July 1999

HCET News Highlights

Hemispheric Center for Environmental Technology, Florida International University

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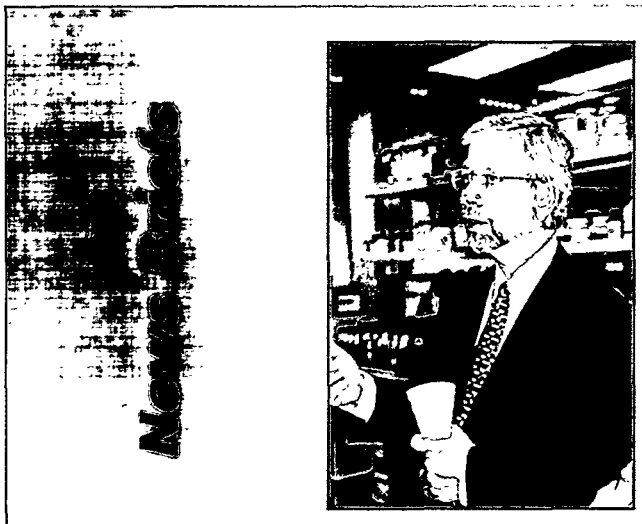


Mr. Gerald Boyd, Acting Deputy Assistant Secretary for DOE's Office of Science and Technology, received an update on HCET's facilities and programs during a recent visit. His last visit had been in 1997. Mr. Boyd toured HCET's laboratories, including the Tanks (TFA) program laboratory, and also met with FIU President Modesto Maidique and other administrators. Mr. Boyd was also given an overview of the Center's Technology Assessment Program and technical R&D efforts. He was provided a demonstration of the Internet-based technology information tools developed by HCET on behalf of the DDFA. Mr. Boyd expressed particular interest in the multimedia and decision analysis systems for their possible usefulness as models for the focus areas.

Sponsors Call for Papers for the IDS 2000 Conference

The Technical Program Committee of IDS 2000 (International Decommissioning Symposium) invites managers, researchers, engineers, and scientists to submit abstracts of technical papers for presentation or poster sessions during the IDS 2000 conference to be held in Knoxville, TN, June 12-16, 2000.

The international conference will include participation by representatives from Canada, France, Germany, Japan, Russia, the United Kingdom, and Latin America. The conference will have an indoor exhibit hall for trade shows as well as outdoor sites for technology demonstrations. Sessions will be geared toward information exchange and "lessons learned." There will be a tour of the DOE Oak Ridge Site, where current operations include equipment removal, metal recycling, and facility characterization and decommissioning. The workshops, presentation and poster sessions, and panel discussions will cover such overall topics as characterization, deactivation, re-industrialization, recycling, technology applications, decommissioning, and waste disposal. The technical committee seeks abstracts on those topics as well as on worker health and safety, regulatory and stakeholder issues, and innovative business practices.

The U.S. Department of Energy (DOE) Office of Environmental Management will be hosting the Fourth Annual International Decommissioning Symposium. FIU-HCET will be the lead coordinator, under the direction of DOE's Oak Ridge Operations-based National Center of Excellence for Metals Recycle (NCEMR) with support from DOE's Office of Science and Technology's (DOE-OST) Deactivation and Decommissioning Focus Area (DDFA) and industry and university programs at the Federal Energy Technology Center (FETC).

Abstracts for the conference are due August 20, 1999 and may be submitted through the FIU-HCET web site at www.hcet.fiu.edu.

For more information on IDS 2000 and the call for papers, check the following sources: http://www.em.doe.gov/dd, http://www.hcet.fiu.edu, or contact Elaine Elder at elaine@eng.fiu.edu or phone: 305-348-3752.

Dr. Roelant Joins FIU-HCET Team

Dr. David Roelant is the new program manager for the Characterization, Monitoring and Sensor Technology (CMST) program.

Dr. Roelant has been involved with performing or managing research and development for the past 20 years. For the past nine years, he has worked on the development of software, sensor and data acquisition system development, testing and evaluation for the U.S. Department of Defense (DOD) and the U. S. Department of Energy (DOE). He has overseen systems engineering projects, including functional requirements, acquisition regulations and documentation, performance metrics, cost analyses, test and evaluation protocols, and project

management software. Before coming to FIU-HCET, Dr. Roelant was the deputy program manager at Professional Analysis, Inc. in Las Vegas, Nevada. He has worked at Environmental Technology Development, BDM International as a senior scientist, at H. M. Technologies, Inc., and at Berkeley Scholars.

Dr. Roelant received his doctorate in 1990 in nuclear engineering from University of Michigan, where he also earned in 1984 two masters of science, one in nuclear engineering and one in mechanical engineering, and where he earned a dual Bachelors degree in nuclear engineering and applied mathematics in 1982.

FIU-HCET Participates in the Applied Research, Development & Deployment Cleanup Technology Colloquium

Rob Rose, program manager of the FIU-HCET D&D program, participated in a panel session entitled, "DOE's Aggressive Program to Identify, Demonstrate and Evaluate the Performance of D&D Technologies." Rose (pictured below) described FIU-HCET's performance evaluation process. The panel session included presentations from John Meservey of INEEL-LMITCO and John Pierpoint of DOE's Savannah River Site. The session was part of the 10th annual Colloquium held in Scottsdale, Arizona, in May. This year's event was sponsored by The Environmental Council of the States and the Interstate Technology and Regulatory Cooperative.

News Briefs

Large-Scale Slurry Flow Loop Built at FIU-HCET

A 150,000-square-foot field is being used at FIU-HCET to study plugging and unplugging of waste slurry transfer lines. This project will provide DOE with information leading to technologies for solving the pipeline plugging problems experienced at DOE's Hanford, Savannah River, and Oak Ridge Sites.

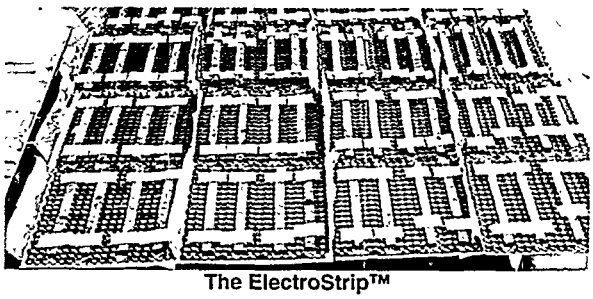
FIU-HCET Disseminates Information for the IV Hemispheric Energy Ministers Conference

The IV Hemispheric Energy Ministers Conference will be held in New Orleans, Louisiana, on July 28-30. Participants will include U.S. Secretary of Energy William Richardson and Energy Ministers throughout the Americas. FIU-HCET, host of the Interactive Communication Website (www.americasenergy.org), has been designated to disseminate all information deriving from conference coordinators. Information pertaining to the conference—including live broadcasts—is currently available on the website.

Masonry Decontamination Technologies Recently Assessed at HCET Facilities

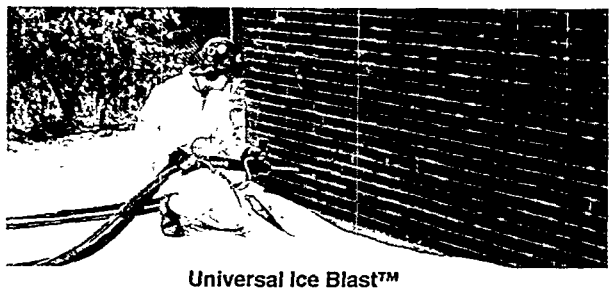
Three technologies to decontaminate metal and masonry that were designed to remove coatings from steel and masonry structures were recently assessed by HCET staff from the Technology Assessment Program.

- The ElectroStrip™ process by EMEC Consultants is designed to remove paint from steel structures. Debonding of the coating is achieved by applying a cathodic current to a painted metal substrate. The environmentally benign electrolyte is contained in a liquid-absorbent material, the ElectroPad™, to which a counter electrode is attached. After electrochemical treatment for ½ to 2 hours at a safe voltage of 8 to 10V, the ElectroPad™ is removed, and paint fragments are recovered. Banks of ElectroPads™ may cover an area up to 150 square feet and can be run simultaneously. Pads can accommodate various sizes and geometries (e.g., rounded surfaces).



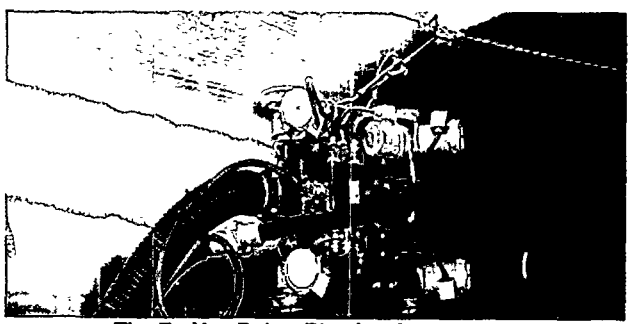
The ElectroStrip™

- Universal Ice Blast™ demonstrated an ice blast technology with a chemical softener. The chemical softener is sprayed on the painted surface and left on for several hours. Ice blast utilizes compressed air to accelerate ice particles made from tap water to remove the paint and clean surfaces without damaging substrates. Ice is produced instantly and continuously for blasting. The ice is transported via compressed air through a hose to a specially designed, ergonomic blast nozzle to be propelled against the surface to be cleaned. By varying the blast pressure, the ice blast system can remove a variety of coatings from hard and soft surfaces.



Universal Ice Blast™

- The En-Vac Robot Blasting System consists of the En-vac robot, a recycling unit, a filter unit and a vacuum unit. The mobile robot unit moves along the work surface and adheres to it with the aid of a high vacuum suction. Mobility is provided with individually motor controlled wheels. The system uses abrasive steel grit or steel shot as the surface removal media. It can work on vertical, horizontal, and inverted surfaces. All operations are contained in a closed loop. The system concurrently separates the removed surface from the removal media. The removal media is recycled continuously with no interruption in system operation. The waste is collected in a storage container within the recycling unit.



The En-Vac Robot Blasting System

Information on technologies evaluated through the HCET Technology Assessment Program (TAP) can be found at http://www.hcet.fiu.edu/tap. Data compiled through the TAP can be found in the new Multimedia Information System accessed through http://www.dandd.org.

August 12, 1999

Ms. Carla Winaught
Reports Receipt Coordinator
U.S. Department of Energy
Federal Energy Technology Center
P.O. Box 880, MS F07
Morgantown, WV 26507-0880

Subject: HCET Monthly Report for July 1999

Dear Carla;

Enclosed you will find the July 1999 Monthly Report and the July 1999 News Highlights produced by the Hemispheric Center for Environmental Technology (HCET) at Florida International University.

Should you require any additional information, please feel free to contact me.

Best regards,

Ali

M.A. Ebadian, Ph.D.
Director

enc.

M.A. Ebadian, Director
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HEMISPHERIC CENTER FOR ENVIRONMENTAL TECHNOLOGY

MONTHLY PROGRESS REPORT

FISCAL YEAR 1999

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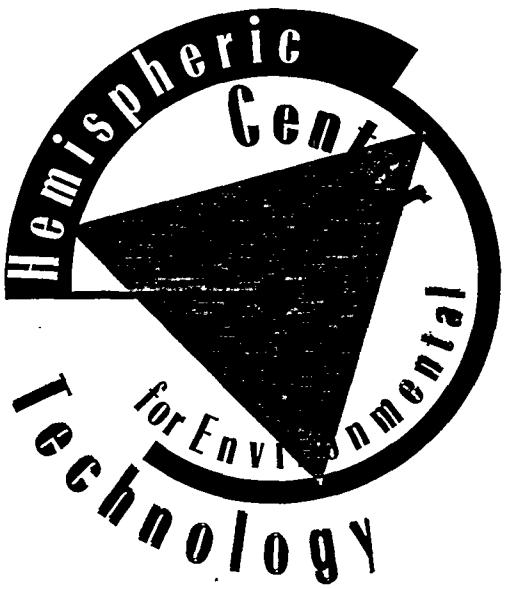

JULY 1999

FIU-HCET Principal Investigator — M.A. Ebadian
Focus Area Technical Lead — Paul Hart
Program Officers — John Wengle
Karl-Heinz Frohne

http://www.hcet.fiu.edu

SUMMARY

- FIU-HCET personnel visited the Special Technologies Laboratory (STL) for discussions with the Principal Investigator (PI) of Laser Induced Fluorescence Imaging (LIFI) and for training in LIFI.

- Mr. Peter Gibbons, Tanks Retrieval Technology Integration Manager, visited FIU-HCET on July 20, 1999. Mr. Gibbons inspected the pipeline unplugging experimental facility at the HCET testing field. The detailed test bed construction, testing plan, and plugging material specifications were discussed.

