GRAND GULF NUCLEAR STATION
TYPICAL INSTRUCTIONS/REQUIREMENTS
TO BE PROVIDED FOR
SOLIDIFICATION OF RADWASTE SLURRIES AND
EVAPORATOR BOTTOMS CONCENTRATES

A. General

1. The Radwaste Solidification System is designed to mix waste slurries and evaporator bottoms concentrates with specific proportions of Portland Cement and Sodium Silicate in order to obtain a solid with definite shape and no free water.

2. Each of the two mixing "trains" (i.e., Trains A and B) is provided with the ability to select one of nine generic waste streams identified by number:
   Stream #1 - Waste Surge Tanks (condensate filter backwash)
   Stream #2 - RWCU Phase Separator Tanks (RWCU and FPCC filter demineralizer backwash)
   Stream #3 - Liquid Radwaste Floor Drain Filter (Ecodex)
   Stream #4 - Radwaste Equipment Filter (Ecodex)
   Stream #5 - Resins H-OH from Condensate and Liquid Radwaste
   Stream #6 - Evaporator Bottoms from Resin Regeneration
   Stream #7 - Evaporator Bottoms from miscellaneous chemicals
   Stream #8 - Evaporator Bottoms from Floor Drain Wastes
   Stream #9 - Future

3. Parameters have been established for various pump speeds required to maintain correct flow rates within the system. These have been preset within the system Modicon Programmable controller. When a particular stream type is selected, the controller will operate the various pumps as required for the solidification process, at speeds appropriate for the waste stream type being proce .

4. The operator will determine which specific generic batch the waste input represents (using methodology specified in Section B of this Enclosure) and select the corresponding generic batch position before starting the solidification process.

   a. The operator is not authorized to "adjust" the individual process pump speed settings without specific authorization from the Radwaste Supervisor.
   b. If the waste input cannot be categorized into a specific generic batch using Section B of this Enclosure, a sample of the waste input will be obtained and analyzed. Process selection is then made using Section D of this Enclosure.

5. The Solid Radwaste System will be operated in accordance with GGNS operating procedures in a manner which will permit segregation of waste inputs into generic batches. With proper segregation, the only parameters that are variable are pH (applicable for evaporator

bottoms only) and percent solids. Categorized wastes will be conditioned to adjust the pH and solid/liquid content within boundary conditions and then solidified as a batch with no further additions of solids or liquids into the respective waste holding tank(s) until the batch is completely processed.

6. Waste holding tanks A and B should be normally used only to collect radwaste equipment drain filter and floor drain filter discharges (Ecodex) respectively. Liquid additions may be from the Condensate and Refueling Water Storage and Transfer System (CRWST) or regenerant evaporator bottoms.

7. Waste holding tank C should normally be used for spent resin discharges and filter and filter/demin (Ecodex) sludge with liquid additions from regenerant evaporator bottoms or CRWST.

8. Reactor Water Cleanup System (RWCU) filter/demin sludge (Ecodex) is, typically, approximately one hundred times higher in specific activity than other sludges processed and should be segregated from other wastes and handled with extra care. RWCU filter/demineralizer sludge is normally processed through waste holding tank C.

9. Evaporator bottoms should normally be processed through waste holding tank C.

B. Categorizing Waste Holding Tank Contents Into Specific Generic Batches

1. A knowledge of the sources of sludge and segregation of specific types of waste inputs is essential.

2. The operator will determine from the Water Treatment/Radwaste Logbook the type and volume of waste to be transferred to the waste holding tank. Typical inputs will be:

