APPENDIX J

WASTE MANAGEMENT DEMONSTRATION PROGRAMS

This appendix describes hazardous, low-level radioactive, and mixed waste demonstration programs that have been implemented on the Savannah River Plant (SRP). These programs were established to demonstrate the feasibility of treatment or disposal technologies for these categories of waste. One demonstration program has led to the establishment of a full-scale operating system for groundwater recovery and remedial action.

J.1 HAZARDOUS WASTE DEMONSTRATION PROGRAMS

Research is under way on cement/fly-ash solidification of the Defense Waste Processing Facility (DWPF) supernate to form saltstone monoliths suitable for disposal. This process is also being considered for stabilizing the following wastes: (1) incinerator ash and scrubber blowdown, (2) effluent treatment facility (ETF) sludges, and (3) still-bottom sludge from the Naval Reactor Fuel Materials Facility (FMF) process-water treatment.

J.2 MIXED WASTE DEMONSTRATION PROGRAMS

Presently, the Savannah River Plant has no demonstration programs for mixed wastes. However, research on a method for the stabilization of some wastes of this type is under way (see Section J.3.2).

J.3 LOW-LEVEL RADIOACTIVE WASTE DEMONSTRATION PROGRAMS

J.3.1 INCINERATION

The U.S. Department of Energy (DOE) is developing a full-scale incineration process for nonhazardous, slightly radioactive solvent and beta-gamma contaminated solid wastes and is demonstrating this process on the SRP. The incinerator is a two-stage, controlled-air unit capable of incinerating 181 kilograms of solids per hour or 1500 liters of liquid wastes per hour. Waste in the first chamber is pyrolyzed at 900°C. Final combustion is achieved with excess air in the second stage at 1000°C (Lewandowski, Long, and Mersman, 1984).

From October 1981 through September 1982, the Savannah River Laboratory (SRL) demonstrated the incineration equipment by burning nonradioactive solid and solvent wastes. The equipment was moved from the laboratory for further demonstration and low-level waste incineration. In January 1984, DOE began an SRP demonstration program to develop further the process for incinerating nonhazardous solvents, to demonstrate solids burning capabilities, to incinerate the existing inventory of radioactive solvents, and to burn a fraction of the newly generated, suspect-low-level, radioactive solid wastes. This incinerator has received all applicable permits.

This program demonstrated the following key elements of equipment operation, optimization, and maintenance (Lewandowski, Long, and Mersman, 1984):

- Successful relocation and operational testing of the process equipment.
- Selection and testing of a suitable spray nozzle for burning solvent slurry; optimization of the feed rates for the solvent and atomizing medium.
- Testing of several spray nozzle locations and orientations.
- Conformation of parameters for operating the dry off-gas system.
- Chemical fixing of the phosphorus released by burning tributyl phosphate using tetrabutyl titanate as a fixative; this minimizes the formation of phosphoric acids and reduces long-term corrosion rates and filter blinding.
- Removal of ash from the incinerator on a semicontinuous basis, using two automatically sequenced and electrically interlocked ash rams; the ash remains in a removal duct until it has cooled.
- Replacement of the castable refractory in both chambers of the incinerator with 80-percent brick and 20-percent castable refractories.
- Enhancement of combustion safeguards by placing strongbacks on the incinerator cleanout doors.
- Improvements in the application of the hydraulic cylinders.
- Development of a method for incinerating small amounts of water in the solvent slurry.
- Burning suspect waste oil as a supplementary fuel.

In addition, a pilot incinerator for transuranic (TRU) wastes is operating on the Plant. This is an infrared movable-grate incinerator with a capacity of about 11 kilograms of solids per hour. Results of research conducted with this incinerator could be applied to low-level radioactive mixed wastes on the Plant.

J.3.2 SOLIDIFICATION/STABILIZATION

SRP has an active waste-stabilization program. Greater confinement disposal (GCD) techniques are being demonstrated at the Burial Ground (643-7G). The goal of GCD is to dispose of the higher activity fraction of low-level radioactive wastes in a near-zero-release facility that would meet U.S. Nuclear Regulatory Commission (NRC) guidelines (10 CFR 61). Self-leveling cement grout is used to solidify the wastes before they are placed in a GCD demonstration borehole or trench (Cook et al., 1984).

While GCD boreholes on the Plant have been in operation for some time, it is too early to assess long-term performance. The boreholes have been free of liquids, indicating that no water is infiltrating to the waste. The grout

liner is expected to last for hundreds of years. While the lifetime of the inner fiberglass liner is not known, the fiberglass is made with a resin that is specifically unaffected by most chemicals; it is expected to be stable in the grout matrix for more than 100 years (Du Pont, 1986).

The Greater Confinement Disposal Engineered Trench (GCD-ET) began receiving waste in April 1987. The four-celled, 30.5 by 15.2 meter trench has reinforced concrete walls and steel covers that are placed over each cell when it is not in use. TC

Research also is under way on cement/fly-ash solidification of various low-level radioactive wastes (see Section J.1).

J.3.3 COMPACTION

Compactor demonstration programs on the Plant are evaluating volume reduction technologies for low-level radioactive waste. The Du Pont Reactor Department and the Savannah River Laboratory each use a small (0.15-cubic-meter) box compactor. Annually, these units will reduce approximately 425 cubic meters of job-control wastes to approximately 140 cubic meters. Data from these demonstrations will determine the number of additional compactors to be installed.

A large box compactor in H-Area compacts wastes so they can be placed in 2.5-cubic-meter, carbon steel boxes. As waste items are received in cardboard boxes, radiation levels are verified, and the waste is fed manually to the compactor. Approximately 2265 cubic meters of waste can be compacted to a volume of about 565 cubic meters. This demonstration will permit the determination of achievable volume reduction for low-level radioactive waste and a classification of compactible material, loading techniques, and ventilation-control requirements.

Another large box compactor has been installed in M-Area. This unit will compact about 700 cubic meters to a volume of about 170 cubic meters or less.

These compactor programs are expected to achieve a 9-percent reduction (approximately 2400 cubic meters annually; Mentrup, 1985) in the amount of low-level waste disposed of at the Burial Grounds.

J.3.4 SHREDDING

SRP generates as much as 1415 cubic meters of TRU combustible and noncombustible wastes each year. Since 1965, such waste has been stored at the Burial Ground (643-G and 643-7G) for retrieval. Shredders will be used in the TRU processes developed to prepare these wastes for final disposal; these processes will handle both newly generated wastes and waste now being stored for retrieval.

Demonstration programs are in progress at both SRP and SRL. Two small (45- and 15-horsepower) shredders will prepare combustible TRU-contaminated waste for incineration. These units, which have been installed in a pilot-plant facility for thorough nonradioactive testing, will demonstrate a remote operation and maintenance capability.

A large (160-horsepower) shredder will size-reduce decontaminated noncombustible items, such as decommissioned glove boxes and process equipment. This unit is being installed in an integrated test facility for demonstration of remote operation and maintenance technique. Simulated glove boxes made of both 0.3- and 0.6-centimeter steel and stainless steel have been size-reduced successfully (Charlesworth, 1985).

J.4 REMEDIAL AND CLOSURE ACTION DEMONSTRATION PROGRAMS

At present, DOE has no major demonstration projects on the SRP to define specific remedial and closure actions for existing waste sites. An earlier major demonstration project has led to a specific remedial action project; that is, the pilot air stripper in the M-Area was used to demonstrate the removal of volatile organics from the groundwater. The air stripper and a groundwater recovery well system are in full-scale operation.

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