HCET News Highlights

March 1999

Hemispheric Center for Environmental Technology, Florida International University

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Bartlett Demonstrates Robotic Climber at HCET

As part of HCET's Technology Assessment Program in support of the U.S. DOE Federal Energy Technology Center's Deactivation and Decommissioning Focus Area (DDFA), 16 technology assessments are scheduled for FY99 at the HCET Technology Assessment Site under the direction of Dr. Paul Hart, DDFA Program Manager. Among these technologies, the Robotic Climber from Bartlett Services Inc. & Bartlett Nuclear Inc. was demonstrated at HCET in December 1998 and again in February 1999. The climber is a remote-controlled, free-climbing robot using Ultra High Pressure Water Jetting within a contained vacuum shroud, and employs a self-propelled, joystick-operated robotic device designated for surface decontamination, coating removal, and concrete "scabbling." Adhesion to the surface is achieved using vacuum, enabling the robot to perform on vertical or inverted surfaces as well as horizontal flats and sloped surfaces. This vacuum also serves to capture the water and waste from the removal process. The robotic climber successfully removed coatings from metal plates, concrete wall, floor, ceiling, and performed aggressive concrete removal (approximately ¼-inch) from a wall.

The International Union of Operating Engineers (IUOE) provides a detailed analysis of the human factors related to each of the technologies assessed.

Additional information can be found in the HCET January monthly report or by contacting Cindy Zhang at (305) 348-6340.

High Productivity Vacuum Blasting System

The U.S. Department of Energy (DOE) is constantly searching for improved technologies to decontaminate large areas of both contaminated concrete and metal surfaces. To aid in this search, LTC Americas and Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET) have been tasked by the Federal Energy Technology Center's Industry Programs to research and develop an innovative and improved Vacuum Blasting decontamination technology.

This applied research and development project will improve the currently used decontamination technology by implementing an innovative nozzle design. Additional elements, such as the blasthead and dust separator, will be redesigned and modified. The project entails the use of numerical analysis and computational fluid dynamics software packages for the design of the new nozzle. After the performance of the improved nozzle is finalized, prototypes will be fabricated and tested in a lab environment. Once experimental results confirm numerical calculations, a final nozzle will be fabricated and integrated to LTC's Sealed Waste Transfer System (SWATS™) and LTC Vacuum Blasting machines. A final field test will be conducted to investigate their performance in the field.

Recent research for the open blasting industry has shown that the performance of the nozzle can be improved in three ways:

- Run at the design nozzle pressure or above
- Run the smallest feasible abrasive grit size
- Use an improved blasting nozzle.

Among these three, the redesign of the nozzle alone offers an estimated 80 percent increase in efficiency. Work done recently has achieved a substantial increase in the overall performance of blasting nozzles. With a better understanding of the air-abrasive flow inside the nozzles as well as inside the blasthead, a better vacuum blasting nozzle should be developed.

Improvements and modifications to the existing LTC dust separator will also be addressed. Present operating experience with the LTC Vacuum Blasting Machine shows that the separation performance is not satisfactory. Fine steel grit particles are useful for improving the cleaning production rate. However, such fine particles are easily entrained by the fine particles and ash cleaned from the decontamination surfaces. This decreases the efficiency of the whole system. A secondary separator will be designed and tested.

In addition, a new blasthead will also incorporate sensors for triggering a shut-down of the system once the blasthead loses contact with the surface. These sensors will ensure neither under- nor over-cleaning of a given surface area, thereby resulting in a gain in production rates. An additional sensor will be incorporated into the blasthead to perform real-time characterization of the surface. Sensors to determine the effectiveness of decontamination are highly desirable; therefore, sensors to meet such demands will be developed and integrated.

Duke Selects HCET for Argonne CP-5 D&D Project Support

Duke Engineering and Services (DE&S) has been awarded the contract to manage and execute the CP-5 D&D Project at Argonne National Laboratory (ANL). Using technology Information generated through the efforts of FETC's DDFA, HCET collaborated with DE&S to produce a proposal highlighting technology expertise and low cost. As a result of these efforts, HCET assisted DE&S in submitting the winning proposal; HCET will continue to provide project support in technology application, project engineering, and characterization.

During the first phase of the project, HCET will provide full-time support at the project site in planning and project engineering activities. HCET's support of plan and procedure writing and engineering and technology reviews will help determine the optimum technical approach.

In the second phase HCET will facilitate ongoing operations and provide assistance in technology deployment and task execution.

The CP-5 D&D Project at Argonne will continue for approximately 14 months, with HCET providing both on-site and remote technical support.

Web Site Introduced at Hemispheric Conference in Peru

On February 10-12, 1999, Ms. Ana M. Ferreira, International Coordinator for HCET, and Mr. Walter Conklin, Information Technology Program Manager for HCET, showcased the "Interactive Communication Web Site" for the Steering Committee of the Hemispheric Energy Initiative in Lima, Peru.

The Web Site facilitates the efforts of the energy representatives as they oversee the region's hemispheric energy cooperative undertakings as agreed to at the 1994 Summit of the Americas.

All participants agreed the Web Site would be an integral tool for the success of the Steering Committee and its working groups. It was also agreed that a training session for the users of the site and a future Steering Committee meeting at Florida International University would be coordinated.

Honorary participants at the meeting included the Minister of Energy and Mines, the Honorable Daniel Tokachike of Peru; the Vice-Minister of Energy, Ing. Jorge de Romani; the President of PetroPeru, Ing. Juan Assereto; and many others.

Hotel los Delfines, Lima, Peru, site of the VIII Steering Committee Meeting. Participants: Enrique Paga, PDVSA, Venezuela; Ana M. Ferreira, HCET, USA; Gary Ward, DOE, USA; and Gustavo Navarro, PetroPeru, Lima, Peru.

The internet address of the "Interactive Communication Web Site," is www.americasenergy.org. For more information, contact Ms. Ana M. Ferreira, International Coordinator, HCET, 305-348-1818 or e-mail at ferreira@eng.fiu.edu.

HCET Offers New ISO 14000 Environmental Services

HCET is now offering ISO 14000 Environmental Services, a new business line to assist companies toward effective environmental management. Europe and the Pacific Rim countries are using the ISO international standards to establish uniform practices for commerce throughout the world.

ISO 14001 certification is becoming very important for U.S. companies to compete in the global market. In all likelihood, certification will become mandatory for doing business.

HCET provides experienced personnel who understand the complexities of ISO 14001. The first step in implementing an Environmental Management System (EMS) is to conduct a gap analysis and to chart the course for management to achieve compliance with ISO 14001 requirements. HCET teams combine environmental specialists with management system and documentation experts to streamline integration of the ISO 14001 standard with existing environmental, health, and safety systems.

HCET first

1) Assists with understanding ISO 14001 and its components.
2) Reviews the company's readiness for registration or self-certification.
3) Assists in establishing systems for preparing to register or be certified.
4) Provides support to internal environmental and quality teams.
5) Assists in developing policies and procedures.
6) Assists in preparing management systems manuals.

HCET offers specialized courses in ISO 14000 implementation, ISO 9000/14000 integration, and internal auditing of ISO 14000 EMSs tailored to the needs of corporate executives, line managers and employees, EMS/QMS managers, internal auditors, and EMS implementers. Interested organizations can obtain additional information by contacting Myrna Goss at 305-348-6307, (FAX) 305-348-6308, or (e-mail) mjgoss@eng.fiu.edu.

HCET Exhibits at National Environmental and Standards Integration Conference

HCET exhibited in Las Vegas, NV, with information packets, CDs, and videos to demonstrate the Center's technological capabilities and its ISO 14000 environmental management system services. The conference theme, "Managing Integrated Systems: Practical Tools and Global Lessons," ran from March 15 through 18, 1999, and focused on the real-world task of effectively implementing quality, environmental, and health and safety management systems under practical business operations. The conference was sponsored by the American Society for Quality in cooperation with the Registrar Accreditation Board.

DISCLAIMER

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HEMISPHERIC CENTER FOR ENVIRONMENTAL TECHNOLOGY

MONTHLY PROGRESS REPORT

FISCAL YEAR 1999

DE-FG21-95EW55094

MARCH 1999

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

http://www.hcet.fiu.edu

SUMMARY

- A vendor was selected for the diamond wire technology demonstration scheduled for this summer at Princeton Plasma Physics Laboratory (PPPL). A team consisting of personnel from FIU-HCET, PPPL, and AEA Technology reviewed the submitted bids. FIU-HCET will contract this vendor.

- At the SRS Ninth ICT teleconference, the ICT team discussed the status of the following demonstrations: LRAD; x-ray, K-edge; Strippable Coatings; Thermal Spray Vitrification; Cutting/Shearing/Dismantlement/Size Reduction; and Electrets. The LRAD demo is complete, and the x-ray/K-edge, Strippable Coatings, and Electrets demos are ongoing. The Asbestos and Thermal Spray Vitrification demos require more laboratory testing. The Cutting/Shearing/Dismantlement/Size Reduction demo is undergoing procurement.

- Five FIU-HCET staff members took the ISO 14000 environmental auditor training course February 22-26, 1999, given by ASC.

- The test plan for the Facility Dismantlement Technology Assessment is finished and ready for internal review.

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MONTHLY PROGRESS REPORT

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

Major milestones

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.	Two technologies evaluated for various applications for a total of three demonstrations. Two technologies are scheduled for April. The PPPL demo is scheduled for July.

Milestone No.	Milestone Description	Completion Criteria	Status
D038-M2	Test Plan for Characterization Technologies Assessment Program	Characterization Technology Test Plan Approved	Under development. Scheduled completion 4/30/99.
D038-M3	Test Plan for Waste Management Technologies Assessment Program	Waste Management Technology Test Plan Approved	Revised scheduled start 5/17/99. Scheduled completion 6/30/99.
D038-M4	Access to the multimedia information system web-based user interface for dismantlement	Assignment of user name and passwords to DDFA provided distribution list.	Design started 12/7/98. Scheduled completion 10/1/99.
D038-M5	Access to the information system characterization database	Assignment of user name and passwords to DDFA provided distribution list.	Scheduled start 7/6/99. Scheduled completion 10/29/99.
D038-M6	Report on the information system waste management design	Final copy of report sent to DDFA.	Scheduled start 10/1/99. Scheduled completion 10/29/99.
D038-M7	Report on the decision analysis tool for dismantlement design	Final copy of report sent to DDFA.	Scheduled start 7/6/99. Scheduled completion 10/29/99.

Significant events

- Bluegrass Concrete Cutting, Inc. has been awarded the contract to demonstrate the diamond wire saw technology to size-reduce mockups of the Tokamak Fusion Test Reactor at Princeton Plasma Physics Laboratory (PPPL). The vendor will begin by reviewing and providing input to both the Test Plan and mockup designs. The actual demonstration is scheduled for July 1999.
- Demonstration of the ElectroStrip™ technology by EMEC Consultants is scheduled for 4/12/99–4/14/99. This technology will be assessed for its ability to decontaminate (remove coatings and rust) from metal.
- Demonstration of Universal Ice Blast Inc.'s technology is tentatively scheduled for the week of April 26, 1999. They will be assessed on decontamination (coating removal) of metal and masonry.
- Work is progressing to transfer several non-contaminated gloveboxes and tanks from Rocky Flats to FIU-HCET for the purpose of performing size reduction technology assessments. These materials have been identified as high risk (IAEA Nuclear Trigger List) equipment and negotiations are underway between Rocky Flats, FETC, and FIU-HCET to ensure that these items will be stored, destroyed, and disposed of according to IAEA Trigger List criteria.
- Expressions of interest are being received in response to the Commerce Business Daily advertisement requesting technologies for the glovebox and tank dismantlement technology assessment. Companies responding included NUKEM Nuclear Technology, NFS/RPS, and AEA Technology.
- The data has been completed on the assessments of the Bartlett Robotic Climber demonstration. A Technology Evaluation and Assessment Summary for the demonstration is attached.

- The remaining data has been received from Mississippi State University – DIAL concerning the December assessment of their FTP characterization technology. The comparison of the DIAL data to the professional surveyor's results is ongoing.

Accomplishments and technical progress

- Under this grant project, which began in FY96, and earlier technology assessment projects funded from other sources, FIU-HCET assessed over 60 innovative/improved and baseline technologies for decontamination and equipment dismantlement under standardized, non-nuclear testing conditions. Many of the technologies identified for demonstration at FIU-HCET are selected to address the needs identified in the EM-50 Needs Management System (http://EM-Needs.em.doe.gov/Home/). As a result of these assessments, directly comparable performance data related to operations and maintenance, primary and secondary waste generation, and health and safety have been compiled. This data has been valuable in assessing if a technology meets the screening criteria for those DDFA LSDDPs where these technologies are being considered, as well as assisting EM-40 project managers in making decisions on the deployment of innovative technologies. Technology assessment data are managed using a Microsoft Windows-based multimedia information system.
- To date, two technologies have been demonstrated in multiple applications for a total of three assessments in FY99. Two additional technologies are scheduled for demonstration in April 1999 and the vendor for the PPPL demonstration is now under contract.

