Defense Waste Processing Facility

The largest radioactive waste glassification plant in the world, the Defense Waste Processing Facility (DWPF) converts the liquid nuclear waste currently stored at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

Scientists have long considered this glassification process, called "vitrification," as the preferred option for treating liquid high level waste. By immobilizing the radioactivity in glass, the DWPF reduces the risks associated with the continued storage of liquid nuclear wastes at SRS and prepares the waste for ultimate disposal in the federal repository. About 36 million gallons of liquid nuclear wastes are now stored in 49 underground carbon-steel tanks at SRS. This waste has about 417 million curies of radioactivity, of which, the vast majority will be vitrified at DWPF..

Construction of DWPF began in late 1983, and it began radioactive operations in March 1996. To complete its waste vitrification mission, DWPF is projected to produce more than 5,000 canisters by the year 2019.

Waste Feed to DWPF

The liquid nuclear waste in tank storage exists in two forms, a sludge form and a salt form. The sludge form, while comprising only about 10% of the volume in the tanks, contains about half of the radioactivity. The salt form readily dissolves in water, comprises about 90% of the volume and contains the balance of the radioactivity. DWPF is designed to treat the highly radioactive radionuclides from both forms of waste; however, DWPF treatment of those from the salt waste awaits the construction of new pre-treatment facilities, including the Modular Caustic Side Solvent Extraction Unit and Actinide Removal Process (which are anticipated to begin radiological operations in 2007) and the Salt Waste Processing Facility (which is projected to become operational by 2012).

DWPF Operations

DWPF is presently vitrifying the sludge form of the liquid nuclear waste currently in tank storage. In this process, a sand-like borosilicate glass (called "frit") is mixed with the waste and sent to the plant's 65-ton steel and ceramic melter. In the melter, electricity is used to heat the waste/frit mixture to nearly 2,100 degrees Fahrenheit until molten. This molten glass-waste mixture is poured, in a pencil-thin stream, into stainless steel canisters to cool and harden.

Each canister is 10 feet tall and 2 feet in diameter, and it typically takes a little over a day to fill one canister. A filled DWPF canister weighs about 5,000 pounds.

After filling, the exterior of each canister is blasted with a frit-water mixture to remove contamination. A stainless steel plug is fitted into the neck of each filled canister and the canister is welded shut using a current of 250,000 amps applied for 1.5 seconds, while 80,000 pounds of force simultaneously rams the plug into the neck of the canister. The resulting weld is as strong as the three-eighths-inch thick stainless steel canister itself.

Moving Canisters to Temporary Storage

A specially designed "Shielded Canister Transporter" moves each sealed canister, one at a time, from DWPF to one of the temporary Glass Waste Storage Buildings adjacent to the facility. This transporter, more than 18 feet tall, 25 feet long and weighing 235,000 pounds, is a two-wheel drive vehicle powered by redundant diesel engines. It has a center module with a shielding cask, floor plug cavity and associated canister lifting equipment. At DWPF, the transporter draws canisters up into the shielded cask for the short trip to the storage building.

At the storage buildings, canisters are lowered by the transporter into an underground reinforced concrete vault. In these vaults, the site has the capacity to safely store over 5,000 canisters. These seismically qualified storage vaults can hold about 16-20 years of canisters at current DWPF production rates. More storage buildings can be built, if necessary, depending on the need for additional interim storage space.

The canisters will be safely stored at SRS until a federal repository is established.

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