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Hanford's 1st radioactive tank farm emptied

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An extended reach sluicing system is installed in Hanford's underground Tank C-105 to restart work to empty the tank of 30,375 gallons of radioactive waste that remained after the Mobile Arm Retrieval System gave out. *Washington River Protection Solutions.*

The Department of Energy looks to have finished a major project, emptying radioactive and hazardous chemical waste from an entire tank farm.

"It's taken longer than we had hoped, but still we're very happy to see retrievals

completed at the first Hanford tank farm," said Alex Smith, manager of the Washington State Department of Ecology's Nuclear Waste Program, a Hanford regulator.

But she cautioned that it is only one step toward getting all 149 leak-prone single- shell tanks emptied.

Work began about 19 years ago to empty the thick, radioactive sludge and salt cake from the 16 underground tanks in the group called C Tank Farm.

The tanks were built during World War II with a plan to last 20 years, rather than the current 70 years. Seven of the farm's 16 tanks are suspected of having leaked waste into the ground before much of the liquid was pumped from the tanks by 2010. They were left holding mostly solids.

Work to retrieve waste has halted at the last of the 16 tanks to be emptied, Tank C- 105, after contractor Washington River Protection Solutions used three different technologies to remove as much of the waste as possible.

DOE has a legal requirement to either remove all but about 2,700 gallons of waste from the tank or, alternately, get as much waste from the tanks as possible trying three different technologies.

A composite photo shows the interior of Hanford single-shell Tank C-105. *DOE*

The tank, with a capacity of about 530,000 gallons still has an estimated 4,500 gallons remaining, or between 1 to 2 inches if it were spread evenly across the bottom of the tank.

DOE has yet to declare the tank emptied to regulatory standards.

It believes it has met the standard of three technologies used to their capacity, but plans a video camera inspection to verify the amount of waste left. It also will sample the remaining waste to report to the Department of Ecology the level of radioactivity it contains.

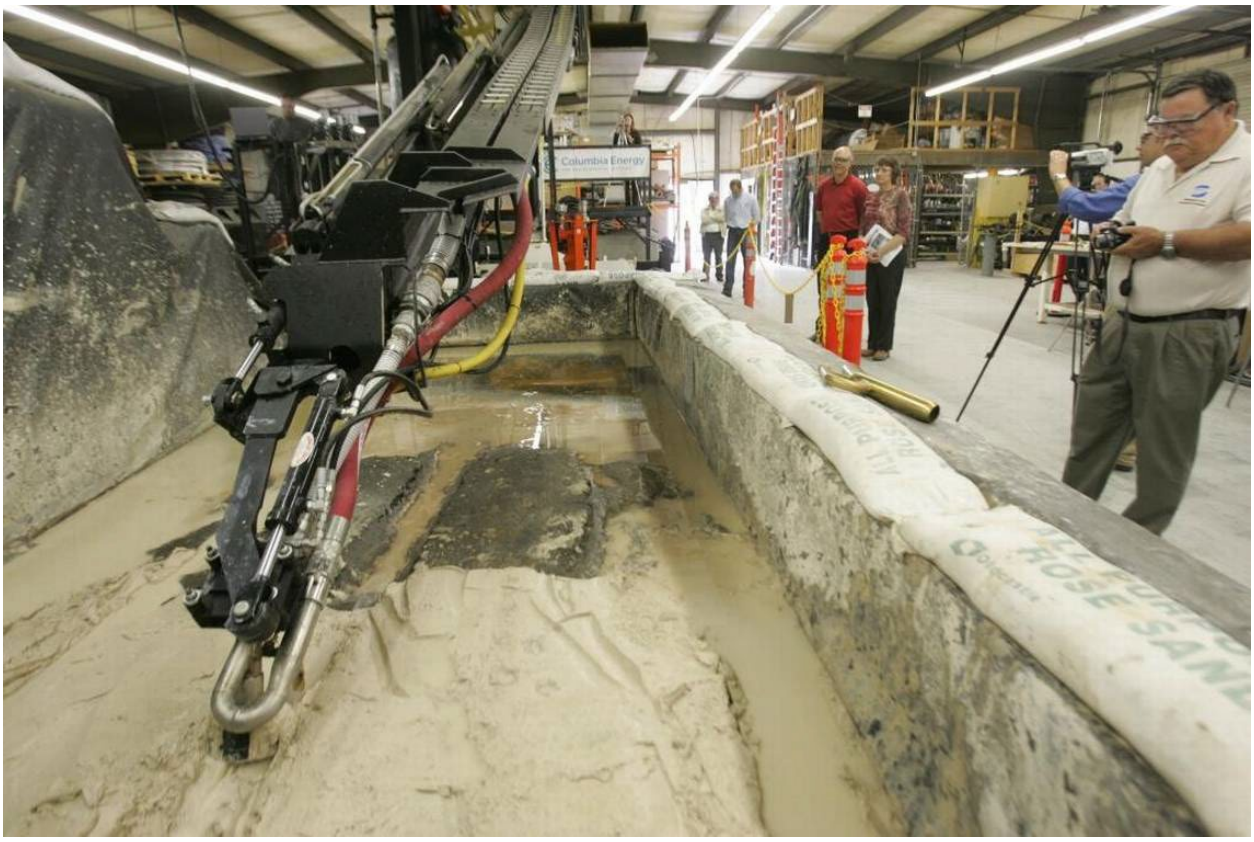
The C Tank Farm was approached as a project to demonstrate technology to get waste out of the enclosed tanks, a difficult process.