Assessment of current status

This project is on schedule. Two technologies have completed assessment and three additional technologies are scheduled. The test plan for Waste Management Technology Assessment has been postponed to complete the work being performed on the Glovebox and Tank Size Reduction Technology Assessments. However, the milestone for the Waste Management test plan is not in jeopardy.

Plans for the next two months

Activities for the next two months include

- Continue technology search for FY99 demos. Demonstrate two technologies, ElectroStrip and Ice Blast, by the end of April 1999.
- Finalize the test plan for the PPPL demonstration with the vendor for the diamond wire technology assessment.
- Complete the test plans for Facility Characterization, Glovebox/Tank Dismantlement, and Facility Dismantlement. Begin identifying technologies for demonstration.
- Begin drafting the test plan for Waste Management technology assessments.

- Complete the design of the multimedia information system for dismantlement and beginning programming.

FIU-HCET collaborator

Susan C. Madaris, (305) 348-3727

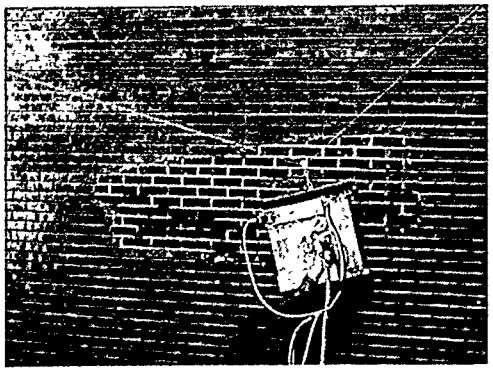
TECHNOLOGY ASSESSMENT PROGRAM (TAP)
Technology Evaluation and Assessment Summary

Bartlett Robotic Climber

DEMONSTRATION OBJECTIVE

The Robotic Climber was demonstrated twice at FIU-HCET, December 1998 and February 1999. The objective of the demonstration was for the technology to remove coatings from a masonry floor, wall, and ceiling, as well as from carbon steel plates. In addition, the technology was to remove approximately ¼-inch of concrete from both floor and wall.

TECHNOLOGY DESCRIPTION



The Bartlett Robotic Climber removing the coating from a brick wall.

The Bartlett Robotic Climber is a remote controlled, free climbing robot using Ultra High Pressure Water Jetting within a contained vacuum shroud. This technology employs a self-propelled, joy-stick-operated robotic device designated for surface decontamination, coating removal and concrete "scabbling". Variable water pressure (0 to 36,000 PSI) at low consumption rates is the medium used by the H-1 model.

Adhesion to the surface is achieved using vacuum, enabling the robot to perform on vertical or inverted surfaces as well as horizontal flats and sloped surfaces. This vacuum also serves to capture the water from the removal process as well as the waste. An Ultra High Pressure rotary nozzle with 8 to 14 spray tips housed beneath the robot spins at high speed delivering the water jet to the surface which cuts an 8-inch path. A vacuum chamber houses the spray tips and is encircled with a seal which holds the robot to the surface and prevents the egress of water and waste into the environment.

RESULTS

The Robotic Climber was remotely operated using joysticks, which allowed the robot to move in any direction and the operator to stay up to 500 ft from the equipment. The rubber seal was mostly successful in containing the water and debris during operation; however, some leakage was noticed when the equipment stopped. The water generated during cutting is separated from the solid debris leaving both water and sludge as final waste products. For flat surfaces, the unit adheres well to the substrate. Adherence is lost when obstacles or irregularities are present on the surface. Hoses must be physically moved by an operator during floor decontamination activities to keep them out of the unit's way.

Production rates for coating removal from masonry ranged from 80 ft^2/h (ceiling) to 235 ft^2/h (floor). For 1/4-in concrete removal, the production rates were 87 ft^2/h (wall) and 174 ft^2/h (floor). Metal coating removal was performed at 87 ft^2/hr for paint removal and 173 ft^2/hr for rust removal.

Problems occurred during the original assessment when the technology attempted to decontaminate the ceiling and perform aggressive concrete removal. The vendor modified the unit and the technology returned to FIU-HCET and successfully completed the assessment.

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

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D023-M1	Selection of Industrial Partner to design and manufacture decontamination and deployment systems	Selection of a responsible and qualified vendor	In progress. See section "Assessment of current status" for detailed explanation
D023-M2	Approved Design Specifications for the Decontamination System	Approval of final design specifications for the decontamination system	Scheduled completion 4/6/99.
D023-M3	Fabrication of Decontamination System	Complete fabrication of decontamination system unit	Scheduled completion 7/30/99
D023-M4	Field Testing of Decontamination System	Completion of testing of decontamination unit at FIU-HCET Test Site	Scheduled completion 8/16/99.
D023-M5	Design Drawings for the Characterization System	Approval of final design specifications for the characterization system	Scheduled completion 6/1/99
D023-M6	Fabrication of Characterization System	Complete fabrication of characterization system	Scheduled completion 9/30/99.
D023-M7	Testing the Characterization System	Completion of characterization system testing at FIU-HCET	Scheduled completion 10/15/99
D023-M8	Final report on the Decontamination and Characterization System.	Deliver final report to DDFA-determined distribution list	Scheduled completion 11/30/99

Significant events

- 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 has issued an extension of the Bid Opening Date until April 2, 1999.

- Based on the extension to the bid opening date, D023-M1 has been deferred and will result in a delay in subsequent milestones. The new Bid Opening Date directly affects M2, "Approved Design Specifications for the Decontamination System," and possibly M3, and M4.
- A Test Plan for the development of a mock-up facility for the testing of the characterization technology has been reviewed. A final draft copy will be sent to D&D program manager for review and approval.

Accomplishments and technical progress

- Performance Specification document which included conceptual designs of the decontamination and deployment systems were sent for review to D&D Program Manager and HCET Senior Program Manager. Comments were obtained and implemented by the end of January 1999. The reviewed documents and comments have been documented and are available.
- Vendor selection process is currently being carried out. Requisition form and Performance Specification document were sent to FIU-Purchasing on February 9. Vendors received Invitation to Bid package on March 11, 1999.
- During FY98 an extensive search for decontamination technologies was conducted. Several sources were utilized, including Remedial Action Program Information Center (RAPIC), FIU-HCET databases for decontamination technologies, and others. Eight technologies were shortlisted for comprehensive analysis to determine the optimum technology to deploy. The criteria for final selection were
  - Removal capabilities
  - Production rates
  - Cost information
  - Waste generation
  - Health and safety.
- Based on the comprehensive technology analysis, the Marcrist Diamond Wheel Shaving Technology was selected for deployment.
- In addition to the selection of the optimum decontamination technology, the characterization technology and deployment platform selection criteria were determined, and screening of potential technologies to integrate with the selected decontamination technology was commenced.
- For additional details on accomplishments and technical progress, refer to the Integrated Vertical and Overhead Decontamination System FY98 Year-End Report.

Assessment of current status

The original schedule date for M1 was February 1, 1999. Due to revisions to the Performance Specification documents, HCET's Requisition Request was delayed.

Due to the delay in issuing the Requisition request, vendors requested an extension to respond to the bid. Based on vendor's request the Bid Opening Date was extended until April 2, 1999.

The delay in the completion of M1 will have an impact in M2, "Approved Design Specifications for the Decontamination System," scheduled for completion on April 6, 1999. A better assessment for the completion of this milestone, as well as M3 and M4, will be made once a contract is put in place with the selected vendor.

A draft Test Plan for the development of the mock-up area for testing of the radiological sensors was sent for internal review. HCET's Senior Engineer, CMST Project Manager and HCET's Radiological Officer reviewed and commented on this Test Plan. All comments were incorporated and a final copy will be given to D&D Program Manager for review and approval.

Plans for the next two months

Activities for the next two months include the following:

- Opening of Bid and selection of vendor. Scheduled for April 2, 1999.
- Obtain approval for Test Plan document for the development of a test site for the characterization system.
- 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 subtask include the following:

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D039-M1	Release 1 of the TIS	User Access to the functional LSDDP-TIS via the Internet	Completed on schedule on 1/4/99.
D039-M2	Information from new LSDDPs incorporated	Screening data from new LSDDPs accessible through TIS	Scheduled completion – 3/1/99 delayed – data still being received.
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	Scheduled completion – 3/1/99 delayed. Vendor information not available and being researched.
D039-M4	Information from DOE databases incorporated	Data from DOE designated databases accessible through TIS	Ongoing – Scheduled completion – 4/30/99
D039-M5	TIS Linked to other D&D Technology Web Sites	Users of TIS provided with hyperlinks to other technology web sites	Scheduled completion –6/30/99
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 FY-00.

Significant events

On March 12, 1999, the TIS was demonstrated to an FIU-HCET peer review group. Participants identified a series of functions and reports that would be of benefit to Project Managers using the system, specifically:

- Common queries and search criteria that would be frequently used. These could be pre-programmed and provide the user with information easily and quickly.
- Information that users typically expect to find on each technology, such as technology description and purpose, and manufacturer and vendor contact information.
- Formats of reports and screens that can be read easily and understood by users.

Accomplishments and technical progress

- A data conversion utility has been developed to export validated data from HCET's Technology Assessment Program database into the TIS database. Similar utilities are being developed to convert technology data in DOE's databases for export to the TIS database.
- The Hanford C-Reactor LSDDP ICT has provided 308 technology screening sheets on technologies that were not formally evaluated but contain valuable information on commercially available technologies that could be of benefit to D&D projects. 120 of these have already been entered into the TIS database.
- Technology screening datasheets from the four new LSDDPs are being collected. Summarized below are the numbers that have been received to date.

New LSDDP Sites	# of Technologies Reviewed to Date	# of Datasheets Received to Date
Mound Environmental Management Project (MEMP)	62	62
Savannah River Site (SRS)	45	45
Idaho National Environmental Engineering Laboratory (INEEL)	123	48
Los Alamos National Laboratory (LANL)	41	41

Assessment of current status

The system development phase of the project is proceeding on schedule and no major problems are foreseen. Currently, the recommendations from the TIS beta testers and FIU-HCET peer review group are being implemented.

Plans for the next two months

- Programmed user queries, utilities, and reports identified by the FIU-HCET review group will be implemented.
- The additional data from the Hanford C-Reactor LSDDP will be entered into the TIS database.
- The utilities for exporting data from available DOE databases will be completed, and data will be transferred from these databases into the TIS database.
- Research will continue on collecting vendor information on DOE's baseline technologies and entering the information into the TIS database.

FIU-HCET collaborator

Mabel Acosta, (305) 348-6650

Ex-Situ Large-Bore Pipe Decontamination and Characterization System

Project Number: HCET-1997-D017

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.	Ongoing. Scheduled completion 6/30/99. Delivery schedule for container has impacted the completion date. This delay does not place this item on the critical path.

Milestone No.	Milestone Description	Completion Criteria	Status
D017-M2	Field testing of the decontamination system	The decontamination system will be tested to ensure the performance specifications are met. This will be accomplished by witnessing the cleaning of five tons of pipe of various diameters.	Ongoing. Scheduled completion 4/20/99
D017-M3	Close-out of decontamination system	This milestone requires the completion of all required activities, including operation/maintenance procedures. Five people from FIU-HCET will be trained on the operation and maintenance of the system. The completed system will be turned over to FIU-HCET for operation and integration with the characterization system.	Ongoing. Scheduled completion 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*
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 slipped 18 days due to problem with procurement of conveyor.

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

Significant events

- The blast cabinet and conveyor system for the decontamination system has been fabricated. The major system component fabrication was completed in January 1999. The initial run-off of the system was a success, and the system was able to clean the internal and external surfaces of a 10-inch pipe. Final system fabrication is underway with the second run-off scheduled for the third week of March 1999.
- The ventilation container was delivered to Delong Equipment on February 23, 1999, to facilitate the installation of the ventilation equipment.
- The procurement of the decontamination container is complete. The revised delivery schedule for the container is April 30, 1999.
- The Title II design documents were received on Janaury 29, 1999. The Title II design review meeting was held at Canberra on February 10, 1999. Comments were incorporated, and the FIU acceptance letter was sent to Canberra on February 18, 1999.
- The Ex-Situ Large-Bore Pipe Decontamination and Characterization System was presented at the HBCU/MI conference on March 18, 1999, in Miami, FL.
- The procurement of the transportation trailers is complete. The contract shall be awarded the week of March 22, 1999.
- The procurement is underway for the material off-loading system. The material off-loading system will manage the material when it leaves the characterization system and hold the material in storage racks for final disposition.
- An air cooler dryer is currently being procured to ensure a clean dry air supply is available to the blasting system and the dust collector.

Accomplishments and technical progress

Literature Search to Determine Pipe Remediation Problem Set

Rough order-of-magnitude quantities were obtained from Hanford and Fernald, including 150,000 m^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 involve laying out the system to fit into transportation containers. All critical issues have been resolved, and the system design indicates the performance specifications will be met.

