

FIU PROJECT 1 - 2012 FACT SHEET

## Chemical Process Alternatives for Radioactive Waste

*FIU's Applied Research Center (ARC) is supporting the U.S. Department of Energy Headquarters in its mission to provide solutions in the area of tank waste management.*

This project focuses on supporting DOE HQ (EM-21) in the area of tank waste mixing, processing and management. This work is relevant to HLW activities being carried out at DOE sites located at Hanford, Savannah River, and Idaho.

### Project Objectives

The overall objective of this project is to provide support to DOE HQ (EM-21) Office of Tank Waste Management in the areas of waste transport and characterization. Objectives of the current tasks under this project include:

- Task 2 (Pipeline Unplugging) focuses on developing novel pipeline unplugging tools within the constraints and limitations required by the sites. The new approaches that are being investigated include an asynchronous pulsing system (APS) and a peristaltic crawler. Both technologies utilize lessons learned from previous experimental testing and offer advantages that other commercially available technologies lack.
- Task 12 (LBM) focuses on providing the sites with mathematical modeling, validation, and testing of computer programs to support critical issues related to HLW retrieval and processing. A lattice Boltzmann model for multiphase flow that utilizes a multi-relaxation-time approach has been developed that can be used to model air sparging and other multiphase mixing processes.
- Task 15 (HLW Instrumentation) focuses on identifying possible technologies that could enhance current out-of-tank instrumentation through an in-situ, real-time monitoring of the mixing process. Additional objectives included: evaluation of possible candidate technologies through confirmatory testing and comparison of testing results to sampling and real-time monitoring collected by standardized techniques.



**Peristaltic crawler performing an unplugging operation**

### Project Benefits

- Task 2 (Pipeline Unplugging) will develop cost effective tools that can be used by site engineers in the event that a plug forms in a waste line. Deployment of the new technologies will result in major cost savings and minimization of risk to scheduled milestones and the environment.
- Task 12 (LBM) will provide essential data and a computational tool for the engineering staff at the sites to use in order to predict various scenarios that can occur during operations at DOE sites that involve multiphase flows. Successful completion of the task will result in time and cost savings and risk minimization leading to increased environmental safety in the operations at the DOE sites.
- Task 15 (HLW Instrumentation) will evaluate technologies that will provide viable alternatives to costly sampling and laboratory analysis by allowing retrieval engineers to assess waste feed and adjust the mixing and preparation as necessary prior to transfer.

### Project Accomplishments

- Task 2 (Pipeline Unplugging) has developed a peristaltic crawler that can navigate through complex pipe geometry and utilize unplugging tools in close proximity to plugs. Additionally, an asynchronous pulsing system has been developed that is non-invasive and utilizes pressure pulses on both sides of a plug to impose optimal unplugging forces.
- Task 12 (LBM) has developed a 3D multi-relaxation time LBM code that offers increased stability and accuracy when modeling multiphase flows.
- Task 15 (HLW Instrumentation) has evaluated and tested an ultrasonic spectroscopy system manufactured by ITS for its ability to measure bulk densities in slurries with various carrier fluids and containing particles with various sizes and densities.