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

MONTHLY PROGRESS REPORT

FIU-HCET Principal Investigator	**M.A. Ebadian**
FIU-HCET D&D Program Manager	**Rob Rose**
Focus Area Technical Lead	**Paul W. Hart**
Program Officers	**John Wengle**
	Karl-Heinz Frohne

http://www.hcet.fiu.edu

Deactivation and Decommissioning Technology Assessment Program

Project Number: HCET-1996-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 websites 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 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

Milestone No.	Milestone Description	Completion Criteria	Status
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.	Five technologies evaluated for various applications for a total of eight demonstrations. Six technologies are scheduled for July/Aug including the PPPL demo.
D038-M2	Test Plan for Characterization Technologies Assessment Program	Characterization Technology Test Plan Approved	Completed 5/24/99

Milestone No.	Milestone Description	Completion Criteria	Status
D038-M3	Test Plan for Waste Management Technologies Assessment Program	Waste Management Technology Test Plan Approved	Scheduled completion 6/30/99. On hold (see issues section below)
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.	Started 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.	Started 7/6/99. Scheduled completion 10/29/99.

Significant events for this reporting period

- Work is progressing on the technology assessment test facilities for the size reduction of glove boxes and tanks. The construction of the hydraulic system for standing and supporting the tanks inside the testing facility is in progress. The test plan is nearing final internal HCET approval, and the Scope of Work is in process.
- The Princeton Plasma Physics Laboratory (PPPL) demonstration of the diamond wire cutting technology on the mockup of the Tokamak reactor has been delayed until August 23, 1999.
- The evaluation of the Ice Blasting, Inc., technology that was evaluated at FIU-HCET in May 1999 is complete. The Technology Assessment Summary sheet is attached to this monthly report.
- A preliminary evaluation report on the En-Vac Robot Blasting System demonstrated by MHI Marine Engineering, Ltd., in June 1999 is completed. The report will be sent to the vendor, and they will be given 30 days for review. The Technology Assessment Summary sheet will be incorporated into the August monthly report.
- TAP personnel participated in the assessment of the VitalSense™ Telemetric Monitoring System by the Mini Mitter Co., Inc., at the Operating Engineers National Hazmat Program (OENHP) in Beaver, West Virginia. Due to problems during the demonstration, the technology assessment will be repeated in August with a newer model.
- TAP personnel are working closely with Fluor Daniel Fernald personnel to design a test mockup for evaluating technologies for the location of underground utilities and equipment. Water lines, electrical lines, telephone lines, pipes, and tanks are most likely to be found underground at the Fernald site. The items are primarily made of aluminum, steel, copper, PVC and PE. FIU-HCET is working with the Operating Engineers National Hazmat Program (OENHP) to build a test facility in Beaver, WV, for evaluation of innovative and baseline technologies.

- General Lasertronics Corporation has informed HCET that it will submit a proposal for demonstration of their recently modified Laser Coating Removal System. The tentative demonstration date is late September or early October 1999.

Accomplishments and technical progress to date

- Under this grant project 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 has been compiled. This data has been valuable in assessing whether 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 innovative technologies. Technology assessment data is managed using a Microsoft Windows-based multimedia information system.
- In FY99, five technologies have been evaluated to date in multiple applications giving a total of eight demonstrations. The technologies evaluated include
  - Bartlett Robotic Climber - Bartlett Services, Inc.
  - Fourier Transform Profilometry – Mississippi State University, DIAL
  - ElectroStrip™ -- EMEC Consultants
  - Ice Blast with Chemical Softener – Ice Blast, Inc.
  - En-Vac Robot Blasting System – MHI Marine Engineering, Ltd.

Assessment of current status and issues

This project is on schedule. Five technologies have been assessed in FY99, and six additional technologies are scheduled. Test plans for assessing Facility Dismantlement and Facility Characterization technologies have been completed.

The generation of a test plan for Waste Management Technology Assessment has been placed on hold pending a reassessment of the complex-wide needs and on-going development programs to allow for an optimized assessment strategy.

Plans for the next two months

Activities for the next two months include the following:

- Continue technology search for FY99 demos. Demonstrate at least six technologies, the diamond-wire cutting at PPPL and several health and safety technologies, by the end of August 1999. The evaluation schedule for the Human Factors Assessment for Heat Stress Management Technologies at the OENHP facility is as follows:

Technology name	Technology vendor	Demonstration date
Temp 2 Personal Heat Stress Monitor	Quest Technologies	7/19/99 - 7/23/99 & 8/2/99 - 8/6/99
HS3800 Personal Heat Stress Monitor	Metrosonics	7/26/99 - 8/6/99
MTR Chemical Protective Suit	Kimberly Clark	7/19/99 - 8/13/99
Cooling Vest	Kool N Safe	8/16/99 - 8/20/99

- Finalize the data collected from the En-Vac technology assessments completed in June. Include summaries of the technology in the monthly reports.
- Complete the test plan and mock-up for the Glove Box and Tank size reduction technology assessments and begin scheduling technologies for demonstration.
- Determine a strategy for FIU-HCET to perform Waste Management technology assessments.
- Work with the OENHP to design the test facility for Non-Intrusive Location of Buried Items Technologies and write test plan for this project.
- Complete the design of the multimedia information system for dismantlement and begin programming.

FIU-HCET Collaborator

Susan C. Madaris, (305) 348-3727

TECHNOLOGY ASSESSMENT PROGRAM (TAP)
Decontamination Technology Assessment Summary

Ice Blast with Chemical Softner

DEMONSTRATION OBJECTIVE

The technology was demonstrated at FIU-HCET on April 26 to May 3, 1999, by Universal ice Blast, Inc. The objective of the demonstration was to remove coatings from masonry walls, carbon steel plates, and I-beams.

TECHNOLOGY DESCRIPTION

Universal Ice Blast, Inc.
Epoxy coating is removed from a brick wall.

A chemical softener is sprayed on the painted surface to be removed and left on for several hours. After the chemical has dissolved the paint, the softener and the reacted paint are removed by scraping with hand tools. The remaining paint will then be removed by ice blast.

Ice blast utilizes compressed air to accelerate ice particles made from tap water to decoat and clean surfaces without damaging substrates. Ice is produced essentially instantly and continuously for blasting. The ice is transported via compressed air through a hose to a specially designed, ergonomic blast nozzle to be propelled against the surface to be cleaned. By varying the blast pressure, the ice blast system can remove a variety of coatings from hard and soft surfaces.

RESULTS

Before blasted by ice crystals, all surfaces to be removed were sprayed with Stingray 874B Paint Stripper and benzyl alcohol and cured overnight. During the blasting process, the majority of the ice crystals sublimed and released to the ambient air. The rest of the ice crystals turned into water, which is left on the floor along with the removed surface residue.

The technology was able to remove coating from the brick wall at a production rate of approximately 30 ft^2/hr. With some paint left on the surface, the technology managed to remove the majority of the paint from the concrete wall at a production rate of 36 ft^2/h. The technology was unable to remove any paint from the steel plates and I-beams. All masonry surfaces and steel plates were painted with an epoxy paint. The I-beams were painted with a less aggressive anti-corrosive paint.

The technology required simple equipment setup and little maintenance. No toxic chemicals were used, and little waste was generated.

For additional information about this Decontamination Technology Assessment contact: Cindy Zhang, D&D Project Manager, FIU-HCET, (305) 348-6340.

Integrated Vertical and Overhead Decontamination System

Project Number: HCET-1998-D023

Project objectives

The overall objective of this project 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 To design and manufacture decontamination and deployment systems	Selection of a responsible and qualified vendor	Completed. Contract placed with selected vendor on 6/14/99.
D023-M2	Approved Design Specifications for the Decontamination System	Approval of final design specifications for the decontamination system	Scheduled completion 4/6/99. This date has been revised to 8/6/99.
D023-M3	Fabrication of Decontamination System	Complete fabrication of decontamination system unit	Scheduled completion 7/30/99. This date has been revised to 11/5/99.
D023-M4	Field Testing of Decontamination System	Completion of testing of decontamination unit at FIU-HCET Test Site	Scheduled completion 8/16/99. This date has been revised to 11/24/99.
D023-M5	Design Drawings for the Characterization System	Approval of final design specifications for the characterization system	Scheduled completion 6/1/99. See "Assessment of current status and issues" for explanation.
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 for this reporting period

- On July 1, 1999, a kick-off meeting was held at Redzone Robotics in Pittsburgh, PA. The meeting was attended by representatives from Redzone, Bartlett Services, and FIU-HCET.
- Minutes from the kick-off meeting were generated by Redzone and sent out for approval. Appropriate action items for both parties have been completed or are near completion.
- Title I Design review documents were submitted by Redzone. FIU-HCET is currently reviewing these documents and will provide comments to Redzone.
- Design documentation for development of a test area for testing the characterization technology was reviewed by FIU-HCET QA Manager. Comments were incorporated into the document and a design review committee is being convened.

Accomplishments and technical progress to date

- For details on accomplishments and technical progress on this project during FY98, please refer to the *Integrated Vertical and Overhead Decontamination System FY98 Year-End Report.*
- Performance Specification documents that include conceptual designs of the decontamination and deployment systems were sent for review to the FIU-HCET D&D Program Manager and FIU-HCET Senior Program Manager. Comments received were implemented by the end of January 1999. The reviewed documents and comments have been documented and are available.
- Bid Opening was conducted on April 2, 1999. Two bids were received and reviewed. Bid proposals were reviewed for technical content and responsiveness to bid specifications. A letter was sent to one of the vendors on 4/13/99 seeking clarification on issues in their bid response. A letter was received from the vendor on 4/16/99 containing answers to FIU-HCET questions.
- The Invitation to Bid was sent out to vendors on March 8, 1999. The original Bid Opening date was scheduled for March 19, 1999. All qualified vendors requested additional time to adequately respond to the bid. Based on this request, FIU-HCET issued an extension of the Bid Opening date until April 2, 1999.
- All issues were resolved between the vendor and FIU-HCET. The bid was awarded to a team composed of Redzone Robotics and Bartlett Services.
- Design review documentation for development of a test site for characterization unit was submitted for review and approval by FIU-HCET QA Manager.
- A kick-off meeting was held at Redzone Robotics headquarters in Pittsburgh, PA. This meeting took place on July 1, 1999, and was attended by representatives from Bartlett Nuclear Services and FIU-HCET.
- FIU-HCET is in the process of reviewing this document and will provide comments to Redzone.
- Title I Design for the development of the decontamination and deployment mechanism has been submitted to FIU-HCET by Redzone.

Assessment of current status and issues

A kick-off meeting was conducted at Redzone on July 1, 1999. A tour of Redzone's Pittsburgh facilities was conducted and a formal meeting was held. During this meeting Redzone submitted a revised schedule for completion of the project. It is expected that the project will take seven months with a projected completion date of January 14, 2000.

Title I was submitted for review and approval by Redzone. FIU-HCET is in the process of reviewing this document and will provide comments to Redzone.

Based on the current schedule, the construction and testing of decontamination and deployment platform systems will be completed by January 2000. A Project Technical Plan for FY00 has been developed indicating cost and schedule for completion of this project during FY00.

M2, M3, and M4 have been revised based on the new schedule for completion of the project provided by Redzone Robotic. These new-revised dates are reflected in the milestone table above.

New completion dates for milestones M5 and M6 will be assigned after completion of Title I Design review.

Plans for the next two months

Activities for the next two months include the following:

- Conduct design review process for approval of test site design.
- Start test site development and construction.

FIU-HCET Collaborators

Leonel E. Lagos, (305) 348-1810
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 project 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 on 1/4/99.
D039-M2	Information from new LSDDPs incorporated	Screening data from new LSDDPs accessible through TIS	Completed as of 5/30/99 – additional data will be incorporated into the TIS as new evaluations are done.
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	Completed as of 5/30/99 – additional data will be incorporated into the TIS as new evaluations are done.
D039-M4	Information from DOE databases incorporated	Data from DOE designated databases accessible through TIS	Completed on schedule on 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	Completed on schedule on 5/21/99.
D039-M6	Final Report	Final report on results of the project delivered to DOE.	Scheduled completion – 10/31/99.
D039-M7	DDFA decision on other Media to Access TIS	Users able to access TIS information via other media such as telephone and return fax.	If approved, scheduled for FY00.

Significant events for this reporting period

- The TIS is complete and accessible through the Internet website <http://www.DandD.org/tis>.

Accomplishments and technical progress to date

- This project was completed on May 21, 1999. The new name for the Internet website is Technology Information System (TIS).
- Technology screening datasheets from the four new LSDDPs have been collected. All datasheets received to date have been entered into the database.

New LSDDP Sites	# of Technologies Evaluated at LSDDP to Date	# of Datasheets Received at FIU-HCET to Date	# of Datasheets Entered into TIS to Date
Mound Environmental Management Project (MEMP)	63	63	63
Savannah River Site (SRS)	46	46	46
Idaho National Environmental Engineering Laboratory (INEEL) *	55	55	55
Los Alamos National Laboratory (LANL)	34	34	34

* INEEL screened 123 technologies but produced evaluation forms on only 55 of these. The remaining 68 technologies were verbally screened and evaluation forms will not be produced for these.

Assessment of current status and issues

The system development phase of the project is complete. Currently, we are in the process of developing the final report.

Plans for the next two months

- FIU-HCET will complete and deliver to DOE a final report on the results of this project by end October 1999.

