Hanford Reach
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# Tank cleanup crawler put to the test

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The Department of Energy Office of River Protection and CH2M HILL Hanford Group are taking a clue from the petroleum industry in the effort to clean up an estimated 53 million gallons of radioactive and hazardous waste stored in Hanford's 177 large underground tanks.

Demonstrations of a new remote-controlled cleanup machine are under way in a simulated waste tank at the Cold Test Facility. Called the tank crawler, the machine is a sturdy and agile 1,300-pound system that looks like a small bulldozer with treads and a folding blade. With the push of a button, hydraulics fold the crawler to just 27 inches wide, narrow enough to enter an underground Hanford waste tank through a riser. Once inside the tank, the crawler will push the thick sludge to a central pump that will transfer the contents out of the tank.

**The remote-controlled tank crawler dives into a tank of simulated waste at Hanford's Cold Test Facility. The crawler will help the tank-farm contractor remove sludge from the single-shell tanks.**

The crawler is an adaptation of commercially available technology used extensively in the petroleum and mining industries. A Welsh company, Non Entry Systems, Ltd., which has been making similar machines for the petroleum industry since the mid-1980s, manufactured the crawler. The petroleum industry uses the machines to remove sludge from product tanks. Non Entry Systems' first machine was one that an operator can ride and maneuver inside the tank. It continues to make this model, but it also makes models like the Hanford version that can be operated remotely from a control panel.

The relatively inexpensive adaptation for use in the Hanford waste tanks focused primarily on the construction materials and specific features for application in a radioactive environment. Unlike the models used in the petroleum industry, the Hanford crawler parts are mostly stainless steel, which makes it easier to decontaminate.

ORP and CH2M HILL are conducting crawler demonstrations using simulated sludge waste in the large, to-scale simulated waste tank at Hanford's Cold Test Facility. The first series of tests is being conducted with simulants, which are similar in particle size and viscosity to radioactive and hazardous sludge waste stored in several Hanford tanks. Preliminary tests on each subsystem have been successfully completed, and integrated system testing is under way.

"We are working toward accelerating the retrieval of waste from Hanford's older tanks with innovations such as the tank crawler," said Jim Thompson, manager of ORP's Single-Shell Tank Project. "We will put the crawler through the paces and evaluate its potential for real tank cleanup work."

Working with ORP, CH2M HILL is developing methods for removing solid waste from Hanford's 149 single-shell tanks. Most of the liquid waste has been moved from these older tanks to 28 newer, safer double-shell tanks.

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## Tank cleanup crawler put to the test. cont.

Methods are being developed to remove the remaining solid waste — more than 31 million gallons by volume — from the single-shell tanks. That waste consists of sludge that looks like fine mud and dries very hard, and saltcake, which is somewhat like wet beach sand but can dry to an almost rock-like consistency.

The challenge is to mobilize the sludge and saltcake with enough liquid to move it through pipes to newer tanks, while using as little liquid as possible to reduce the possibility of a tank leak.

That's where the tank crawler comes in.

The crawler must be small enough to fit through a relatively narrow opening on top of the tank, agile enough to maneuver over an uneven waste surface and around obstacles in the tank, and durable enough to withstand the highly radioactive environment and a rigorous decontamination process. Remotely operated, the crawler will be lowered into a tank, where it will push the sludge toward a specially designed vacuum pump. An operator will sit at a bank of monitors in a mobile facility outside the tank farm and use multiple camera views to maneuver the machine. A pump-and-spray mechanism on the crawler will help move the waste to the central pump.

The central pump vacuums up the thick waste, which is expected to contain 30 percent to 80 percent solids, and moves it approximately 50 feet to a holding tank on the surface. During testing, the central pump has been removing about 25 gallons of simulated waste — kaolin clay — per minute.

### The tank crawler's vital role

The tank crawler is being evaluated for retrieving sludge waste from as many as 60 Hanford single-shell tanks for transfer to newer, safer double-shell tanks.

### How does it work?

- The tank crawler will be lowered through a narrow opening in the top of a tank.
- An umbilical line that connects the crawler with equipment above the ground will allow controllers to operate the crawler.
- The crawler will use its bulldozer-like blade to push the sludge waste toward a central vacuum pump.
- The central vacuum pump will dilute and transfer the waste through pipes to a holding tank and then to a newer, safer double-shell tank.

### What is sludge waste?

- Sludge waste looks like fine mud and dries very hard.
- Sludge tends to have small pore spaces, so liquids can't be easily drained or pumped.

As the crawler is removed from a tank, it goes through a vigorous decontamination process. First it is hit with a low-pressure spray, then a high-pressure spray to loosen and wash off most of the material. Finally, the crawler enters an ultrasonic decontamination chamber with several banks of ultrasonic generators that create strong vibrations, and a final wash removes the smaller particles of waste.

"The crawler is designed to be sturdy enough to handle the challenging environment of a real Hanford waste tank," said Joel Eacker, CH2M HILL Hanford Group vice president of Projects. " We think it shows promise for accelerating the removal of waste from several of Hanford's tanks."

Single-shell Tank C-104 is currently scheduled for the first deployment of the crawler; however, ongoing evaluations may support accelerated deployments in other waste tanks. ■