Hanford tests leak-detection upgrade

TRICITYHERALD.COM

This story was published Monday, April 24th, 2006
By Annette Cary, Herald staff writer

New technology being tested at Hanford could more quickly and reliably detect leaks of radioactive waste from its underground tanks.

In addition, a new system is being used to help map contamination from the 67 tanks at Hanford suspected of having leaked about 1 million gallons of waste in the past. Unlike previous systems, it can collect samples from soil beneath the huge tanks.

Hanford officials are hoping that leaking tanks remain a problem of the past.
All 149 of Hanford's oldest, leak-prone tanks have been emptied of most of their liquid waste. But as work continues to remove the salt cake and sludge from the tanks, liquid added to some tanks to break up and remove solids could result in a new leak.

Now, 1960s technology is depended upon to catch any new leaks as waste from single-shell tanks is emptied into newer double-shell tanks until it can be processed for disposal. The waste is left from the past production of plutonium for the nation's nuclear weapons program.

Six to eight dry wells around individual tanks are used to lower gamma monitors to detect radiation and lower neutron monitors to detect moisture through the walls of the dry well.

"It's not very accurate. It's not very timely," said Rick Raymond, CH2M Hill senior director for the S-Tank Farm closure.

The leak has to be large -- many thousands of gallons -- and within a few feet of the dry well to be detected. The contamination can take weeks to months to travel that close to the drywell.

In some past cases, Hanford workers knew a leak had occurred because the volume of liquid in the tanks dropped, but monitors never detected the leaks.

The new technology, called high resolution resistivity, shows promise for real-time leak detection.

It worked well enough at a test site that CH2M Hill and subcontractor Columbia Engineering and Environmental Services of Richland are testing it at Tank S-102 in central Hanford. There the system will have to cope with interference from many tanks, pipes and old leaks.

Because electricity moves more easily through wet soil than dry, the new technology measures resistance as electricity travels between 12 probes installed in dry wells around the tank and between the probes and the tank. Computers can use the measurements collected every second to create a 3-D model of the leak.

"It's working very well," Raymond said.
The first test, using liquid deliberately injected into the ground, detected the moisture within three days when 300 gallons had been injected.

The traditional system, at best, might have detected the liquid after two to three weeks and when 8,000 gallons had been injected, Raymond estimated.
About 10 test injections are planned with results expected in September.

The new system will help map historic leaks from tanks already in use.

CH2M Hill has replaced the bucket on a small backhoe with a hydraulic hammer that can drive a hollow rod 120 feet beneath the soil. The rod is grooved, so it can turn to push rocks out of the way, and can be equipped with a tip to collect a sample or used for radiation or moisture detection monitors.

Traditionally, vertical holes have been drilled near tanks to check for contamination. But as holes are drilled, contaminated soil is brought to the surface, posing a risk to workers and requiring a plan to dispose of it. Because of all the pipes and wires around the tanks, just finding a place to drill a hole was sometimes difficult.

Past attempts to push a rod into the ground, rather than drill a hole, have lacked the power to push the rod as far into the soil.

The backhoe makes the system portable and the hydraulic hammer mounting has had an added bonus: The rod can be pushed into the ground at an angle, allowing checks to be made beneath tanks, instead of just beside them.

It's been used now in five of Hanford's tank farms, or fields of underground tanks, said Frank Anderson, CH2M Hill task lead for the vadose zone project.
"It gives a lot of flexibility in collecting data," he said.

That data will be needed to determine the extent and location of contamination in the tank farms and verify computer models to develop a plan to clean up the tank farms as tanks are emptied and closed for good.

---

hydroGEOPHYSICS, Inc. (HGI) is providing the data acquisition systems, monitoring, interpretation and reporting for the new tank farm leak detection systems at Hanford. At the same time, HGI is providing the contamination mapping services for the tank farms. The High Resolution Resistivity technique spoken of in this article is a patented technology developed by scientists and engineers at HGI in order to improve the accuracy of acquisition and interpretation of contaminant plume data and remedial actions.

2302 N. Forbes Boulevard • Tucson, AZ 85745 • Tel. (520) 647-3315 • Fax (520) 647-3428 •
www.hydrogeophysics.com