Rheological Properties of a SRS Simulant.  
Concentration: 19.7 wt%, Temperature: 23°C.

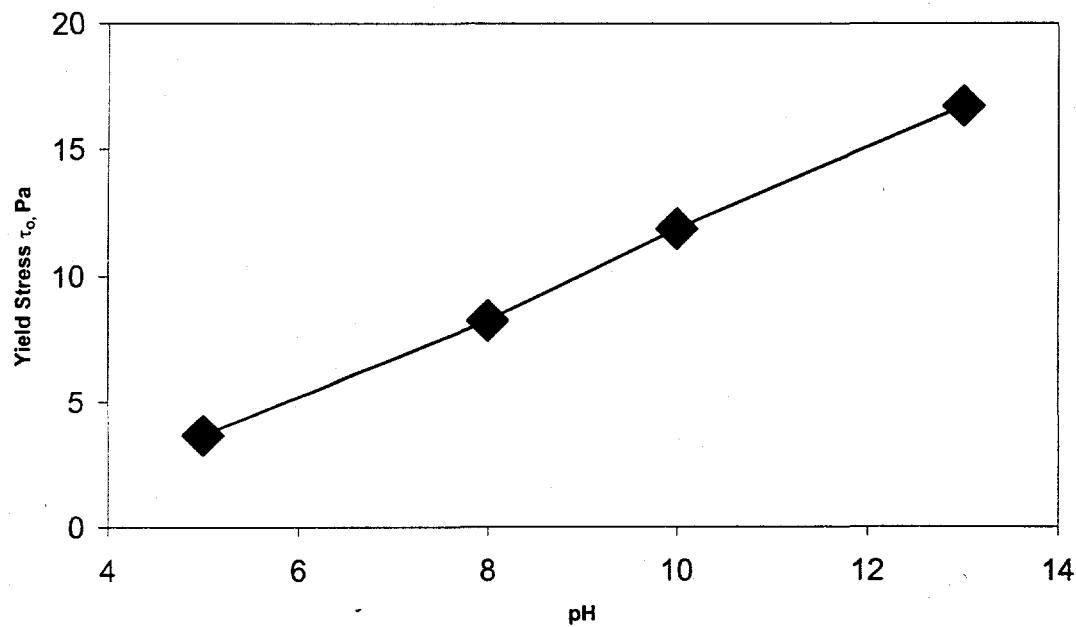
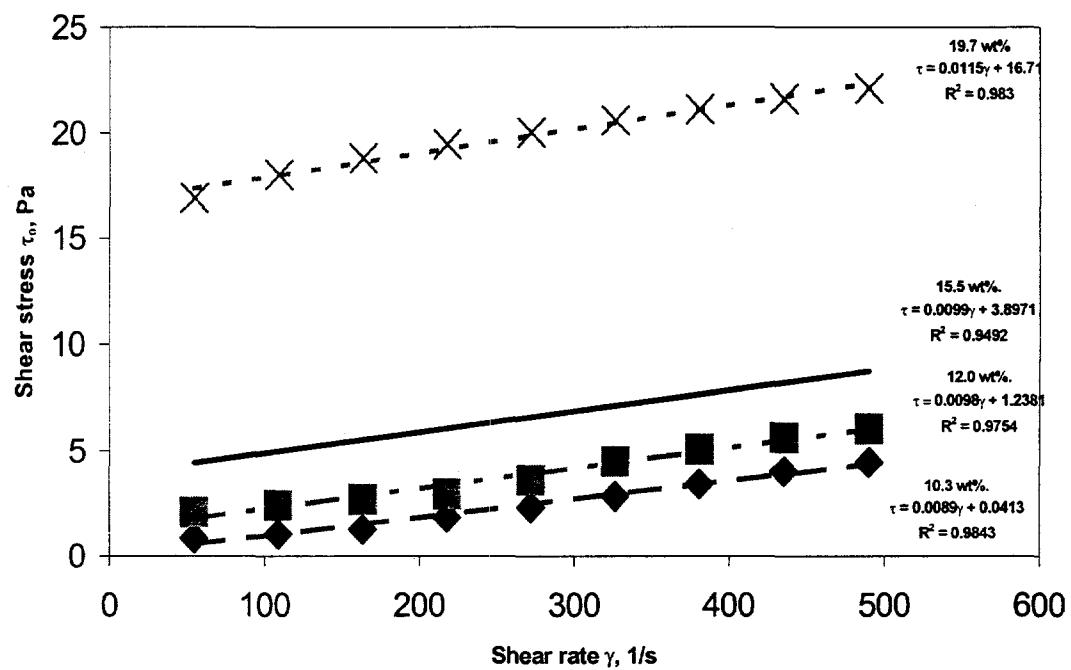
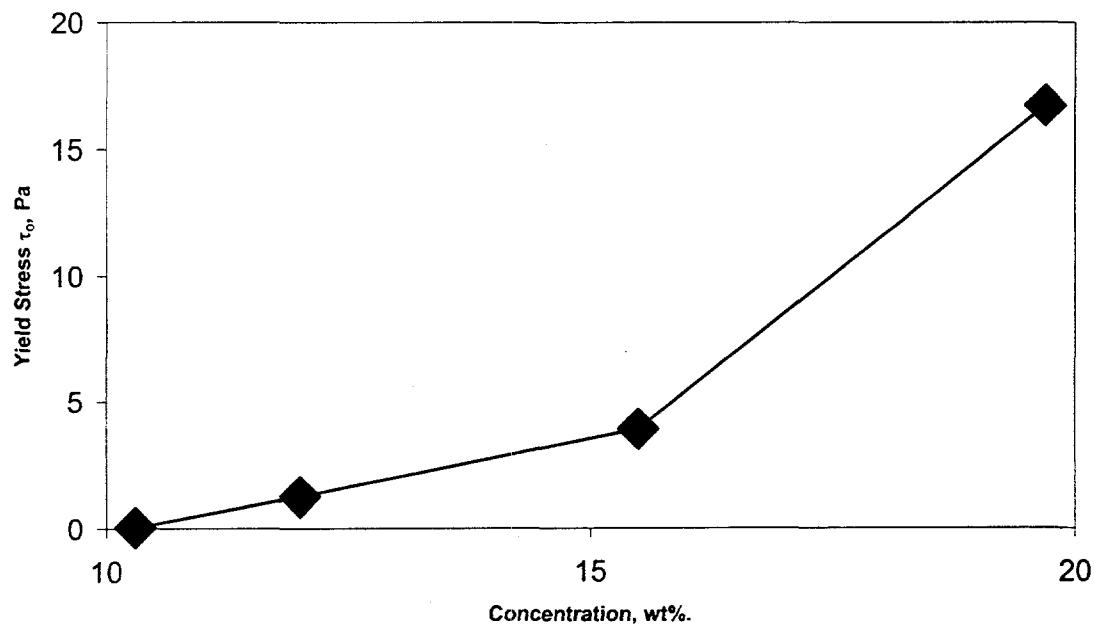


Figure 2. Effect of pH on a SRS Slurry Simulant Yield Stress.  
Concentration: 19.7 wt%, Temperature: 23°C.



**Figure 3. Effect of Concentration on the Rheological Properties of a SRS Slurry Simulant.**  
pH: 13, Temperature: 23°C.



**Figure 4. Effect of Concentration on a SRS Slurry Simulant Yield Stress.**  
pH: 13, Temperature: 23°C.

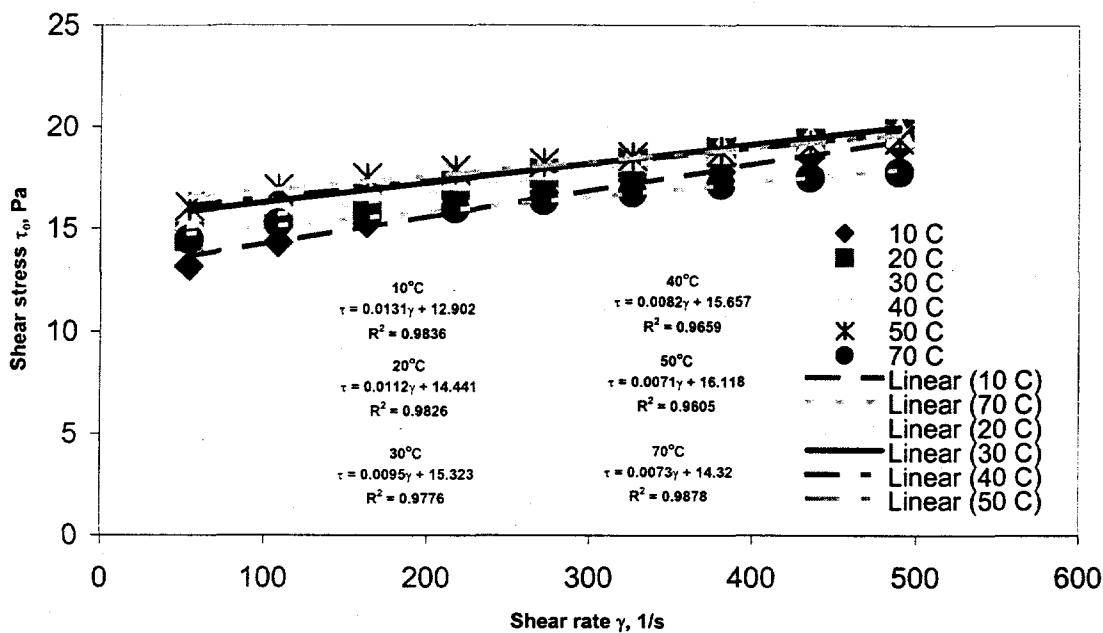


Figure 5. Effect of Temperature on the Rheological Properties of a SRS Slurry Simulant.  
pH: 13, Concentration: 19.7 wt%.

