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Hanford ready to try new system to empty tank

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Work could start late this week to use a new technology to empty radioactive waste from an underground Hanford tank suspected of leaking in the past, according to Washington River Protection Solutions.

Nearly a year ago, workers cut a hole in single-shell Tank C-105 to install a riser large enough to insert a new robotic arm.

That arm -- the Mobile Arm Retrieval System, or MARS -- is much bigger, tougher and more versatile than technologies previously used to empty waste from tanks.

MARS-V being installed into Tank C-105.

It has been used in another tank, C-107, but with a sluicing system that added liquid to the tank. This time, a new MARS vacuum system will be used.

The vacuum system was developed for use in tanks that require special handling. Sluicing, a commonly used technology that relies on liquid to break up waste and move it toward a pump, could cause them to leak.
The goal is to remove waste from single-shell tanks and store it in sturdier double- shell tanks until it can be treated.

Work stopped this spring with the MARS sluicing system in Tank C-107 after two different attachments failed to get all the waste out. The Department of Energy has directed that a third system be used in the tank, and work is paused at Tank C-107 until that system is selected.

In the meantime, work will start on Tank C-105 with the MARS vacuum system. Work can be done on only one of the two tanks at a time because they use the same infrastructure for waste retrieval.

For the new MARS vacuum system, liquid is injected through a a system above the waste to create a vacuum that pulls up the waste from the tank. The liquid stays in the retrieval system and is not introduced into the tank.
The system was designed and built by Columbia Energy and Environmental Services of Richland and tested for hundreds of hours on a mock tank, showing it could remove sludge, rocks and sand, as well as the hard-packed waste found at the bottom of some tanks.

Other vacuum systems have been used to empty some of the smallest underground tanks at Hanford. But the work was very slow even for small quantities of waste -- about 2,000 gallons -- and the vacuums were not powerful enough to pull up the heaviest waste at the bottom of some tanks.

Tank C-105 has 132,000 gallons of waste from past chemical processing to remove weapons plutonium from fuel irradiated at Hanford reactors.

The only known drawback to the MARS vacuum system is that it is too large to fit down the 12-inch diameter risers that provide the only access into the older, underground tanks.

To prepare to insert MARS into Tank C-105, Washington River Protection Solution workers had to dig up the dirt covering the top of the underground tank, then cut a55-inch-diameter circle to remove a portion of the tank dome to allow a larger riser to be inserted. It's only the second time a Hanford tank holding waste has been opened up. On the first tank at which MARS has been used, Tank C-107, waste pumping started in fall 2011. But the system has been down for long stretches, not because of problems with the MARS technology, but because of the failure of pumps used in harsh radiological environments.

The state of Washington had expected the tank to be emptied in March.

A sluicing system worked well to remove about 88 percent of the waste in the tank, according to Washington River Protection Solutions. Then high pressure liquid was used to attack the hard waste beneath the sludge that made up most of the tank's waste.

However, that stopped being effective with about 7 percent of the 253,000 gallons of waste in the tank remaining.

Hard chunks of waste at the bottom of the tank are too large to be pumped out and a "bathtub ring" remains of hard, crusted waste on the tank's wall, said Rob Roxburgh, Washington River Protection Solutions spokesman.
Using a hot water wash is being considered as the third system for the tank, although a decision has yet to be made, he said.

One of the benefits of MARS is that it is equipped with multiple systems, Roxburgh said, and a hot water wash could be done using the MARS system already in the tank.

Work also has stopped to empty Tank C-102 with a sluicing system. About 98,000 gallons of 316,000 gallons have been removed. Now Hanford officials are considering whether more sludge can be put in the double-shell tank that's receiving the waste. Concerns were raised that if the sludge gets too deep in a double-shell tank, a bubble of flammable gas could build up.

DOE is required under the court-enforced consent decree to have waste removed from all 16 tanks in the group called C Tank Farm by the end of September. Waste retrieval is continuing on four of the tanks. DOE is waiting to hear from the state if enough waste has been removed from two more of the tanks or if it must continue waste retrieval on a total of six tanks.