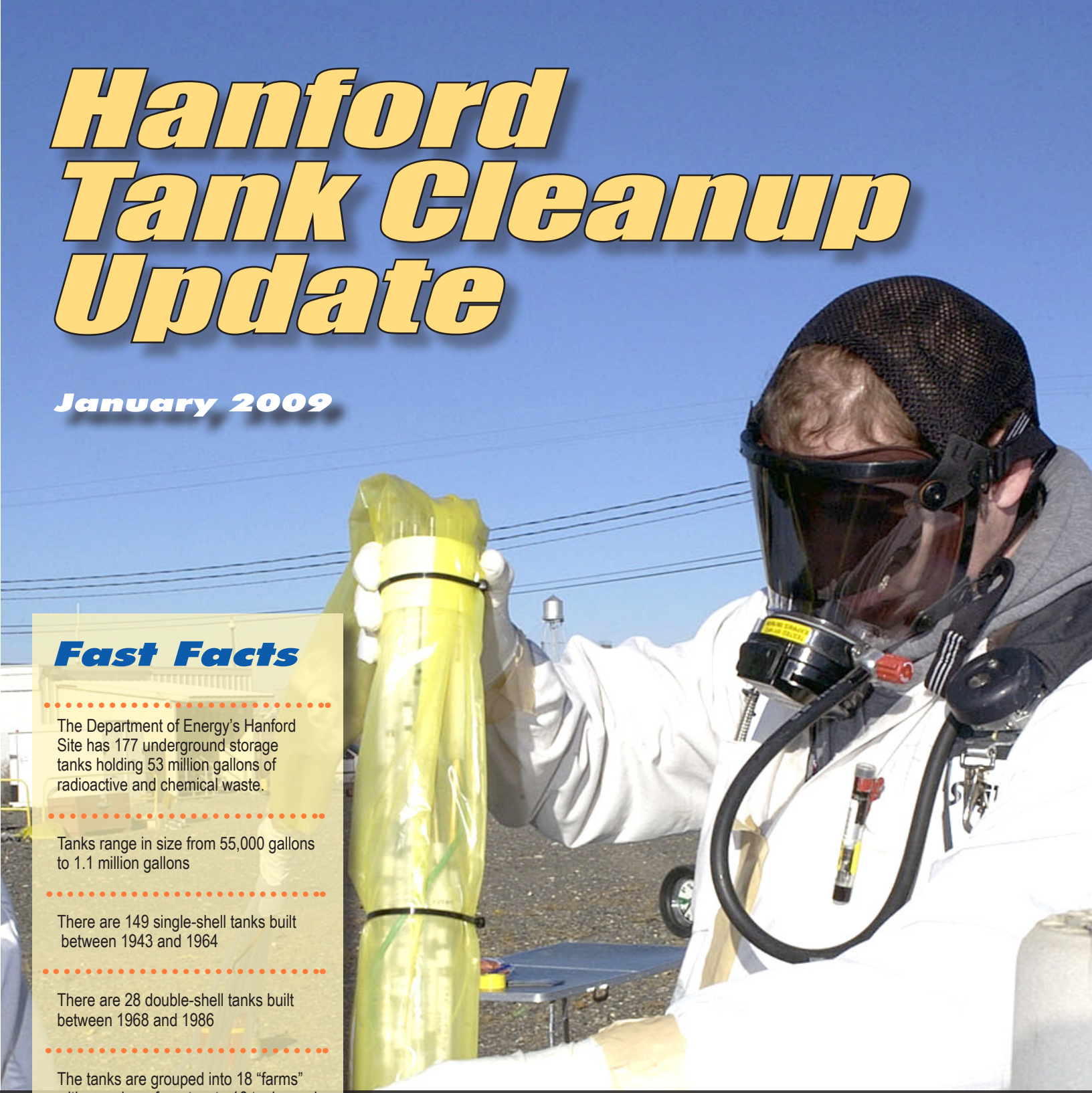
Hanford Tank Cleanup Update

January 2009



Fast Facts

- The Department of Energy's Hanford Site has 177 underground storage tanks holding 53 million gallons of radioactive and chemical waste.
- Tanks range in size from 55,000 gallons to 1.1 million gallons
- There are 149 single-shell tanks built between 1943 and 1964
- There are 28 double-shell tanks built between 1968 and 1986
- The tanks are grouped into 18 "farms" with anywhere from two to 16 tanks each
- The tanks are located in the center of the Hanford Site and are divided between two locations known as the 200 West Area and the 200 East Area.

Washington River Protection Solutions (WRPS), a company owned by URS Corporation and EnergySolutions, assumed responsibility for Hanford tank operations on Oct. 1, 2008. The primary focus of the work is reducing risk to the Columbia River, employees and the public. WRPS is working with the U.S. Department of Energy's Office of River Protection to safely store, retrieve and treat Hanford tank waste and close the tank farms at the 560-square-mile Hanford Site in southeastern Washington state.

washington river protection solutions

Visit us at www.wrpstoc.com or www.hanford.gov/orp/ for more information.

Office of River Protection

Focus continues on waste retrieval from single-shell tanks

Tank C-110 next in line for retrieval

Washington River Protection Solutions is preparing to resume waste retrieval from tank C-110 in early 2009. The 530,000-gallon tank was built in 1946 and currently holds approximately 126,000 gallons of sludge and other radioactive and chemical waste materials.

Waste retrieval activities were stopped in September 2008 to allow modifications to a nearby double-shell tank that will be receiving the C-110 waste. Through innovation WRPS has developed a new approach (see insert) that will reduce costs and allow retrieval to begin several months sooner than previously planned.

Pump collar mockup

Innovative approach

The waste from C-110 is being transferred to nearby double-shell tank AN-106. But accumulated solids from other waste transfers are nearing levels that would block the intake of the pump in AN-106 that recirculates the double-shell tank liquid used for sluicing in C-110.