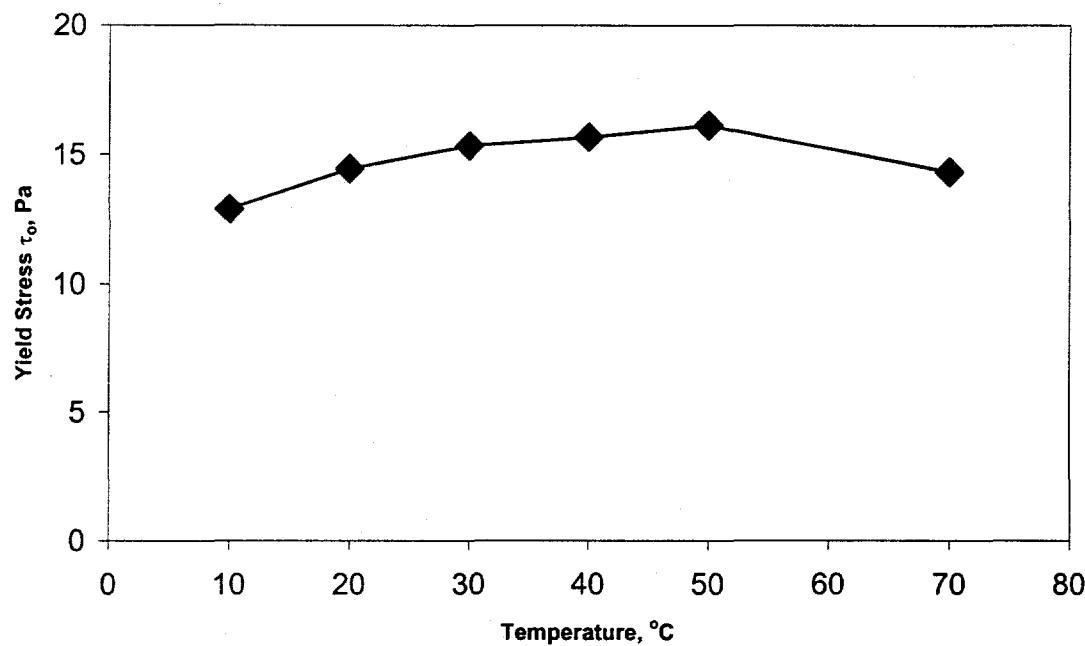


Figure 6. Effect of Temperature on a SRS Slurry Simulant Yield Stress.  
pH: 13, Concentration: 19.7 wt%.

### **Assessment of current status**

Simulant development and characterization is a challenging task because of complexity in multiple phases and chemical compounds. In addition, the rheological property and the particle size distribution of the actual nuclear waste slurry varies from site to site, so efforts will be made to identify how these parameters influence the slurry performance.

### **Plan for the next two months**

- Perform particle size distribution analyses for all simulant samples prepared as described in Table 1 in the PTP.
- Continue working together with the Plugging and Unplugging of Waste Transfer Pipelines project (HCET-1998-T005) on simulant development and characterization.
- Obtain training on the operation of the scanning-electron microscope for particle shape analysis.

### **FIU-HCET collaborators**

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Rubén Darío López, (305) 348-1872

## Plugging and Unplugging of Waste Transfer Pipelines

Project Number: HCET-1998-T005

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### Project objectives

As the waste tank clean-out and decommissioning program becomes active at the DOE sites, there is an increasing potential that the waste slurry transfer lines will become plugged and unable to transport from one tank to another or from the mixing tank to processing facilities. Whereas some sites, such as Savannah River, Hanford, and Oak Ridge, have already experienced plugged or blocked lines, plugging may occur at additional sites at the onset of waste transfer.

Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) will continue to investigate pipe plugging and unplugging behaviors of waste slurry transfer lines for a high-level waste (HLW) system on the waste transfer simulation flow loop in FY99. In addition to the pipe plugging caused by settling, pipe plugging and unplugging phenomena induced by gelling will also be studied by both experimental and theoretical methods. Some key aspects of particle deposition associated with pipe plugging will be addressed. These will include particle agglomeration leading to larger particles that fall out of suspension and particle deposition in the pipe at the end of the transfer as a function of pipe slope or dip depth. The experimental setup used for settling-induced plugging will be modified for the study of gelling-induced plugging and unplugging. The core-annular flow technology, which may be used to unplug the gel-caused blockage, will be examined.

In FY99, activities of industrial equipment tests and demonstrations of plug locating and pipe unplugging technologies will be coordinated by FIU-HCET, Numatec Hanford Corporation (NHC), Pacific Northwest National Laboratory (PNNL), Federal Energy Technology Center (FETC), and DOE sites. FIU-HCET will complete the design and construct the Plug Locating and Removal Demonstration test bed for the industrial equipment test and demonstration to be conducted in FY00. FIU-HCET will also plan additions to the large-scale (full-size) test bed required for pipeline inspection tools testing in the future.

The objectives of this work include the following:

- Further understand the pipeline plugging and unplugging mechanism by particle settling and gel formation.
- Identify and test industrial methods to locate and remove waste transfer pipeline blockage.
- Inspect and verify the condition of those pipelines.

## Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
T005-M1	Issue project technical/test plan for pipeline plugging and unplugging activities	Planned activities, tasks, and milestones of slurry transport experiments in a flow loop, and of construction of full-size test beds for demonstration of blockage locating and pipe unplugging technologies	Completed by 2/15/99; met the schedule
T005-M2	Develop systematic methods for characterization of slurries for transport experiments	Documentation and application of slurry characterization method for slurry preparation, rheology measurement, and data presentation of slurry transport experiments.	Scheduled completion 03/19/99
T005-M3	Modification of flow loop setup for additional slurry transport experiments with horizontal pipeline	Set up the flow loop with a higher capacity pump, improved sampling system, and an additional pressure transducer.	Scheduled completion 03/30/99.
T005-M4	Perform additional slurry transport experiments in flow loop with horizontal pipeline	Obtain reasonable data by data acquisition system and video recording system at one additional slurry concentration. Some critical velocity data will be repeated by varying slurry flow rate from very high level to low level.	Scheduled completion 05/28/99
T005-M5	Plan, design, and modification of flow loop with inclined pipelines	Set up a flow loop with inclined pipelines that have the same geometrical layout as those used at DOE sites.	Scheduled completion 06/25/99.
T005-M6	Perform slurry transport experiments in flow loop with two inclined pipelines	Obtain reasonable results of pressure drop and critical velocity in the flow loop with two kinds of inclined pipeline	Scheduled completion 09/30/99.
T005-M7	Data processing, correlation, and comparison	Present the measured data and data correlation for the slurry transport experiments	Scheduled completion 10/15/99.
T005-M8	Identify and determine industry companies and potential technologies for equipment tests and demonstrations	Create a database with a list of potential companies and technologies with contact information for the large-scale equipment test.	Scheduled completion 11/01/99.
T005-M9	Finalize the design of full-size test bed for equipment tests and demonstrations	Detailed design drawings of the pipelines for the three full-size test beds.	Scheduled completion 03/30/99
T005-M10	Construction of the test beds for equipment tests and demonstrations	Three test beds representing gravity pipeline, long pipeline, and buried pipeline will be fabricated with the specified material and dimensions.	Scheduled completion 09/15/99.
T005-M11	Draft and distribute the year-end report of the plugging and unplugging project	Report covers detailed experimental studies and progress of the full-size test bed in FY99.	Scheduled completion 11/15/99.

Note: The current milestones are from the latest version of FY99 PTP, which has been revised based on suggestions from Peter Gibbons (NHC) and Dr. Fadel F. Erain (PNNL).

## Significant events

- Peter Gibbons from Numatec Hanford Corporation (NHC), Mike Rinker, and Dr. Fadel F. Erian from Pacific Northwest National Laboratory (PNNL) visited FIU-HCET February 1 to February 3. Issues on the flow loop experiment, data correlation, large-scale demonstration test bed, and PTP for FY99 were discussed. Agreements have been achieved on these issues.
- The FY99 PTP has been revised based on the agreement.
- The lab-scale test loop is under modification. A new sampling system using isokinetic principles will be installed on the flow loop. The new sampling system consists of thermistors, flow controller, and Wheatstone-bridge.
- The new drawing of the modified flow loop has been completed and sent to PNNL technical personnel for comments.
- The slurry pump with higher flow rate has been ordered and received. The layout for the pump installation is being designed.
- Major revision on the design of test beds for large-scale technology demonstration of blockage locating and pipe unplugging has been performed.

## Accomplishments and technical progress

### Part 1 Flow Loop Research on Pipeline Plugging and Unplugging

Figure 1 is the new schematic of the flow loop under modification. It contains the collection tank, slurry tank, water tank, slurry pump, pressure transducer, flow meter, sight glass visual section, differential pressure transducer, and so on. Compared to the original flow loop used last year, the eight sampling tubes were removed, with another 2-ft-long sampling section added in the center of the test section. One additional differential pressure transducer in the flow developing section is included to determine the difference in the pressure drops between the developing section and the developed section. The differential pressure transducer covers the distance of 19.5 ft. The new slurry pump with higher flow rate will be arriving at FIU-HCET and will be installed in the flow loop.

Figure 2 shows the sampling section arrangement. Two points of sampling data shall be obtained. One is near the top and the other is near the bottom of the pipe. The sampling arrangement includes four thermistors marked A, B, C, and D, incorporating the sampling tube with 3 mm diameter. Thermistors A and B are connected with a Wheatstone electric bridge. When the average velocity at point A in sampling is equal to the local velocity at thermistor B, the Wheatstone electric bridge gets a zero current indication. The project will continue the selection of the thermistors that can be used for the present applications.