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

Design and Fabricate Characterization System

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

Assessment of current status

- The operations and maintenance procedures for the decontamination system are delayed due to revisions to the blast lance for pipe internal blasting. These procedures are not on a critical path for the completion of the decontamination system and will be available prior to the required date for use in the completion of milestone D017-M3.
- Project is on schedule to meet demonstration date.

Plans for the next two months

- The transportation container for the decontamination system will be designed and fabricated.
- The final material run-off for the decontamination system will be complete prior to installing the components in the container.
- The procurement for the material off-loading system will be completed.
- A draft of the ventilation operations & maintenance procedure will be completed.
- All ventilation equipment will be installed and operationally checked.

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 discolorations caused by rust stains, mill scale stains, or previously applied paint stains." (Structural Steel Painting Council, 1991, *Surface Preparation Specifications*, Structural Steel Painting Council, Pittsburgh, PA, pp. 53-56.)

- The transportation trailers will be delivered.
- The decontamination system will be installed into the decontamination container.
- The air cooler dryer will be delivered.

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

The objectives of the project are the following:

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D041-M1	Technology selection complete	Determine optimum technology to deploy considering production rate, decontamination factor, and safety factors	Completed 2/1/99
D041-M2	Design plan complete	Peer review of design plan complete and approved	Scheduled completion 2/23/99. Deferred to 3/31/99 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
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

- Completed review of the candidate technologies and selected grit blasting technology to deploy on integrated system.
- Completed peer review of design plan.
- Comment resolutions of design plan approved by review committee.

Accomplishments and technical progress

- Candidate technologies for in-situ decontamination of pipes were screened and a list completed.
- Candidate technology selected.

Assessment of current status

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

Plans for the next two months

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

FIU-HCET Collaborators

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

Project Number: HCET-1999-D042

Project objectives

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

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

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D042-M1	Report on site licensing, decommissioning, and participation information	List of NPRs indicating nature of operation, license expiration date, decommissioning schedule, and willingness of the site to participate in the study.	February 28, 1999 completion date rescheduled to April 15, 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.	March 15, 1999 completion date rescheduled to April 30, 1999.
D042-M3	Site needs assessment	Identification of key problem sets facing each NPR scheduled for decommissioning.	Scheduled to begin April 1999.
D042-M4	Technological solutions	Identification of candidate technologies for addressing problem sets identified in milestone 3.	Scheduled to begin July 1999.
D042-M5	Final report production and distribution	Report summarizing problem sets and potential technological solutions submitted to DOE and upon approval distributed to NPR sites and candidate technology providers.	To be completed before October 31, 1999.

Significant events

- Contact information for managers at all 43 NPRs in the survey has been obtained. Survey information is being collected via telephone interviews and written confirmation sent to participants.

Accomplishments and technical progress

- To date, 27 NPR managers have been contacted, and 13 have committed to participating in the survey and providing site assessment and decommissioning information on their facilities.

Assessment of current status

- The project is approximately one month behind schedule due to difficulties in contacting site managers. Further attempts will be made to contact the remaining managers. Those who have not responded by April 15, 1999, will be assumed to be uninterested in participating in the survey.

Plans for the next two months

On April 30, 1999, FIU-HCET will submit to DOE a report outlining those NPRs that have committed to participate in the study. The report will provide information on the nature of operation, the type of reactor, type of license, and expected decommissioning schedule for each NPR. Based on this information and the expected participation level of site managers, FIU-HCET in consultation with DOE will decide whether to proceed to Phase II of the project.

FIU-HCET collaborator

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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 2,000,000 tons of RSM will be generated from the deactivation and decommissioning of radioactively contaminated facilities at the DOE and in the private sector.

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

The objective of the subtask is the following:

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D043-M1	RSM inventory	A summary of estimated current and future RSM generated from D&D activities.	The scheduled completion date of 2/1/99 has been revised to 4/30/99.
D043-M2	List of committed waste site managers	A list of waste site managers willing to provide information necessary for developing LCCAs.	The scheduled completion date of 2/1/99 has been revised to 4/30/99.

Milestone No.	Milestone Description	Completion Criteria	Status
D043-M3	Report to DOE on Phase 1 (milestones 1 and 2)	Summary of results of milestones 1 and 2 and recommendation to DOE whether to proceed.	The scheduled completion date of 3/1/99 has been revised to 4/30/99.
D043-M4	Decision on RSM disposal sites and options to be assessed	List of waste disposal sites that will be surveyed and disposal options for which LCCAs will be developed.	The scheduled completion date of 3/15/99 has been revised to 5/15/99.
D043-M5	Documentation of NRC and commercial means of costing RSM disposition	Comparative analysis of costing methodology and factors used by selected sites.	Scheduled for completion 5/31/99.
D043-M6	Documentation of DOE means of costing RSM disposition	Procedural outline of DOE's costing methodology, indicating variances with other sites surveyed.	Scheduled for completion 5/31/99.
D043-M7	Life-Cycle Cost Analyses	Revised LCCAs submitted to DOE considering variances identified in milestone 6 as well as ORNL's *Life Cycle Decision Methodology for RSM.*	Scheduled for completion 8/31/99.
D043-M8	Finalize LCCAs and update DOE handbook	Revised LCCAs incorporating DOE's comments and procedures for LCCA incorporated in DOE handbook.	Scheduled for completion 9/30/99.
D043-M9	Final report	Final report documenting results of project submitted to DOE.	Due 10/31/99.

Significant events

Progress toward completion of milestones 1 through 4 has picked up significantly since February 1999, when FIU-HCET assigned a Project Manager to work full-time in Oak Ridge to facilitate data collection and analysis and to collaborate with staff of the National Center of Excellence for Metals Recycle in Oak Ridge.

Accomplishments and technical progress

A Phase I detailed project plan has been developed and put into action. Project activities during the reporting period included the preparation of an RSM inventory survey to gather information on current and future RSM inventories at DOE sites. The survey has been distributed on diskette along with an explanatory cover letter, to sites at LANL, ORO, SRS, INEEL, NTS, Fernald, Hanford, and Rocky Flats.

A predecisional outline for the report to DOE on Phase I activities has been drafted and is awaiting data from the above listed sites.

Once the data from existing RSM inventories have been analyzed and reconciled by FIU-HCET, the results will be reviewed with DOE-EM's National Center of Excellence for Metals Recycle (NMR)

at Oak Ridge and correlated to NMR's current estimates in order to derive a realistic estimate of DOE's present and future RSM inventories.

During March 1999, a strategy meeting was held at FIU-HCET, Miami, to begin developing a plan for Phase II of this project. During discussions the point was raised that DOE-managed LLW land disposal sites are limited in their capacity and it is unrealistic to assume that current sites will be able to accommodate projected RSM generated by future D&D activities. Moreover, current disposal cost estimates based on prevailing conditions will not be relevant and applicable to new sites built in the future. This complicates the issue of a "true" cost analysis for the purpose of comparison with alternative disposal methods. Because the issue of capacity is so relevant, insofar as obtaining a comparable "true" cost analysis, this study will take a *zero-based approach* (i.e., starting from scratch) to assess all methods to be compared. In that way, no alternative has the benefit of prior non-inflated dollar investments achieving growth that may or may not be financially restricted by 1999 dollars. This approach should be able to identify all initial costs, operating costs, direct costs, variable costs, closure costs, if any, and value added. Based on this approach, a proposed Phase II Project Plan is being readied.

Assessment of current status

Despite the initial delay in completion of Phase 1, all project tasks are progressing. No major technical issues are anticipated; however, a critical success factor is whether or not DOE's waste site managers cooperate in providing the requested information. Additional resources deployed to this project by FIU-HCET will ensure that future milestones and deliverables are met.

Plans for the next two months

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

- FIU-HCET will complete the inventory of the quantities and characteristics of RSM currently stockpiled at DOE facilities as well as RSM expected to be generated from future D&D activities.
- FIU-HCET shall contact DOE waste site managers and other appropriate personnel to discuss this scope of work for assessment of life-cycle costs for disposal of RSM. FIU-HCET shall ascertain the level of cooperation expected from these managers in providing full information needed for the assessment and to develop LCCAs. A list of site managers surveyed indicating their willingness to participate will be submitted to DOE.
- A meeting has been scheduled for March 30, 1999 in Oak Ridge, TN at the federal office building at 9:00 a.m. to assess and coordinate the efforts of the NMR and FIU-HCET in support of the goals of this project. Participants from DOE-FETC, FIU-HCET, DOE-ORO and NMR will review the statement of work, progress to date, and have a general discussion on this task.
- FIU-HCET will complete its report to DOE on Phase I activities which will contain available information on the current and future inventories of RSM, contamination ranges, site points of contact, and specific types of metals.

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

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
D044-M1	Report on TSD options for residue from MLLW metal feeds to the TSCA incinerator	A set of feasible disposition paths for the MLLW metal feeds to the TSCA incinerator.	Scheduled for completion 4/30/99
D044-M2	Report on TSD options for contaminated accelerator lead shielding.	At least 2 feasible options for disposing of the contaminated lead shielding.	Scheduled for completion 3/31/99.
D044-M3	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.
D044-M4	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.
D044-M5	Report on performance of PM-CEMs in meeting EPA monitoring guidelines.	A statistical correlation of the performances of the two tested CEMs.	Scheduled for completion 6/30/99.
D044-M6	Final report summarizing research findings and disposal maps for various MLLW streams.	Final report submitted to Bechtel Jacobs.	Due 10/31/99.

Significant events

Recently, Bechtel-Jacobs/DOE established an initiative to expedite the treatment of "broad spectrum" waste streams. In 1996 and early 1997, analysis of contractor 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 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, which 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 have identified the following needs:

- Review the 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 recent developments have led to a redefinition by Bechtel-Jacobs of the scope of technical assistance that they would like FIU-HCET to provide. The overall objectives of the project would remain essentially the same; however, some tasks and milestones would have to be redefined to better address the needs identified above. The revised plan would take 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. In fact, several of the specific streams originally identified by ORNL to be investigated by FIU-HCET (specifically, those related to milestones 2 through 5), would either be subsumed by the revised scope of work or are no longer of interest to Bechtel-Jacobs. ORNL personnel involved in establishing the original set of tasks have agreed to investigate DOE's and Bechtel-Jacobs' continuing interest in them. This issue should be resolved by the end of March.

Accomplishments and technical progress

- FIU-HCET is working with Bechtel-Jacobs personnel to identify, define, and develop current 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.
- Work is currently focusing on a review of current RCRA/BDAT regulations for updating the MLLW inventory database and a review of the waste code groupings in the MLLW waste populations.
- 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

The presence of a full-time FIU-HCET project manager in Oak Ridge has facilitated project collaboration and communication, and accelerated progress.

Meetings planned for the week of March 22 with Bechtel-Jacobs will assess their current MLLW disposition planning needs and identify the tasks that FIU-HCET will pursue to both parties' mutual benefit.

The scope of this subtask is currently being reviewed with the Federal Energy Technology Center in light of the redefined needs of Bechtel-Jacobs. The review may result in modification of the tasks, milestones, and deliverables for the project.

It is anticipated that the time and effort invested in re-evaluating the tasks and deliverables under 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 assess the MLLW Broad Spectrum Treatment Plan developed by Bechtel-Jacobs and conduct an engineering study of the current TSD process for MLLW. FIU-HCET will

- Carry out a thorough review of the MLLW database.
- Work with Bechtel-Jacobs to assess and document the current processes and options for characterizing, transporting/handling, treating, and disposing of the sample MLLW streams.
- Perform a review of current RCRA/BDAT regulations and update the MLLW database.

FIU-HCET collaborators

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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	Due date: 05/17/99
T004-M4	Characterize solid particle solubility and crystallization behavior	Perform nine solubility and crystallization tests as described in Table 3 in the PTP	Due date: 07/05/99
T004-M5	Measure particle settling velocity.	Perform 27 settling tests as described in Table 4 in the PTP	Due date: 08/15/99
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

- Particle size distribution tests were completed as described in milestone 2 in the PTP. Sixteen different reports and graphs are available for each test performed. The data will be analyzed, and the results will be reported in the next monthly report.
- A paper titled *Parametric Investigation of the Characteristics of a Nuclear Waste Slurry Simulant* has been revised for submission to a scientific journal for publication.