The tops of the tank are seven to 10 feet below the surface of the ground and retrieval is usually done through risers as small as 12-inches in diameter that extend from the ground into the tanks. The radioactive and chemical waste limits the type of equipment that can be used. Electronic equipment can be quickly ruined by radioactivity.

A new technology was tried for Tank C-105, which has held waste since 1947, and may have leaked in the past.

Rather than using the narrow risers to provide access to the waste, Washington River Protection Solutions dug down to the top of the tank and cut a 55-inch-diameter circular hole to install the Mobile Arm Retrieval System, or MARS, a robotic arm that is the largest technology used to date to remove waste.

Because the tank may have leaked in the past, the plan was to try MARS equipped with a vacuum system for the first time rather than more commonly used technologies that use significant amounts of water or other liquid to break up the waste and move it toward a central pump.



The vacuum Mobile Arm Retrieval System is shown during testing with a waste simulant before the robotic arm vacuum system was used to empty some of the waste from Hanford's Tank C-105. File *Tri-City Herald*

In 2014 and 2015 the MARS vacuum sucked up 92,000 gallons of the waste from the tank.

"At the end of the day, it broke of old age," said Doug Greenwell, manager of single- shell tank retrieval for Washington River Protection Solutions, after work with MARS ended.

With an estimated 30,375 gallons of waste left in the tank, a decision was made to pull out the major components of the MARS vacuum system and try a newer technology that has worked well at some other tanks.

Two extended reach sluicers were installed in the tank. Unlike the first sluicing system tried, they are able to reach more areas within a tank to get closer to the waste to move it toward a central pump.

Much of what was left in the tank was a hardened waste with complex aluminum components.

Washington River Protection Solutions in August began alternating soaks of hot water or a caustic solution with sluicing to get most of the remaining waste out of the tank.

"The last run has been the most efficient we've had in the C Farms," Glyn Trenchard, DOE assistant manager of the tank farms, told the Hanford Advisory Board.

Because of the risk that the tank could leak as more liquid was added for waste retrieval, daily monitoring was done of the soil beneath the tank using a technology that measures how electricity moves through the soil. Damp areas conduct current better than dry areas.

No leaking was detected.

While the retrieval of waste from the C Tank Farm "marks a major milestone in the Hanford cleanup, it also highlights the huge amount of work still to do," Smith said.

"Yet, we know (DOE) has been learning lessons as it progressed through C-Farm retrievals," she said. "We'll work to ensure that those lessons are applied moving forward, so retrievals proceed at a much faster pace."

DOE plans to next empty the waste from two of the tanks in the AX Tank Farm.

Rather than installing infrastructure one tank at a time as was done in the C Tank Farm, all infrastructure to provide electrical power, ventilation, water and transfer lines will be installed before work starts to empty the tanks in both the A and AX Tank Farms.

The change will allow workers to quickly switch to another tank if they encounter an issue at one tank, such as the need to stop retrieval there to replace a pump, Trenchard said.

The 16 tanks in the C Tank Farm still need to be closed, possibly by filling them with grout.

DOE and the Department of Ecology have been in talks this year on how soon the C Farm tanks must be closed.