FIU-HCET Collaborators

Mabel Acosta, (305) 348-6650
Robert Tucker, (305) 348-6181

Ex-Situ Large-Bore Pipe Decontamination and Characterization System

Project Number: HCET-1997-D017

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:

- Conduct detailed analysis 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.	Completed
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.	Completed

Milestone No.	Milestone Description	Completion Criteria	Status
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 for completion 7/30/99
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. This date has been revised to 8/9/99.
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
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 been moved forward to allow for a more extensive demonstration to be completed at a commercial site.

Significant events for this reporting period

- The scope of work has been completed for testing and deployment of this unit at Big Rock Point. A service contractor has been identified and procurement issues are being addressed.
- A conveyor system has been installed on the characterization unit.
- Construction of the four trailers began on July 13, 1999. It was completed by the end of July 1999. Company had the last trailer sent to Adrian, Michigan, on 8/2/99.
- Title I for the material off-loading system was completed and approved by FIU-HCET.

Accomplishments and technical progress to date

Literature Search to Determine Pipe Remediation Problem Set

Rough order-of-magnitude quantities were obtained from Hanford and Fernald, including 150,000 m^3 of pipe at Hanford and 5,880 m^3 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[1] 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 involved laying out the

1 "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 discoloration 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.)

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, Title II, and Title III design have been completed. The entire decontamination system is currently being installed inside a specially designed strong tight container. Once this is accomplished, the entire assembled unit will be placed on a flatbed trailer for transportation.

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.

Assessment of current status and issues

- Factory Acceptance Test (Title III Design) has been scheduled for the week of August 16th. During this test several different diameter pipes will be processed to test the characterization unit. The completion date for Title III Design has been revised to 8/9/99. This milestone has slipped by 7 days due to the production of an additional Germanium detector.
- A small problem was identified in the Peener mechanism used for marking processed pipe coming out of the characterization system and before entering the off-loading system. The issue was brought up by Canberra and was resolved by consulting with Canberra and the Peener vendor.
- The decontamination and characterization units are on schedule. Assembly of decontamination and ventilation units is expected to be completed on time. The characterization system is expected to be completed and delivered to Big Rock Point as scheduled.
- The characterization system is on schedule. The current schedule is valid with no major concerns anticipated.
- Title I for the material off-loading system was completed and approved by FIU-HCET.
- Three of the four transportation trailers have been delivered. The fourth trailer was completed by end of July 1999. It was shipped to Adrian, Michigan, on 8/2/99.
- Canberra's software programming is progressing on schedule. The main electrical control box has been completed and installed in the container.
- Conveyor system for the characterization system has been installed inside the characterization container.
- The computer and printer have been tested and are working well. The cabinet for the computer and NIM has been assembled and is awaiting installation into the container.
- The run-off of the decontamination unit was successfully completed. Installation of the decontamination unit inside a strong tight container is under way and expected to be completed by the middle of next month.
- Development of the detectors for the characterization is progressing on schedule. The manufacturing of the germanium detector is of significant schedule risk and therefore will be monitored closely by FIU-HCET.

- All ventilation equipment was completed on time. The system was installed and operationally checked.

Plans for the next two months

- Transport the completed decontamination unit to DeLong Equipment in Atlanta and integrate the unit with the vacuum system during August.
- Conduct final decontamination system and ventilation system inspections at DeLong Equipment in Atlanta by early September.
- Conduct Factory Acceptance Test on the characterization system at Canberra during the week of August 16, 1999.

FIU-HCET Collaborator

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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 project 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	Completed 2/1/99
D041-M2	Design plan complete	Peer review of design plan complete and approved	Scheduled completion 2/23/99. Completed 3/31/99. Delay due to revisions in approval requirements.
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. Peer review of the design performed on June 8, 1999. Cost estimate to be completed by end of July 1999.

Milestone No.	Milestone Description	Completion Criteria	Status
D041-M4	Prototype system complete and demonstration test plan developed	Fabricated prototype system ready for tests and demonstration test plan approved	Scheduled completion 10/15/99

Significant events for this reporting period

- Tests were performed on the grit-blasting system to ensure that it was working satisfactorily. Tested were the use of inline air dryer, cleaning of clogged feed valve and feed pipe, proper positioning of the pneumatic pipes connecting the feed valve, straightening of the throat valve holding the deflection tip, and use of lightweight long galvanized pipe for retrieval of used grit. A potential application of the pipe cleaning system at a DOE site prompted these tests. The system is now in good working condition.
- Research was completed into the South Florida Building Code (Revised 1994), which establishes specifications for the positioning of cleanout openings for pipes of various diameters and lengths. This information is required for the design of the cleaning and grit recovery system. The requirement as per code is that every building drain, branch drain, and building sewer shall have an accessible cleanout point every 75 ft for 4-inch and larger piping, and every 50 feet for 3-inch and smaller piping.
- The existing pipe decontamination system was designed for vertical pipes. To extend its applicability to horizontal pipes and to pipes with smooth bends, design drawings for these systems were prepared and approved by the HCET design review committee. Documentation of this review and approval of the design drawings will be submitted to the Quality Assurance Manager for review prior to entering in the project files or system completed. Work on the fabrication drawings will be initiated.

Accomplishments and technical progress to date

- Candidate technologies for in-situ decontamination of pipes were screened and grit blasting was selected for further development.
- IPDS concept drawings were prepared and approved by the design review committee.
- Modifications were made in the grit blasting and recovery system to make it work satisfactorily.

Assessment of current status and issues

This is the first year of a two-year project. The project is currently on track. The milestone 3 concept design for the enhanced capability unit was completed. Fabrication drawing was completed by end of July 1999. A cost estimate of the new system will be developed. No other issues impacting design or deployment have been identified to date.

Plans for the next two months

- Complete fabrication drawings for the enhanced capability system.
- Perform cost estimates for the pipe decontamination system.

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. 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.	Originally scheduled for completion February 28, 1999. Delayed due to slow responses to survey. Recommendation to proceed sent to FETC on April 26, 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.	Recommendation to proceed to Phase II approved by FETC June 18, 1999.
D042-M3	Site needs assessment	Identification of key problem sets facing each NPR scheduled for decommissioning.	Needs assessment survey has been has been sent via e-mail to NPR managers on June 25, 1999. The July 31 completion date has been rescheduled to August 30.
D042-M4	Technological solutions	Identification of candidate technologies for addressing problem sets identified in milestone 3.	Scheduled to begin September 1999. August completion date rescheduled to September due to delays in M1 and M2.

Milestone No.	Milestone Description	Completion Criteria	Status
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 30, 1999.

Significant events for this reporting period

- The Needs Identification and Potential Decommissioning Problems Survey was finalized and has been sent via e-mail to the participating NPRs on June 25, 1999.

Accomplishments and technical progress to date

The project is being executed in two phases.

In Phase I, FIU-HCET contacted site managers at NRC-licensed NPRs to ascertain the nature of their operations, the duration of their operating licenses, and whether they had plans for decommissioning or intended to renew their licenses. In addition, site managers were asked to participate in a follow-up study to assess and identify current and/or future D&D needs at their facilities. Forty-four NPRs were surveyed, of which 36 responded. Among the 36 respondents:

- Eleven were unable to participate in the study.
- Twenty-three have already filed, or plan to file, for extension of their licenses when they expire.
- Twenty-five agreed to participate in the follow-up needs assessment survey. Five of these had immediate needs for D&D technologies. The remaining 20 responded that they would not be undergoing decommissioning in the near future but were interested in participating in the study.
- Based on this high level of interest and participation, on April 26, 1999, FIU-HCET recommended to DOE that Phase II of the project be undertaken. On June 18, 1999, DOE concurred.

To date in Phase II, FIU-HCET has researched and compiled a checklist of potential D&D problems which NPR facilities may face during decommissioning. This list formed the basis of a follow-up survey of participating NPR site managers to more accurately assess their current and future D&D needs. This list has been converted to PDF format and sent to the participating NPR institutions. Follow up calls will be made to confirm survey response. Site visits to the State University of New York in Buffalo, University of Virginia, and University of Washington are planned for August 1999. These visits will provide a better understanding and definition of NPR site clean-up needs.

Assessment of current status and issues

- FIU-HCET is awaiting survey responses from NPR site managers.
- Delays in milestone 3 and subsequent milestones were due in part to initial difficulties in establishing contacts at the NPRs and in their slow responses to surveys. However, no major issues are foreseen that would hinder completion of this project on time.

Plans for the next two months

- FIU-HCET has begun working with selected NPRs in defining D&D problem sets, developing technology needs assessments, and identifying feasible technology solutions. In August 1999, FIU-HCET personnel will visit three NPR sites to assess their current and potential decommissioning needs. These visits will allow FIU-HCET personnel to better assess site-specific decommissioning needs.
- Based on discussions, site visits, and survey results, FIU-HCET will compile an inventory of current and potential problems that NPRs face during decommissioning. Identified problems will be ranked according to frequency of occurrence at sites and urgency assigned by site managers.
- Mr. Brendan Ryan, Reactor Facility Manager at Kansas State University and a member of the American Nuclear Society (ANS), has requested permission from FIU-HCET to publish in the ANS news letter the results of the survey. Mr. Ryan is of the opinion that technological solutions to remediation problems will be very useful not only to research facilities, but also to others in the nuclear decommissioning community. This will provide additional exposure for DOE-OST-developed technologies and for FIU-HCET as an environmental technology leader.

  Mr. Ryan's request is under consideration by FETC.
- Work will begin on identifying technological solutions to decommissioning problems and developing the decision model that NPR site managers may use to identify feasible technology solutions for their site-specific problems.

FIU-HCET Collaborators

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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 1,000,000 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 may be understated. It is perhaps because they do not reflect the total costs associated with the full life-cycle of LLW land disposal. The long-term maintenance and surveillance cost of disposal sites once they have been closed is one issue. A complete life-cycle cost analysis (LCCA) could reflect higher costs for direct disposal and could lead to increased material recycling, resource recovery, and waste minimization, which are key goals of the DOE.

DOE-managed LLW land disposal sites are limited in their capacity. It has been stated that to think that additional sites could be available to contain the projected generation of RSM from D&D activities is unrealistic. This complicates the issue of a "true" cost analysis. Because the issue of capacity is so relevant, insofar as obtaining a comparable "true" cost analysis, this study will take a zero-based approach that should be able to identify all initial costs, operating costs, direct costs, variable costs, closure costs, and value added. The objectives of this project are

- to conduct a DOE-wide survey to collect existing information on the quantities and characteristics of RSM currently in DOE stockpiles, as well as quantities likely to be generated from future D&D of DOE's surplus facilities and buildings.
- to estimate the range of the real costs for direct disposal of DOE-generated RSM. The study is limited to designated low-level waste (LLW) direct disposal facilities selected by FIU-HCET and DOE.

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D043-M1	RSM inventory	A compilation of existing estimates of current and future RSM inventories generated by D&D activities.	Completed: June 15, 1999
D043-M2	Committed waste site managers	A list of waste site managers willing to provide information necessary for developing LCCAs.	Completed: June 15, 1999
D043-M3	Report to DOE on Phase 1 (milestones 1 and 2)	Summary of results of milestones 1 and 2 and recommendation to DOE on RSM disposal facilities to be surveyed.	Completed: June 15, 1999
D043-M4	Decision on RSM disposal sites to be assessed	FIU-HCET and DOE-FETC shall consult and decide whether to proceed to Phase II and select sites to be surveyed.	Due date: July 15, 1999 Draft report sent to DOE-FETC on July 21, 1999. Delay in completion due to slow response to survey.
D043-M5 (deleted)	Documentation of NRC and commercial means of costing RSM disposition	Comparative analysis of costing methodology and factors used by selected sites.	This task has been deleted.
D043-M6 (deleted)	Documentation of DOE means of costing RSM disposition	Procedural outline of DOE's costing methodology, indicating variances with other sites surveyed.	This task has been deleted.
D043-M7	LCCA for direct disposal of RSM	Develop LCCA for direct disposal of RSM at selected disposal sites. LCCAs will be submitted to DOE for review.	This task was revised to exclude LCCAs for disposal means other than direct disposal. Due date: August 31, 1999.
D043-M8 (deleted)	Finalize LCCAs and update DOE handbook	Revised LCCAs incorporating DOE's comments and procedures for LCCA incorporated in DOE handbook.	This task has been deleted.
D043-M9	Final Report	Review comments provided to FIU-HCET by DOE to be incorporated into LCCAs and resubmitted to DOE with final project report	Due date: October 31, 1999

Significant events for this reporting period

- As of July 21, 1999, five of 11 sites have responded to the RSM inventory request for information. The June 15th deadline was extended due to the initial slow response to the survey. Data collected have been tabulated and the Phase I draft report has been submitted to DOE-FETC for preliminary review.
- FIU-HCET visited the Fernald site to gather information on the methodology they used to determine the life cycle disposal cost for a large amount of copper that was disposed of at the site.
- DOE-FETC and ORO have directly contacted those sites that did not respond to the survey. As a result, additional responses have been received from three sites in writing and verbally from another site.
- Planning activities for Phase II are continuing and will be accelerated. Life-cycle costs for disposal of LLW RSM have been identified for a commercial disposal facility, Envirocare of Utah, Inc. Additional information on DOE LLW disposal facilities has been requested from selected sites via current BPS documents.

