SALEM GENERATING STATION, UNITS 1 & 2

Solid Radioactive Waste Process Control Program

I. Purpose

In the processing of radioactive waste with the intention of final disposal at a licensed radioactive waste burial site, it has become increasingly important that the waste products be appropriately analyzed, processed and packaged in a manner that meets the regulatory requirements, representing a final waste product that is acceptable for shallow land burial. The purpose of this Process Control Program is to document the radioactive waste processing methods and the quality control steps that are taken at Salem to assure an acceptable waste product.

This Process Control Program covers all major waste processing streams and the final waste products. Operating criteria for waste processing are addressed as are solidification verifications, QC check points and visual examinations of the final waste product.

The waste streams, processing methods and solid radioactive waste products that are covered by this Process Control Program include:

- Solidification of resins, Stock Cement System;
- Solidification of evaporator bottom, Stock Cement System;
- Solidification of oil;
- Dewatering of resins;
- Packaging of non-compactable waste;
- Compaction of DAW; and
- Use of contractor for waste processing.

II. Regulatory Overview

All waste processing, packaging and shipping are conducted in accordance with approved procedures to assure compliance with all applicable federal, state and burial site requirements. Waste processing is performed within specified

bounds with appropriate operating verifications to assure a product meeting applicable waste form characteristics; packaging is in containers meeting DOT specifications; and shipments are conducted in accordance with the requirements of 49 CFR 172-177 and 10 CFR 71.

All waste processing is performed in a manner consistent with the principles of ALARA. The procedures that have been developed to cover waste processing operations address appropriate radiation safety measures such as job preplanning (REP), radiation source shielding, and job prerequisites and material requirements so as to minimize stay times.

III. Solidification of Resins, Stock Cement System

The normal method of processing spent resins at Salem is dewatering and disposal in an appropriate liner, carbon steel or HIC (See Section VI). However, the installed Stock Cement System is available, if deemed necessary, for the solidification of spent resins from both the reactor water clean-up system and the miscellaneous (radwaste) waste collection system.

System operation is by fully trained and qualified personnel. Prior to the processing of resins, appropriate tests are conducted to assure the generation of an acceptable waste product. A laboratory verification of processing parameters is performed for any of the following conditions:

- before initial full scale solification of a resin batch;
- if any resin has been added to the spent resin storage tank since last laboratory verification; and
- after the final full scale solidification for the day is completed.

The laboratory test to verify solidification includes collecting a representative sample of the resin (and water) and blending with a predetermined binder mixture. Mixing ratios for the resin, free standing water and binder are based on contractor supplied information specifically developed for the solidification of resins. After blending, the sample is allowed to sit undisturbed for at least 24 hours. Prior to full scale operation, the mixture is checked to verify solidification.

If the test mixture does not yield an acceptable solidified waste product, modifications are made to the mixture ratios and a retest is conducted. Final samples are retained for future observation of the solidified product and presence of any free water. A QA and supervisory check is required for the final approval of the solidification mixture prior to full scale processing.

Prior to full scale operation, a decant operation is performed to establish a proper resin/water slurry mixture (12.5% free standing water) in the decant tank. Upon completion of a resin batch processing, drums containing the solidified resins are stored at least 7 days prior to shipment for disposal to assure sufficient time has been allowed for the cement to fully solidify and cure.

IV. Solidification of Evaporator Bottoms, Stock Cement System

All operations covering the determination of waste-to-cement mixing ratios and the actual evaporator bottoms solidification process are covered by approved procedures. Fully trained and qualified personnel are utilized for all required operations. Prior to the full scale solidification of any batch of evaporator bottoms, a laboratory test is conducted to determine appropriate waste-to-cement mixing ratios to assure the generation of an acceptable waste product. A 300-400 ml sample of the bottoms is collected; the pH is determined to be within the range of 6.0-9.0. Based on the results of a boron concentration analysis and the pH analysis, appropriate mixing ratios of the evaporator bottoms, cement and sodium metasilicate are selected from a nomogram that has been developed specifically for the solidification of PWR evaporator bottoms.

The bottoms sample is blended with the determined ratios of cement and sodium metasilicate. After blending, the mixture is allowed to stand for at least 24 hours and checked for solidification. A supervisory and QA verification of proper solidification of the laboratory test sample is required prior to full scale operation. Samples of the laboratory test are retained until the waste has been accepted for burial. Drums from the processing of an evaporator bottoms batch are stored at least 7 days prior to shipment to assure adequate cement curing time. Radwaste Supervisor and QA sign-off is required prior to release for shipment.

V. Solidification of Oil

Oily wastes are segregated from the routine waste processing systems and are processed independently. Oils are solidified in a disposable liner using a predominantly manual operation. Since radioactive material contamination levels are relatively minor for oils, the use of remote handling equipment and personnel shielding is not required from an ALARA standpoint as is for the processing of spent resins and evaporator bottoms. Personnel that are fully trained in the procedures for waste oil processing are utilized for the performance of the solidification testing and actual waste processing.