   a. Spent resin tank contents; bead resin from the condensate cleanup demineralizer or radwaste (i.e., floor drain or equipment drain) demineralizers.
   b. Filter sludge from the condensate cleanup filter; (Ecodex).
   c. Filter sludge from the RWCU and FPCC filter/demineralizers; (Ecodex).
   d. Filter sludge from radwaste (i.e., floor drain or equipment drain) filters; Ecodex.
   e. Evaporator bottoms from regenerant of resin will normally be 25% sodium sulphate with trace amounts of other dissolved solids and suspended solids.
   f. Evaporator bottoms from floor drains will normally be 25% to 50% suspended solids with dissolved solids significantly below saturation.
   g. Evaporator bottoms from miscellaneous chemical waste will normally contain dissolved solids from water treatment chemicals (sodium nitrate, TSP), pH neutralizers (H_2SO_4 or NaOH), miscellaneous laboratory wastes and trace amounts of suspended solids.

3. If the operator can not obtain adequate information from the inline instruments (pH, conductivity, and radioactivity) to categorize the waste as a specific generic type designated for solidification, a grab sample will be taken, analyzed and categorized.

   a. If the batch does not fall within the boundary conditions for any of the specified generic types, processing will be in accordance with Section D of this Enclosure.

4. A sampling program will be established to ascertain that the various individual batches are within established boundary conditions for specific generic batches. Sample analysis will be as follows:

   NOTE: The sample shall be analyzed for pH, conductivity, total suspended solids (TSS), silica or presence of oil or grease to determine if its constituents are similar to the original specific generic type or may be solidified in the laboratory using the proportions of solidifying agents specified for the original specific generic type.

   a. If any sample indicates an off-standard batch (i.e., outside the boundary conditions for the specific generic type), the sampling frequency will be increased to a higher rate.
   b. Samples will be analyzed from each batch of miscellaneous chemical evaporator bottoms to assure the batch is within the boundary conditions for the generic type.

5. If the sampling program indicates a trend in specific generic type constituents beyond the boundary conditions originally established, the Process Control Program will be modified to assure continuing production of acceptable solidified wastes as follows:

   a. New specific generic types will be established with appropriate changes to the proportion of solidification agent(s).

      1. These new specific generic types will be tested in a manner similar to the original test program.

   b. Tests will be conducted to determine the acceptable changes in the boundary conditions for existing generic types based on the analysis trends.

C. Conditioning of Specific Batches of Waste

Conditioning waste holding tank contents for solidification as a specific generic type will consist of adjusting the water content of the slurry to within the solids/liquid boundary conditions and pH to within the pH boundary conditions specified for the particular waste.

1. Radwaste filter sludge as transferred to the waste holding tank may have an excess of solids and therefore need liquid added to prepare it for solidification as generic stream #3 or #4 (20% or 27% solids).

   a. With the agitator OFF, add regenerant evaporator bottoms (preferred source) or condensate and refueling water until there is an observable change in tank level.
      NOTE: This will assure that the filter sludge is sufficiently wet to prevent agitator overload.
   b. Turn on agitator and add liquid as indicated on graph, Attachment I (later), to obtain a 20% by weight mixture or Attachment II (later) for a 27% by weight mixture.
   c. Start the agitator at least 30 minutes prior to solidifying to assure a homogeneous mixture.

2. RWCU and FPCC filter/demin sludge as transferred to the waste holding tank will have an excess amount of water which must be reduced to prepare it for solidification as generic batch #2.

   a. Transfer sludge from the phase separator until the level in the waste holding tank is (later %).
   b. Allow contents to settle for at least four hours, then decant excess liquid to the RWCU phase separator until the decant pump trips.
      NOTE: This will leave approximately 1" of free standing water above the sludge.
   c. Start the agitator and add liquid from the regenerant evaporator bottoms (preferred source) or condensate and refueling water as indicated on graph, Attachment II (later), to obtain a 27% by weight mixture.
   d. Start the agitator at least 30 minutes prior to solidifying to assure as homogeneous mixture.

