Tank Farms and Waste Feed Delivery – 12507

Thomas Fletcher, Stacy Charboneau, Erik Olds
US DOE
thomas_w_fletcher@orp.doe.gov, Stacy_L_Charboneau@orp.doe.gov,
Theodore_E_Erik_Olds@orp.doe.gov

The mission of the Department of Energy's Office of River Protection (ORP) is to safely retrieve and treat the 56 million gallons of Hanford's tank waste and close the Tank Farms to protect the Columbia River. Our discussion of the Tank Farms and Waste Feed Delivery will cover progress made to date with Base and Recovery Act funding in reducing the risk posed by tank waste and in preparing for the initiation of waste treatment at Hanford.

The millions of gallons of waste are a by-product of decades of plutonium production. After irradiated fuel rods were taken from the nuclear reactors to the processing facilities at Hanford they were exposed to a series of chemicals designed to dissolve away the rod, which enabled workers to retrieve the plutonium.

Once those chemicals were exposed to the fuel rods they became radioactive and extremely hot. They also couldn't be used in this process more than once. Because the chemicals are caustic and extremely hazardous to humans and the environment, underground storage tanks were built to hold these chemicals until a more permanent solution could be found.

The underground storage tanks range in capacity from 55,000 gallons to more than 1 million gallons. The tanks were constructed with carbon steel and reinforced concrete. There are eighteen groups of tanks, called "tank farms," some having as few as two tanks and others up to sixteen tanks.

Between 1943 and 1964, 149 single-shell tanks were built at Hanford in the 200 West and East Areas. Heat generated by the waste and the composition of the waste caused an estimated 67 of these single-shell tanks to leak into the ground. Washington River Protection Solutions is the prime contractor responsible for the safe management of this waste. WRPS' mission is to reduce the risk to the environment that is posed by the waste. All of the pumpable liquids have been removed from the single-shell tanks and transferred to the double-shell tanks. What remains in the single-shell tanks are solid and semi-solid wastes. Known as saltcakes, they have the consistency of wet beach sand. Some of the waste resembles small broken ice, or whitish crystals.

Because the original pumps inside the tanks were designed to remove only liquid waste, other methods have been developed to reach the remaining waste. Access to the tank waste is through long, typically skinny pipes, called risers, extending out of the tanks. It is through these pipes that crews are forced to send machines and devices into the

tanks that are used to break up the waste or push it toward a pump. These pipes range in size from just a few inches to just over a foot in diameter because they were never intended to be used in this manner.

As part of the agreement regulating Hanford cleanup, crews must remove at least 99% of the material in every tank on the site, or at least as much waste that can be removed based on available technology. To date, seven single-shell tanks have been emptied, and work is underway in another 10 tanks in preparation for additional retrieval activities. Two barriers have been installed over single-shell tanks to prevent the intrusion of surface water down to the tanks, with additional barriers planned for the future. Single and double-shell tank integrity analyses are ongoing.

Because the volume of the waste generated through plutonium production exceeded the capacity of the single-shell tanks, between 1968 and 1986 Hanford engineers built 28 double-shell tanks. These tanks were studier and made with a second shell to surround the carbon steel and reinforced concrete. The double-shell tanks have not leaked any of their waste.

In 1996, an underground Cross-Site Transfer Line was constructed that links the tanks in the 200 West and East Areas. The piping is double-contained and buried 4 to 10 feet below the surface. This transfer line allows waste to be pumped from the single-shell tanks to the double-shell tanks and to the 242-A Evaporator in the 200 East Area. Most importantly, it supports the primary mission of disposal since the Waste Treatment Plant (WTP) is being constructed in the 200 East Area.

The 242-A Evaporator is vital to Hanford's waste storage and disposal mission. The Evaporator receives liquid wastes from the double-shell tanks that is pumped through underground piping and boils off the water. The concentrated waste goes back into the tanks, while the water that was removed is stored in the Liquid Effluent Retention Facility basins until it can be treated in the Effluent Treatment Facility. The evaporator process is critical because it provides more storage space in the double-shell tanks and thereby avoids the need to build additional tanks.

In 2009, ORP received an additional $326M through American Recovery and Reinvestment Act (ARRA) funding to support tank farm upgrades. ORP directed WRPS to accelerate work under the Tank Operations Contract (TOC) and to ensure that organization and management systems were put in place to support completion of all original ARRA funded projects by the end of fiscal year 2011. The primary objectives of the ARRA for ORP were: (1) to create jobs to execute the ARRA work scope; (2) to accelerate life cycle extension upgrades to tank farm infrastructure and waste feed delivery systems required to support the delivery of tank waste to the WTP for treatment; (3) to improve reliability and availability of waste feed delivery systems, which reduce surveillance and maintenance costs over the life cycle of the TOC project; and, (4) through Decontamination and Decommissioning activities, further reduce tank farm surveillance and maintenance costs and eliminate potential sources of contamination.

In the last fiscal year, WRPS completed the original ARRA scope and achieved 100% of ARRA key milestones by the September 30, 2011 deadline. WRPS completed 21 sub-projects and a total of 2,300 Key Performance Parameters using ARRA funds in fiscal year 2011 alone. WRPS used ARRA funding to upgrade tank farm infrastructure, extend the life of critical operating facilities and prepare to feed waste to the WTP. Other key projects focused on the development of state-of-the-art technologies that will be used to retrieve and consolidate tank waste. ARRA funds also facilitated improved integration with the WTP as WRPS developed systems to mix and sample tank waste in order to consistently feed waste to the WTP. The completion of these projects over the past two and a half years leaves the tank farms better prepared for ORP's long-term mission to retrieve and treat the 56 million gallons of waste stored in Hanford's 177 underground tanks.

Much more work remains to be done to upgrade and put in place the infrastructure needed to reliably supply the WTP a steady and consistent feed of waste from the tank farms. This includes the removal of aging, contaminated equipment and installation of pumps, transfer piping, valves, electrical systems and other components, and the upgrade of existing nuclear facilities and construction of new facilities that will support the operations of the WTP.