## Part 2 Large-Scale Industrial Equipment Test Bed of Plug Locating and Unplugging Technologies

### 2.1 Introduction

FIU-HCET has been designing and will construct a Large-Scale Industrial Equipment Test Bed of Plug Locating and Unplugging Technologies. The concept design of the test bed has been performed and continuously revised in the past months. Three revised simulated cases or test beds have been proposed from the five original cases, based on discussions with Peter Gibbon at NHC, Dr. Fadel F. Erian at PNNL, and the document "Functions and Requirements for Blockage Locating and Removal Methods in Waste Transfer Lines," which describes the pipeline conditions in SRS and Hanford sites.

In FY99, the designs of the Large-Scale Test Bed will be finalized followed by the construction and demonstration of the Test Bed and its equipment at FIU-HCET.

### 2.2 New Design of Pipeline

The following major revisions were made based on meetings with Pete Gibbons of NHC, Mike Rinker, and Dr. Fadel F. Erian of PNNL on February 2 and 3, 1999.

New names will be used for each following case:

- Test Bed #1** ---gravity pipeline (simulated case #1)
- Test Bed #2** --- horizontal pipeline (simulated cases #2 & #3)
- Test Bed #3** --- buried pipe

The latest revised drawings of Test Beds #2 and #3 are provided in this monthly report.

#### Test Bed #1

- For Test Bed #1, the original design remains the same: The pipe is 86 ft long with 4ft slope elevation. Height of the vertical section will be approximately 6 ft.
- The possible blockage materials might include wax, epoxy, or melted glass. Approximate length of plug section: 3 to 5 ft.

#### Test Bed #2

- For Test Bed #2, pipes will be connected every 20 ft by a grooved coupling to necessitate removal.
- Pipes will be secured to ground using Unistrut clamp and framing bar connected to railroad ties that will be anchored to the ground by rebar.
- For Test Bed #2, a blockage will first be placed near entry of the pipe to test unplugging technologies.
- The loop of long pipeline will first be built with the length of 1000 ft to 1500, as shown in Figure 3. Future extension will be based on success of technologies to maneuver through 1000 ft length.
- At this moment, steel pipe is considered for Test Bed #2. The feasibility of using two Lexan sections of 10 ft length should be investigated. Lexan could be used at the corners where

technologies are most likely to get stuck and could easily be replaced if damaged by blockage removal/pipeline inspection tools.

- The Test Bed entry will be a recreation of original case #3 as closely as possible and then it will enter the variable 1000 ft to 3000 ft section.
- Hanford connector at entry will have a threaded connection to necessitate technologies that might prefer a threaded connector.
- All sections of Test Bed will be sloped to facilitate drainage. Catch basins will be considered at all drainage locations.

### **Test Bed #3**

- Pipes will be placed at ground level and separated 4 ft, as shown in Figure 4, from each other. Back Fill will be built up to 5 ft above the pipeline level. Piping will extend through both sides of mound to necessitate blockage removal and installation.
- Various blockage materials and locations could be set in the bed. The material component is similar to that in the actual tanks. Information on representative core samples from each site where the pipes are buried is needed.
- Unjacketed pipe will have fixed blockages, whereas jacketed pipe will have the capability to have plugs removed/installed.
- Jacket piping and Core piping will be purchased to investigate diameter tolerances.
- The design of test bed will take into consideration weather conditions (gravel or tarp cover) and vehicle weight.
- Priority will be given to Test Bed #3 for completion by the first week of June 1999.

### **Assessment of current status**

The experiments with the new sample system will be conducted based on a trial-and-error approach due to uncertainties and complexity of the new sampling system. Some questions or difficulties are summarized as follows: 1) The inside diameter of the test loop is only 0.875 inch; the sampling tube shall need a small diameter to avoid disturbing the local flow field. This limits the size range of the thermistors to be selected. 2) The heat source for this system is basically from the striking and rubbing of the thermistor surface by the particles in the slurry. As the heat generated in this way is very small, the signal may be not strong enough to be detected by the system.

The information about the pipeline unplugging technologies and vendors is being collected for the large-scale pipeline testing and demonstration.

### Plans for the next two months

- The test loop modification will be completed, and the high capacity slurry pump will be installed.
- To identify the mixing performance in the slurry tank, sampling from the top and bottom of the mixing tank will be performed to confirm if the solid-liquid in the mixing tank is well mixed.
- The reason why the present slurry simulants show the nonlinear behavior of shear stress versus shear rate will be explained.
- A set of data sheets containing the experimental results and calculations will be developed.
- The assessment and selection of the thermistors that may be used in the sampling section will be continued.
- The composition of the slurry simulants to be used in the large-scale industrial test bed will be studied and identified. The locations of blockages to be prepared in the full-size test beds will be considered.
- The search for candidates of potential technologies for equipment tests and demonstrations in the full-size test beds will be continued.
- The detailed design of the Large-Scale Industrial Test Beds of Plug Locating and Unplugging Technologies will be finalized.

### FIU-HCET collaborators

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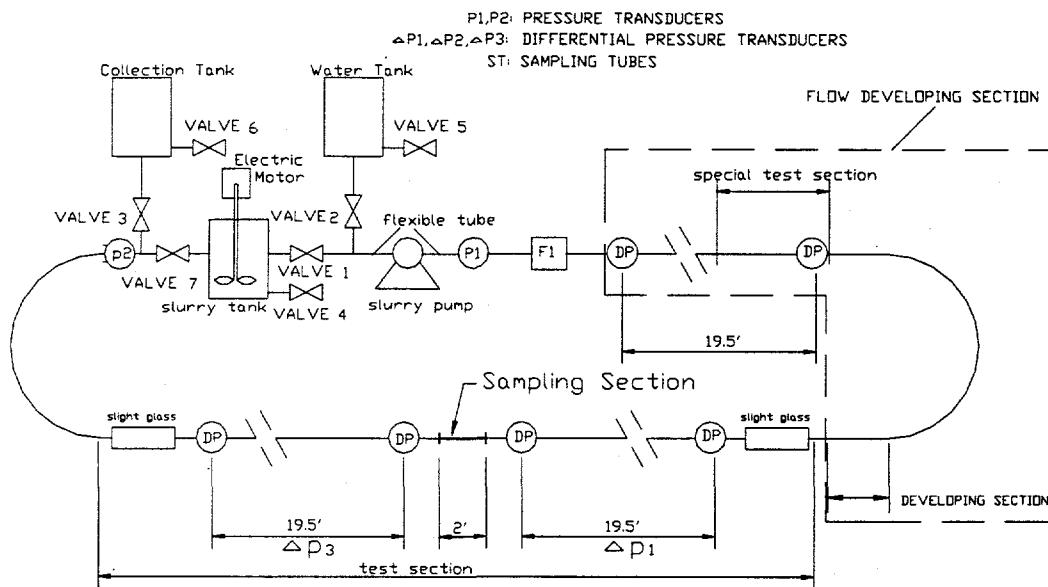


Figure 1 Revised schematic diagram of flow loop.

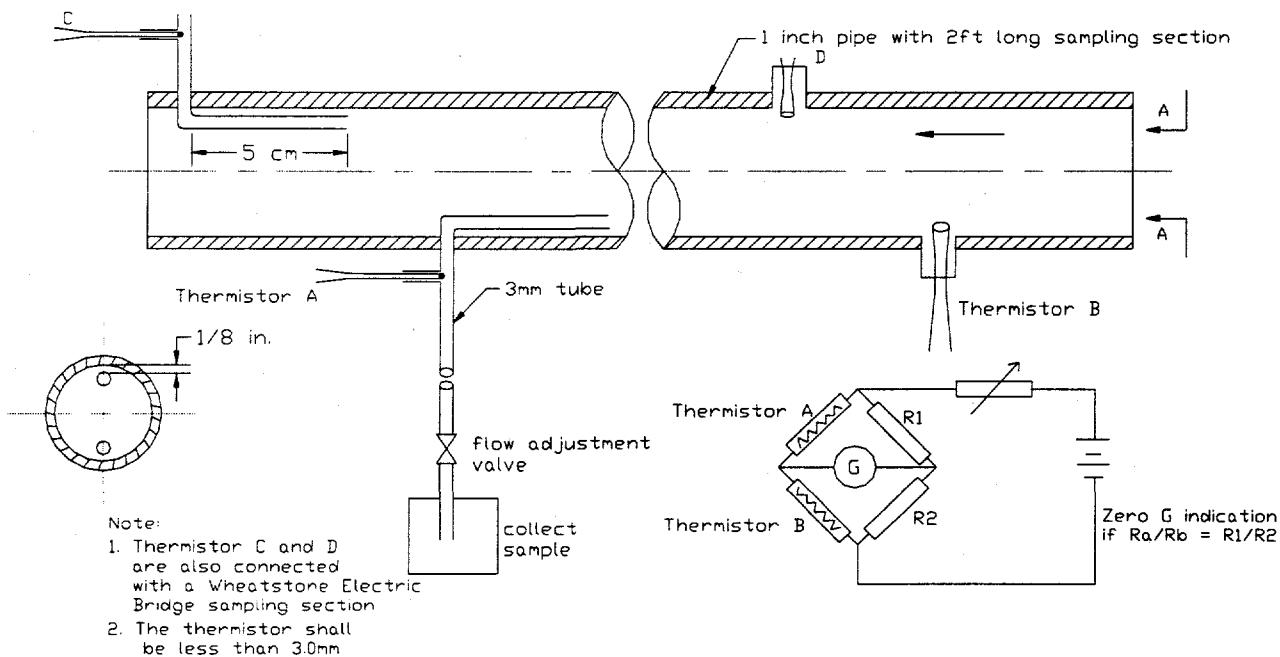


Figure 2 Proposed sampling section.