Accomplishments and technical progress

- Particle size distribution analyses were performed to three waste slurry simulants: SRS, Hanford, and Fernald.
- Results show that most particles were in the fine range between 10 and 20 micrometers.
- Sixteen different reports and their correponding graphs were automatically obtained when testing these samples. These data include volumetric concentrations, population concentrations, and particle cross-section surface percents.
- In addition, tests were performed to a solid mix of known particle size distribution. The purpose of these tests was to check on the efficiency of the counter, which have a maximum detectable size of 400 micrometers. Results of this test were satisfactory.
- The following rheological data correlation graphs were added to the paper. The data corresponds to an SRS simulant, and the model projections were obtained from previous experience found in the literature.
- As shown in Figures 1 to 3, the effect of concentration, pH, and temperature on the simulant's yield stress can be observed. The following models were obtained from data correlation and indicated the functions of the corresponding parameters.
    * Concentration: $\tau_o = 3.4 \times 10^{-10} \times e^{\wedge}(2.42C - 0.06C^2) \times \frac{1}{1 - C/100}$
    * pH: $\tau_o = -3.67 + 1.21pH + 0.028pH^2$
    * Temperature: $\tau_o = 74.8 \times e^{\wedge}[-489.4/(273 + T)]$

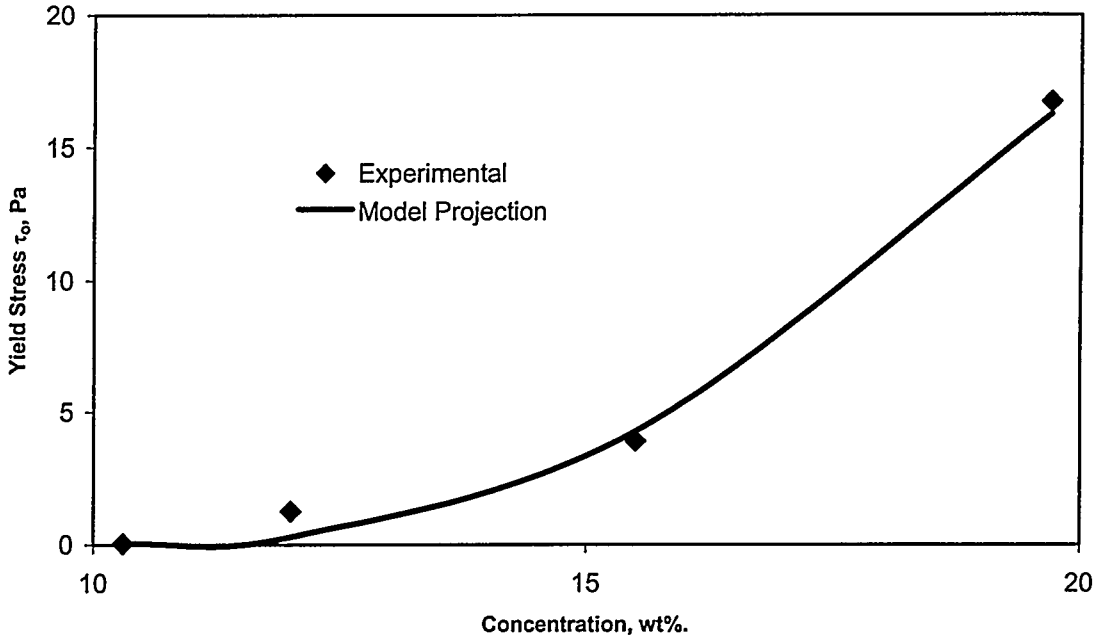

Figure 1. Effect of concentration on the yield stress at pH = 13, temperature = 23°C.

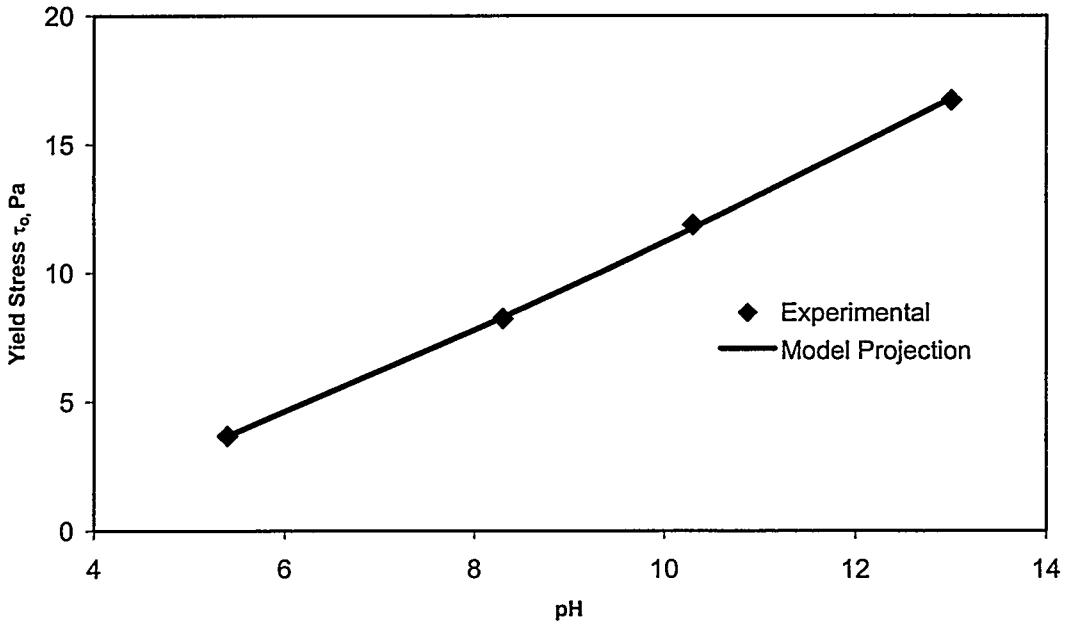

Figure 2. Effect of pH on the yield stress at temperature = 23°C, concentration = 19.7 wt%.

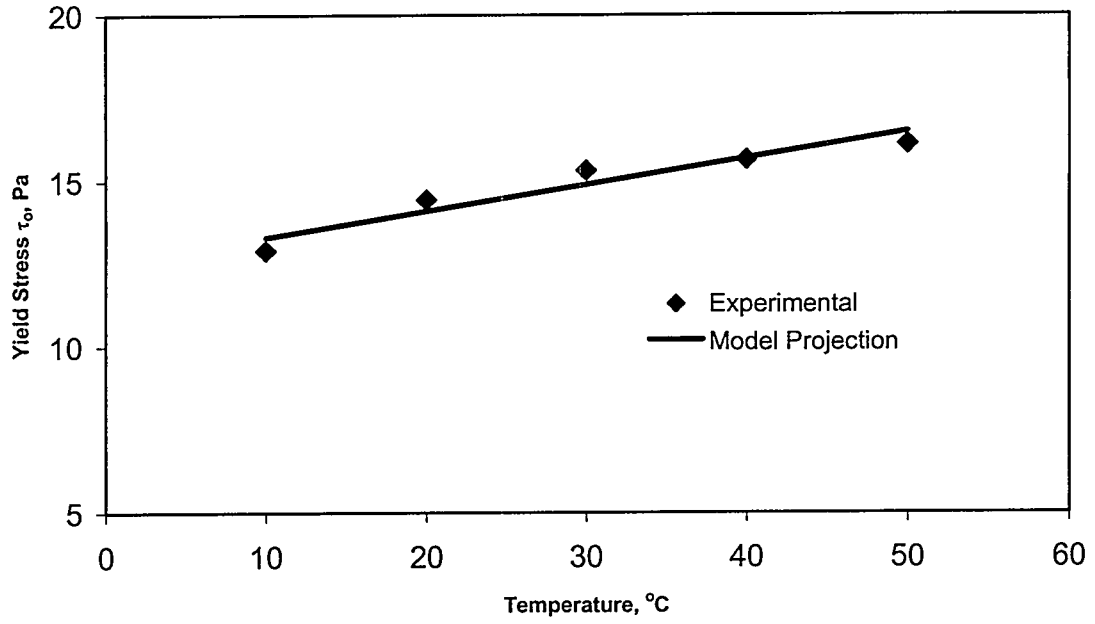

Figure 3. Effect of temperature on the yield stress at pH = 13, concentration = 19.7 wt%.

Assessment of current status

The data available in the different particle distribution reports will be of great help when analyzing the particle shapes. Particle shape analysis will provide graphical demonstration of the results obtained this reporting period.

Plan for the next two months

- Perform particle shape analyses for simulant samples prepared as described in table 2 in the PTP. This task corresponds to milestone 3 in the PTP.
- Continue working with the particle distribution data obtained. Try to obtain model correlations for the different parameters.
- Submit the rheology paper for publication.

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 the pipe plugging caused by settling, pipe plugging and unplugging phenomena induced by gelling will also be studied by both experimental and theoretical methods. Some key aspects of particle deposition associated with pipe plugging will be addressed. These will include particle agglomeration leading to larger particles that fall out of suspension and particle deposition in the pipe at the end of the transfer as a function of pipe slope or dip depth. The experimental setup used for settling-induced plugging will be modified for the study of gelling-induced plugging and unplugging. The core-annular flow technology, which may be used to unplug the gel-caused blockage, will be examined.

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

The objectives of this work include the following:

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
T005-M1	Issue project technical/test plan for pipeline plugging and unplugging activities	Planned activities, tasks, and milestones of slurry transport experiments in a flow loop, and 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.
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
T005-M5	Perform additional slurry transport experiments in flow loop with horizontal pipeline	Obtain reasonable data by data acquisition system and video recording system at one additional slurry concentration. Some critical velocity data will be repeated by varying slurry flow rate from very high level to low level.	Scheduled completion 5/28/99
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.
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 reasonable 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

- The new slurry pump with higher flow rate capacity for the flow loop has been received by FIU-HCET. The pump is now being installed in the flow loop.
- Two thermistors have been ordered for sampling test in a horizontal pipeline. The corresponding measurement Wheatstone bridge instrument is being identified.
- Sampling in the storage tank was performed with initial results obtained on the slurry concentration at different vertical direction without baffles. The tests will be continued for more measuring points with and without baffles.
- Based on the factors affecting the slurry hydraulic characteristics, several rheology parameters were presented to characterize the slurry.
- Partial completed data sheets were submitted to Dr. Fadel F. Erain at PNNL.
- Latest drawing on the large demonstration test bed of plugging and unplugging is presented in this monthly report.

Accomplishments and technical progress

Part 1 Flow Loop Research on Pipeline Plugging and Unplugging

1.1 Slurry sampling measurements in the slurry tank

In order to verify the slurry mixing characteristics in the slurry tank, experiments were performed using slurry with 20 percent by weight (half of Fe_2O_3 solids and half SiO_2 solids). The rotating speeds were chosen to be 705 rpm. Samples were taken from three different locations. One is at the free surface; the other two points are at the tank's outlet and inlet tube. The detailed locations are shown in Figure 1. The measurement results are illustrated in the following Table 1.

Table 1.
Slurry sample results taken from the slurry mixing tank

Becker No	Becker weight, g	Wet sample + Becker, g	Dry sample + Becker, g	Solid weight concentration
No.1 (from location 1, near top surface)	176.80 g	519.10 g	238.55 g	**18.04 %**
No.2 (from location 2, tank outlet)	173.67 g	595.68 g	255.86 g	**19.50 %**
No.3 (from location 3, tank inlet)	174.64 g	628.19 g	263.35 g	**19.56 %**

It is seen that the weight concentrations at tank inlet and outlet are very close to the average value, 20 percent, providing the evidence for the present arrangement. The weight concentration at the free surface is 18.04 percent, showing a little smaller than the average value. Additional results will be obtained on additional points. One possible modification of the slurry tank to improve the mixing process is simply to insert baffles in the tank.The modification of the mixing system will be determined based on the final sampling results without baffles.

1.2 Rheology parameters to characterize the slurry hydraulic characteristics

Consider the liquid-solid two-phase pipe flow with single solid species. For such a system, the rheology parameters that are critical to characterize the flow are the mixture density ρ_m, volume concentration C_v, density ratio ρ_s / ρ_l, mean particle size d_{50}, d_{85} / d_{15}, and the viscosity. The above parameters are easily calculated or measured based on the definitions due to the single chemical component existing in the slurry mixture. For instance, the slurry density is equal to the mixture weight per unit volume. The volume concentration is the solid volume relative to that of the total slurry mixture. The density ratio shows the relative particle density relative to that of the carry liquid. The mean particle size d_{50}, d_{85} shall be obtained from the curve of the particle frequency distribution versus particle size. The viscosity shall be measured by the viscometer.

However, for a slurry system that contains many solid species, apparent rheology parameters shall be developed. Assuming the slurry mixture including liquid with density ρ_L and N different solid species, with each one having its own density ρ_1, $\rho_2 \ldots\ldots \rho_i \ldots\ldots \rho_N$, and particle size distribution. In the slurry mixture each solid species has a weight concentration of $C_{w,1}$, $C_{w,2} \ldots\ldots C_{w,i} \ldots\ldots C_{w,N}$. The slurry density is calculated by

$$\rho_m = \frac{1}{\dfrac{1-\sum_{i=1}^{N} C_{w,i}}{\rho_L} + \sum_{i=1}^{N} \dfrac{C_{w,i}}{\rho_i}} \tag{1}$$

In equation 1, the numerator is assuming the slurry weight of 1 g. The first term of the denominator represents the volume that liquid covers in the mixture, and the second term means the sum of the volumes that all solid species cover in the mixture. Similarly, the volume concentration is

$$C_V = \frac{\sum_{i=1}^{N} \dfrac{C_{w,i}}{\rho_i}}{\dfrac{1-\sum_{i=1}^{N} C_{w,i}}{\rho_L} + \sum_{i=1}^{N} \dfrac{C_{w,i}}{\rho_i}} \tag{2}$$

The volume concentration is an important parameter to govern the slurry characteristics. It specifies how much area is occupied by the total solid particles at a certain flow cross-section. Such a concept is similar to the void fraction in the gas-liquid two-phase flow.

