A new generation of robotic arm offers the potential to increase the efficiency of waste removal from Hanford’s single-shell tanks. This new retrieval system is referred to as the Mobile Arm Retrieval System (MARS). It includes the robotic arm as well as the ancillary equipment to transfer the tank waste from the aging single-shell tanks to newer and safer double-shell tanks.

Development of new and innovative technologies to speed the retrieval of tank waste and make retrieval operations more efficient and cost effective is a cornerstone of Washington River Protection Solutions’ (WRPS) goals to eliminate the risk to the environment posed by the waste in Hanford’s aging underground storage tanks.

The arm is capable of a wide range of motion and includes a telescoping capability to enable it to reach all parts of a tank. The arm has high pressure water nozzles as well as low pressure water nozzles to enable it to mobilize difficult waste forms such as salt cake, sludges, and the hard heel that has built up at the bottom of the tanks.

Robotic arms have been studied at Hanford in connection with tank cleanout several times in the past but the technology and deployment strategies were not sufficient to make them viable. Incorporating lessons learned and new technology innovations for effective waste retrieval have been significantly increased.

Part of the design challenge has been to make a large portion of the system transportable so it can be moved from one tank to another and make use of existing tank farm utilities, such as electrical and water systems. Initial testing of the MARS concept was completed in September 2009. Design and fabrication of a unit to be installed in a tank followed, with installation expected in the summer of 2011.

MARS will see its first deployment in tank C-107. To accomplish this, a 55-inch hole was cut in the top of the tank as none of the existing tank openings are large enough to accommodate the equipment.

MARS is a WRPS technology development and deployment activity intended to improve on past activities not only at Hanford but at other Department of Energy sites and produce a viable robotic arm retrieval system.
Facts About MARS

- Remote operation with computer control station

- In-tank viewing capability- 3 cameras will be used to view and control the activity. Two of the cameras will be inserted into the tank while one will be on the robotic arm mast assembly

- Able to use water or liquid waste from other tanks to mobilize waste solids and sludges for retrieval. Using liquid waste avoids generation of new waste volume.

- Arm reach – 40 ft, able to reach 360 degrees of the tank wall/floor via arm and rotation of system

- In-tank equipment weight – 20,000 lbs which includes the arm, carriage, mast, and in-tank hose management system

- Above ground equipment weight – 96,000 lbs which includes containment box and support structure, contaminant box internals rotary union, and above ground hose management system

- Ancillary equipment weight – 60,000 lbs which includes above ground instruments and valve box, electrical system, hydraulic power unit, and high pressure water system

- Overall weight of entire system – 176,000 lbs

- Retrieval pump capacity – Approximately 100 gallons per minute and 120 psi normal operating pressure

- Retrieval pump operation- Can be raised and lowered in tank a total of 10 feet

- Sluicing nozzle – 90 gallons per minute at 100 psi

- Backstop low pressure sluicing nozzles – 64 gallons per minute and 100 psi

- High pressure sluicing nozzles – up to 20 gallons per minute at up to 5000 psi

Changes since initial testing

- Improved wear resistance and start-up torque of the slurry transfer pump

- Improved operability of software

- Improved operability of backstop

- Improved operability of in tank hose management system