To avoid the delay and expense of purchasing a new pump on a shorter intake pipe, engineers devised, fabricated and installed a collar that will lift the existing pump assembly vertically and move the pump intake well above the layer of solid material at the bottom of AN-106, eliminating the need to design and build a new pump.

Evaporator upgrades set stage for waste reduction

The 242-A Evaporator is undergoing major upgrades in preparation for liquid waste volume reduction campaigns beginning in spring 2009. Workers have finished upgrading the ventilation and monitoring and control systems and rebuilding one of two main pumps and have removed nearly all of the radioactive contamination in the condenser room.

The condenser room is the operating heart of the evaporator, containing most of the operating instrumentation and transmitters.

As the last operating nuclear facility at Hanford, the 242-A Evaporator is critical to the cleanup mission. The evaporator creates storage space in double-shell tanks by removing water and concentrating the liquid waste, making it possible to empty the waste from Hanford's aging single-shell tanks.

242-A decontamination

Independent panel to review single-shell tank integrity

With the support and direction of DOE's Office of River Protection, Washington River Protection Solutions is convening an independent panel of experts to review all pertinent information and programs regarding construction and operation of the single-shell tanks.

The panel will recommend enhancements to the existing program of monitoring the integrity of the tanks and propose methods to better inspect and assess them. The panel is made up of nationally recognized experts in numerous engineering and scientific disciplines associated with single-shell tank integrity.

A similar expert panel process was used several years ago for Hanford's 28 double-shell tanks, resulting in a very effective integrity assessment program.

Hanford's 149 single-shell tanks, many of which date back to the early days of the Manhattan Project during World War II, have passed their original design life, and their integrity is critical as they will need to continue to hold solids and sludges until the waste can be removed and prepared for disposal in the nearby Waste Treatment Plant which is still under construction. All pumpable liquids were removed from these tanks several years ago.