Accomplishments and technical progress to date

- In December 1998, FIU-HCET in consultation with Dr. Katherine Yuracko, an expert in life-cycle analysis at the ORNL, identified and defined tasks to complement the life-cycle decision methodology developed by Dr. Yuracko.
- In March 1999, representatives from FIU-HCET, DOE-FETC and NMR reviewed the project's scope of work and objectives. The outcome of the review was that FIU-HCET would focus exclusively on collecting existing information to estimate current and future RSM inventories and on developing an LCCA for estimating the true costs associated with direct disposal of DOE-generated RSM at selected disposal sites. Costs associated with other means of RSM disposal would not be investigated. These changes were endorsed by DOE-FETC and reflected in the Major Milestones table above.
- In April 1999, FIU-HCET prepared and issued a survey questionnaire to 11 DOE sites requesting data on current and future RSM inventories. The survey provided the sites with their specific Internet address for the Accelerating Cleanup: Paths to Closure Baseline Disposition Maps. An Excel spreadsheet was included to facilitate data reporting.
- The Nevada Test Site and Envirocare of Utah, Inc., waste disposal sites were designated by the DOE for evaluation. These sites were visited in May 1999 and information on cost elements collected. The visit to Envirocare provided information on cost elements for commercial LLW disposal facilities that are different from those at the DOE sites such as NTS.
- FIU-HCET attended DOE's Waste Issues Team Workshop V in Las Vegas, NV, to make a presentation on the LCCA-RSM project goals and objectives. The Nevada Test Site personnel provided information on the disposal costs for the NTS LLW facility.
- As of June 15, 1999, completed RSM survey questionnaires were returned by two of the 11 sites surveyed.

- On July 26, 1999, FIU-HCET met with representatives from NMR and DOE-ORO to brief them on the status of the project and to coordinate efforts regarding the review team.

Assessment of current status and issues

Responses to the RSM inventory request for information have been slow, but it is anticipated that by the end of the project, the majority of the sites will have reported, and FIU-HCET will be able to update the Phase I data to provide a more accurate and representative inventory.

No major issues are anticipated that would delay completion of this project as scheduled.

Plans for the next two months

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

- FIU-HCET will develop a comprehensive list of cost elements associated with DOE disposal facilities and commercial disposal facilities. In conjunction with this, the cost elements will be reviewed and verified by facility representatives during site visits.
- FIU-HCET will complete development of the costing methodology and collect data from participating sites necessary to apply the methodology and determine costs per unit volume for disposal of LLW RSM.
- The project will submit to Dr. Yuracko of LMER's Center for Life Cycle Analysis the proposed algorithms to be utilized in the delineation of RSM LCCAs.
- A review team will meet in Oak Ridge, TN, on August 26-27 to go over the final report draft document and incorporate comments to the document as recommended by representatives of FETC.

FIU-HCET Collaborators

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Legacy Waste Disposition for the Oak Ridge Reservation

Project Number: HCET-1999-D044

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 project, 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.

The original tasks identified in this project were defined by Bechtel-Jacobs, LLC (hereinafter referred to as Bechtel Jacobs), the Management and Integration contractor for the ORR, based on preliminary needs assessments conducted at ORR. These needs have since been reassessed, and the tasks were redefined in March 1999 by Bechtel Jacobs in consultation with FIU-HCET. The new tasks are within the scope and goals of the project and are reflected in the Major Milestones table below.

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D044-M1 (deleted)	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. This task has been deleted by Bechtel Jacobs (see Note 1).
D044-M2 (deleted)	Report on TSD options for contaminated accelerator lead shielding.	At least 2 feasible options for disposing of the contaminated lead shielding.	Scheduled for completion 3/31/99. This task has been deleted by Bechtel Jacobs (see Note 2).
D044-M3 (deleted)	Report on TSD options for contaminated cadmium plates.	At least 2 feasible options for disposing of the contaminated cadmium plates.	Scheduled for completion 4/30/99. This task has been deleted by Bechtel Jacobs (see Note 2).
D044-M4 (deleted)	Report on wastewater residue TSD options at Y-12.	A set of feasible disposition paths for the Y-12 wastewater residues.	Scheduled for completion 6/30/99. This task has been deleted by Bechtel Jacobs (see Note 1).
D044-M5	Report on performance of PM-CEMs in meeting EPA monitoring guidelines.	Report on Technical Review of PM-CEMs Performance Evaluation Test Plan	Completed on schedule 6/30/99
D044-M6	Final Report summarizing findings, incorporating previous Bechtel Jacobs review comments, and providing guidance on use of the developed decision tool	Final report submitted to Bechtel Jacobs	Due 10/31/99

The following task milestones were added by Bechtel Jacobs in March 1999 in consultation with FIU-HCET:

Milestone No.	Milestone Description	Completion Criteria	Status
D044-M7 (added)	Regulatory update of the BDAT database	All waste codes in ORR MLLW Balance of Inventory (BOI) database updated to current RCRA/LDR regulations	Completed on schedule 4/15/99
D044-M8 (added)	Report on waste codes in sample populations of the ORR MLLW BOI database	Resolution of problematic waste code assignments and groupings	Completed on schedule 4/30/99
D044-M9 (added)	Report on potential waste disposition conflicts and their resolution	Resolution of potential disposition conflicts; and identification of options	Completed on schedule 5/15/99
D044-M10 (added)	Documentation of effectiveness of systematic approach to ORR MLLW evaluation and disposition	Documentation of reduced treatment effort required	Completed on schedule 6/15/99

Note 1. These tasks were deleted per e-mail received March 31, 1999, from John Patterson, Manager of Planning and Integration at Bechtel Jacobs.

Note 2. These tasks have been deleted per e-mail received May 17, 1999, from John Patterson, Manager of Planning and Integration at Bechtel Jacobs.

Significant events for this reporting period

- FIU-HCET is addressing disposition conflicts and options for four waste streams in order to evaluate the consequences of dropping waste codes and/or reassigning waste populations to alternative treatability groups.
- A technical review of the Test Plan for the performance evaluation of 3 Particulate Matter/Continuous Emissions Monitoring (PM-CEM) systems to be co-installed this summer at the TSCA Incinerator has been completed (Milestone D044-M5).

Accomplishments and technical progress to date

Bechtel Jacobs and DOE established an initiative to expedite the treatment of broad-spectrum waste streams. In 1996 and early 1997, analysis of contractors' responses to a Broad Spectrum Invitation for Bid led to the development of five broad MLLW treatment categories, a make/buy study and life-cycle cost analysis to evaluate onsite and offsite treatment options, and an approach for awarding contracts for MLLW treatment. In June 1998, five Broad Spectrum Treatment Contracts (BSTC) were awarded to two commercial mixed-waste TSD vendors and was earmarked an anticipated expenditure of between $40 million and $260 million for TSD services. Through this vehicle, up to 36 million kilograms of MLLW will be processed at the two permitted facilities for ultimate land disposal. The BSTC initiative has also led to the development of a web site that provides tools and information for DOE project personnel and other users to evaluate process knowledge about their specific MLLW streams, determine appropriate treatment vendors, estimate transport and treatment costs, and obtain contract-related information.

Discussions between Bechtel Jacobs and FIU-HCET during March 1999 identified the following needs:

- Review waste codes assigned to waste populations in the ORR MLLW inventory and update them to current RCRA/Best Demonstrated Available Technology (BDAT) treatment regulations and standards.
- Review waste code groups within these waste populations for the correctness of their assignment and to determine the impact of current waste groupings on required treatment type. This latter information can correct potentially costly problems such as the generation of small "orphan" groups requiring special, more costly TSD effort, or by inclusion of such groups in larger populations, causing the entire population to undergo unnecessary treatment.
- These developments have led to a redefinition by Bechtel Jacobs of the scope of technical assistance that FIU-HCET will provide under this project. The overall scope and objectives of the project remain essentially the same; however, some tasks and milestones have been redefined to better address the needs identified above. The revised plan takes a more comprehensive and systematic approach to assessing TSD options and processes for waste streams, rather than simply identifying disposition paths for a limited number of specific streams. Several of the specific streams originally identified by ORNL to be investigated by FIU-HCET (namely, those related to milestones 1 through 4) have been subsumed by the revised scope of work or are no longer of interest to Bechtel Jacobs.

- FIU-HCET is working with Bechtel Jacobs personnel to identify, define, and develop tasks associated with the Broad Spectrum waste disposition effort and the identification of potential orphan MLLW streams, which FIU-HCET can address in this project.

The overall outcome of this project will be a systematic process for evaluating MLLW waste streams to assist in waste code and waste grouping assignment and the choice of most cost-effective disposition option.

Assessment of current status and issues

The scope of this project has been reviewed with Bechtel Jacobs and the DOE's Federal Energy Technology Center in light of the redefined needs of Bechtel Jacobs. This review has resulted in the modification of the tasks, milestones, and deliverables for the project as reflected in this current monthly report. It is believed that the time and effort invested in re-evaluating this project will result in a more comprehensive and useful decision support model with application not only at ORR but at waste processing sites across the DOE complex.

Plans for the next two months

FIU-HCET will

- Complete the assessment of the MLLW Broad Spectrum Treatment Plan (BSTP) developed by Bechtel Jacobs.
- Complete a detailed review of the MLLW database and of waste populations of particular interest to Bechtel Jacobs.
- Work with Bechtel Jacobs to assess and document the current processes and options for characterizing, transporting/handling, treating, and disposing of difficult MLLW streams.
- Complete the outline of a systematic approach for evaluating waste streams in the MLLW inventory.

FIU-HCET Collaborators

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National Contract for Radioactive Scrap Metal Recycle

Project Number: HCET-1999-W002

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 sties and pending disposition. There are also large quantities of RSM buried at commercial and DOE-managed low-level waste (LLW) disposal facilities across the country. In total, it is estimated that more than 2 million tons of RSM will be generated from the D&D 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 over recycling. Two primary reasons for this preference include both cost differential perceptions and the difficulty of attaining and managing recycle contracts. The DOE National Center of Excellence for Metals Recycle (NMR) intends to reduce the difficulty of attaining and managing recycle contracts by implementing a national contract that provides low cost and flexibility along with ease of implementation.

FIU-HCET provides the following services to the DOE complex via NMR:

- Supporting accelerated site cleanup and closure in a safe, environmentally protective manner and in compliance with applicable environmental regulation
- Assisting in the mitigation of risks to ensure that site conditions do not pose unacceptable risks to workers or public
- Endorsing the disposition of contamination, waste materials, buildings, facilities, and infrastructure consistent with national goals.

These services are in direct support of the objectives of NMR. Specific tasks associated with these services and identified in this subtask include the following:

- Propose a strategic plan for the development of a national contract for radioactive scrap metal recycle.
- Identify radioactive scrap metal recyclers providing both decontamination and metal melting capabilities.
- Assist in the development of the Statement of Work, Prequalification Criteria and Selection Criteria for the radioactive scrap metal handling, transportation, processing, and dispositioning.

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
W002-M1	Propose a strategic plan for the implementation of a national contract.	Communicate the strategic plan for consideration by the DOE.	Completed 3/02/99.
W002-M2	Identify radioactive scrap metal processors with Metal Melt capabilities.	Provide a list of processors capable of providing decontamination services, metal melting services and dispositioning services.	Completed 3/22/99.
W002-M3	Assist in the development of a draft Statement of Work, Prequalification Criteria and Selection Criteria for consideration and evaluation by the DOE.	Formalize draft documents for the Statement of Work, Prequalification Criteria and Selection Criteria.	Completed 3/22/99.
W002-M4	Assist in the development of an Acquisition Plan utilizing the National Metal Contract strategic plan.	Submit an Acquisition Plan for the National Metal Contract.	Completed 7/01/99.

Note: Additional milestones to be determined by NMR.

Significant events for this reporting period

- Milestone W002-M4 is now complete. This milestone lead to the development and submittal of a standard Acquisition Plan in support of the procurement of a National Metal Contract. This plan met the requirements set forth in a meeting that was held between FIU-HCET and NMR to discuss scope, objectives, cost, and schedule.

Accomplishments and technical progress to date

Milestones W002-M1 through W002-M4 have been completed. These milestones were communicated to the NMR as formal reports. These documents were reviewed and accepted by the NMR.

Assessment of current status and issues

Completion of milestones W002-M1 through W002-M4 has moved FIU-HCET's involvement with the National Contract for Radioactive Scrap Metal Recycle to an inactive status. FIU-HCET is awaiting further assignments by the National Center of Excellence for Metals Recycle.

Plans for the next two months

- As additional assignments are generated and assigned by the DOE, FIU-HCET will further support implementation and optimization of the Strategic Plan for Radioactive Scrap Metal Recycling.

FIU-HCET Collaborator

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II. TANKS FOCUS AREA (TFA)

MONTHLY PROGRESS REPORT

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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) 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.

