

Liquid Waste Operations



A Supplement to the
SRS Environmental Report for 2008

Washington Savannah River Company

Liquid Waste Operations

High-activity waste is highly radioactive liquid waste that results primarily from the reprocessing of spent nuclear fuel. The waste contains both transuranic waste and fission products in concentrations requiring permanent isolation from the environment.

SRS continues to manage and disposition approximately 37 million gallons of high-activity liquid radioactive waste (about 400 million curies), which is stored in 49 large, shielded, and underground tanks grouped into two “tank farms.” Twenty-nine tanks are located in the H Area Tank Farm and 20 in the F Area Tank Farm. All SRS tanks are built of carbon steel inside reinforced concrete containment vaults.



Many of the waste tanks at SRS were built in the 1950s.

Currently, the major waste streams coming into the tank farms include transfers from H-Canyon and a low-activity waste stream from the Defense Waste Processing Facility (DWPF).

Liquid Waste Operations Facilities

The F Area and H Area tank farms consist of large underground storage tanks that hold liquid radioactive waste. Fresh waste received from the processing of the spent nuclear fuel separates into two parts, as follows:

- A sludge (which contains most of the radioactivity) that settles on the bottom of the tank
- A watery “supernate” that occupies the area above the sludge

The supernate is transferred to an evaporator system, where it is processed further. The evaporator system reduces the volume of this supernate. As the concentrated supernate cools, salts precipitate to the bottom of the receipt tank. This solid, commonly known as salt cake, generally forms in the evaporator concentrate receipt tanks. The sludge layer remains in its original tank until a sludge processing campaign is executed.



Supernate waste within an SRS tank.

Both F Tank Farm and H Tank Farm have their own evaporator systems. F Tank Farm has one operating system (2F), while H Tank Farm has two (2H and 3H).

These evaporators recovered over 2.6 million gallons of tank space in CY 2008.

SRS has successfully conducted this space reclamation operation in the tank farms since 1960, when the first evaporator facilities began operation. Without these evaporator systems, SRS would have required 86 additional waste storage tanks—at about \$50 million apiece—to store waste produced over the site’s lifetime.

The Extended Sludge Processing Facility, one of two DWPF pretreatment operations in the Liquid Waste Operations area, washes sludge (settled insoluble waste) to reduce the concentration of sodium salts, which ensures glass quality when the sludge is processed at DWPF. The facility has processed four of 17 sludge batches that will be required to vitrify all the high-activity waste sludge. A fifth batch is currently being processed at DWPF, while a sixth batch is being prepared.



The 2H Evaporator, located within H Tank Farm.

The washed and decanted sludge is transferred to DWPF as part of “sludge only” operations. DWPF then processes the sludge from the original waste by combining it with glass frit. The mixture is heated until it melts, then is poured into stainless steel canisters to cool. The glass-like solid that forms contains the highly radioactive material and seals it off from the environment. Another word for this process is “vitrification.” The sealed canisters will be stored at SRS until a federal repository is established.

In July 2003, salt waste processing was placed on hold at SRS, as a result of a decision by an Idaho federal judge, who ruled that the Department of Energy did not have the authority to reclassify waste for disposal in facilities other than the national repository. In November 2004, the Ronald Reagan Defense Authorization Act gave DOE that authority. Disposition of salt waste processes via the Deliquification, Dissolution, and Adjustment (DDA) process into the Saltstone Production Facility began in March 2007, was suspended, and resumed in October 2007 upon resolution of permitting challenges.

The DDA process involves removal of the majority of the Cesium-137 contamination from the salt cake by draining the interstitial liquid from the tank (Deliquification). The remaining drysalt cake, with low activity, is dissolved with water (Dissolution) and transferred to a hold tank. This material is then mixed with other waste, chemicals and water as necessary (Adjustment) to ensure it meets the Waste Acceptance Criteria (WAC) for disposition at the SPF.

DOE has authorized the construction of the Salt Waste Processing Facility at SRS following independent validation of the DOE's cost and schedule estimate. The new facility will treat highly radioactive salt solutions currently stored in underground tanks at SRS and prepare these solutions for ultimate disposition.



A new SRS facility will be used to remove cesium from liquid waste stored at the site.

Until the SWPF can be designed and built, SRS plans to use similar technology on smaller scales, to avoid impact to future tank closure and sustain operations for DWPF and H Canyon. In October 2001, DOE approved a record of decision for the SRS Salt Processing Alternative Supplemental Environmental Impact Statement, identifying caustic side solvent extraction as the technology to be used for separation of radioactive cesium from SRS high-activity waste salt. The Modular Caustic Site Solvent Extraction Unit (MCU), which uses this technology, has been built so that some salt waste can be processed until SWPF is operation. Two existing facilities were retrofitted and began operation in April 2008 to remove strontium and actinides from salt waste. The decontaminated salt stream is dispositioned in the SFP while the other streams are vitrified at the DWPF.

Accomplishments

SRS continued to manage its Liquid Waste Operations facilities in support of the integrated high-activity waste removal program in 2008. This included the continued operation of DWPF, SPF, the two tank farms, with their attendant three evaporators, and the startup and successful operation of the Actinide Removal Process (ARP)/MCU salt processing facilities.



Employees conduct work at an SRS tank farm.

Tank Farms

The tank farm evaporators recovered over 2 million gallons of tank space in 2008 through evaporation of the watery supernate that resides atop the sludge in the tanks. The 3H evaporator system contributed 880,000 gallons to the recovery of space during 2008. The 2H evaporator system contributed more than 1.11 million gallons during the year, while the 2F evaporator system contributed 618,000 gallons.

Key to this achievement was increasing operational tank space by removing residual concentrated waste from the evaporator system and completing chemical cleaning of

the 2H evaporator pot. Approximately 485,000 gallons of radioactive waste were transferred via the two-mile inter-area line between F-Tank Farm and H-Tank Farm during 2008. The tank farms conducted more than 100 transfers, moving approximately 14 million gallons of waste, during 2008.



The Defense Waste Processing Facility safely immobilizes radioactive waste by mixing it with molten glass and then pouring the mixture into stainless steel canisters that are welded shut.

DWPF

The Defense Waste Processing Facility (DWPF) continued its successes in 2008 producing 210 canisters of waste totaling about 811,275 pounds of glass with waste throughput for the facility at nearly 270,000 pounds of waste in the glass.

The facility has poured 2,643 canisters as of December 31, 2008.

Contributed by Rick Kelley, WSRC Public Affairs, Public and Employee Communications