Ultrasonic testing of a double-shell tank mockup

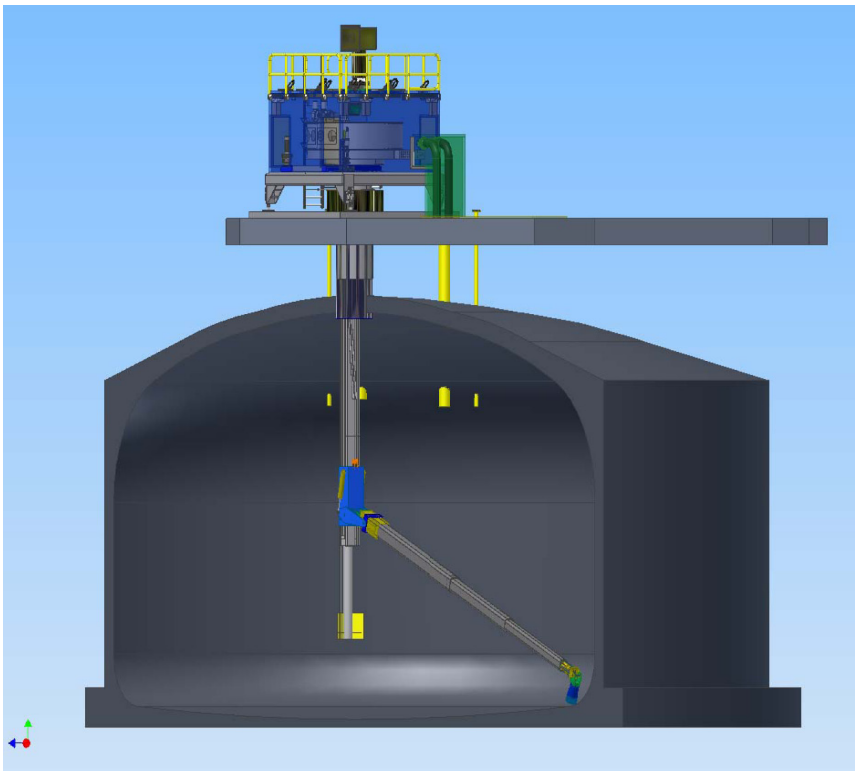
New generation of robotic arm in tank cleanout future

Design work has started on an innovative robotic arm that offers the potential to increase the efficiency of waste removal from Hanford's single-shell tanks. The arm, referred to as the Mobile Arm Retrieval System (MARS), will be capable of a wide range of motion and include telescoping capabilities to enable it to reach the tank extremities. Interchangeable tools on the end of the arm will be used to break up the waste, move it to a pump and remove it from the tank.

The use of robotic arms for waste retrieval has been studied at Hanford since the beginning of the cleanup program, but the state of the technology and deployment strategies limited their usefulness. Incorporating lessons learned from other DOE sites and the corporate parents of WRPS with new technology innovations such as use of lightweight and high-strength composite materials have increased the options for effective tank waste retrieval.

Part of the design challenge will be 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, thus saving time and money. Design work is expected to be completed before the end of 2009, with installation expected in 2010.

Development of new and innovative technologies to speed the retrieval of tank waste and make retrieval operations more efficient and cost-effective is a goal of Washington River Protection Solutions.



Early conceptual approach for robotic arm

Integration with the Waste Treatment Plant key element of WRPS activities

WRPS tests key Waste Treatment Plant process at 222-S Laboratory

Washington River Protection Solutions is testing a prototype of a key Waste Treatment Plant component in the 222-S Laboratory. The testing is conducted on double-shell tank waste in hot cells -- compartments heavily shielded to protect operators from radiation while they remotely handle samples and equipment.

Laser ablation will be a primary analytical tool in the Waste Treatment Plant's Analytical Laboratory. It will be used to analyze the solid waste feed to the High Level Waste Vitrification Facility and the waste glass produced by both the High-Level Waste and Low Activity Waste Vitrification Facilities.