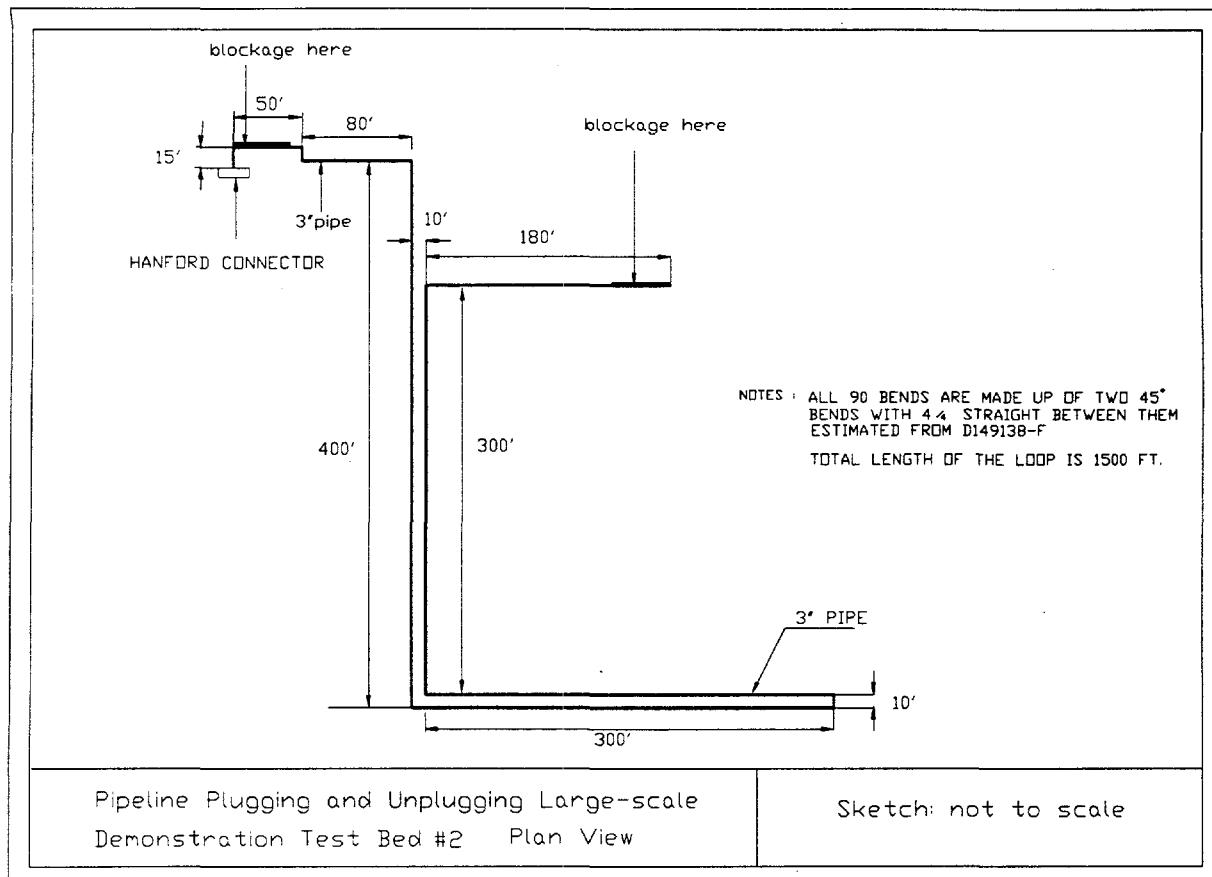
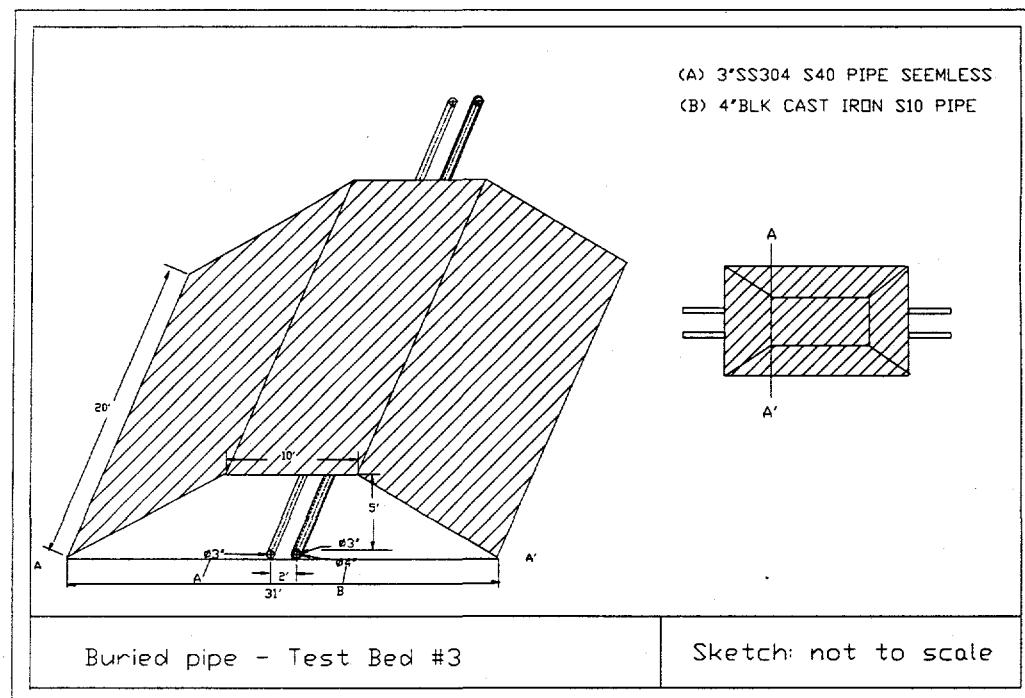


Figure 3 Large-Scale Test Bed #2.



**Figure 4 Large-Scale Test Bed #3.**

## Investigation of Waste Glass Pouring Process Over a Knife Edge

**Project Number: HCET-1997-T003**

### **Project objectives**

Vitrification is the process of capturing radioactive waste in glass. The Savannah River Site's (SRS) Defense Waste Processing Facility (DWPF) is one of the facilities using the vitrification technology to treat and immobilize radioactive waste since March 1996. However, the operation has been marked by extreme difficulty in maintaining a stable pouring process. There have been flow fluctuations accompanied by an unusual flow phenomenon, termed "wicking". In this situation, the falling glass stream wavers and departs from a normal vertical trajectory. The pour spout and associated hardware connecting it to the canister have been coated and often plugged with glass. The objective of the project is to investigate the pouring behavior of molten glass over a pour spout knife edge.

The work to be performed at Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) in support of the Tank Focus Area (TFA) Technology Implementation Manager (EM-50) and the Savannah River Technology Center (SRTC) consists of three phases. Phase 1 involved the assembly, construction, and testing of a melter capable of supplying molten glass at operational flow rates over a break-off point knife edge. Phase 2 evaluated the effect of glass and pour spout temperatures as well as glass flow rates on the glass flow behavior over the knife-edge. Phase 3 (current phase) of the project will identify the effects on wicking that result from varying the knife edge diameter and height as well as changes to the back-cut angle of the knife edge.

### **Major milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
T003-M1	Installation of an additional heat zone	Achievement of 1150°C by the knife edge	Completed on schedule Due Date: 1/31/99
T003-M2	Report the effect of glass chemistry	Experiments II-SF-1, II-SF-2, II-SF-3, II-SF-4, II-SF-5, II-TF-1, and II-TF-2	Due Date: 3/31/99
T003-M3	Report the effect of crud deposits on the back side of the knife edge	Experiments ES-1, ES-2, ES-3, and ES-4	Due Date: 4/30/99
T003-M4	Report the effect of eroded knife edges	Experiments ES-5, ES-6, ES-7, ES-8, ES-9, ES-10, ES-11, ES-12, ES-13, ES-14, ES-15, and ES-16	Due Date: 9/30/99
T003-M5	Final report	Draft and distribute the Final report on results of the project delivered to DOE	Due Date: 10/31/99

## Significant events

- Milestone T003-M1 was achieved as per schedule. The task involved installation of an additional knife edge to the pour spout and attainment of a temperature of 1150°C at the knife edge.
- SRTC personnel will be visiting FIU-HCET during the last week of February 1999 to observe first-hand a glass pouring test in progress and discuss the tasks for FY99. They will also address the scope of additional funding for FY99/00.

## Accomplishments and technical progress

- During the baseline runs, heat losses at the end of the pour spout resulted in temperatures less than 1100°C. An additional heat zone has been installed on the pour spout to account for end heat loss. Thermal profiling (shown in Figure 1) for the improved pour spout was carried out, and the temperature of the knife edge was found to be 1148°C at the tip, 1149°C at the back angle, and 1150°C at the upper knife edge.
- The technical drawings for the eroded knife edge experiments are currently under review by SRTC.
- Modifications (shown in Figure 2) have been made to provide additional support to the pour spout from the top.
- SRS is making arrangements to provide the “new” glass frit for task 2. Task 2 will focus on the effect of glass chemistry on pouring behavior that may be caused by different surface tension and viscosity properties. The nominal pour spout geometry will be used.
- The original glass sample and sample taken from the melter have been sent to Analytical lab to determine the glass composition change due to melting.

## Assessment of current status

The project is on schedule. As per the PTP for FY99, the modifications to the melter/furnace were completed by the end of January 1999, as indicated by milestone T003-M1.

## Plans for the next two months

The plans for the next period include the following:

- Test and validate performance of the glass flow control system.
- Run 4-5 fluctuating glass flow experiments to simulate actual operating conditions of the DWPF melter.