In a still liquid environment, particle settling is related to the particle drag coefficient that includes the particle density and particle size. In a horizontal slurry flowing system, particle settling relies on the axial velocity, the drag coefficient. In both cases, particle density and size are important in determining the settling characteristics. For a single chemical species, the density ratio is easily written as ρ_s / ρ_L. For a slurry system with different chemical species, the concept of density ratio is ambiguous as compared with a system with single solid species. This is because there are many species, and each species has its own density and particle size. For a solid species with higher density but fine particle size, such as Fe_2O_3, and a species with lower density but larger particle size, such as SiO_2, it is not known which species settles down more easily. However, if one "sees" the slurry as the liquid with adding a "mean" single solid species with a mean density ratio and mean particle size, this concept is useful to simplify the complicated problem.

The mean density ratio is defined as the mean particle density relative to the liquid as

$$\frac{\rho_s}{\rho_L} = \frac{\sum_{i=1}^{N} C_{w,i}}{\rho_L \sum_{i=1}^{N} \frac{C_{w,i}}{\rho_i}} \tag{3}$$

where $\sum_{i=1}^{N} C_{w,i}$ means the solid weight and $\sum_{i=1}^{N} \frac{C_{w,i}}{\rho_i}$ is the volume that the corresponding solid covers. Thus, $\frac{\sum_{i=1}^{N} C_{w,i}}{\sum_{i=1}^{N} \frac{C_{w,i}}{\rho_i}}$ is the mean particle density.

The process to predict the mean particle size is complicated and is suggested as follows:

1. Develop the curve of integral volume fraction versus particle size for each solid species. The curve tells information about how much volume percentage passes through at any particle size.
2. Multiplying the vertical coordinate value of each chemical species by $\frac{C_{w,i} / \rho_i}{\sum_{i=1}^{N} \frac{C_{w,i}}{\rho_i}}$, the reduced curve gives information about how much volume fraction of that species at any particle size relative to the whole particle species passes through.
3. By incorporating all the curves performed in step 2, the mean curve of integral volume fraction versus particle size is obtained.
4. The particle size at which 50% particles pass is defined as the mean size d_{50}. Similarly, d_{85} and d_{15} can also be determined.

   Some research literature points out that d_{85} / d_{15} is an important parameter to affect the flow, because it shows the even degree of the particle size.

The whole process is illustrated in Figure 2 with two different solid species. The reason for using only two species is to help understand the problem and system.

Slurry mixture with liquid and solid generally show non-Newtonian behavior. The viscosity is obtained by rheology experiment.

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

2.1 Introduction

FIU-HCET has been designing and will construct a Large-Scale Industrial Equipment Test Bed of Plug Locating and Unplugging Technologies. The concept design of the test bed has been performed and continuously revised in past months. Three revised simulated cases (test beds) have been produced from the five original cases, based on discussions with Peter Gibbons of Numatec Hanford Corporation , Dr. Fadel F. Erian , and the document "Functions and Requirements for Blockage Locating and Removal Methods in Waste Transfer Lines," which was provided by NHC.

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

2.2 New Design of Pipeline

For all the drawings, the locations of blockage won't be identified; however, they are scheduled to be placed near the elbows of the transfer pipeline loops in order to test the blockage detection technology.

As shown in Figure 3 and Figure 4, the pipelines for Test Bed #1 and #2 are slightly elevated with angles differing from 0.14° to 14.48°. Pipes will be drained at the bottom of each elevation.

Figure 5 shows Test Bed #3 for the buried pipes which are placed on the ground level with trench for accessibility in order to plug and unplug the pipes.

Assessment of current status

As agreed during Dr. Erian's last visit to FIU, the new sampling system in the horizontal pipe proposed by Dr. Erian will be implemented based on a trial-and-error approach.

Whether the mixing process in the slurry storage tank will be modified or not will basically depend on the results of final sampling in the storage tank. If the concentration uncertainty is available, we will continue with the existing mixing system in the slurry storage tank.

Plans for the next two months

- Obtain completed final results on the slurry tank mixing and determine the method to enhance the mixing characteristics in the storage tank.
- Re-connect the flow loop and measuring system, and collect data from the slurry transport experiments in horizontal pipelines.
- Planning and construction of large-scale test bed #3 (buried pipeline) to be completed in June.

- Identify more possible candidates of technologies and companies for industrial equipment test and demonstrations of blockage locating and pipe unplugging.

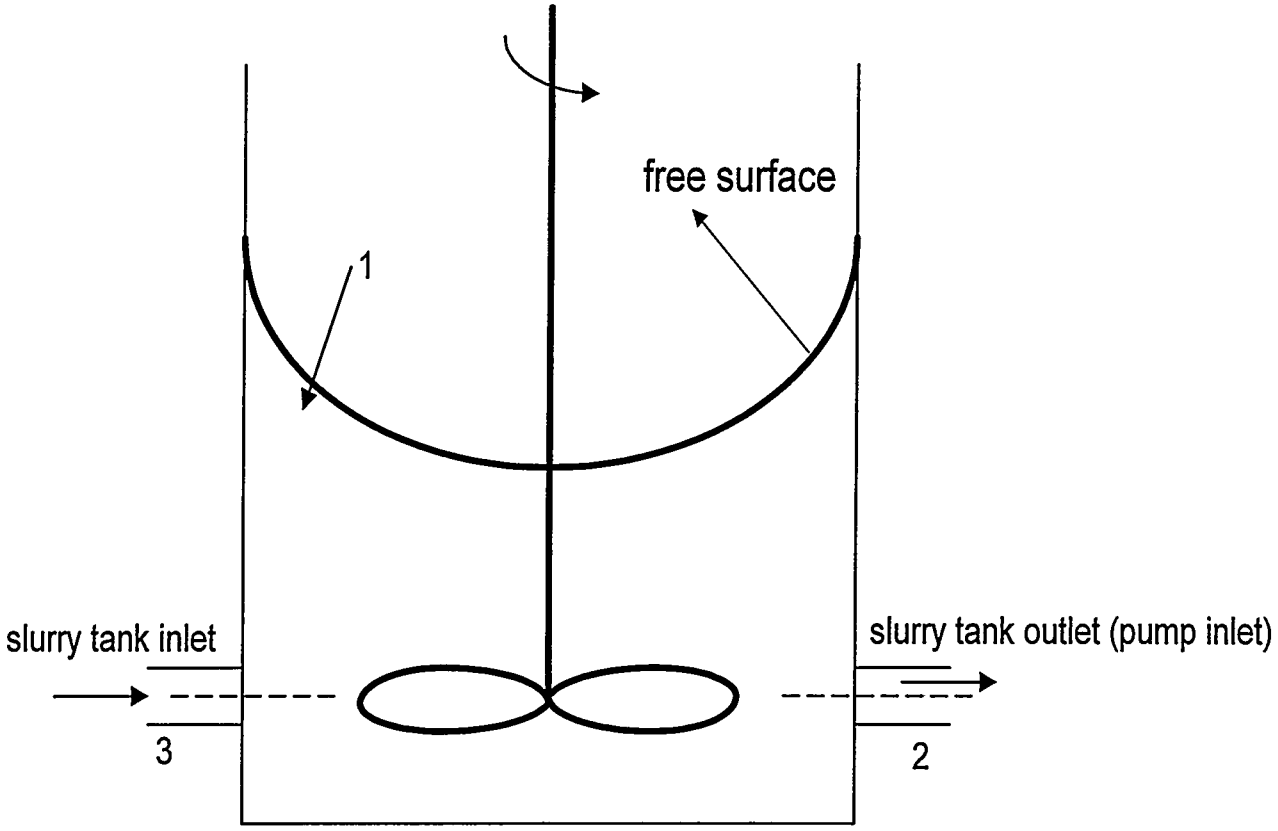

Figure 1. The locations of slurry sampling
1: near at the top free surface, 6 inch from the wall of tank;
2: from the slurry tank outlet tube;
3: from the slurry tank inlet.

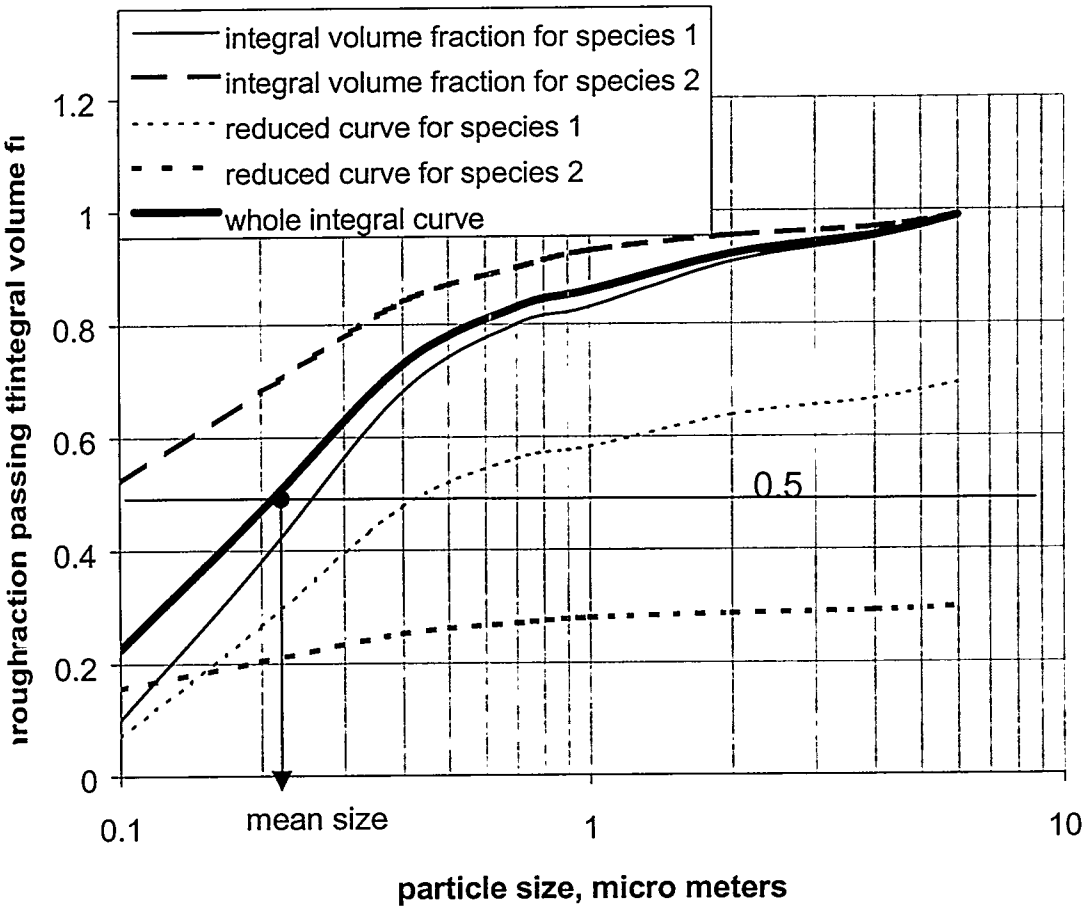

Figure 2. Method of obtaining the mean particle size d_{50}, d_{85}/d_{15}.

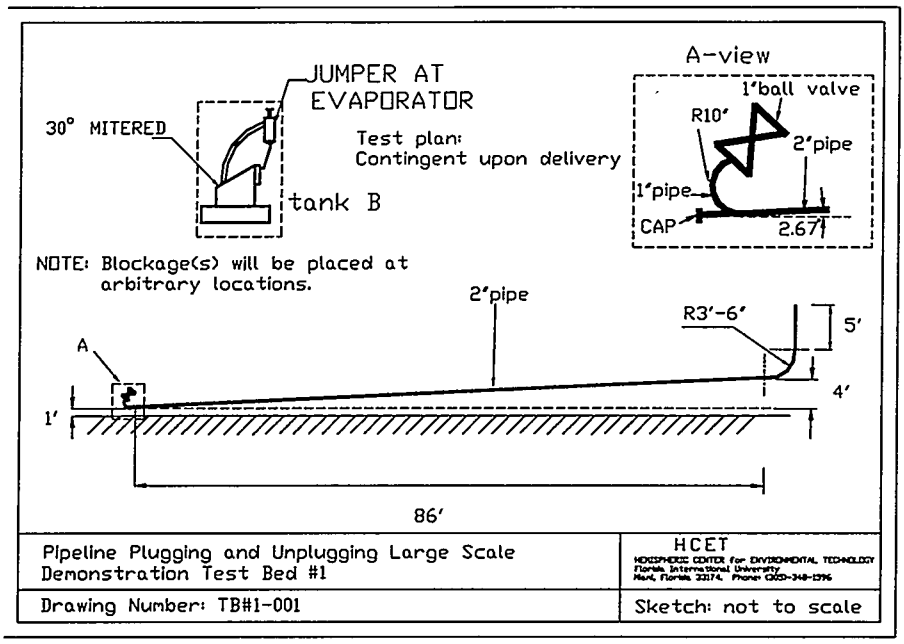

Figure 3.Schematic diagram of large-scale test bed #1.