3. Spent resin beads as transferred to the waste holding tank have an excess amount of water which must be reduced to prepare it for solidification as generic stream #5.

   a. Transfer resin from the spent resin tank until level (later) is reached in the waste holding tank.
   b. Allow contents to settle for at least 30 minutes, then decant excess liquid to the RWCU phase separator until the decant pump trips.
   c. The mixture is now ready to process with approximately 25% by weight of solids.
   d. Start the agitator at least 30 minutes prior to solidifying to assure a homogenous mixture.

4. Regenerant evaporator bottoms as transferred from the evaporator bottoms tank may be added (after pH adjustment) to filter, demineralizer, or filter/demineralizer sludges to adjust liquid content as required for specific generic batches or may be solidified directly (i.e., without combining with any additional water as a generic batch.)

5. Evaporator bottoms as transferred to the waste holding tank will be solidified directly as generic stream #6 or #7, or #8.

D. Adjustment/Conditioning of Non-Specific Batches of Waste

Adjustment/conditioning of non-specific batches of waste (i.e., wastes not categorized as generic batch (later) through (later).

1. If a batch of waste cannot be identified as a specific generic batch designated in C.1 through 5 (above), a grab sample of the mixture will be obtained and the following steps will be performed:

   a. The chemist will analyze the test sample for activity, pH, conductivity, TSS, silica, and presence of oil or grease.
   b. With the above data, the operator will adjust the waste to within the boundary conditions of a generic batch.
   c. A sample of the batch will be mixed with cement and sodium silicate according to ratios specified for that generic batch and verified to solidify after a 30 minute curing time with no free water.
   d. If the batch is not solidifiable using any of the specific generic batch feed rates available, the operator will receive guidance from the Radwaste Supervisor.

E. Sampling for Verification of Solidification System

1. For batches of specific generic wastes processed according to Section C of this Enclosure, (other than every tenth or twentieth batch) no effluent sampling for verification of solidification is required since these have been proven to be solidifiable in the preoperational test program and this process control program.
2. For batches of non-specific wastes processed according to Section D of this Enclosure, a grab sample will be obtained and analyzed to determine if its constituents are within the specified parameters of a generic type.
3. If the test sample of non-specific waste fails to fall within the boundary conditions for a generic type of waste, the following shall be done:

   a. Effluent will be collected in three 500ml plastic beakers.
   b. Three proportions of solidifying agents, specified by the Radwaste Supervisor, will be added to the three test samples.
   c. The three test samples will be allowed to cure.
   d. The cured product will be split to verify the mass is a solid with definite shape and no free water.
   e. The test sample proportions used to produce the best product, as determined by the Radwaste Supervisor, will be used for solidification of the non-specific waste.

PROCESS CONTROL PROGRAM
TABLE I

STREAM #	SOURCES	BATCH	WASTE TYPE	PROCESS PARAMETERS	BOUNDARY CONDITIONS	REMARKS OR SPECIAL CONDITIONS (Cement/Waste Ratio)
1	Condensate Filter Backwash	Waste Surge Tanks	Ecodex	Solid Contents	(Later)	
2	RWCU & FPCC Filter Backwash	Phase Separator Tanks	Ecodex	Solid Contents	(Later)	
3	Liquid Radwaste Floor Drain Filters	Waste Holding Tanks A or B	Ecodex	Solid Contents	(Later)	
4	Liquid Radwaste Equipment Drain	Waste Holding Tank A or B	Ecodex	Solid Contents	(Later)	
5	Spent Resins	Spent Resin Tank	Resin Beads H-OH	pH, Solid Contents	(Later)	
6	Evaporator Bottoms (Regeneration)	Evaporator Bottom Tanks	Na_2SO_4 Solids	pH, Solid Contents	(Later)	
7	Evaporator Bottoms (Misc. Chemicals)	Evaporator Bottom Tanks	Solids	pH, Solid Contents	(Later)	
8	Evaporator Bottoms (Floor Drains)	Evaporation Bottom Tanks	Solids	pH, Solid Contents	(Later)	
9	Future	(Later)	(Later)	(Later)	(Later)	