High–Level Waste Disposition

"High–level 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 36 million gallons of high–level 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).

SRS employees conduct work in one of the site's tank farms.

High–Level Waste Facilities

The F Area and H Area tank farms consist of large underground storage tanks that hold high–level 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.

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 about 3 million gallons of tank space in 2004.

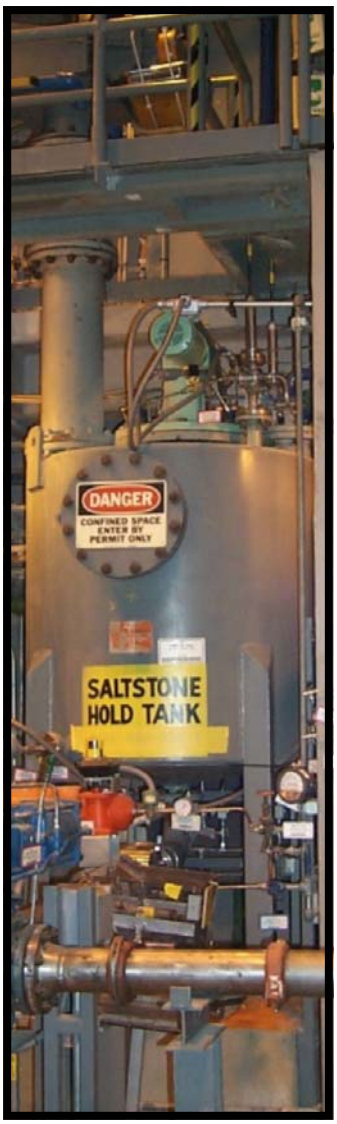
SRS has successfully conducted this space reclamation operation in the tank farms since 1960, when the first evaporator facilities began operation. Without these evaporator systems, SRS would have required 86 additional waste storage tanks—at about $50 million apiece—to store waste produced over the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

A close-up view of sludge inside one of the waste tanks.

A Saltstone employee shows a "pig," which is used in facility operations.

The Extended Sludge Processing Facility, one of two DWPF pretreatment operations in the Liquid Waste Disposition 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 completed three of 10 sludge batches that will be required to vitrify all the high–level waste sludge, and preparation of the fourth sludge batch is continuing. Three million gallons of sludge must be pretreated in this manner.

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.



The new Saltstone hold tank, one of many modifications made in2003 so the facility is ready to process low-curie salt when other modifications are complete.

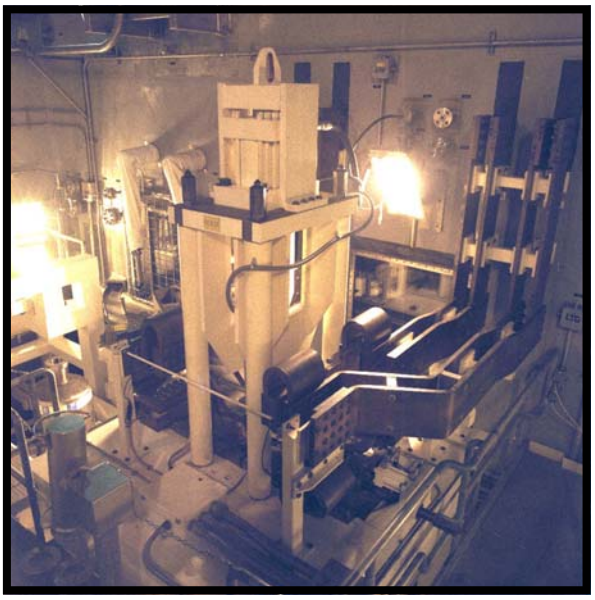
Since July 2003, salt waste processing was on hold at SRS, as a result of a decision by an Idaho federal judge, who ruled that the Department of Energy does not have the authority to reclassify waste for disposal in facilities other than the national repository. In October 2004, the Ronald Reagan Defense Authorization Act gave DOE that authority, and work is now under way at SRS to implement this new legislation.

The Salt Waste Processing Facility, the second pretreatment operation for DWPF, 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 DWPF. In October 2001, DOE approved a record of decision for the SRS Salt Processing Alternative Supplemental Environmental Impact Statement, identifying caustic side solvent extraction (CSSX) as the technology to be used for separation of radioactive cesium from SRS high–level waste salt. A modular facility using this technology is being developed and 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.

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 CSSX facility. The evaluation of alternatives and potential operations would be undertaken to maintain operational capacity and flexibility in the high–level waste system and to meet commitments for the closure of high–level waste tanks.

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.



DWPF's welder is used to weld canisters permanently shut. The resulting seal is stronger than the stainless steel canister itself.

Accomplishments

SRS continued to manage its high–level waste facilities in support of the integrated high–level waste removal program in 2004.

Tank Farms

The tank farm evaporators recovered about 3 million gallons of tank space in 2004 through evaporation of the watery supernate that resides atop the sludge in the tanks. The 3H evaporator system contributed one million gallons to the recovery of space during 2004. The 2H evaporator system recovered more than 1.2 million gallons during the year, while the 2F evaporator system recovered slightly less than one million gallons. One of the keys to this achievement was an inter-area line used to transfer waste from H Area to F Area via a 2–mile underground system. Approximately 1.3 million gallons of radioactive waste were transferred via the inter-area line during 2004. The tank farms conducted more than 139 transfers, moving over 20 million gallons of waste, during FY 04.

DWPF

DWPF had its most successful year ever in 2004, producing 260 canisters of waste and nearing seven million pounds of waste produced.

DWPF is the world leader in converting radioactive waste into glass.

Due to initiatives to increase the amount of waste in every can, DWPF is currently processing more waste faster than any other time in the facility's history. The facility is on schedule to produce 1,100 equivalent canisters by the end of FY06, and some modifications are possible that could improve performance even beyond that.

Approximately 250 canisters of glass are expected to be produced in 2005.

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