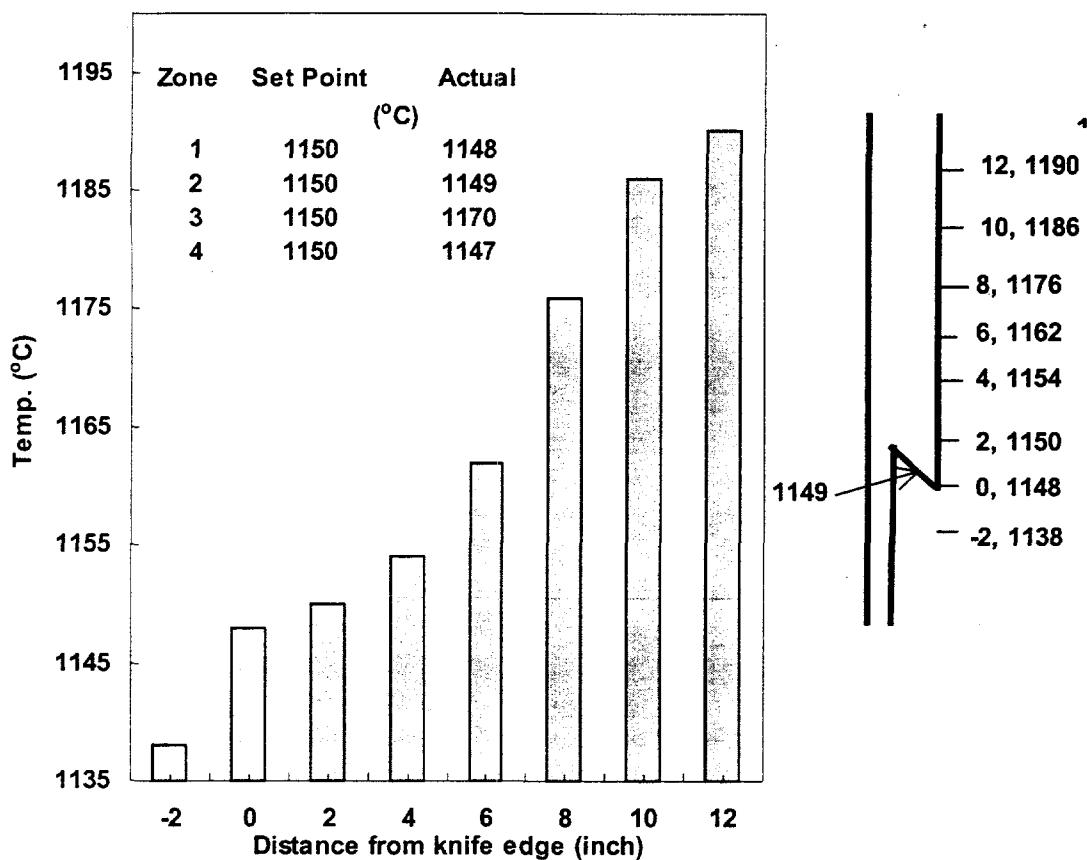
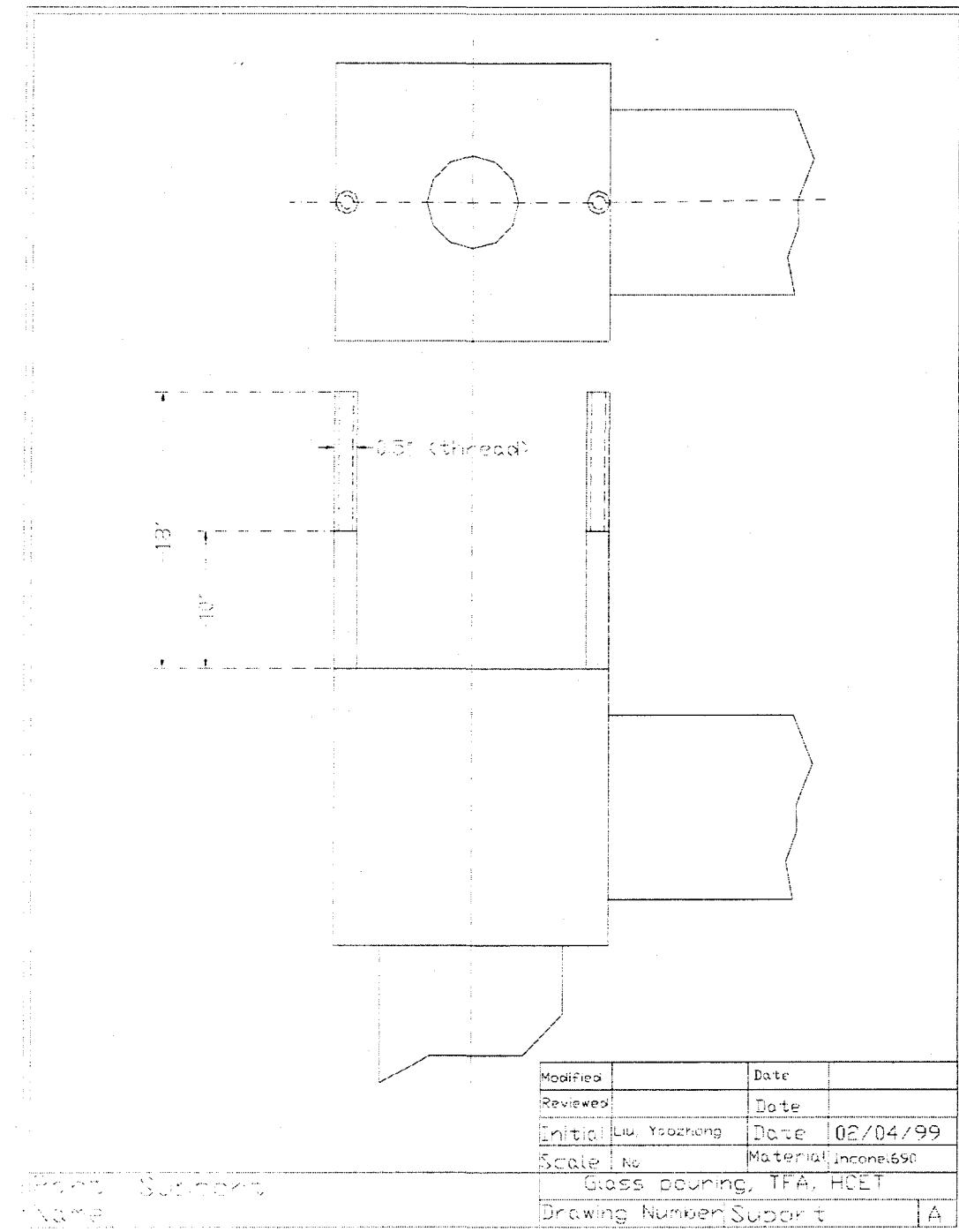


Figure 1. Thermal profile of the pour spout and the knife edge after installation of additional heat zone.



**Figure 2. Additional support structure for the pour spout.**

**FIU-HCET collaborators**

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### **III. CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY**

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#### **MONTHLY PROGRESS REPORT**

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## Online Measurement of the Progress of Decontamination

**Project Number: HCET-1998-C005**

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### **Project objectives**

The accurate characterization of contaminants is a critical task during several different phases of deactivation and decommissioning (D&D) operations. This project focuses directly on in-process characterization. Present characterization technologies typically require the cessation of decontamination activities, while the contamination remaining is assessed. This usually requires the decontamination activity to cease awaiting a separate radiological survey.

The specific aims of this subtask include the following:

- Find in-process characterization methods, especially in the area of radiation sensor systems that can be integrated with a suitable decontamination technology in order to combine decontamination and characterization activities.
- Include in the technology integration data collection, storage, and transmission components on the instrument for remote monitoring and computer downloading functions, allowing for continuous decontamination activities coupled by real-time assessments of the amount of contamination remaining. The result would be an overall gain in productivity accompanied by cost and time savings. A second important advantage would be that a minimum amount of material could be removed with a commensurate minimum production of residual waste.
- Adapt an existing decontamination technology with commercially available characterization technologies to develop a prototype instrument that will be assessed and then commercially deployed. A closed-system decontamination technology will be selected that utilizes a vacuum or contaminant collection system and will be integrated with appropriate radiation sensing devices and data collection components. This integration of technologies will yield an improved instrument that may be continuously operated, removing contaminated materials and simultaneously assessing the removal progress.

### **Major milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
C005-M1	Operational prototype	Prototype functional	Due 3/3/99 *Delayed until 5/14/99
C005-M2	Demonstration at FIU-HCET	Documented demonstration of prototype	Due 5/30/99 *Delayed until 7/30/99
C005-M3	Deployment	Initiate deployment at DOE site	Due 8/28/99
C005-M4	Year-end report	Submission	Due 9/30/99

\* As per FY99 PTP and Assessment of Current Status following a design and implementation review required revisions to design and procurement. Milestone 1 is expected to be delayed until no later than May 14, 1999, and milestone 2 until no later than July 30, 1999.

## **Significant events**

New sensors have been requisitioned for integration. Sensor and human interface electronics design is underway, and micro-controller design has been initiated. Effluent monitoring sensor sub-system is designed. Peer review has been initiated.

## **Accomplishments and technical progress**

- Alternative technologies and vendors for sensors identified.
- Operator interface and associated components design refined.
- A three-level characterization implementation platform has been integrated: sensors before decontamination; sensors following decontamination; sensors of effluent during contamination. Logical and operator efficacious display of acquired data is under consideration.

## **Assessment of current status**

Review of preliminary system design and proposed implementation revealed discrepancies between design and ordered equipment with original scope and plan. A revised design and requisition is in process with expected minimal disruption of the initial milestone and task procession. Parallel projects are providing synergism and effectively accelerating the rate of progress. One of these projects, High Productivity Vacuum Blasting System, includes real-time operator feedback of the efficacy of the decontamination process. Another is Integrated Vertical and Overhead Decontamination and includes real-time characterization of vertical and overhead surfaces during decontamination. The function and implementation of the three sensor systems will by intent include interchangeable processes and components. The primary decontamination machine for the instant project prototype is available at FIU-HCET. Assembly of characterization components has begun.

