Liquid Waste Operations

A Supplement to the
SRS Environmental Report for 2007

Washington Savannah River Company

Liquid Waste Operations

Safety

To operate in a high-hazard environment, Liquid Waste Operations (LWO) uses a myriad of proven safety programs that are woven into the fabric of employees' everyday work. From Integrated Safety Management to Behavior Based Safety to informal "timeouts" to review safety issues, employees have shown a vigilance for being safe, and the safety statistics show they are succeeding. In calendar year 2007, there were zero days of lost work in LWO because of injuries.

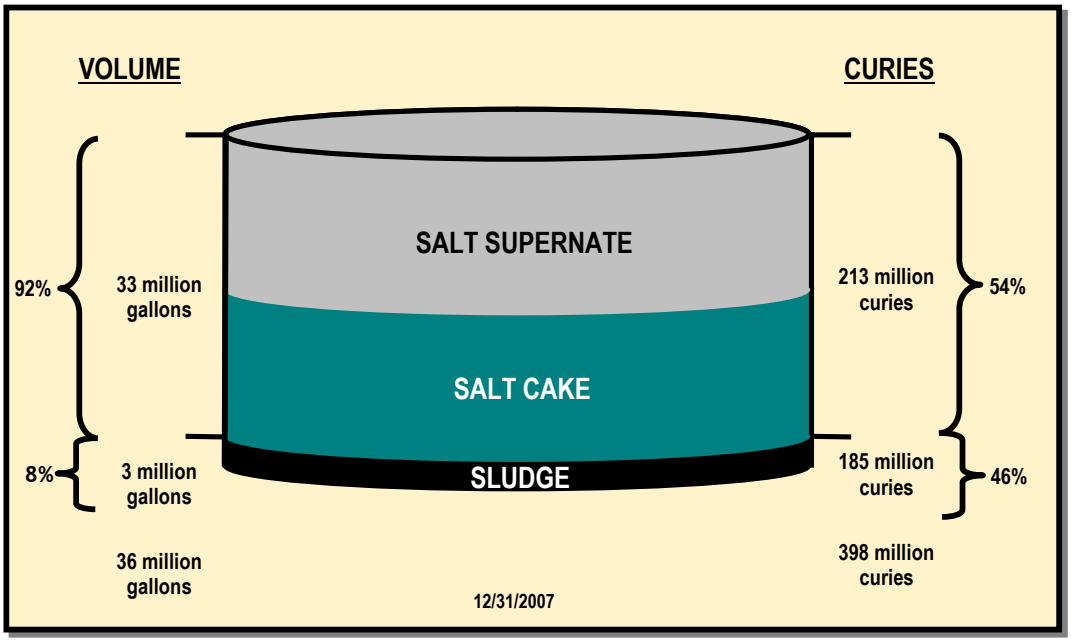
Many of SRS's waste tanks were built in the 1950s.

Operational Background

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 36 million gallons of high–activity liquid radioactive waste (about 400 million curies), which is stored in 49 large, shielded,

Waste Inventory



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 H Area Tank Farm include transfers from the canyons and a low–activity waste stream from the Defense Waste Processing Facility (DWPF).

The 2H Evaporator, located within H Tank Farm.

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:

- 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

Employees work in an SRS tank farm.

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 waste, 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 eliminated over 2.3 million gallons of waste material in 2007.

SRS has successfully conducted this space reclamation operation in the tank farms since 1960, when the first evaporator facilities began operation. Without these evaporator sys-

tems, 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 LWO 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 17 sludge batches that will be required to vitrify all the high–activity waste sludge. A fourth batch is currently being processed at DWPF, while a fifth batch is being prepared.

The top of a waste tank. The large, underground tanks receive waste to maintain Site operations.

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 resulting glass–like solid 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 opened.

The majority of the volume in the Site's tank farms is salt-like waste. New facilities, some of which go on line in 2008, will dispose of the salt waste in the Saltstone Production and Disposal facilities.

The initial salt waste solutions will be treated and transferred to Saltstone as a result of the Interim Salt Disposition Project (ISDP), scheduled to begin hot operations in March 2008 and, beginning in 2013, the Salt Waste Processing Facility.

