



AN UPCOMING ROBOTICS SUCCESS: Cleaning and Refurbishment of Tank Riser Pits at Hanford

The Problem: More than 600 pits associated with tanks are at the Hanford Site. Many of these pits provide access to tank riser penetrations and contain the out-of-tank portion of equipment that has been inserted into tanks. Waste transfer lines and jumpers are also contained in these pits. In order to insert any new equipment into tanks or reconfigure existing equipment, it is necessary to operate in these pits. Radiation levels in the pits can be as high as 50 rad/hour. Current pit operations are performed manually from behind shielded panels using long-handled tools. These operations are therefore slow, tedious, time consuming, and expensive. In addition, workers receive a significant exposure during these operations.

The Technology: The Robotics Crosscutting Program (Rbx) is working with the Tanks Focus Area and the Office of River Protection to develop a remotely operated system to enhance pit operations. The Pit Viper system includes a backhoe with a remotely operated manipulator, cameras and viewing equipment, and an operator console. In the first application, the backhoe will be operated manually. If feedback from initial pit operations indicate a sufficient benefit, a second-generation Pit Viper system will be developed in which the backhoe will be operable remotely.

Procurement of the major components was initiated in FY 2000 with delivery anticipated in early FY 2001. The manipulator arm is a Cybernetix SAMM hydraulic manipulator with a

reach of approximately 6 ft and a payload capacity of 250 lb at full extension. The backhoe is a FERMEC Model 860SB. These components along with the cameras, viewing systems, and operator console will be integrated in a cold test facility located at the Hazardous Material Management and Emergency Response facility in Richland.

The Deployment: The Pit Viper system will be used by Hanford Project W-314 for deployment in the 200 East Tank Farm AW valve pit A or B starting in June 2001. Seven primary tasks are identified for the system: size reduction, decontamination/fixative application, debris removal, paint preparation and painting, concrete repair (cracks), pit riser plug/drain plug removal, and radiation mapping and characterization.

The Benefit: Implementation of this remote pit operations system will result in significant cost and schedule savings as well as reduced worker exposure. Because of the large number of tank risers and valve pits at Hanford and the long-term need for pit operations to support waste retrieval, the potential payback for even small improvements in efficiency is extremely large.

Future Advances through Rbx

Initiatives: The remote system deployed initially as part of Hanford Project W-314 will certainly provide improvements in safety, cost, and schedule. However, the need for extreme simplicity and reliability in this first deployment resulted in an approach that is far from state of the art in remote systems. The experience gained from this first deployment will be used as a springboard to identify opportunities for

integration of more advanced technologies. Some candidate areas for advancement include teleoperation of the backhoe, automation of some operations in the pits, coordinated motion control of the backhoe and manipulator, and modeling capabilities and sensors for operator feedback. The Rbx could provide technology to increase the level of automation within these systems thereby increasing the efficiency and productivity.

For more information on this project please contact:

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