## **Plans for the next two months**

- Purchase remaining components for radiological sensing, operator interface, data logging, and spatial orientation.
- Generate revised design drawings for component integration.
- Integrate components into prototype assembly.
- Continue negotiations for DOE facility deployment.
- Continue development of an FIU-HCET demonstration plan.
- Complete peer review of effluent monitoring subsystem.

## **FIU collaborator**

Richard Musgrove, (305) 348-6622

## Remote Surveillance of Facilities Awaiting Deactivation and Decommissioning

Project Number: HCET-1998-C006

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### Project objectives

FY99 is the second year of the three-year project. Many United States Department of Energy (DOE) sites -- Albuquerque Operations Office, Chicago Operations Office, Idaho Operations Office, Ohio Operations Office, Oak Ridge Operations Office, and Savannah Operations Office -- require remote surveillance of their facilities such as production areas, structures, utilities, equipment, drums, tanks, and effluent lines. Currently, these facilities awaiting deactivation and decommissioning (D&D) must be periodically surveyed for various criteria including contamination levels, structural deterioration, water intrusion, animal intrusion, integrity of storage containers, the atmospheric conditions, and radioactive and hazardous substance releases. The surveys themselves are intrusive, time-consuming, expensive, and expose survey personnel to radioactive contamination and radiation. The purpose of this project is to develop a remote surveillance system that is capable of collecting data from a DOE site (remote station) and transmitting the data to a central location (base station).

Following are the objectives of the project:

- Define specific surveillance needs among the facilities awaiting D&D.
- Select appropriate sensors for different facilities and test them for their performance.
- Select components of the measuring system, integrate them, and test the performance of the sensors and the system.
- Select appropriate data collection, storage, transmission, and receiving units.
- Design a central monitoring unit.
- Integrate the different units into a prototype surveillance system and test the system.
- Test the system at a DOE site.
- Deploy the system at a DOE site.
- Design and implement a plan for commercialization.

## Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
C006-M1	Testing at FIU-HCET	Components and integrated unit tested at FIU-HCET	Due: 1/11/99 *. Rescheduled for 5/31/99
C006-M2	Testing at a DOE site	Tested at a DOE site for site-specific parameters	Due: 4/16/99 * Rescheduled for 6/30/99
C006-M3	System Improvement	Modifications completed.	Due: 5/17/99 * Rescheduled for 7/30/99
C006-M4	Performance evaluation	Performance evaluated under ambient environmental conditions	Due: 8/27/99
C006-M5	Deployment plan	DOE site deployment plan created.	Due: 10/1/99
C006-M6	Commercialization plan	Industrial partner interested in commercialization of the system identified	Due: 10/30/99
C006-M7	Year-end report	Report completion	Due: 11/30/99

\* In FY98 the project has had difficulty securing site user support that was originally planned to be the driver for technology development and integration. During FY99 this approach has been reversed as users expressed an interest in reviewing an a-priori design and then ordering customized options for deployment at their sites. The project has been redirected accordingly. Additional explanation is provided below in *Assessment of current status*.

## Significant events

- Redirection of project has produced change in the project design and execution approach:
  - Previous design concept was based on solicited user specifications.
  - Current design concept is based on modular design that will be marketed to users in an established core system with provision for customization.
- Lack of responsiveness to the previous design concept from potential users was due to the desire to consider the proposed system in detail. The current design concept allows specific presentation of design features.

## Accomplishments and technical progress

- Design review was initiated; will be completed next month and review-documented to QA standards.
- Commercial entities providing potentially synergistic products were contacted.
- Initial contacts were made with a new DOE site representative to solicit site involvement.

### **Assessment of current status**

- Project has been reviewed, and redirection has been created enabling convergence with initial scheduled status within fourth quarter of the fiscal year.
- FY98 tasks incomplete and scheduled for execution in FY99 include:
  - \* Selection of suitable technology
  - \* Assessment of cost saving and safety improvements expected from the development of the monitoring system
  - \* Engineering review of the selected remote surveillance technology
  - \* Procurement of sensors, components, and measurement units
  - \* System integration.

### **Plans for the next two months**

- Obtain a firm commitment from a site.
- Purchase system components, assemble, and test at FIU-HCET.
- Provide FIU-HCET's site liaisons with design information to aid their site participation solicitation efforts.
- Refine context of system capabilities and orientation to fit most common remote surveillance needs at DOE sites and to provide modular adaption for specific sites.
- Complete design review to meet FIU-HCET QA standards.

### **FIU collaborator**

Richard Musgrove, (305) 348-6622

## Measurement of Alpha Contamination on Contaminated Surfaces Using an Electret Ion Chamber

**Project Number: HCET-1998-C008**

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### **Project objectives**

In and around nuclear plants such as vitrification plants, fuel reprocessing plants, uranium plants, thorium plants, waste storage facilities, reactors, and radiological laboratories, surfaces (floors, walls, ceiling, and equipment) and soil may become contaminated with alpha-emitting radionuclides such as uranium, thorium, radium, americium, or plutonium. It is important to be able to measure such contamination and classify it as below or above the permissible levels. The permissible levels of alpha contamination are low. The U. S. Department of Energy (DOE) requires low-cost, reliable methods for measuring low levels of alpha contamination. Current methods for measurement of low levels of alpha contamination in a large facility are expensive and expose survey personnel to radiation. The goal of this two-year project:

- Develop a system for low-cost and reliable measurement of surface alpha contamination and to deploy it at a DOE site. This involves the use of commercially available electret ion chambers and their calibration using reference alpha sources.
- Determine times required for measurement of an alpha contamination at the free release level for six different chamber-electret combinations, their useful range, effect of environmental radon and gamma radiation on alpha contamination measurement, cost comparison with baseline technologies, and demonstration and deployment at a site.

### **Major milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
C008-M1	Cost-benefit analysis	Data showing performance of EIC vs. baseline technologies	<p>Scheduled for completion by 12/15/98.</p> <p>Measurements using EICs and baseline technology (alpha probe) completed at a test-bed at FIU-HCET. Cost comparison performed. Vendor negotiations and site user solicitation delayed completion.</p> <p>Completion scheduled: 3/5/99</p>

Milestone No.	Milestone Description	Completion Criteria	Status
C008-M2	Deployment plan	Commitment for use of EICs for alpha contamination from one or more DOE sites	Scheduled for completion by 2/8/99. Liaison at Oak Ridge informed FIU-HCET of a potential test demonstration opportunity for the EIC technology for floor characterization at K-1420. Main source of contamination: depleted and enriched uranium. Began working to support DDFA on LSDDP. Test plan prepared. Expected completion date: 3/12/99
C008-M3	Deployment	Deployment of the EIC system at one or more DOE sites	Scheduled for completion by 5/17/99
C008-M4	Information flow	Availability of procedures, instructions, manuals, and information on developments and improvements to DOE	Scheduled for completion before 10/30/99
C008-M5	Final report	Report completed and issued	Scheduled for completion by 11/30/99

## Significant events

- Calibration of the EICs for alpha contamination has been performed. Response factors, useful range, and effect of radon and gamma radiations on alpha contamination measurement have been determined.
- A paper entitled "Measurement of Surface Alpha Contamination Using Electret Ion Chamber" was submitted to the *Health Physics* Journal and has been accepted for publication.
- A test-bed has been set up at FIU-HCET. Measurements have been performed using EIC and alpha probe. EICs (window areas of  $48.5 \text{ cm}^2$  and  $180 \text{ cm}^2$ ) with Mylar and Tyvek covers were tested on the test-bed. The data generated in this experiment shows that bathroom tiles can be used as test-bed for calibration of instruments. The experiments on tiles add the following value to the project:
  - A comparison of the EICs with a baseline technology is made for alpha contamination on tiles.
  - Tiles of a particular make have uniform contamination and can serve as test-beds for calibration of instruments, and is particularly useful for large area instruments as large area calibration sources are not easily available or are prohibitively expensive.
  - Different types of tiles have different surface alpha activity. Thus, it is possible to have sources of varying fixed alpha contamination levels needed for instrument calibration.
- An abstract on measurements performed at a test-bed was submitted to the Health Physics Society for presentation at the 44<sup>th</sup> Annual Meeting of the HP Society.

## Accomplishments and technical progress

- The response of the 145-mL windowless chamber for an  $^{241}\text{Am}$  alpha source placed at different distances from the chamber's centerline was measured. Its response for other alpha emitters ( $^{237}\text{Np}$ ,  $^{239}\text{Pu}$ , and  $^{244}\text{Cm}$ ) was also measured.
- The response of 960-mL chambers, with and without aluminized Mylar windows, for different alpha sources placed at different distances from the chamber's centerline was measured.
- Interference of environmental radon and gamma radiation on alpha contamination measurement was determined for both 145-mL and 960-mL. The minimum times required for measurement of alpha contamination, useful ranges for different combinations of electrets and chambers, and attenuation by Mylar were determined. EICs are light-weight and can be easily placed on different surfaces, such as floors, walls, and ceilings for alpha contamination measurement. An electret can be used many times before its charge drops to a low value that necessitates its replacement with a new electret.
- A test-bed has been set up at FIU-HCET. Measurements using EIC and alpha probe are nearing completion.

## Assessment of current status

- The system has been calibrated and is ready for demonstration. FIU-HCET is contacting representatives from Fernald, Oak Ridge, Rocky Flats, and Savannah River for demonstration of the technology. Among these sites, there is strong potential for demonstration and deployment at Oak Ridge (K-1420). New information about DDFA's desire for demonstration and deployment at the SRS LSDDP was received.
- Measurements performed on ceramic tiles on FIU-HCET test-bed demonstrated the usefulness of the system for measurement of low levels of alpha contamination (less than one-half the free release limit for transuranics). These measurements are providing comparative performance data and detailed information for cost-benefit analysis.
- Rad Elec, Inc., vendor of EICs, tested electret ion chambers at a 12m  $\times$  12m bay at the East Tennessee Technology Park (ETTP), Oak Ridge, during the early part of November 1998. This data will be used cooperatively by FIU-HCET and combined with FIU-HCET generated data to provide comprehensive comparative information on EIC performance.