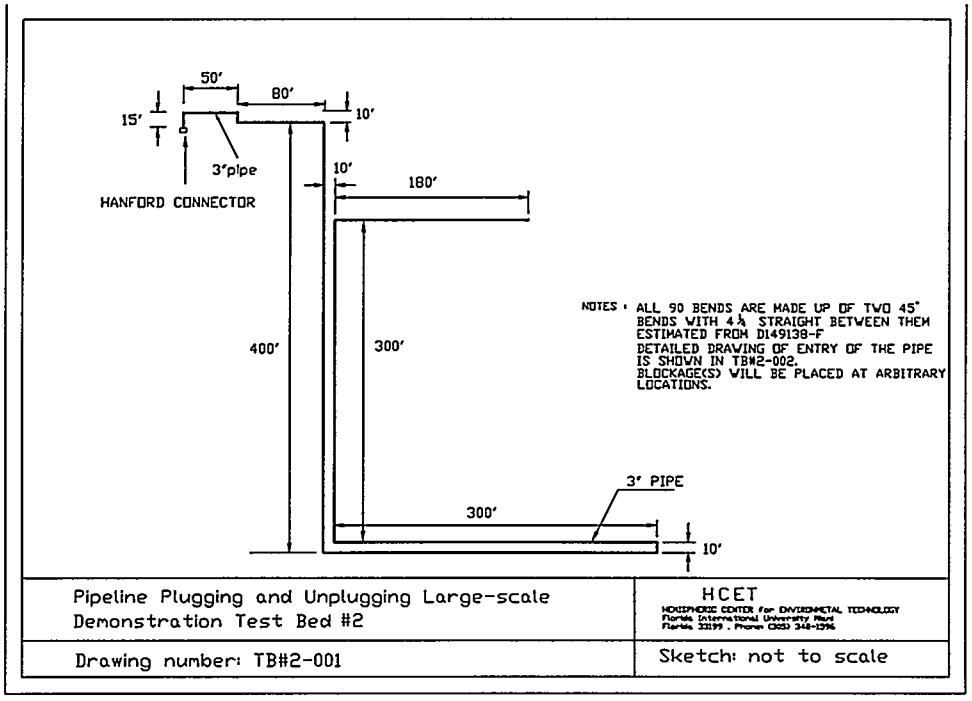

Figure 4a. Schematic diagram of large-scale test bed #2: plan view.

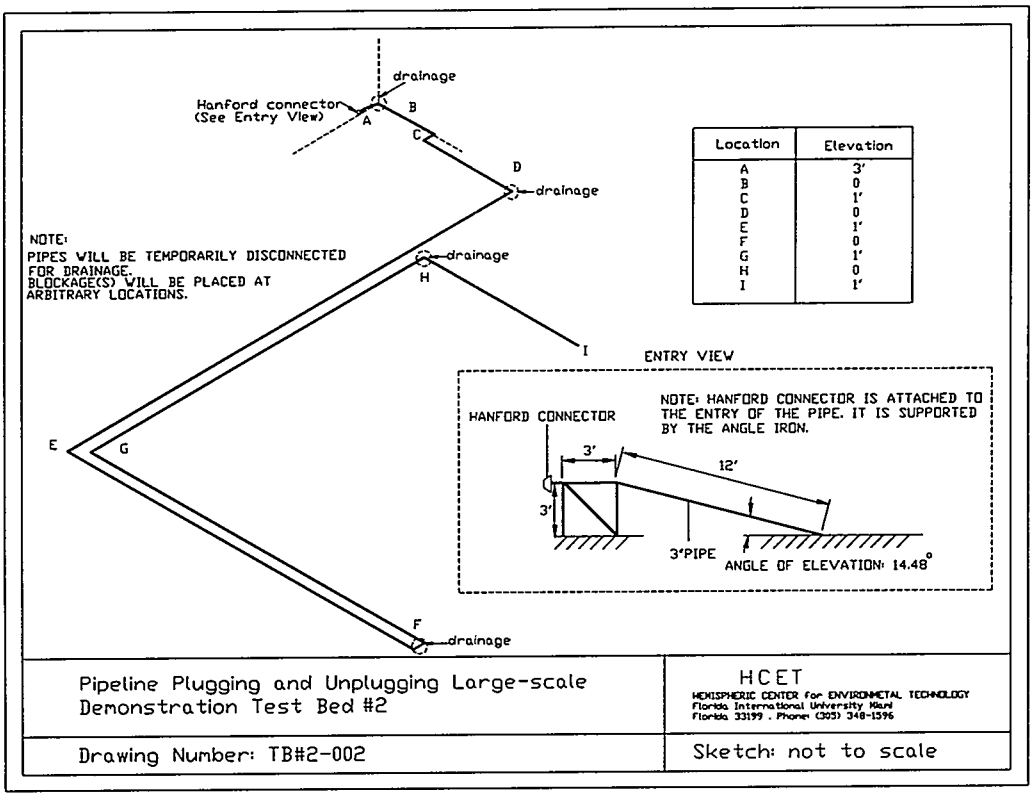

Figure 4b. Schematic diagram of large-scale test bed #2: isometric view.

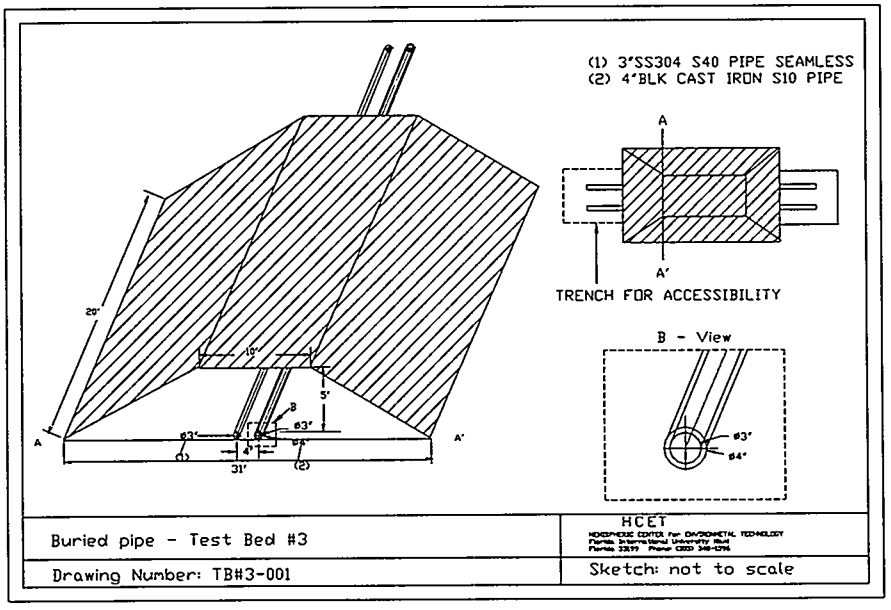

Figure 5. Schematic diagram of large-scale test bed #3.

FIU 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 on schedule. Due date: 1/31/99
T003-M2	Report the effect of glass chemistry	Experiments II-SF-1, II-SF-2, II-SF-3, II-SF-4, II-SF-5, II-TF-1, and II-TF-2	Due Date: 3/31/99
T003-M3	Report the effect of crud deposits on the back side of the knife edge	Experiments ES-1, ES-2, ES-3, and ES-4	Due Date: 4/30/99
T003-M4	Report the effect of eroded knife edges	Experiments ES-5, ES-6, ES-7, ES-8, ES-9, ES-10, ES-11, ES-12, ES-13, ES-14, ES-15, and ES-16	Due Date: 9/30/99
T003-M5	Final report	Draft and distribute the Final report on results of the project delivered to DOE	Due Date: 10/31/99

Significant events

- SRTC personnel visited FIU-HCET on February 25, 1999, to observe firsthand a glass pouring test in progress and discuss the tasks for FY99.
- A transient (fluctuating) flow experiment was done during their presence. The "wicking" phenomenon was clearly observed during this experiment. With this experiment the FIU-HCET melter has now successfully duplicated the wicking problem that is observed at the DWPF melter.

Accomplishments and technical progress

- A meeting was held with SRTC personnel on February 25, 1999, followed by a demonstration of a transient glass flow experiment. Dr. Hector Guerrero, Dr. Dennis Bickford, and Dr. Bill Holtzcheiter represented SRTC at the meeting. Dr. Frank Mao, Richard Burton, and Dr. Rajiv Srivastava represented FIU-HCET at the meeting.
- SRTC is satisfied with the FY98 year-end report. They suggested making the following additions to the report:
    1. An extended glossary explaining in detail some of the terms that may not be obvious to a person who is not well versed in the project specifics.
    2. Superimposed knife edge on the video frames of the glass pouring experiments.
    3. Addition of error bars on the film thickness graphs.
    4. Multivariate analysis for determining the effect of glass flow rate, glass temperature, and pour spout temperature on the deflection of the glass stream.
- FIU-HCET plans to incorporate the suggested additions as an addendum to the year end report. The addendum should be completed by the next reporting time.
- SRTC stressed the fact that the 4 video cameras be placed orthogonal to the knife edge during the experiments.
- SRTC has suggested that changes be made to the PTP for FY99. The emphasis will be on transient glass flow experiments and the planned glass chemistry experiments will be scheduled toward the end of fiscal year. The logic behind this change to obtain comprehensive test results using glass with a specific chemistry before switching over to a new glass composition.
- The technical drawings for the eroded knife edge experiments are currently under review by SRTC.
- A transient glass flow experiment was demonstrated to the SRTC personnel. This was achieved by varying the melter head pressure periodically, by carefully controlling the N_2 flow rate and by alternately opening and closing the vent to the melter reservoir. The variation in pressure achieved during the experiment is shown in Figure 1. The "wicking" phenomenon (wavering of the glass stream from the normal vertical trajectory) was observed during the experiment. Still pictures and a video copy of the experiment were provided to SRTC.

- The wicking phenomena observed during the transient glass flow experiment are shown in Figure 2. The deflection (from an arbitrary axis) of the glass stream at the two different flow rates is clearly visible and is denoted by Y and Y', respectively. The knife edge is shown as a white line and is superimposed on the video frames.
- The melter has surpassed more than one year of high temperature (1150 °C) operation. The high temperature limit for Inconel (melter material of construction) is 1200 °C. The horizontal section of the pour spout curved toward the pour spout because of the gravity of the pour spout and lack of support. To take care of the situation, the horizontal pipe was sectioned and the structure was realigned. The pour spout of the melter is vertical and should take care of the orthogonal camera view of the knife edge concern mentioned earlier.
- The angle iron frame that houses the furnace and the melter has been extended with a unistrut structure. The unistrut structure consists of a plate (as shown in Figure 3) that now supports the pour spout from the bottom. Additionally, there are 4 all thread rods welded to the top of the pour spout that provide support from the top. These two arrangements will ensure that the pour spout remains unperturbed during expansion at high temperatures (1150 °C).
- The 4" gate valve on the top feeder spout has been replaced by a 4" threaded cap. The replacement should take care of the N_2 leak problem.
- The following safety issues have been addressed during the period:
    1. A panel has been mounted to the unistrut frame to provide electric outlets to the video cameras and their cooling fans.
    2. The secondary N_2 feed cylinder has been moved from the back of the furnace to the front to provide ease of access.
    3. Shutdown procedures and emergency contact information have been posted near the melter/furnace.

Assessment of current status

The project is on schedule. The PTP for FY99 is being modified and the glass pouring experiments are being moved toward the end of the fiscal year as per the request of the client. The revised PTP is currently awaiting approval from the client.

Plans for the next two months

The project will perform 3-4 transient glass flow experiments every week in the coming months. The transient glass flow experiments have shown the "wicking" phenomenon that is causing problems for the DWPF melter operation. The data obtained from these transient runs will be of extreme importance to SRTC and may shed light on the cause of the phenomenon, which in turn may lead to a solution of the problem.