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

Milestone No.	Milestone Description	Completion Criteria	Status
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	Completed by 03/15/99 Due date: 04/12/99
T004-M3	Determine surrogates particle shapes	Perform six particle geometry tests as described in Table 2 in the PTP	Completed by 04/30/99 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	Completed by 06/30/99 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
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 for this reporting period

- Mr. Peter Gibbons, Tank Retrieval Technology Integration Manager, visited FIU-HCET on July 20, 1999. Mr. Gibbons visited the pipeline unplugging experimental facility at HCET testing field. The detailed test bed construction, testing plan, and plugging material specification were discussed.
- A newly generated slurry simulant based on Savannah River waste slurry composition was analyzed for its rheological properties. This slurry was used to run pipeline plugging experiments in a testing loop.

Accomplishments and technical progress to date

- Crystallization tests for Hanford, SRS, and Fernald slurry supernate have been completed. The experiments were conducted in an ethylene-glycol coolant bath. The temperature was controlled by a Fisher chiller. In the temperature range of 0 to 20 °C, crystallization did not occur for any of the supernates. When temperature was lowered to –7 °C, the supernates of Hanford and Fernald slurry were frozen, but the SRS supernate was not.
- Blockage materials for the large-scale test bed were tested using bentonite and sand. Three blockages under the following composition were created:
  - 50 wt% bentonite with 50 wt% water.
  - 25 wt% sand and 25 wt% bentonite with 50 wt% water.
  - 66 wt% bentonite with 34 wt% water.
- A procedure for measuring slurry density profile in the settled cylinder was developed. The densities of the SRS slurry simulant at different settling layers were measured according to the procedure.
- The measured density profile of the SRS slurry simulant indicated that the density increases along the settling direction. The results are shown in Table 1, and the profile is illustrated by Figure 1.
- The rhelogical properties including shear rate, shear stress, and apparent visicosity for a new prepared SRS slurry simulant have been measured. The data is under analysis and correlation. This new slurry simulant is being used in the experimantal run in the pipeline plugging test loop.

Table 1.
Measured SRS slurry simulant density profile

Slurry type : **SRS**

Concentration: 5% by weight
Weight of Cylinder (g): 135.2
Total Weight(g): 238.7

Sample Volume: 10 ml.	Weight (g) W1	Weight(g) W2	Mass W1-W2	Density M/V
1	238.7	228.6	10.1	1.01
2	228.6	218.5	10.1	1.01
3	218.5	208.5	10	1
4	208.5	198.4	10.1	1.01
5	198.4	188.3	10.1	1.01
6	188.3	178.3	10	1
7	178.3	167.8	10.5	1.05
8	167.8	156.6	11.2	1.12
9	156.6	145.3	11.3	1.13

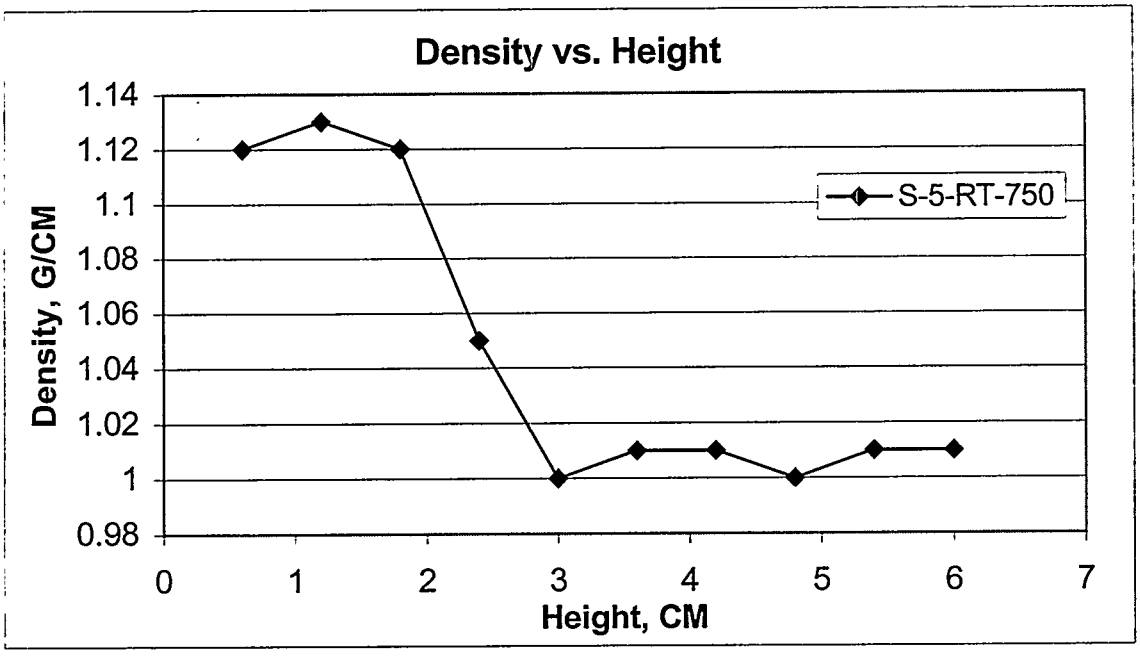

Figure 1. Slurry density at different settling layers.

Assessment of current status and issues

The chemical compounds and operating conditions, which cause slurry crystallization, need to be identified. The current composition of the slurry simulant and the actual slurry recipe will be compared to modify the slurry composition in future experiments.

Plan for the next two months

- Continue with density profile measurements for Hanford slurry.
- Identify key chemical components that cause gel formation in the slurry.
- Test blockages using different materials such as chemical gel and metal salts.
- Coordinate with the loop experiments and characterize waste slurry simulant at various solids concentrations and particle sizes.

FIU-HCET collaborators

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Plugging and Unplugging of Waste Transfer Pipelines

Project Number: HCET-1998-T005

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.

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 pipe plugging caused by settling, pipe plugging and unplugging phenomena induced by gelling will also be studied by both experimental and theoretical methods. 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 construction of full-size test beds for demonstration of blockage locating and pipe unplugging technologies	Completed 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.	Completed 3/20/99, met the schedule
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 3/30/99, met the schedule
T005-M4	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 3/30/99, met the schedule
T005-M5	Perform additional slurry transport experiments in flow loop with horizontal pipeline	Obtain 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 5/28/99 Test loop was modified and tasks were completed
T005-M6	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 6/25/99. The tasks are behind schedule but are being performed.
T005-M7	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 9/15/99.
T005-M8	Perform slurry transport experiments in flow loop with two inclined pipelines	Obtain results of pressure drop and critical velocity in the flow loop with two kinds of inclined pipeline	Scheduled completion 9/30/99.
T005-M9	Data processing, correlation, and comparison	Present the measured data and data correlation for the slurry transport experiments	Scheduled completion 10/15/99.
T005-M10	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-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.

Significant events for this reporting period

- Chemical components for the new recipe of SRS slurry simulants (including NiO) have been received.
- Experimental study on SRS slurry simulant at 10 wt% has been finished in the horizontal flow loop.
- Construction of Large-scale Test Bed #1(long pipe) and #2 (pipe with jumper) are almost finished (minor modifications still needed).
- Hanford connector and nozzle for the Large-scale Test Bed #2 has been received.

Accomplishments and technical progress to date

Part 1 Flow Loop Research on Pipeline Plugging and Unplugging

1.1 Critical Velocity Definition and Experimental Study of SRS Slurry Simulant at 10 wt%.

1.1.1 Definition of Critical Velocity in Existing Literature

The following are definitions of critical velocity from articles:

Reference [1]: "The critical velocity, sometimes called the deposit or deposition velocity, for slurry transport is that below which particulate suspension is no longer maintained. The lowest energy requirements (i.e., the lowest pressure drop) are associated with transporting the slurry at this bulk velocity."

Reference [2]: "The slurry velocity at which a particle bed forms is defined as the critical velocity, V_{Dc} and represents the lower pump rate limit for minimum particle settling."

Reference [3]: "Most of the proposals for a calculation of the critical velocity are based on experimental data, generated on the basis of visual observation, as state of the art at that time." "The measurements were analyzed and compared with proposals of other authors. Especially the question concerning Durand's proposal that minimum pressure gradient and critical velocity should coincide at the same mean velocity, could be answered for the solids examined so far."

Reference [4]: "The critical velocity at which a bed of particles begins to form is known as the deposition velocity (for homogeneous system)." "In this case the critical velocity corresponds to the transition from turbulent to laminar flow and is referred to as the transition velocity (for heterogeneous system)."

In summary, to the authors' knowledge, no other way was found to obtain the critical velocity except the above methods based on experimental data of pressure gradient.

1.1.2. Initial Experimental Data and Calculation of Critical Velocity

For FIU-HCET's present test (10 wt% SRS slurry simulant, see Tables 1 and 2 for details), the mixture density ρ_{mix}=1.081 g/cm^3.

Table 1.
New recipe with weight % concentration of SRS chemical components found in literature [5]

Chemical Component	Weight Concentration	Adjustment Based on Density	Other Balance	Total
Fe_2O_3	36.7	0.5		37.2
Al_2O_3	16.3	3.3		19.6
NiO	3.0	8.7		11.7
MnO_2	10.8			10.8
SiO_2	10.0	6.1	4.6	20.7
Subtotal	76.8	18.6	4.6	100

Table 2.
The properties of slurry simulant given in Table 1 (10 wt%)

Chemical Component	Density g/cm^3	Quantity kg	Size μm
Fe_2O_3	5.24	3.17	5
Al_2O_3	3.97	1.67	45~150
NiO	6.67	1.00	< 10
MnO_2	5.03	0.92	< 45
SiO_2	2.65	1.76	150~180
Subtotal		8.52	

Figure 1 (a), (b), and (c) show the experimental data at different scales and coordinate systems. From the experimental result, it can be found that the critical velocity (corresponding to the turning point of the curve of pressure gradient versus velocity) is about 0.52 m/s. The critical velocity from Wasp's method is a little less than 0.52 m/s. It is 0.50 m/s. Table 3 shows the comparison of

experimental data and calculation result (based on Wasp's method). It can be found that they agree with each other very well. The deviation is 4%.

Table 3.
Comparison of experimental critical velocities with prediction

Experiment (m/s)	Prediction (m/s)	Deviation
0.52	0.50	4%

Wasp's Method

$$U_C = 3.116 C_v^{0.186} \left[2gD \left(\frac{\rho_s - \rho_l}{\rho_l} \right) \right]^{\frac{1}{2}} \left(\frac{d}{D} \right)^{\frac{1}{6}} \quad (1)$$

In the above relationship, C_v is the total particle volume fraction (2.66%); ρ_l and ρ_s are the liquid and solid densities (4695 kg/m^3 and 1000 kg/m^3, respectively); D is the pipe diameter (0.0221 m); and d is the average particle diameter (6.9 x 10^{-5}m).

1.1.3. Slurry Density

Theoretically, for the present slurry simulant, which consisted of water, SiO_2, and several insoluble particle components, the mixture density can be calculated as

$$\rho = \frac{1}{\sum \frac{C_{w,i}}{\rho_i}} \quad (2)$$

where $C_{w,i}$ is the weight concentration of component i and ρ_i is the density of component i. In equation (2), the unit of density is g/cm^3.

For the present recipe, mixture density ρ_{mix}=1.081 g/cm^3.

1.1.4. Slurry Volume Concentration

Volume concentration is one of the most important parameters affecting slurry flow. The volume concentration of the component j can be calculated based on the following equation:

$$C_{v,j} = C_{w,j} \frac{\rho_{mixture}}{\rho_j} \quad (3)$$

Therefore, the total volume concentration of all insoluble components is

$$C_v = \sum C_{w,j} \frac{\rho_{mixture}}{\rho_j} \tag{4}$$

where the subscript j represents each insoluble chemical component.

For the present slurry simulant, $C_v = 2.66\%$.