Interim Salt Processing

The Interim Salt Disposition Project will decontaminate and transfer millions of gallons of treated salt solutions to Saltstone. Both of the production facilities that make up the Interim Salt Disposition Project have successfully completed startup testing, cold runs and a Management Self-Assessment.

The two ISDP processes, known as the Actinide Removal Process (ARP) and Modular Caustic Side Solvent Extraction Unit (MCU), work together as an integrated system to remove nearly all of the radioactive isotopes from salt waste solutions before they are transferred to the Saltstone facility.

ARP was constructed within existing facilities; whereas MCU is housed within a new structure. Both projects were completed on schedule. Overall, WSRC achieved a cost-savings exceeding $6 million over the duration of these combined projects.

ARP will remove strontium and long-lived radioactive particles, such as plutonium and americium, by adding monosodium titanate (MST) to radioactive salt solutions stored at SRS and then filtering out the MST that has adsorbed the radioactive particles. The MST will then be transferred to DWPF, where it will be mixed with molten glass, poured into stainless steel canisters and later shipped to an off-site federal repository. The remaining filtered salt solution is then sent to MCU for further radionuclide removal.

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

Using principles involving centrifugal force and a special engineered solvent, MCU contactors take the higher activity salt solution and divide it into two waste streams. The radioactive cesium is removed and sent to DWPF for vitrification. The remaining decontaminated salt waste solution will be transferred to Saltstone for processing and disposition as a solid and stable form.

Located within the site's H Area Tank Farm, ARP and MCU are scheduled to operate as an interim process until the larger scale Salt Waste Processing Facility is constructed and fulfills this function on a long-term basis.

Early Salt Processing

Prior to ARP/MCU becoming operational in March 2008, LWO received regulatory approval and re-initiated salt processing through the Saltstone Production Facility. More than 700,000 gallons of Deliquification, Dissolution and Adjustment (DDA) material were processed through Saltstone. The facility is poised to complete its near-term objective of processing more than 1 million gallons of DDA waste material by the end of March 2008.

Accomplishments

SRS continued to manage its Liquid Waste Operations facilities in support of the integrated high–activity waste removal program in 2007.

Tank Farms

The tank farm evaporators eliminated over 2.3 million gallons of waste material in 2007 through evaporation of the watery supernate that resides atop the sludge in the tanks. The 3H evaporator system contributed 127,000 gallons to the recovery of space during 2007. The 2H evaporator system contributed more than 1,870,000 gallons during the year, while the 2F evaporator system contributed 372,000 gallons.

Salt cake forms in the waste tanks, taking up most of the room inside the tanks.

Approximately 296,000 gallons of radioactive waste were transferred via the two-mile inter-area line between F Tank Farm and H Tank Farm during 2007. The tank farms conducted 78 transfers, moving approximately 10.5 million gallons of waste during 2007.

In the tank closure area, LWO developed and successfully tested a new enhanced chemical cleaning process that will be used to clean waste tanks to the much more stringent standards currently in effect. This process destroys the spent cleaning solution so it imposes no burden on tank space.

In addition, LWO awarded the Tank 18/19 mechanical cleaning (heel removal) contract to a vendor and completed phase 1 testing, which is a critical activity on the path to meeting Tank Federal Facilities Agreement closure dates.

Also, LWO completed the last phase of mechanical waste removal on Tank 6 using two submersible mixer pumps, resulting in the reduction of remaining sludge from approximately 7,000 gallons to about 6,000 gallons. This tank, along with Tank 5, will undergo a chemical cleaning process in 2008 that will complete the waste removal process, positioning these tanks for operational closure.

DWPF

The Defense Waste Processing Facility (DWPF) had another successful year in 2007, producing 196 canisters of waste totaling containing about 764,000 pounds of glassified waste. DWPF performed well over the last year with waste throughput for the facility at nearly 268,000 pounds of waste in the glass.

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 met its DOE contract minimum performance expectation by completing 197 canisters in December, six months ahead of schedule. The facility also began pouring glass at a rate of up to 0.90 gallons per minute, compared to its historical average of 0.49 gallons per minute. Also in December, the facility achieved a record-setting production rate by filling 26 canisters during the month, compared to an average monthly production rate of 17-20 canisters. That production rate has only been achieved two other times in DWPF's history.

DWPF has now poured over nine million pounds of glass containing more than150 million curies since operations began in 1996.

Contributed by Dean Campbell, WSRC Public Affairs