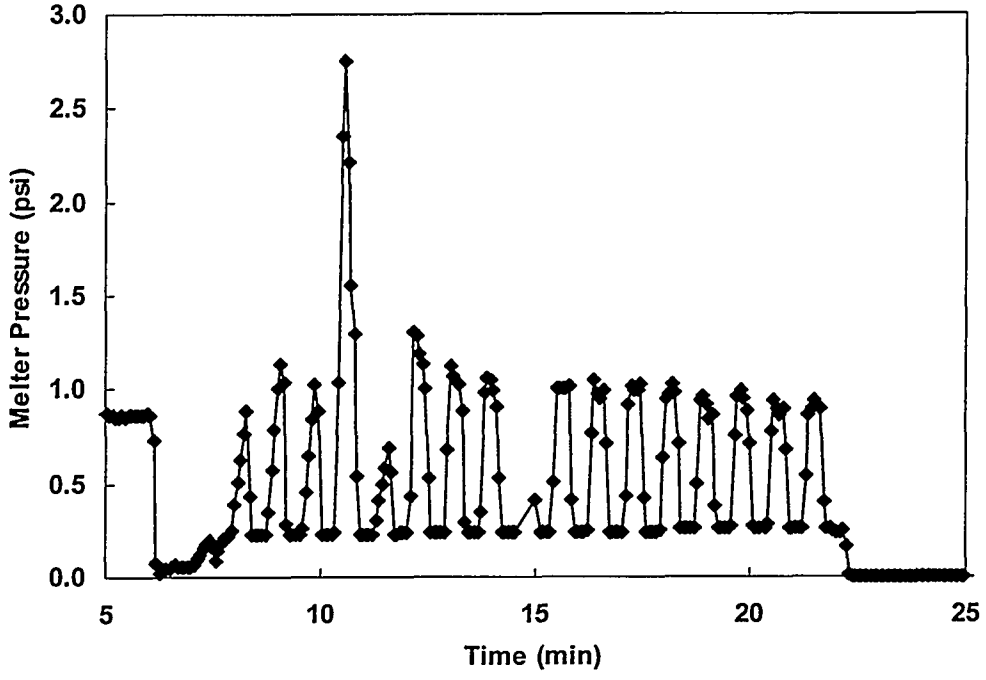

Figure 1. Periodic variation of melter head pressure during the transient glass flow experiment done on 2/25/99.

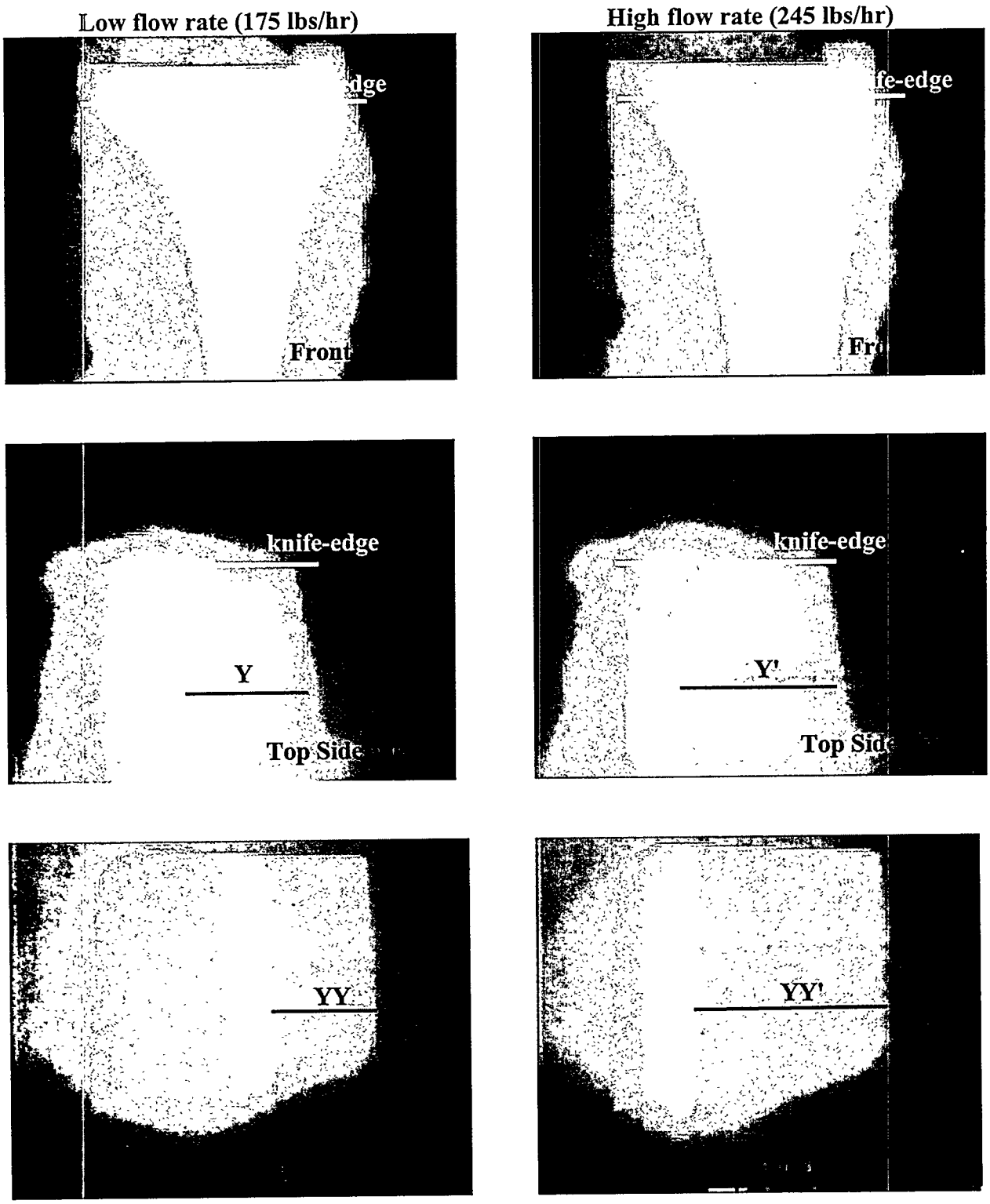

Figure 2. Wicking phenomena observed during the transient glass flow experiment. The defelection(from an arbitrary axis) of the glass stream is denoted by Y-Y' and YY-YY', respectively.

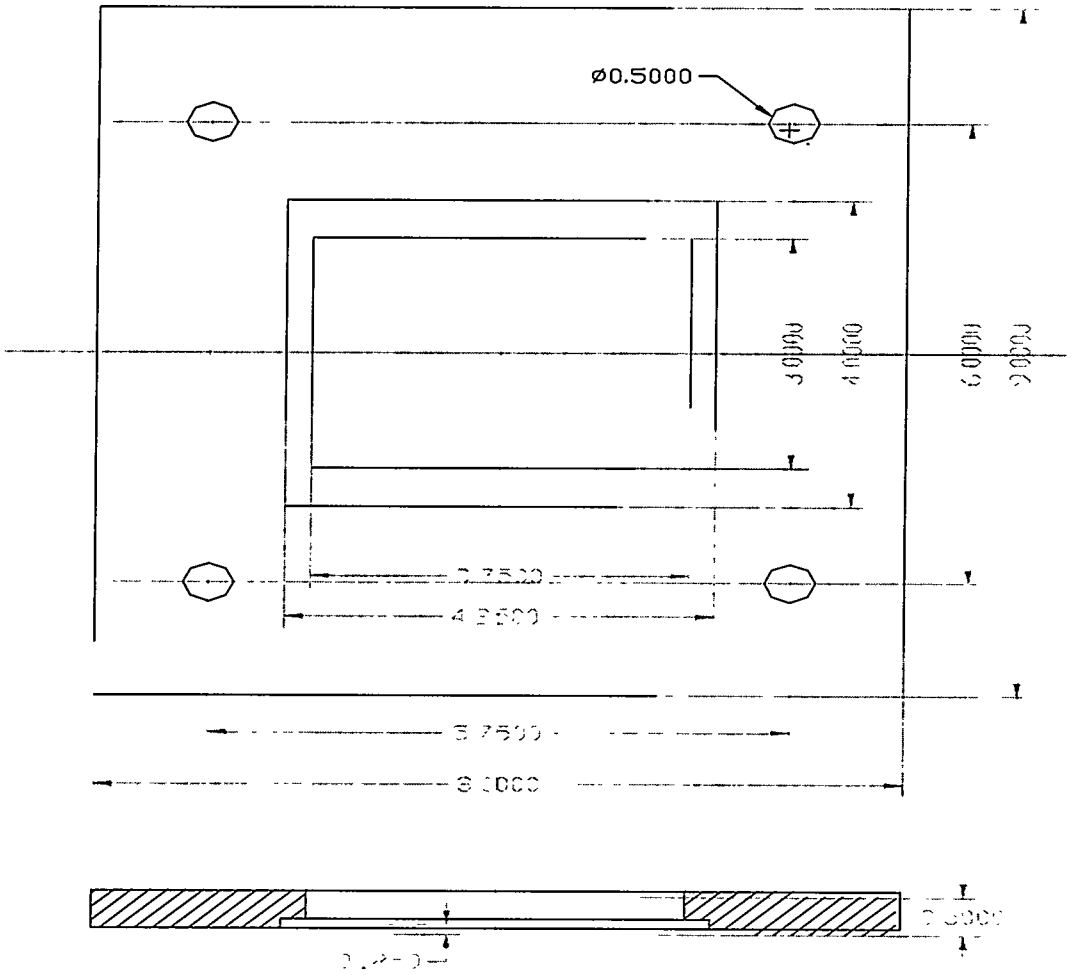

Figure 3. Additional bottom support structure for the melter pour spout.

FIU-HCET collaborators

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III. CHARACTERIZATION, MONITORING, AND SENSOR TECHNOLOGY

MONTHLY PROGRESS REPORT

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FIU CMST Program Manager	**Paul Szerszen**
Focus Area Technical Lead	**Charles Nalezny**
Program Officers	**John Wengle**
	Karl-Heinz Frohne

http://www.hcet.fiu.edu

Online Measurement of the Progress of Decontamination

Project Number: HCET-1998-C005

Project objectives

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

The specific aims of this subtask include the following:

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
C005-M1	Operational prototype	Prototype functional	Due 3/3/99 *Delayed until 6/25/99
C005-M2	Demonstration at FIU-HCET	Documented demonstration of prototype	Due 5/30/99 *Delayed until 7/30/99
C005-M3	Deployment	Initiate deployment at DOE site	Due 8/28/99
C005-M4	Year-end report	Submission	Due 9/30/99

* As per FY99 PTP and Assessment of Current Status following, a design and implementation review required revisions to design and procurement. Milestone 1 is expected to be delayed until no later than June 25, 1999, and milestone 2 until no later than July 30, 1999.

Significant events

- Project was presented at CMST-CP Mid-Year Review.
- Expanded technical staff including mechanical and embedded computer/controller electronic engineering experience is joining the project team.

Accomplishments and technical progress

- Demonstration prototype detectors of sealed gas proportional type have been selected.
- Calibration electronics to accompany the detectors was selected.
- Functional design of the detector mechanical arrangements is complete:
  - * Vibration, shock, and debris isolation suspension for pre- and post-decontamination
  - * Replaceable shields (brush) and 'tear-off' windows
  - * Shot blast suspension modifications
  - * Pneumatic tube section for effluent (waste stream) sensors.
- Operator interface and associated components design refined:
  - * Simple go/nogo indication using colored and/or flashing indicator light (with or without an intermediate indication)
  - * Selectable limit calibration, either absolute engineering units through industrial digital switch or placement of the sensors over known condition of clean and contaminated.
- Conceptual design of a proprietary 3D position-determining system initiated:
  - * Combination angulation/range relational geometry
  - * Mixed source technologies
  - * Single stationary station required
  - * No RF links necessary.
- A three-level characterization implementation platform has been integrated:
  - * Sensing before decontamination
  - * Sensing following decontamination
  - * Sensing of effluent during decontamination.
- Specific contacts have been established with representatives directly involved with DOE site demonstration and deployment to ascertain a scheduled demonstration.

Assessment of current status

- 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 with any additional schedule time being absorbed within the previous intervals between tasks. Minimal disruption of the initial milestone and task procession will result, and the deployment should take place as scheduled.

- Parallel projects are providing synergism and effectively accelerating the rate of progress. One of these projects, High Productivity Vacuum Blasting System, includes real-time operator feedback of the efficacy of the decontamination process. Another is Integrated Vertical and Overhead Decontamination and includes real-time characterization of vertical and overhead surfaces during decontamination. The function and implementation of the three sensor systems will by intent include interchangeable processes and components.
- The primary decontamination machine for the instant project prototype is available at FIU-HCET.
- Assembly of characterization components has begun.

Plans for the next two months

- Purchase remaining components for radiological sensing, operator interface, data logging, and spatial orientation.
- Continue design/development activities on position determination system.
- Fabricate mechanical components to integrate sensors and indicators to decon machine.
- Generate revised design drawings for component integration.
- Continue negotiations for DOE facility deployment.
- Continue development of an FIU-HCET demonstration plan.
- Perform and document design reviews to meet FIU-HCET QA standards specified in the HCET QA Program Manual.

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

Following are the objectives of the project:

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

Major milestones

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

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

Significant events

- Expanded technical staff initalized to assemble a demonstratable package of interchangable components suitable for a variety of identified 'to be mothballed' facilities.

Accomplishments and technical progress

- Matrix of anticipated sensors, power sources, event controllers, and communication modules is being created to provide a product promotional package.
  - * Low-power sensors for radiological, physical, and chemical status
  - * Power sources, specifically commercial/facility line, photovoltaic, thermoelectric (dynamic ambient and induced heat source), and static electrochemical
  - * Continuous, integration, abnormal event, conditional interrupt, and fixed interval sample and reporting convention
  - * Satellite, cellular, RF, dedicated connection; interrogated, self-initiated, continuous; unidirectional and bi-directional communication.
- Power management is critical for modules with integral power source. Techniques are being developed for micro-power event timing, standby mainenance, and data collection. The allowable selectable schemes include
  - * Intermittent sensing to ascertain status without data logging or transmission (regular or on-demand function confirmation)

  * Intermittent sensing with data logging for non-synchronous transmission
  * Intermittent sensing with immediate transmission
  * Some combination of above with exception reporting.