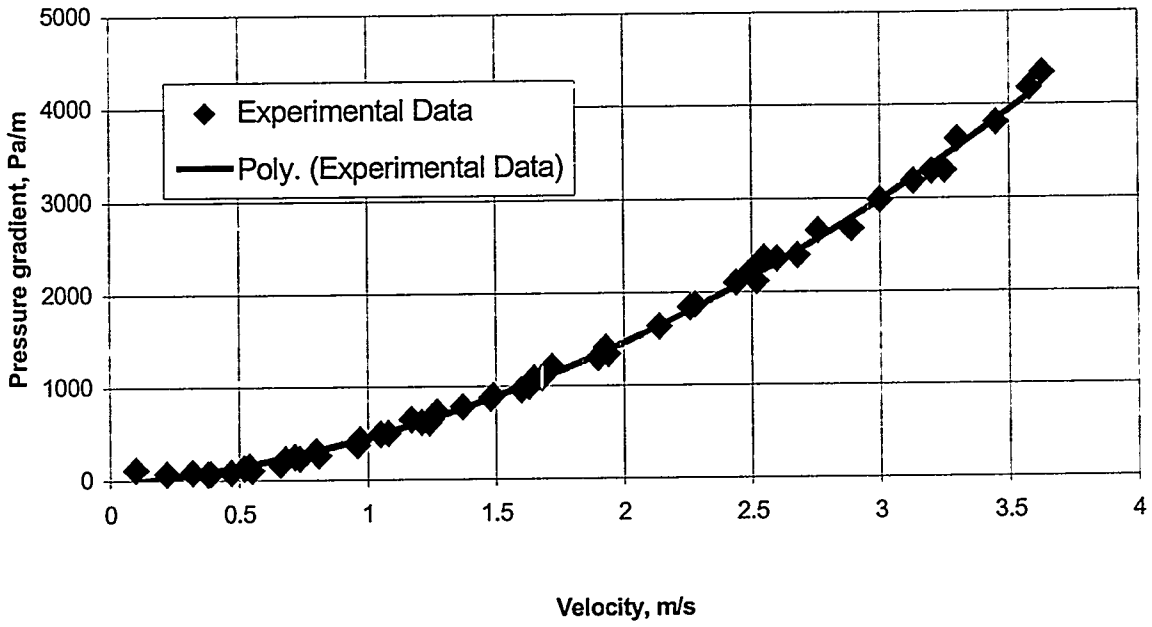

Figure 1(a). Pressure gradient versus flow velocity for SRS slurry simulant at 10 wt%. Velocity range 0-4.0 m/s, linear coordinate.

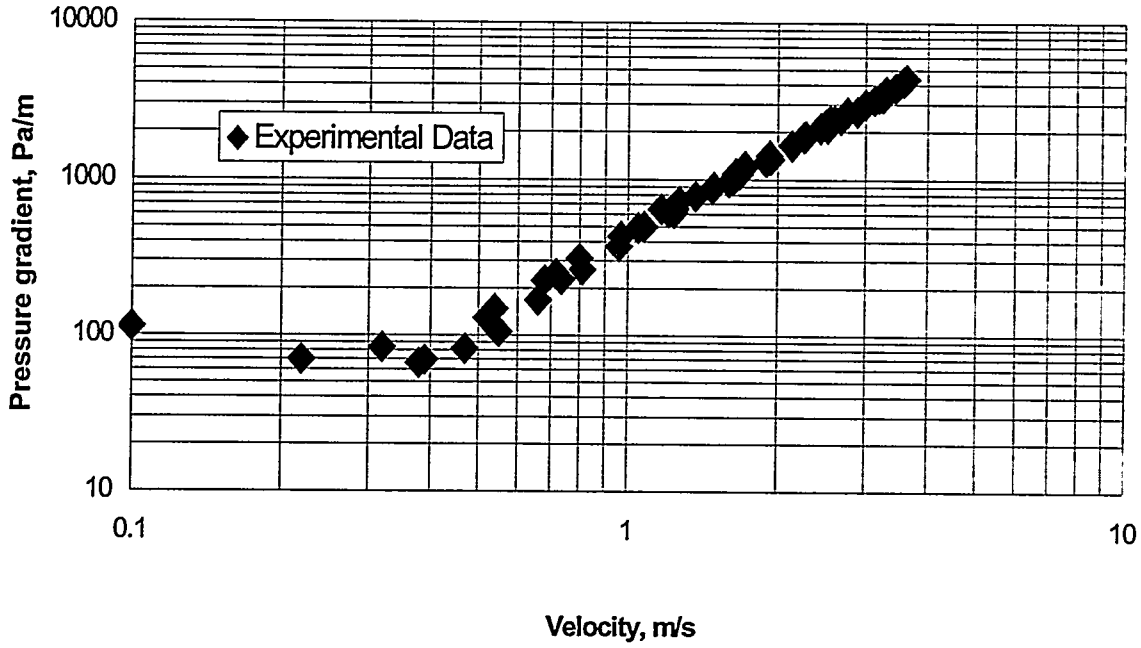

Figure 1(b). Pressure gradient versus flow velocity for SRS slurry simulant at 10 wt%. Velocity range 0-4.0 m/s, logarithmic coordinate.

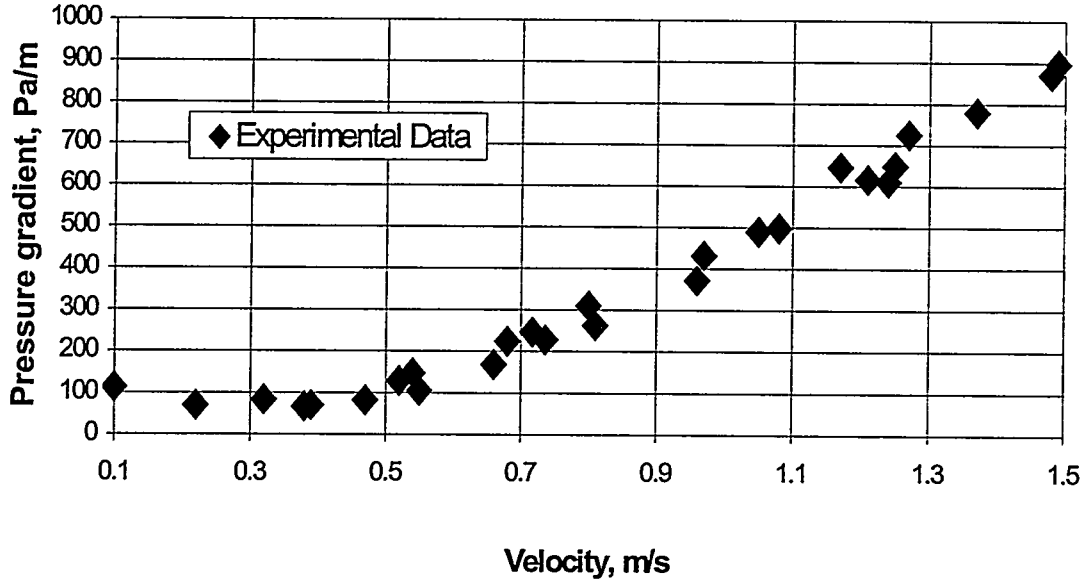

Figure 1(c). Pressure gradient versus flow velocity for SRS slurry simulant at 10wt%. Velocity range 0-1.5 m/s, linear coordinate.

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

2.1 The Construction of the Test Beds

Construction of Test Beds #1 (long pipe) and #2 (pipe with jumper) is almost finished except for some adjustment to be made on Test Bed #1. There should be a 1-inch cleaning tool access pipe with 1-inch threaded ball valve to be attached at the end of Test Bed #1. Also the jumper at evaporator for Test Bed #1 has not been received yet from NHC; however, construction will resume as soon as it is received at FIU-HCET and is expected to be completed as planned.

For Test Bed #2, Hanford connector has been received at FIU-HCET, and it has been decided that a sample test of reaching the blockage will be conducted at the very end of the long pipeline section (last 180-ft section) instead of preparing a separate piece of pipe next to the entry section.

Figure 2 is the updated schematic diagram of Large-scale Test Bed #3 (underground pipe). It shows the location of the railroad ties under the berm and cross-sectional area of the railroad ties.

2.2 Blockage material simulation and its location

DOE's Tank Focus Area Technical Leader, Pete Gibbons, visited FIU-HCET the week of July 19, 1999. CBD Announcement, Specification, and SOW were reviewed, and test strategy and plan outline were discussed to fit each technology to be tested on the three Test Beds.

As it is getting closer to the end of the construction phase of Large-scale Test Beds, there are some questions to be answered before the construction can be finished. For Test Bed #3, two pipes will be buried: the one jacketed and the other unjacketed. All pipes will be accessible, but only stainless steel pipe in a jacketed pipe is removable, since pipes will be buried under the berm strapped to railroad ties with clamps and Unistruts®. Therefore, the blockages will be placed before the end of construction. However, all the necessary information about the blockage is not available at this moment; there is still some research to be done to decide on the blockage materials.

Dr. Erian of PNNL is also expected to visit FIU-HCET to work with the HCET team to identify the composition of gelation material. He will also provide the new HANFORD recipe for the blockage. As soon as the materials information is available, the blockages for Test Bed #2 and #3 can be prepared, and pipelines for Test Bed #3 will be buried.

Plans for the next two months

- Perform additional slurry experiments and obtain data in flow loop with horizontal pipeline and possibly inclined pipeline with SRS dip.
- CBD announcement, Spec, and SOW for the technology demonstration of Large-scale Test Beds will be sent out this summer to solicit the technology application.
- The construction of the three Large-scale Test Beds will be completed.
- Potential candidate technologies for pipe plugging inspection and removal will be identified.
- Test Plan of the Large-scale Test Beds is in progress and expected to be completed after the candidates for technology demonstration are identified.

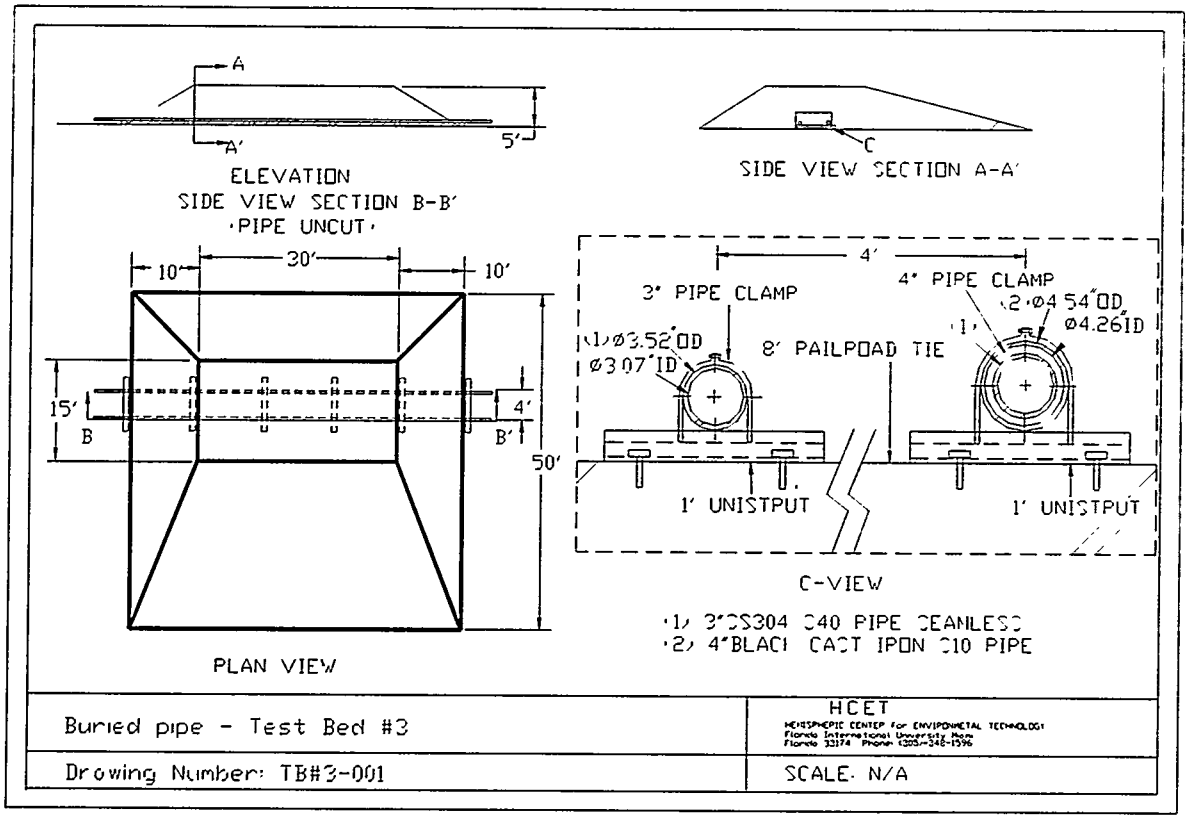

Figure 2. Schematic diagram of large-scale test bed #3.

FIU-HCET collaborators

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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 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

Milestone No.	Milestone Description	Completion Criteria	Status
T003-M1	Installation of an additional heat zone	Achievement of 1150 °C by the knife edge	Completed as scheduled. Due date: 1/31/99
T003-M2	Report the effect of crud deposits on the back side of the knife edge	Experiments ES-1, ES-2, ES-3, and ES-4	Completed as scheduled. Due date: 5/31/99
T003-M3	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: 8/31/99
T003-M4	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: 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 for this reporting period

- Dr. Munoz, Assistant Secretary of the Office of Science and Technology, Department of Energy was briefed on the objective and the progress of the vitrification project when he visited FIU-HCET on June 30, 1999.
- The vitrification project is on schedule, and the major accomplishments, such as installation of an additional heat zone, changes in flow setup to achieve pulsating flow, safety issues, glass analysis, etc., have been discussed in detail.