## Plans for the next two months

- Analyze the measurements performed at a test bed set up at FIU-HCET. These will provide a comparative study with a baseline technology—time required for measurement, cost of measurement, and radiation exposures likely to be received.
- A potential demonstration opportunity for the EIC technology for floor characterization at K-1420 exists. The main source of contamination is depleted and enriched uranium. FIU-HCET will be planning and performing a demonstration of the EIC at this facility. Measurement will also be performed using an alpha probe for cost comparison and performance evaluation. A test

plan has been prepared and a demonstration planned for a date in March 1999, mutually acceptable to FIU-HCET and Oak Ridge.

- Present the results of EIC at the CMST-CP Mid-Year Review Meeting at Gaithersburg, MD.

**FIU-HCET collaborator**

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## Review of Current Characterization and Monitoring Practices at DOE Sites

**Project Number: HCET-1999-C009**

### **Project objectives**

The goal of this project is to document current practices (baseline technology) for environmental technologies in the areas of site characterization and waste/processing monitoring at DOE sites. Data concerning each technology's cost and performance will be tabulated in a database. This information will assist the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) in evaluating innovative technologies by facilitating the comparison of performance and cost data for the new technologies to the baseline technologies.

This activity, during its previous stages in FY97 and FY98, collected and compiled information from technology users, purchasers, and project sponsors. This information was published and converted into a database. FY99 is the first year that this project is managed by Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET). FY99 activities include the following objectives:

- Review the current characterization and monitoring practices and baseline technologies at Hanford (RL) and Oak Ridge (OR).
- Collect and assess cost and performance data for these baseline technologies.
- Update the database to include this new information.

### **Major milestones**

Milestone No.	Description	Completion Criteria	Status
C009-M1	Evaluate Current DOE Characterization and Monitoring Needs at Hanford and Oak Ridge.	Table of the current STCG needs indicating title, description, requirements, regulations, baseline method/technology, and point of contacts	Completed on 1/11/99, before due date of 2/11/99
C009-M2	Identify DOE Baseline Characterization and Monitoring Technologies at Hanford and Oak Ridge.	List of the baseline methods and technologies currently used to meet the STCG needs.	On schedule to be completed by 4/16/99
C009-M3	Describe the baseline technologies and the DOE requirements they meet.	List of the description and performance data of each method/technology identified in milestone #2.	On schedule to be completed by 5/17/99
C009-M4	Assess costs of use of baseline technologies	Table of the cost data of each method/technology identified in milestone #2.	On schedule to be completed by 8/27/99
C009-M5	Maintain and describe the CMST-CP current practice database	Incorporation of the data from milestones #1, 2, 3, and 4 into a database	To be completed by 10/30/99
C009-M6	Prepare year-end report for FY99	Report summarizing the accomplishments of Fiscal Year 1999 for this project.	To be completed by 11/30/99

### **Significant events**

- STCG characterization and monitoring needs at Hanford and Oak Ridge have been entered into the database. Information in the database includes need number, name, description, technology requirement, regulatory concerns, baseline technology, and points of contact.

### **Accomplishments and technical progress**

- Continued the review and tabulation of the STCG baseline technologies currently used to realize STCG characterization and monitoring needs for Oak Ridge and Hanford.
- Continued developing and designing the database.

### **Assessment of current status**

This project is proceeding and no scheduling deadlines have been missed. Milestone 1 has been completed. Currently, no impediments are known that could delay the on-schedule completion of milestone 2.

### **Plans for the next two months**

- Complete the review and tabulation of the baseline technologies currently used to meet the STCG needs for the Hanford site and Oak Ridge (milestone 2).
- Initiate the description of the baseline technologies (milestone 3).
- Initiate acquiring cost and performance data for the baseline technologies. Data will be obtained from end users, vendors, STCG members, and available documentation.
- Initiate contacting site personnel to arrange interviews and a site visit.
- Continue work on developing database.

### **FIU-HCET collaborator**

Hans Weger, (305) 348-6620

## Demonstration and Deployment of CMST-CP Technologies

**Project Number: HCET-1998-C010**

### **Project objectives**

The Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) exists to deliver appropriate characterization, monitoring, and sensor technologies to the Department of Energy (DOE), Office of Waste Management (EM-30), Office of Environmental Restoration (EM-40), and Office of Facility Transition and Management (EM-60).

The purpose of this project is to assist CMST-CP with the final steps of this process. In short, it will help to take the technologies developed by CMST-CP to their ultimate use in the field. It is also a goal of this project to strengthen CMST-CP relationships with the users with the idea of deploying technologies more quickly and efficiently. To that end, Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) will help coordinate some of the deployment and related activities between the CMST-CP and the site users. In addition, this activity will directly support CMST-CP's D&D coordinator.

To assist CMST-CP, FIU-HCET will provide the following:

- Examine the technology development activities and work together with CMST-CP to develop schedules for demonstration and deployment of these technologies.
- Match the technologies with characterization and monitoring needs of the customers.
- Choose sites to help facilitate demonstration and/or deployment.
- Use FIU-HCET's existing relationships with the rest of EM and the other focus areas to assist CMST-CP in selling the use of its technologies.
- Once an agreement has been reached, work with the customer to refine the demonstration/deployment process and schedule. If the user and CMST-CP so desire, FIU-HCET could then coordinate and perform the demonstration at the user's site.

### **Major milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
C010-M1	Schedule & number demonstrations and/or deployments	Definitive list of activities generated.	To be completed by 3/15/99
C010-M2	Choose sites	Deployment/demonstration sites identified.	To be completed by 3/31/99
C010-M3	Demonstrations	Complete scheduling and organization	Due 3/31/99
C010-M4	Deployment	Site commitment to deploy a selected CMST-CP technology(ies).	Due 10/30/99
C010-M5	Marketing	Site commitment to deploy	Due 10/30/99

## Significant events

Due to funding cuts from CMST-CP, the project scope has been reduced. CMST-CP technology(ies) will be selected during the CMST-CP Mid-Year review.

## Accomplishments and technical progress

- A literature review of CMST-CP technologies has begun. Based on the literature review and information gathered at CMST-CP Mid-Year review, technologies will be selected for deployment assistance. Initial site contacts have been made.

## Assessment of current status

Review of project scope revealed discrepancies between intended purpose and realizable accomplishments. A revised tasking and milestone list are in process. Concerted effort to select and target a number of undeployed and/or not demonstrated technologies is presently underway.

## Plans for the next two months

- Select technology(ies) for deployment during CMST-CP Mid-Year review.
- Hold discussions with CMST-CP management for explicit support with project efforts.
- Initiate contact with CMST-CP, DOE focus areas, and technology PIs.
- Mobilize FIU-HCET resources in anticipation of active demonstration/deployment.

## FIU-HCET collaborator

Hans Weger, (305) 348-6620

## Identification of DOE's Post-Closure Monitoring Needs and Requirements

Project Number: HCET-1998-C011

### Project objectives

The 2006 plan sets an ambitious agenda for the U.S. Department of Energy, Office of Environmental Management's (DOE-EM) cleanup work. In the context of Accelerating Cleanup: Focus on 2006, closure refers to the completion of area- or facility-specific cleanup subtasks. The cleanup levels are determined by the planned future use of the site or facility. Many of the future land use decisions have yet to be made, though certain basic cost-based land use assumptions have been determined. Little or no EM land will be remediated to "residential use" levels; most will be remediated to "industrial use" levels with access restrictions, while some areas will be closed off through containment.

Most of the industrial use and closed-off lands will require monitoring. In the restricted and waste storage areas, the waste levels, condition, and containment will need to be monitored. In the nearby areas, groundwater and soils will need to be monitored per monitoring requirements imposed by regulators and stakeholders. Regulators will not approve closure plans without the specification of clearly defined monitoring methods using approved technologies. Therefore, inadequate planning for monitoring and the lack of appropriate monitoring technologies often prevent closure.

The current and evolving post-closure monitoring requirements at DOE-EM sites must be determined, documented, and tracked to provide the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) with information to guide its post-closure technology development and deployment efforts. As part of this subtask, Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) will

- Determine and track post-closure monitoring needs at the Hanford, Savannah River, and Fernald sites (FY98) and the Oak Ridge (OR) and Rocky Flats (RF) sites (FY99).

### Major milestones

Milestone No.	Description	Completion Criteria	Status
C011-M1	Identify key post-closure monitoring needs and commitments at Oak Ridge.	A report, to be included as part of the final report, of the post-closure monitoring needs and commitments for Oak Ridge.	On schedule to be completed by 4/30/99
C011-M2	Identify key post-closure monitoring needs and commitments at Rocky Flats.	A report, to be included as part of the final report, of the post-closure monitoring needs and commitments for Rocky Flats.	On schedule to be completed by 6/30/99
C011-M3	Identify the most common post-closure monitoring needs within EM	A report, to be included as part of the final report, of the most pressing post-closure needs based on the five sites reviewed in FY98 and FY99.	Scheduled to begin 6/30/99
C011-M4	Write the final report for the project	Report describing the post-closure needs for Oak Ridge and Rocky Flats, summarizes the post-closure needs for all five sites reviewed in FY98 and FY99, and the most pressing post-closure needs with EM	To be completed by 10/31/99

## **Accomplishments and technical progress**

- Continued reviewing information for Oak Ridge concerning post-closure requirements and needs. Obtained and reviewed Records of Decisions, fact sheets and other. Obtained post-closure permits for several sites at Oak Ridge.
- Contacted and obtained useful information from Steve Tarlton of Colorado Department of Public Health and Environment.
- Continued the identification of technology, either available or being developed, that is capable of meeting post-closure needs of DOE sites.
- Contacted Keith Wilkerson (STCG representative) of Fernald. He agreed to review and comment on the post-closure review of Fernald from FY98. Report was mailed to him.