  Specific micro-power controllers and interface electronics are being selected to minimize effective duty cycle of power-hungry operations involving sensors and communication.
- Product package concept presented intended to provide a compact implantable hermetic sensor module into a site location for up to 10 years without attendance or maintenance.
- Conceptual design reviewed; will be reviewed and documented to QA standards.
- Additional commercial entities capable of providing components and subsystems were contacted.
- Specific contacts were made with DOE site representatives at CMST-CP Mid-Year Review Meeting involving site involvement.

Assessment of current status

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

Plans for the next two months

- Continue detailed electronic design of sensing modules.
- Further purchase of system components and test at FIU-HCET.
- Continue to provide FIU-HCET's site liaisons with detailed design information to aid their site participation solicitation efforts.
- Finalize designs to meet FIU-HCET QA standards.

FIU collaborator

Richard Musgrove, (305) 348-6622

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

Project Number: HCET-1998-C008

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

Major milestones

Milestone No.	Milestone Description	Completion Criteria	Status
C008-M1	Cost-benefit analysis	Data showing performance of EIC vs. baseline technologies	Scheduled for completion by 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 on 2/26/99. The reason for delay addressed in section "Assessment of Current Status" of this report.

Milestone No.	Milestone Description	Completion Criteria	Status
C008-M2	Deployment Plan and Demonstration	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	Originally scheduled for completion by 2/8/99. Delayed due to slow response from DOE site users. 1. HCET will support DDFA for LSDDP at Savannah River, including evaluation of EICs and preparation of the Innovative Technical Summary Report (ITSR). LSSDP for EIC is scheduled for Summer 1999. 2. Deployment plan for Oak Ridge completed on March 17, 1999 and is being evaluated. Test will be performed on approval of the test planned. Tentative completion date is May 1999.
C008-M3	Deployment	Deployment of the EIC system at one or more DOE sites	Scheduled for completion by 5/17/99. On schedule. Site for first deployment: Oak Ridge (K-1420) for characterization of floor. Main source of contamination: depleted and enriched uranium.
C008-M4	Information flow	Availability of procedures, instructions, manuals, and information on developments and improvements to DOE	Scheduled for completion before 10/30/99
C008-M5	Final report	Report completed and issued	Scheduled for completion by 11/30/99

Significant events

- The results of the project were presented at the CMST-CP Mid-Year Review Meeting (March 8-11, 1999) at Gaithersburg, MD, and were well received. The results described performance of EICs. The benefits that the EIC technology provides over baseline technology are as follow:
  - * It is robust— damage to Mylar window does not affect its performance.
  - * It is less expensive— provides saving of $ 1.00 per measurement.
  - * It reduces survey team's exposures— ~ 8 minute per measurement.

Accomplishments and technical progress

- Test plan was prepared for deployment of the EICs for characterization of floor for alpha contamination at Oak Ridge (K-1420). It was submitted to HCET liaison at Oak Ridge for review and approval by Oak Ridge.
- Coordination activities to support DDFA with the SRS LSDDP were begun. HCET activities will include assistance with planned use and configuration of EICs, since the technology and application are well-known to HCET.
- On the FIU-HCET ceramic test bed, measurements with EIC and alpha probe were completed. These test-beds with alpha contamination in the range 34 to 130 dpm/100 cm2 provided valuable information on the behavior of EICs to uniform large-area low-level alpha contamination at various electret voltages.
- The presentation for the CMST-CP Mid-Year Review was developed and presented.
- An abstract for Health Physics Society's 44th Annual Meeting was accepted.

Assessment of current status

- 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, LSDDP is scheduled at SRS. FIU-HCET is planning to support DDFA in SRS LSDDP and in preparation of ITSR.
- Milestones 1 and 2 were delayed due to difficulty in obtaining user responses. However, Milestone 1 was completed on February 26, 1999. Milestone 2 is nearing completion because user involvement has occurred and DDFA has committed to using EICs at SRS LSDDP. Based on recent progress and existing commitments, Milestone 3 and all other activities planned for FY99 expect to be successfully accomplished on schedule..

Plans for the next two months

- To obtain final commitment from Oak Ridge for deployment of EIC technology at Oak Ridge for floor characterization at K-1420.
- Based on obtaining commitment from Oak Ridge, perform tests (at Oak Ridge) that will be necessary to precede deployment.

FIU-HCET collaborator

S.K. Dua, (305) 348-1640

Review of Current Characterization and Monitoring Practices at DOE Sites

Project Number: HCET-1999-C009

Project objectives

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

This activity, during its previous stages in FY97 and FY98, collected and compiled information from technology users, purchasers, and project sponsors. This information was published and converted into a database. FY99 is the first year that this project is managed by FIU-HCET. FY99 activities include the following objectives:

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

Major milestones

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

Significant events

- Completed Milestone 2 ahead of schedule. Milestone 2 is the identificaiton of baseline technologies currently being used at Hanford and Oak Ridge.
- Presented database at the CMST-CP Mid-Year Review for user involvement and functional requirements.

Accomplishments and technical progress

- Initiated obtaining cost and performance data for the baseline technologies identified. Data was obtained from vendors (Canberra and Dexsil), Hanford contact, and FIU-HCET personnel.
- Contacted University Program Coordinator for Fluor Daniel Fernald concerning adding Fernald to the list of DOE sites being reviewed. If Fernald is added to the list, then cost and performance data will also be obtained from end-users at Fernald.
- Presented this database for comments and suggestions at the 1999 CMST-CP Mid-Year Review at Gaithersburg, Maryland. Comments and suggestions received will be incorporated into the database.
- Continued developing and designing the database.

Assessment of current status

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

Plans for the next two months

- Complete Milestone 3: a description for each baseline technology and current practice.
- Contact end-users at Oak Ridge concerning obtaining cost and performance data.
- Continue obtaining information from Hanford contact and from vendors. Initiate contacting end-users at Hanford.
- Continue work on developing database. Parellel versions will be developed in two different database software: Microsoft's Access and SQL.

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 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 D&D coordinator.

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

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

Major milestones

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.	To be completed by 3/31/99
C010-M3	Demonstrations	Complete scheduling and organization	Due 3/31/99
C010-M4	Deployment	Site commitment to deploy a selected CMST-CP technology(ies).	Due 10/30/99
C010-M5	Marketing	Site commitment to deploy	Due 10/30/99

Significant events

- Identified a CMST-CP technology to be demonstrated and deployed: Portable Uranium Survey Tool Using Laser-Induced Fluorescence Imaging (LIFI).
- Milestone 1 completed. A list of activities for demonstration and deployment has been generated.

Accomplishments and technical progress

- Attended the 1999 CMST-CP Mid-Year Review and discussed with CMST personnel the possible CMST technologies to be demonstrated and deployed. The portable uranium survey tool using laser-induced fluorescence imaging (LIFI) was chosen.
- Discussions were held with the Principal Investigator (PI), project engineer from Special Technologies Laboratory (STL), of LIFI. The PI expressed a desire to work with FIU-HCET concerning demonstration and deployment of LIFI and agreed to cooperation between FIU-HCET and STL.
- Discussions were held with the CMST-CP Field Program Manager in which he agreed to support FIU-HCET's work with STL to demonstrate and deploy LIFI.

Assessment of current status

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. Milestone 1 has been completed. Milestones 2 and 3 should be completed on schedule.

Plans for the next two months

- Discuss with the STL PI of the portable uranium survey tool project and FIU-HCET manager of the field office at Oak Ridge concerning demonstrating and deploying the technology at Oak Ridge.
- Attend technology demonstration of LIFI at Oak Ridge that has been tentatively arranged by STL with a contractor. The project requires additional demonstration and deployment help.
- Initiate work on brochure describing the technology.

FIU-HCET collaborator

Hans Weger, (305) 348-6620

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

Project Number: HCET-1998-C011

Project objectives

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

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

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

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

Major milestones

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

Significant events

- Contacted personnel involved with the closure of Rocky Flats and obtained helpful information.
- Completed review of documents concerning post-closure needs and requirements (excluding regulations) for the Oak Ridge Reservation.

Accomplishments and technical progress

- Concluded the review of documents (Records of Decisions, Stakeholder Report on Stewardship, permits, monitoring and assessment plans, annual site environmental report, and other) for Oak Ridge concerning post-closure requirements and needs (does not include regulations that govern the post-closure phase).
- Contacted and obtained useful information from a Project Manager of Colorado Department of Public Health and Environment.
- Contacted a member of the Rocky flats Local Impact Initiative (a stakeholder's group) concerning stewardship of Rocky Flats after closure. The stewardship report will be sent to me when it is released in April.
- Continued the identification of technologies, either available or being developed, that is capable of meeting post-closure needs of DOE sites.

Assessment of current status

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

Plans for the next two months

- Conclude the review of regulatory requirements of post-closure at the Oak Ridge Reservation. This will conclude the Oak Ridge review of post-closure requirements and needs (Milestone 1).
- Review relevant documents concerning post-closure activities at Rocky Flats.

FIU-HCET collaborator

Hans Weger, (305) 348-6620

IV. INTERNATIONAL TECHNOLOGY INTEGRATION (ITI)

MONTHLY PROGRESS REPORT

FIU 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.

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

Open-ended milestones

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.	Sent out surveys to all on line environmental companies. Those responding incorporated in database. Will continue to identify organizations to incorporate. Will discuss with DOE's Office of Policy, the possibility of incorporating database with energy web site. Due date: 4/10/99. Date was postponed due to Secretary of Energy's travel schedule.

Milestone No.	Milestone Description	Completion Criteria	Status
I001-M2	Interactive Communication Web site: Maintain the Energy web site for the members/participants of the Western Hemisphere Energy Initiative	Identify funding mechanism for the support of the Interactive Communication Web site.	A tentative meeting was proposed by DOE's Office of Policy to discuss funding the Web site. Office of Policy is in the process of opening a direct funding vehicle between FIU-HCET and DOE-PO. The Office of Policy to support the Energy web site has allocated additional funding. Due date: TBD (Note: The due date has been postponed at the request of DOE 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 is being reviewed by EM/OST. Once review by EM is complete, report will be sent out to international representatives and Milestone will be completed. EM/OST has communicated they are in the process of completing review. Due Date: 3/99

Significant events

- Visited the Chilean Consulate in Miami. Had a meeting with the Consul General of Chile and the Ambassador of Chile, Carlos Ducci. The meeting focused on discussing Chile's environmental market and the opportunities available in promoting environmental technologies to this country. This was an opportunity to promote U.S. environmental exports to the region.
- FIU-HCET has been invited to attend a special event honoring the President of Argentina, Carlos Menem. President Menem will be presented with an honorary degree, Doctor of Public Service, at FIU's main campus, Tuesday, March 23rd. DOE-EM has been informed of this event and invited to participate.

- Attended the Third Climate Technology Initiative (CTI) Energy Efficiency, Information, Generation, End Use, and Transportation Technologies Training Course for the Caribbean Region, Central America, and Mexico (March 8-12, 1999) in Tampa, Florida. The U.S. Department of Energy sponsored this event. The training sessions promote the objectives of the United Nations Framework Convention on Climate Control (UNFCCC) by fostering international cooperation for accelerated development and diffusion of climate friendly technologies.

  This Forum was focused on the developing countries of the Western Hemisphere. FIU-HCET participated as an observer, with the opportunity to meet a number of individuals from Mexico, Central America, and the Caribbean involved in climate change issues in their respective countries.

  The session discussed the following topics: CTI, and the Working Group on Capacity Building; Global Climate Change for the perspective of the UN Framework Convention on Climate Change; Introduction to Technologies (i.e., electric, industrial, and renewable). In addition, FIU-HCET attended the 24th International Technical Conference on Coal Utilization and Fuel Systems sponsored by USDOE/FETC in Clearwater, Florida. This conference allowed the opportunity to collect information on fossil fuel technologies being applied in the transportation sector.

- The preliminary funding meeting for website proposed by DOE for March 99 has been postponed. New date will be determined by DOE representative. The date was changed due to Secretary's Richardson extensive travel schedule to Latin America. However, additional funding to support the website until a meeting can be scheduled has been identified by the Ofiice of Policy, DOE.

Accomplishments and technical progress

- The Interactive Communication Website member area is in the process of identifying the Steering Committee representatives who will be authorized users. To date, the following countries are registered and have password authorization: Argentina, Canada, Colombia, the United States, and Venezuela.
- The successful implementation of the website to the energy initiative of the Summit of the Americas is consistent with the ITI plan to promote FIU-HCET and OST-DOE internationally. In addition, the site will have a private sector focus as it looks to outside sources of funding.

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 will aid in the identification of technologies for the countries of the Caribbean represented at the CTI meeting and aid in the diffusion of these technologies.

FIU-HCET collaborator

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