Accomplishments and technical progress to date

- Six glass pouring experiments were done with the zero angle insert behind the knife-edge during this reporting period. No significant changes were observed in the glass flow dynamics as compared to the baseline case of the sharp knife edge (45 degree cut back angle). So far FIU-HCET staff have performed steady state experiments. They expect to observe major changes in glass flow dynamics (wicking) once the pulsating flow tests are done.
- Almost half the electronic data from the videotapes of the previous experiments has been compiled. It should take another 2-3 weeks for the data compilation to be complete.
- A copy of the glass pouring experiments video for this fiscal year has been shipped to Dr. Hector Guerrero. Two more copies of the video will be provided to SRS as per their request.
- A trifold brochure has been prepared that describes the FIU-HCET melter's salient features, capabilities, and the major accomplishments of the vitrification project.
- Besides the trifold brochure, a 5-10 minute video is in development for the vitrification project. The filming of the glass pouring experiments has been completed. The FIU-HCET communications coordinator will do the voice-over for the video. The video should be complete by next reporting period.
- A breakage of the heating element in Zone 1 forced the furnace to be shut down for repairs. On startup after repair, another breakage occurred in Zone 1. The disassembly of the furnace showed breakages at multiple places. The element coil was replaced by installing a new piece.
- After the installation of the Zone 1 heating coil, the melter/furnace was reassembled and started. The temperature in Zone 2 was found to be lagging by approximately 200 °C. On inspection, it was found that the electrical fasteners connecting the heating element to the power cable had corroded. The formation of the oxide layer resulted in poor contact causing the resistance to increase. New fasteners were installed to take care of the problem.
- An operation manual for the video setup has been prepared for ready reference. The manual is complete with the wiring instructions for video recording, video display, and film thickness calibration and measurement.

Assessment of current status and issues

FIU-HCET has had discussions with Dr. Hector Guerrero (technical monitor) to resolve the issue of alternate glass chemistry experiments. According to the original PTP, alternate glass chemistry experiments were scheduled for the beginning of FY99. However, these were pushed to the latter part of the fiscal year, as SRS could not supply the chemistry in time. The next phase of the experiments involves methodical destruction of the knife edge and the pour spout. Once the knife edge profile is altered, the altered glass chemistry experiments can not be performed unless a fresh pour spout and knife edge (that will be FY00) are available. SRS has suggested that FIU-HCET build another pour spout and knife edge for FY99. Given the project budget and time constraints, this will not be possible.

The most feasible scenario is that FIU-HCET do the altered glass chemistry experiments before the methodical destruction of the knife edge/pour spout. The problem here will be flushing the melter of the changed chemistry glass. For this effect, the plan is to pour 10-15 batches of normal surrogate glass through the melter. Viscosity and chemistry measurements will be done on the poured glass to ensure that the melter has been flushed of the alternate chemistry glass. Discussions are currently underway with the technical monitor to resolve the issue. On SRS approval, the milestone table will be adjusted to reflect the changes. A formal request to SRS has been made to supply FIU-HCET with fresh surrogate glass and alternate glass chemistry.

Plans for the next two months

- FIU-HCET will end the zero insert experiments after performing the pulsating glass flow experiments. This will be followed up with alternate glass chemistry experiments. Once the alternate glass chemistry experiments are complete, FIU-HCET will then perform the last set of experiments that require physically altering the knife and the pour spout to resemble corrosion at the DWPF melter pour spout and knife edge.

FIU-HCET collaborators

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III. CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY (CMST)

MONTHLY PROGRESS REPORT

FIU-HCET Principal Investigator	**M.A. Ebadian**
FIU-HCET CMST Program Manager	**David Roelant**
DOE CMST Technical Lead	**Joe Ginanni**
DOE HQ Program Manager	**Charles Nalezny**
Program Officers	**John Wengle**
	Karl-Heinz Frohne

Online Measurement of the Progress of Decontamination

Project Number: HCET-1998-C005

Project objectives

There is a critical need for accurately characterizing contaminants during several phases of deactivation and decommissioning (D&D) operations. Present characterization technologies typically require the cessation of decontamination activities, so as to properly assess existing contamination areas using some method of radiological surveying. This project focuses directly on in-process characterization, with specific aims that will include the following:

- Find in-process characterization methods, specifically in the area of radiation sensor systems capable of being integrated with a suitable decontamination technology so as to combine decontamination and characterization activities.
- 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 a minimum amount of material could be removed with the production of little 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. The integration of technologies will provide an improved instrument that may be continuously operated, removing contaminated materials and simultaneously assessing the removal progress.

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
C005-M1	Operational prototype	Prototype functional	Due 3/3/99 *Delayed until 8/31/99
C005-M2	Demonstration at FIU-HCET	Documented demonstration of prototype	Due 5/30/99 *Delayed until 9/20/99
C005-M3	Deployment	Initiate deployment at DOE site	Due 9/28/99 *Rescheduled 11/15/99
C005-M4	Year-end report	Submission	Due 9/30/99

* As per FY99 PTP, a design and implementation review required revisions to design and procurement. The project has been redirected accordingly. Milestones 1–3 have been forecast delayed as shown above. Additional explanation is provided below in *Assessment of current status and issues*

Significant events for this reporting period

- Progress toward operational prototype milestone C005-M1 was delayed by extensive project review and adjustment in emphasis from decontamination efficiency to characterization for release.
- 3D position identification system preliminary design is complete, and requisition of components is in progress. Positioning system has added benefit of being capable of providing a detailed topographic map revealing actual removal depths following decontamination in addition to the radiological characterization survey maps.

Accomplishments and technical progress to date

- Preparation of plans for FY00 complete.
- Initiated the integration process of the online system into the Idaho LSDDP.
- Completed a detailed component design of the detector mechanical arrangements:
  - Vibration, shock, and debris isolation suspension for pre- and post-decontamination
  - Replaceable shields (brush) and 'tear-off' windows
  - Radiation shielding for background from room and mechanical shields also affecting collimation
  - Shot blast suspension modifications
  - Low-cost disposable pneumatic tube section for effluent (waste stream) sensor array liner.
- Operator interface and associated components design refined:
  - Simple indication using commercial circular colored indicator light arrays with absolute value indication
  - Simplified limit calibration, either absolute engineering units or placement of the sensors over calibration surfaces
  - Preliminary operational procedures generated for creation of control coding.
- 3D position-determining system preliminary design complete:
  - Combination angulation/lateration relational geometry
  - Single stationary station required
  - No RF links necessary.
- Discussions are continuing with representatives directly involved with DOE site demonstration and deployment to finalize a schedule for demonstration of this system.

Assessment of current status and issues

- Review of conceptual design and proposed implementation, as required by FY99 PTP, revealed discrepancies between design and specified equipment with original scope and plan. A revised design and requisition is in process.
- 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 three sensor systems will employ similar processes and components, e.g., calibration and indication.
- The primary decontamination machine for the project prototype is available at FIU-HCET and required modification is underway.
- Demonstration prototype detectors, interface electronics, display components, and communication modules have been selected.
- Assembly of characterization components has begun.

Plans for the next two months

- Completion of the mechanical design and fabrication of mechanical components to be integrated with sensors and indicators to decon machine.
- Complete electronic design including control software.
- Assemble all components into prototype assembly.
- Test and refine prototype assembly.
- Demonstrate prototype at FIU-HCET.

FIU-HCET collaborator

Richard Musgrove, (305) 348-6622

Remote Surveillance of Facilities Awaiting Deactivation and Decommissioning

Project Number: HCET-1998-C006

Project objectives

FY99 is the second year of a three-year project. Many DOE sites -- Albuquerque Operations Office, Chicago Operations Office, Idaho Operations Office, Ohio Operations Office, Oak Ridge Operations Office, and Savannah Operations Office -- desire 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 *Delayed until 9/15/99
C006-M2	Testing at a DOE site	Tested at a DOE site for site-specific parameters	Due: 4/16/99 *Delayed until 10/15/99
C006-M3	System Improvement	Modifications completed.	Due: 5/17/99 *Delayed until 12/31/99
C006-M4	Performance evaluation	Performance evaluated under ambient environmental conditions	Due: 8/27/99 *Rescheduled for FY00
C006-M5	Deployment plan	DOE site deployment plan created.	Due: 10/1/99 *Rescheduled for 12/31/99
C006-M6	Commercialization plan	Industrial partner interested in commercialization of the system identified	Due: 10/30/99 *Rescheduled for 2/20/00
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 and issues.*

Significant events for this reporting period

- Deactivation and Decommisioning Focus Area (DDFA) project support was assured following program review meetings.
- Commercial source for adaptable multichannel micropower data acquisition system identified and technical discussions underway.

Accomplishments and technical progress to date

- Initiated discussions with representatives of Bechtel Hanford and Pacific Northwest National Laboratory (PNNL) regarding deployment of custom remote surveillance systems at Hanford facilities. Discussions were set up in response to an expression of interest by Bechtel Hanford at the DDFA Mid-year Review. Discussions are currently in progress.
- Prepared and delivered project status presentations to visiting DDFA Program Managers.
- Initiated the integration process of the Remote Surveillance system into the Idaho LSDDP. Technology screening forms have been received and are being completed.
- Commercial sources of remote power maintenance subsystems investigated.
- Matrix of possible transducers, power sources, and sampling conventions assembled.
- Incorporation with and improvements to existing DOE remote sampling systems investigated.

Assessment of current status and issues

- Project has been reviewed, and redirection has been created enabling convergence with initial scheduled status within fourth quarter of the fiscal year. Securing a deployment site still remains difficult.
- FY98 tasks incomplete and in progress for execution within FY99 include
  - Selection of suitable technology – nearing completion
  - Assessment of cost-saving and safety improvements expected from the development of the monitoring system – continuing
  - Engineering design review of the selected remote surveillance technology – ongoing
  - Procurement of sensors, components, and measurement units – underway for first components
  - System integration.
- Communication hardware and protocol structure is being engineered.
- Incorporation of/with existing commercial intermittent remote data sampling systems investigated.

Plans for the next two months

- Finalize all possibilities for closure on deployment issues at Hanford and begin planning stage. Reach a decision from Bechtel Hanford regarding deployment of a custom system.
- Submit completed LSDDP technology screening forms for Idaho LSDDP.
- Complete detailed electronic and mechanical design of sensing modules.
- Complete purchase of remaining system components and test at FIU-HCET.
- Continue to provide FIU-HCET's site representatives with detailed design information to aid their site participation solicitation efforts and to clarify the details of system design in light of actual needs expressed.
- Finalize designs to meet FIU-HCET QA standards.

FIU-HCET collaborator

Richard Musgrove, (305) 348-6622

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

Project Number: HCET-1998-C008

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 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, low exposure and reliable measurement of surface alpha contamination and deploy it at a DOE site. This involves the use of commercially available electret ion chambers (EICs) 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

Milestone No.	Milestone Description	Completion Criteria	Status
C008-M1	Cost-benefit analysis	Data showing performance of EIC vs. baseline technologies	Due 12/15/98. 1. Measurements using EICs and baseline technology (alpha probe) completed at a test-bed at FIU-HCET. Cost comparison performed. 2. Comparative assessment with baseline technology performed. Completed 2/26/99. The reason for delay addressed in section "Assessment of current status and issues" of this report.

Milestone No.	Milestone Description	Completion Criteria	Status
C008-M2	Deployment Plan and Demonstration at DOE facilities	Integration with D&D Focus Area's Large-Scale Demonstration and Deployment Program (LSDDP). Commitment for use of EICs for alpha contamination measurement from one or more DOE sites	Due 2/8/99 Delayed due to slow response from DOE site users. Completed 7/1/99 1. HCET will support DDFA for LSDDP at Savannah River, including evaluation of EICs and preparation of the Innovative Technical Summary Report (ITSR). HCET reviewed the test plan for EIC. LSDDP begun in June. 2. Deployment plan for Oak Ridge reviewed on April 17, 1999, and suggested changes were incorporated. Pending site approval of the plan.
C008-M3	Deployment of EICs at DOE site. Likely Oak Ridge (Bldg. K-1420) for characterization of floor. Main source of contamination: depleted and enriched uranium.	Deployment of the EIC system at one or more DOE sites	Due 5/17/99. Delayed due to pending approval of the test plan by Oak Ridge (Bldg K-1420). Rescheduled for August 30, 1999 Possible that SRS LSDDP could be a demonstration as well as a deployment
C008-M4	Information flow- HCET development of work and controlling documents	Transmittal of procedures, instructions, manuals, and information on measuring contaminants on DOE sites	Due 10/30/99, on schedule
C008-M5	Final report	Report completed and issued	Due 11/30/99, on schedule

Significant events for this reporting period

- Coordination activities to support DDFA with the SRS LSDDP continued. Discussions were held with SRS personnel and it was determined that HCET will participate in the writing of ITSR using electret ion chamber technology for surface alpha contamination measurement for the SRS LSDDP. FIU-HCET journal and conference publications on EIC were also sent to SRS.
- Presented a paper entitled "Ceramic Tiles as Inexpensive Large Area Test-beds for Electret Ion Chambers and other Instruments used for Measuring Alpha Contamination on Surfaces" at the 44th Annual meeting of the Health Physics Society, Philadelphia, PA, June 27-July 1, 1999. Interest was expressed and requests for reprints were received from several participants.
- Analysis of measurements performed show that it is now possible to determine average energy of alpha emitters. Additional measurements, with thicker Mylar window, were performed with the aim of resolving a mixture of alpha emitters.