The laser ablation process uses a high-powered laser to vaporize a small bit of solid waste to form an aerosol. The aerosol is transferred into plasma where the emitted light is analyzed in a spectrograph to determine its chemical composition.

WRPS is proving the technique works on actual tank waste and writing the operating procedures.

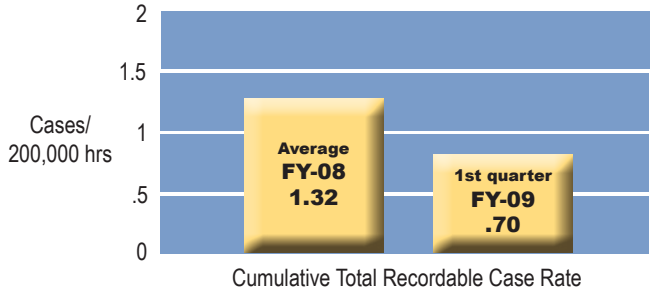
222-S hot cell

Worker and environmental protection remain priorities

Tank farm workers achieve one million hours without a lost-time injury

WRPS employees achieved one million hours without a lost-time injury this fall. Attaining this milestone demonstrates that tank farm workers are maintaining a strong focus on safety and have not been distracted by the transition to a new contractor.

Another indicator of employees' attention to safety is the reduction in the total recordable case rate for the first quarter of FY-09. It is almost half the rate experienced in FY-08. (See graph at right.)



WRPS to improve chemical vapors program

Chemical vapors are a fact of life in Hanford's tank farms. To protect worker health and safety, the WRPS Industrial Hygiene program is constantly reviewed, updated and improved to keep up with industry best practices.

The most recent program review by a group of independent experts, conducted under the auspices of the Hanford Concerns Council for the previous tank farm contractor, confirmed that the methodology and supporting data used to develop the Industrial Hygiene Technical Basis is consistent with industry best practices. However, the team questioned whether the Technical Basis is conservative enough to adequately protect tank farm workers during waste retrieval, when most chemical vapors are generated.

Since assuming operational responsibility, WRPS has proposed a strategy for improving the current Technical Basis, based on its own review, the expert committee's recommendation and dialogue with stakeholders and workers.

WRPS is working closely with the Hanford Concerns Council and Hanford Challenge on this issue. The company was commended in the latest Hanford Challenger newsletter for "committing to put worker health and safety first."

Tank farm monitoring

Technology helps map waste plume

For the first time, a fully-three-dimensional view may be possible of a plume of radioactive and chemical contaminants in the soil near an area of the Hanford Site known as C Farm. The so-called "farm" is home to more than a dozen underground storage tanks containing radioactive and chemical waste. Surface Geophysical Exploration (SGE) probes were installed on the surface around a diversion box, while four SGE sensors were placed deep in the soil.

SGE uses electricity to measure differences in soil resistance caused by changes in moisture and chemical content. Steel probes are connected to a computerized system that directs electrical impulses between them and measures differences in soil resistance. These differences are then used to provide a "map" of the plume of contaminants.

The diversion box was used to direct liquid waste from the processing plants to the tanks within the farm. In October 1969, a pipe broke, allowing about 36,000 gallons of liquid to leak into the surrounding soil. A vital element of the Hanford cleanup program is to identify such leaks in and near tank farms and map their spread so decisions can be made about the best way to clean them up to protect the public and the environment.

A total of 336 surface electrodes have been installed around the diversion box, plus two more at a depth of 50 feet and two more at a depth of 100 feet.

SGE technology has been used to map plumes in and around several Hanford tank farms, but this is the most challenging application of the technology due to the large number of buried pipes as well as other infrastructure around the diversion box that create interference in the electrical signals coming back to the computer. The use of deep buried probes should help overcome that problem by allowing electrical signals to travel under the other pipes and infrastructure.

Surface Geophysical Exploration probes