Prior to the processing of any oils, a representative, composite sample of the oils to be solidified is collected and a laboratory verification of solidification is performed. The composite sample is analyzed for pH, radioactivity and percent water. A boron concentration analysis is performed on the water that is to be blended with the oil; concentration limits for boron are <19,700 ppm boron or <120,000 ppm boric acid. If required, water is added to the oil to achieve a minimum of 40% water, by volume. A predetermined quantity of an emulsifier is added at a ratio of 1 part emulsifier to 5 parts oil/water, by volume. This mixture is blended for a minimum of 5 minutes, longer if needed to achieve a homogeneous mixture. Cement (432 grams) and anhydrous sodium metasilicate (50 grams) are blended in and allowed to stand for a minimum of 2 hours. The product represents an acceptable solid waste if there is no visual or drainable water, holds its shape upon removal from the container, and resists penetration by a rigid rod. If unacceptable, the mixing ratios are adjusted and another laboratory test is conducted.

Based on the laboratory determination of acceptable waste and solidifying medium ratios, the batch of oil is processed. Two (2) grab samples of the final waste product are collected from the liner. Solidification is acceptable if upon visual examination the waste appears solid, resists penetration by a rigid rod and contains no visual free standing water. The 2 grab samples are also verified to constitute an acceptable solid waste product. A supervisor and QA verification is required of the final waste product.

VI. Dewatering of Resins

The processing of certain waste water by ion exchange resins results in a waste product that is more appropriately dewatered in a suitable disposable liner (carbon steel or high integrity container) rather than solidified by the Stock Cement System. Most reactor water clean-up resins and miscellaneous radwaste demineralizer resins are processed and disposed of in this manner. All dewatering processes are conducted in accordance with approved procedures with appropriate verifications and QA checks to assure a waste product with as little free standing water as possible but in no case in excess of 1% by volume. Prior to the dewatering of a resin liner, verifications are conducted of all temporary hose connections and of a suitable drain path for the removed water.

The procedure for the dewatering process requires an initial continuous 8 hour pumping of the liner to remove free standing water. The liner is allowed to stand for 16 hours; dewatering is conducted at least 2 more times (more if needed) to remove any residual water that may have resulted from settling of interstitial water in the resin matrix. A record is kept of the volume of water removed on the third and subsequent dewaterings. The dewatering process is continued until removal of essentially all free standing water. An acceptable volume of water from a dewatering operation that verifies removal of essentially all free standing water is <2000 ml. A QA inspection point is included in the dewatering procedure to verify the <2000 ml removed water for the final dewatering process.

VII. Packaging of Non-Compactable Waste

Non-compactable radioactive waste materials are segregated from other DAW. No oils, liquids or chemicals are allowed. Non-compactable wastes are packaged in plastic or herculite lined LSA boxes. An inspection of the box is conducted prior to packaging to verify integrity. All materials are surveyed by Health Physics personnel prior to inclusion in a box. The box is secured, weighed, numbered, surveyed and appropriately labeled for transportation.

VIII Compaction of DAW

Most all compactable solid waste is processed by a box compactor prior to shipment for burial so as to minimize the volume. During the compaction process reasonable effort is made to ensure that no oils, liquids or chemicals are included. Boxes are inspected to assure a strong, tight container. Each box is secured, weighed, numbered, surveyed and appropriately labeled for tranportation.

IX. Use of Contractor for Waste Processing

Contractor supplied services may be used at Salem for the processing of radioactive waste. For the operation of such process systems, it may be desirable to use process control measures and procedures developed by the contractor specifically for the system. Therefore, previously addressed process control measures for a particular waste stream may be superseded by contractor supplied measures as appropriate. The following discussion addresses the administrative controls that are imposed to assure that contractor supplied services for processing radioactive waste for disposal at a burial site are compatible with plant operations, procedures and regulatory requirements.

Prior to the use of any contractor for the processing of waste at Salem, a management review of the contractor's process controls and operating procedures is performed for the purpose of assuring a safe operation in accordance with plant procedures and applicable regulatory requirements. For the processing of waste that is intended to be shipped for disposal to a licensed radioactive waste burial site, additional precautions are taken to assure a final waste product that meets the appropriate waste characteristic requirements for solidification or dewatering. In particular, the following items are to be documented by the contractor (or Salem manuals or procedures) prior to utilization for solid waste processing at Salem:

- a general description of the solidification process, including type of solidification agent, major process equipments and interface with plant equipment, type of wastes that can be processed, and operating parameters;

- a process control program that provides for the verification of the generation of a suitable waste product, including items such as representative sampling, laboratory tests to establish waste-to-process medium ratios, and criteria for evaluating acceptability of lab test;

- specifically approved procedures for the operation of the process equipment that will assure operation within the bounds as determined by the process control program; and,

- appropriate QA check point and acceptance criteria for evaluating the acceptability of the final waste product.