Accomplishments and technical progress to date

- To further enhance measurement capability of EICs to alpha spectrometry, measurements at FIU-HCET were performed using thicker Mylar window (2.5 mg cm^{-2}). Different energy alpha sources were used, and response factors of ST electrets in 960- mL chamber were determined. Earlier measurements with 0.8 mg cm^{-2} Mylar window enabled determination of average alpha energy. It is expected these measurements may enable us to determine mixtures of alpha emitters. This is a potentially significant development accomplished by FIU-HCET. It could appreciably lower the current cost of spectral characterization.
- Gamma spectrometric measurement on another type of ceramic tile from the FIU-HCET test-bed was performed at the National Institute for Standards and Technology (NIST). The spectrum shows the presence of uranium and thorium and their decay products, including short-lived ones, in the tile. Short-lived decay products of radon and thoron are high energy alpha particle emitters. This type of tile, called Type B, has higher gamma activity than Type A measured earlier, although its alpha activity is nearly half of Type A tile. These measurements suggest Type B tile has thicker layer of material covering uranium and thorium than Type A tile thus allowing a smaller fraction of alpha particles to emanate from the surface. Such a situation may exist in actual field conditions too, where dust on the floor attenuates the emitted alpha particles.

Assessment of current status and issues

- The system has been calibrated and is ready for demonstration and deployment. FIU-HCET is working with representatives from Fernald, Oak Ridge, Rocky Flats, and Savannah River for demonstration and deployment of the technology. Among these sites, deployment in the LSDDP at SRS was initiated. FIU-HCET reviewed the test plan of using EICs for the SRS LSDDP. It will support DDFA at SRS LSDDP and in preparation of ITSR. Test plan for Decontamination Recovery Services L.L.C. (DRS), Oak Ridge, which was reviewed by FIU-HCET liaison at Oak Ridge, was submitted to DRS for approval. DRS has reviewed the plan. Further discussions were held on its implementation. DRS wants both alpha and beta contamination to be measured by an EIC. There are some difficulties with beta measurement. (1) As per scope of the project, the system has been calibrated for alpha sources only. For surface with both alpha-beta contamination, we measure beta contamination, which is subtracted from the total reading to obtain alpha contamination. (2) Response of EICs depends on beta energy, which means beta calibration standard should represent surface beta contamination. Procurement time for these calibration standards is more than two months. These sources are expensive, and unless DRS commits to testing and deployment of the EIC after the calibration for beta is performed, the whole exercise may prove to be futile.
- Milestone 1 was completed on February 26, 1999. Milestone 2 is moving forward because users have become involved and DDFA has committed to using EICs at SRS LSDDP. However, the final step to completion is being delayed due to still slow user response. Based on recent progress and existing commitments, pending approval of DRS test plan, Milestone 3 will be delayed. Alternatively, deployment of EICs in the glove box size reduction facility at Rocky Flats, is being actively pursued. FIU-HCET is a team member for this project. All project objectives planned for FY99 are expected to be met by the end of the fiscal year, but some

milestones will have been completed later than originally planned. The user response continues to be a problem.

- It is possible that FIU-HCET found an important extension of the EIC technical performance in developing a spectral measurement methodology.

Plans for the next two months

- Pursue floor characterization at Bldg. K-1420, DRS, Oak Ridge, to get commitment from user on actual date of deployment.
- Pursue EIC deployment at Savannah River and Rocky Flats.
- Continue supporting the SRS-LSDDP and obtain concurrence for preparation of ITSR.
- Continue to refine spectral measurement methodology and perform tests to determine quantity and energy of alpha emitters from a mixture of two or more alpha emitters.

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 DOE's 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 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.	Completed on 3/1/99, before due date of 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.	Completed on schedule 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 for this reporting period

- Concluded compiling data for another third of the baseline technologies identified, so that data collection for two-thirds of the baseline technologies is now finished.

Accomplishments and technical progress to date

- Continued obtaining and compiling cost information for the baseline technologies.
- Continued designing and programming a database that will be accessible from the Internet.

Assessment of current status and issues

This project is proceeding and no scheduling deadlines have been missed. Milestones 1, 2, and 3 have been completed. Currently, no impediments are known that could delay the on-schedule completion of the milestones.

Plans for the next two months

- Conclude obtaining cost data for the baseline technologies by reviewing documents and contacting vendors and site personnel.
- Continue programming activities to create an Internet accessible database. The database will be peer reviewed for design.
- Write the text for the baseline technologies (description, costs, and performance) that will be included in the 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 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 the CMST-CP with the final steps of this process. In short, it will help 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, 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 liaison to the DDFA.

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

Milestone No.	Milestone Description	Completion Criteria	Status
C010-M1	Schedule & number of demonstrations and/or deployments	Definitive list of activities generated.	Completed on schedule 3/15/99
C010-M2	Choose sites	Deployment/demonstration sites identified.	Completed on schedule 3/31/99
C010-M3	Demonstrations	Complete scheduling and organization	Due 3/31/99, Completed 7/19/99
C010-M4	Deployment	Site commitment to deploy a selected CMST-CP technology.	Due 10/30/99, on schedule
C010-M5	Marketing	Multiple site users are briefed on technology capabilities.	Completed 7/8/99, ahead of scheduled date of 10/30/99

Significant events for this reporting period

- FIU-HCET personnel visited Special Technologies Laboratory (STL) for discussions with the Principal Investigator (PI) of Laser Induced Fluorescence Imaging (LIFI) and for training in LIFI.
- Milestone 5 was completed. Subcontractors at Oak Ridge Reservation were contacted, they were briefed on the capabilities of LIFI, and discussions were initiated for a demonstration.

Accomplishments and technical progress to date

- Visited STL for training in LIFI, to obtain technical information, and for discussions with the PI and CMST-CP representatives concerning demonstration and deployment strategy.
- Contacted subcontractors at Oak Ridge involved in characterizing facilities for decontamination. Two subcontractors agreed to participate in a demonstration of LIFI that could lead to deployment. The demonstration has been set for the week of September 13.
- Conference call between HCET, STL, and a subcontractor concerning a demonstration of LIFI.
- Submitted LIFI to be considered for the LSDDP at the Savannah River Site.

Assessment of current status and issues

Due to funding cuts from CMST-CP, the project scope has been reduced. Discussions about scope with the CMST-CP representatives continued during the first quarter of FY99. The project work began in the second quarter. Milestones 1, 2, and 5 have been completed. Milestone 3 has been rescheduled.

Plans for the next two months

- Continue discussions between HCET, STL, and subcontractors at Oak Ridge concerning demonstration and deployment of LIFI.
- Demonstrate LIFI to one or more subcontractors at Oak Ridge who are interested in deploying LIFI.

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 DOE complex cleanup plan entitled "Accelerating Cleanup: Paths to Closure," sets an ambitious agenda for the DOE, Office of Environmental Management's (DOE-EM) cleanup work. 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. Limited DOE 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, though contained.

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 CMST-CP with information to guide its post-closure technology development and deployment efforts. As part of this project, 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.	Completed on 4/5/99, ahead of schedule 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.	Completed on 6/10/99, ahead of schedule 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.	On schedule to be completed by 9/30/99
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 within EM	On schedule to be completed by 10/31/99

Significant events for this reporting period

- Post-closure monitoring technologies, either currently available or being developed, have been identified and described for the final report.

Accomplishments and technical progress to date

- Continued the identification of technologies, either available or being developed, that are capable of meeting post-closure needs of DOE sites.
- Continued the identification of the most common post-closure needs within EM.

Assessment of current status and issues

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

Plans for the next two months

- Continue identifying technologies, either available or being developed, that are capable of meeting post-closure needs of DOE sites.
- Continue summarizing the common post-closure needs for the five DOE sites reviewed and the most pressing post-closure needs within EM.
- Initiate the writing of the final report.

FIU-HCET collaborator

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IV. INTERNATIONAL TECHNOLOGY INTEGRATION (ITI)

MONTHLY PROGRESS REPORT

FIU-HCET Principal Investigator	**M.A. Ebadian**
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Opportunities to Market U.S. Technologies Throughout the Western Hemisphere

Project Number: HCET 1996-I001

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.

D&D 2000

FIU-HCET's international focus includes the coordination of conferences that promote investment in Latin America and the Caribbean by U.S. industry. To this end, this project involves participating and hosting a number of prestigious international conferences, workshops, and/or seminars. To fulfill this task, FIU-HCET will co-host with the U.S. Department of Energy the Fourth USDOE International Decommissioning Symposium. The international program will be tasked with coordinating all international activities. This includes the development of international marketing material and customized proposals, targeting international organizations and industries, recruiting and appropriate marketing calls.

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, non-governmental organizations (NGOs), governmental institutions, and other participants in Latin America's environmental sector is being developed.

Website

FIU-HCET is also host to the Interactive Communication Website. The Website supports the energy cooperative undertaking agreed to at the 1994 Summit of the Americas in Miami. This entails collecting information on the Latin American energy sector, as well as updating contact information for energy personnel in Latin America. The Energy Minister, the Steering Committee, and working

groups responsible for environmental and economic energy related tasks set by the heads of states of their respective countries use this site <www.americasenergy.org>.

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
I001-M1	Database: Formulate a database of U.S. business contacts working in the field of environmental technologies	This milestone is ongoing.	Will continue to identify organizations to incorporate on database. Will discuss with DOE's Office of Policy, the possibility of incorporating database with energy website. Due date: 8/10/99. Date was postponed due to scheduled DOE ministerial meeting.
I001-M2	Interactive Communication Website: Maintain the Energy website for the members/participants of the Western Hemisphere Energy Initiative	Identify funding mechanism for the support of the Interactive Communication Website.	A tentative meeting was proposed by DOE's Office of Policy to discuss funding the Website. Funding from the Office of International Affairs has been received by HCET. Working on the first draft of the Business Plan on funding website. Due date: 8/28/99 (Note: The due date has been assigned by DOE's Office of Policy.)
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.	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.	Responses by companies were forwarded to Enterprise Fl. Completed: 3/2/99 ahead of schedule.
I001-M5	ITI Year-end Report	Letter by EM/OST to accompany report needs to be sent to FIU-HCET publications.	Report was completed and a draft letter to accompany report was sent. Report has been reviewed by EM/OST. Letter to accompany report has been sent by EM/OST. Due Date: Completed, 5/19/99
I001-M6	The Fourth USDOE International Decommissioning Symposium (D&D 2000)	Coordinate all international activities associated with this event.	Target international organizations and participants for the symposium. Date: TBD

Milestone No.	Milestone Description	Completion Criteria	Status
I001-M7	Open contract vehicle between the Office of International Affairs (IA) and FIU-HCET	Draft a Statement of Work and prepare a five-year budget plan.	Statement of Work and Budget were completed ahead of schedule (due date for this action item was 6/28). Copies were sent to International Affairs Budget and Procurement Officer. Working to have contract vehicle in place by August. Due Date: 8/28/99

Significant events for this reporting period

- FIU-HCET is working on the first draft of a business plan that identifies possible outside sources of funding for the website. The draft will include an expense report on what FIU-HCET has contributed to the support of the site. The final business plan will be submitted to DOE's Office of International Affairs for approval.
- The proposal to bring the IV Ministerial meeting online has been accepted by DOE. FIU-HCET will be responsible for coordinating the activities to bring online the opening session and press conference by Richardson. In addition, FIU-HCET personnel will be responsible for posting papers derived from the breakout sessions and posting documents under the appropriate working group section of the website. The meeting is scheduled to take place in New Orleans, July 28-30.
- Working on identifying the international participants for the Fourth USDOE International Symposium, June 2000. This has included targeting international organizations and industries for a promotional purpose. A final draft project plan has been submitted to DOE, comments have been provided by DOE OakRidge, incorporated and resubmitted for final approval.
- FIU-HCET representative attended the Fourth Annual Latin American Power "99 Conference and Exhibition on June 29. This was an opportunity for FIU-HCET to explore the future of electric power in Latin America and be introduced to cutting-edge technologies by U.S. companies in the industry.
- FIU-HCET representative worked with DOE Public Affairs office to post information on Dr. Moniz's, Under Secretary, of the DOE visit to FIU-HCET on the official DOE website. In addition, the special news highlights edition on the visit was mailed to all DOE international contacts.
- Accepted invitation by the French Consulate General to attend the French Consulate Independence Day Celebration. Both private and government representatives participated in this event. FIU-HCET representative had the opportunity to brief consulate on the work being performed at the center.
- FIU-HCET representative is in communication with TFC International Corporation of Argentina interested in FIU-HCET providing technologies for a project to treat industrial waste. Director of corporation is tentatively scheduled to visit facilities at FIU-HCET in August.
- FIU-HCET representative has been requested by the Department of Energy's Office of Environmental Management (EM) to attend the next Joint Coordinating Committee for

Radioactive and Mixed Waste Management (JCCRM) meeting taking place in De Bariloche, Argentina. FIU-HCET representative will assist EM officials in their interactions with representatives from the National Atomic Energy Commission of Argentina (CNEA).

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 Collaborator

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