## **Assessment of current status**

This project is proceeding and no scheduling deadlines have been missed. Currently, no impediments are known that could delay the on-schedule completion of milestones 1 and 2.

## **Plans for the next two months**

- Conclude reviewing relevant documents (closure plans, post-closure plans, and Records of Decisions) for Oak Ridge. Contact different site personnel concerning specific questions or documents.
- Obtain and review relevant documents concerning post-closure activities at Rocky Flats. Documents will be ordered from the Technical Library, and site personnel will be contacted.
- Contact personnel identified by Steve Tarlton to obtain further information concerning post-closure plans for Rocky Flats.

## **FIU-HCET collaborator**

Hans Weger, (305) 348-6620



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#### **IV. INTERNATIONAL TECHNOLOGY INTEGRATION (ITI)**

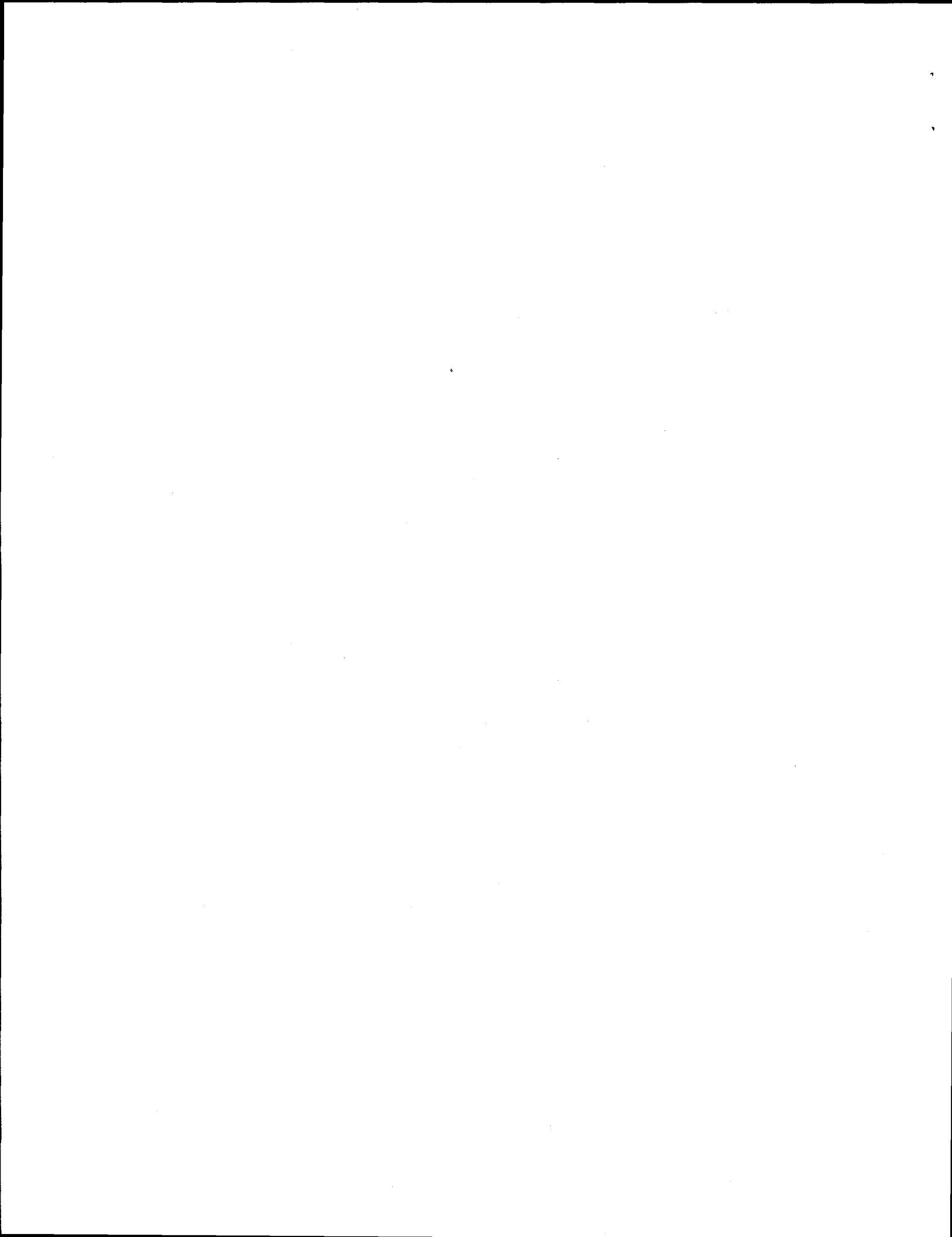
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#### **MONTHLY PROGRESS REPORT**

**FIU Principal Investigator  
FIU International Coordinator  
Focus Area Technical Lead  
Program Officers**

**M.A. Ebadian  
Ana Ferreira  
Elizabeth O'Malley  
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## Opportunities to Market U.S. Technologies Throughout the Western Hemisphere

**Project Number: HCET 1996-I001**

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### **Project objectives**

Because of its size, sophistication, and geographic proximity, the U.S. environmental industry has the potential to become a major player in the environmental markets in Latin America and the Caribbean. Building on the alliances previously established by Florida International University (FIU) with organizations in Latin America and the Caribbean, the Hemispheric Center for Environmental Technology (FIU-HCET) will work with U.S. governmental agencies and industry to develop, adapt, and market/transfer their technologies throughout the Western Hemisphere. FIU-HCET will aid government leaders of the Americas in the promotion of the use of efficient and non-polluting technologies.

FIU-HCET manages an aggressive international program for applied research, development, demonstration, testing, and evaluation. This program to identify opportunities to market U.S. technologies throughout the Western Hemisphere has been successful. It has made a number of cooperative agreements that seek to identify technologies to aid in the cleanup of DOE nuclear component manufacturing sites and, at the same time, identify technologies for international usage to work faster, safer, and cheaper than current available technologies.

This project involves an open-ended, continuous process of information gathering with respect to Latin American and Caribbean environmental issues. This entails the development of contacts with individuals and institutions conducting research and work on issues of sustainability and environmental technology in the Americas. As part of this phase, a database containing information on firms, nongovernmental organizations (NGOs), governmental institutions, and other participants in Latin America's environmental sector is being developed.

### **Open-Ended Milestones**

<b>Milestone No.</b>	<b>Milestone Description</b>	<b>Completion Criteria</b>	<b>Status</b>
I001-M1	Database: Formulate a database of U.S. business contacts working in the field of environmental technologies	This milestone is ongoing.	Survey has been sent out to a number of U.S. environmental technology companies, asking them to describe their abilities and market experience. Will discuss with DOE's Office of Policy, the possibility of incorporating database with web site. Due date: 3/10/99.
I001-M2	Internet Tool: Maintain the Internet tool referred to as the 'Virtual Secretariat' for the participants of the Western Hemisphere Energy Symposium	Identify funding mechanism for the support of the Interactive Communication Web site.	A tentative meeting was proposed by DOE's Office of Policy to discuss funding the Web site. Due date: 3/10/99  (Note: the due date was changed at the request of DOE Office of Policy.)

Milestone No.	Milestone Description	Completion Criteria	Status
I001-M3	Participate at the next Hemispheric Energy Steering Committee meeting in Lima, Peru.	Make a presentation of the 'Virtual Secretariat' and introduce FIU-HCET to participants of the Steering Committee, announce necessity of identifying future funding for the Internet tool and officially request membership on the Climate Change Working Group headed by Canada.	Completed: 2/11/99
I001-M4	Enterprise Florida: Identify U.S. companies who would be interested in participating in the next Export Marketing Mission to Argentina, April 10-16, 1999.	Identify a minimum of 20 companies for mission. Enterprise FL has suggested that FIU-HCET participate.	Went through database, identified 29 companies. Have e-mailed letter to companies; responses will be forwarded to Enterprise FL. Due date: 4/99.

### Significant events

- Attended the VIII Steering Committee meeting held in Lima, Peru, February 11-12, 1999. Successfully introduced the Interactive Communication Website to the members of the Steering Committee. The meeting allowed the opportunity for FIU-HCET to meet all the members of the Steering Committee. In addition, FIU-HCET discussed the possibility of joining the Climate Change Working Group headed by Canada and Venezuela. Discussions are only at the beginning stages; but joining this Working Group will allow the opportunity to market U.S. environmental technologies to Latin America.
- The following initiatives were proposed by the Steering Committee for the next working group agenda: a training session of the Member Area of the Web site for the Steering Committee and working groups by FIU personnel; and identifying funding mechanisms for the maintenance of the Web site. A preliminary funding meeting was tentatively proposed for March 1999.

### Accomplishments and technical progress

- From the response to the survey on Internet capabilities, the Web site has been programmed to accommodate the Internet capabilities of all the Western Hemisphere Steering Committee Representatives, so that all representatives will be able to view the Web site.
- The successful demonstration of the Web site is consistent with the ITI plan to promote FIU-HCET and OST-DOE internationally and to continually seek out business endeavors for U.S. business. Specifically, this demo has allowed FIU-HCET to be a part of the Summit of the Americas process and will expand the ITI knowledge on policy-related issues in the countries of Latin America. This will be accomplished by disseminating information on energy-related issues.

### **Plans for the next two months**

- FIU-HCET personnel will continue to assist the DOE-EM international program manager in activities with the CNEA of Argentina.
- FIU-HCET personnel will continue to send bi-weekly e-mails to DOE-EM on the Center's Latin American initiatives on behalf of DOE.
- FIU-HCET personnel will meet with DOE and Steering Committee representatives to identify funding for the Interactive Communication Website.

### **FIU-HCET collaborator**

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