FIU | Applied Research Center
FLORIDA INTERNATIONAL UNIVERSITY

U.S. DEPARTMENT OF ENERGY

HIGH LEVEL WASTE/WASTE PROCESSING

PROJECT: Technology Development and Instrumentation Evaluation: *Development of Inspection Tools for DST Primary Tanks*

CLIENT: U.S. Department of Energy
LOCATION: Hanford Site, WA
PRINCIPAL INVESTIGATOR: Dr. Leonel Lagos

Description:

FIU's Applied Research Center (ARC) is supporting the U.S. Department of Energy's Hanford Site by developing robotic technologies for the evaluation of double-shell tanks (DST).

Since 2012, when tank waste was discovered in the annulus of AY-102, there has been concern that other DSTs could also face similar structural problems. This has prompted a need for the development of inspection tools that can provide information such as video feedback, environmental conditions or thickness measurements, and can aid in the assessment of the structural integrity of the tank bottoms.

In general, there are three paths of access to the DST tank floors: 1) through the air refractory slots, 2) through the air supply line leading to the central plenum, and 3) through the 6-in leak detection line. Engineers at Hanford have investigated potential inspection tools from the commercial industry with some success, but improvements can still be made in deployment and characterization.

Objective:

The objective of this task is to develop inspection tools that can provide visual feedback of the DST floors by utilizing lessons learned from previous projects, and to gain an understanding of limitations from other potential tools. FIU engineers have worked directly with site engineers to develop alternative designs based on specified performance criteria. Specific subtasks include:

- Design and development of a remotely controlled device than can navigate through the refractory pad channels of the DSTs, providing visual feedback and information on the environmental conditions.
- Design and develop a miniature rover equipped with an ultrasonic sensor (UT Rover) that can take spot measurements of a metallic material.

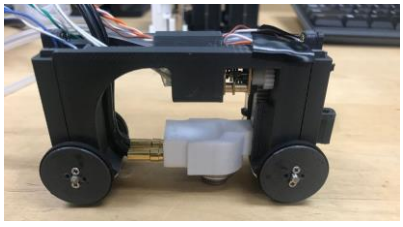
Benefits:

- Provides alternative solutions for monitoring the structural integrity of the bottom of the DSTs.
- Tools developed in this subtask will allow for the detection of potential leaks, providing site engineers with the necessary information needed to generate viable approaches for repair.

Accomplishments:

- Designed and developed a remotely controlled device that can navigate through the DST air refractory channels by traveling upside down along the tank floor, housing various sensors and climbing over weld seams.
- Completed engineering scale testing in FIU's DST mock up. Testing included durability, emergency retrieval, and corrosion and weld seam traversal.
- Developed the initial prototype of the UT rover that is equipped with a cleaning mechanism along with a couplant application device which allows for successful spot measurements.

Miniature rover and control box



UT rover

ABOUT

Since 1995, the Applied Research Center at Florida International University has provided critical support to the Department of Energy's Office of Environmental Management mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program. ARC's research performed under the DOE-FIU Cooperative Agreement (Contract # DE-EM0005213) can be classified as fundamental/basic, proof of principle, prototyping and laboratory experimentation.

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