Liquid Waste Operations

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.

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

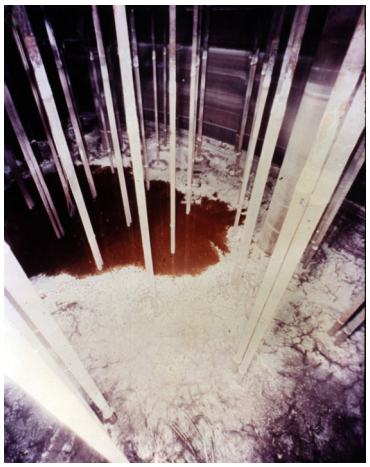
SRS continues to manage and disposition approximately 36 million gallons of high–activity liquid radioactive waste (about 400 million curies), which is stored in 49 large, shielded, and partially underground tanks grouped into two “tank farms.” Twenty–nine tanks are located in the H Area Tank Farm and 20 in the F Area Tank Farm. All SRS tanks are built of carbon steel inside reinforced concrete containment vaults.

The major waste streams in the F Area and H Area tank farms include transfers from the canyons 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



Supernate waste within an SRS tank.

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.

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 million gallons of tank space in 2006.

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 2H Evaporator, located within H Tank Farm.

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 three of 12 sludge batches that will be required to vitrify all the high–activity waste sludge, and preparation of the fourth sludge batch is continuing.

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, and work continues at SRS to implement this new legislation.

The Salt Waste Processing Facility, the high-capacity salt treatment facility that separates the high-activity waste from the low-activity waste, is completing the Preliminary Design phase and is planned to process the salt cake and highly concentrated supernate waste (the result of the evaporation process) from tanks.

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. A modular facility called MCU, which uses this technology, has been built so that some salt waste can be processed until SWPF is operational. Two existing facilities have been retrofitted and will be used to perform other portions of the process associated with the removal of strontium and actinides.

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

In parallel, DOE is evaluating the implementation of other salt processing alternatives for specific waste portions that would not need to be processed in the MCU facility. The evaluation of alternatives and potential operations would be undertaken to maintain operational capacity and flexibility in the tank farm system and to meet commitments for the closure of waste tanks at SRS.

In 2002, DOE approved another processing option for salt cake with low levels of radioactivity. This process involves removal of the majority of the Cesium-137 contamination from the salt cake by draining the interstitial liquid from the tank. The remaining dry salt cake, with low activity, would be dissolved with water and transferred to a hold tank for sampling.

Accomplishments

SRS continued to manage its Liquid Waste Operations facilities in support of the integrated high–activity waste removal program in 2006.

Employees conduct work at an SRS tank farm.

Tank Farms

The tank farm evaporators recovered over 2 million gallons of tank space in 2006 through evaporation of the watery supernate that resides atop the sludge in the tanks. The 3H evaporator system contributed 460,000 gallons to the recovery of space during 2006. The 2H evaporator system contributed more than 850,000 gallons during the year, while the 2F evaporator system contributed 775,000 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 2 million gallons of radioactive waste were

transferred via the two-mile inter-area line between F-Tank Farm and H-Tank Farm during 2006. The tank farms conducted more than 85 transfers, moving approximately 15 million gallons of waste, during 2006.

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) had another successful year in 2006, producing 213 canisters of waste totaling nearly one million pounds of glass. DWPF performed well over the last year with waste throughput for the facility at nearly 320,000 pounds of waste in the glass.

Over the last three fiscal years, the facility has poured 1,182 canisters of vitrified waste.

Contributed by "DT" Townsend, WSRC Public Affairs, Public and Employee Communications