Enclosure 1

Connecticut Yankee

Process Control Program

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PROCESS CONTROL PROGRAM

PURPOSE

The purpose of the Process Control Program (PCP) is to ensure that the radwaste liquid solidification system is operated to produce a final product that contains no free water and results in completely solidified waste. Interfacing this effort will be batch sampling of the liquid radwaste to determine: 1) radioactivity content and 2) mixture ratio of concrete to waste liquid that ensures complete solidification with no free water.

The liquid radioactive waste that requires solidification shall be processed as described in the PCP and as directed by the procedures in the Plant Operating Manual.

Section 1 - LIQUID WASTE SYSTEM

1.1 Function

The liquid waste system treats and disposes of aerated radioactive liquids and steam generator blowdown. This system accepts liquid from steam generator blowdown, contaminated and uncontaminated drains and processes these liquids for drumming or discharge to service water. This processing consists of filtration, ion exchange, holdup, evaporation, dilution and drumming.

Heat tracing is provided on systems that are expected to pass liquids with a twelve percent (by weight) boric acid concentration. These systems are heat traced to 170^{o}F to prevent the boric acid from solidifying.

SUMMARY DESCRIPTION

Following concentration of the waste liquid (to ~12 percent boric acid) in the evaporator system, the waste concentrated bottoms are sampled and then transferred to the drumming station where the bottoms are drummed for disposal. Boron recovery system bottoms are handled in the same manner, if drumming is required.

The drumming process is performed manually by mixing, in a drum, approximately 30 gallons of waste liquid with four 90 lb. bags of concrete, and by rolling each drum for 15 minutes. After a set up time of 24 hours, each drum is inspected for free water. Concrete is added to any drum containing excess water.

A program entailing the sampling frequency of bottoms and laboratory determinations of concrete to bottoms ratios will be developed. Until that time a ratio of 1.4 parts of concrete to 1.0 part of water will continue to be used in conjunction with visual inspection.

1.2 PRECAUTIONS, LIMITATIONS, AND CONTROL

1.2.1 Technical Specifications

The following sections of the Technical Specifications apply to the Liquid Waste System:

1.2.1.1. Section 4.6 RADIOACTIVE LIQUID WASTE RELEASE

Specification: A. Verification shall be made to ensure that dilution flow sufficient to meet the requirements of 10 CFR 20 is available whenever radioactive liquid wastes are released to the plant discharge system.

B. All radioactive wastes shall be sampled prior to release to the plant discharge system.

C. A record shall be kept of all releases.

D. The liquid effluent monitor shall be calibrated at refueling intervals and normal response of the monitor shall be tested monthly.

E. All liquid waste releases shall be continuously monitored for gross activity during discharge to ensure that the activity limits specified in 10 CFR 20 for unrestricted areas are not exceeded.

1.2.2 Relation to Other Systems

1.2.2.1 Systems required for the operation of the Liquid Waste System:

a. Main steam or heating boilers to provide steam for operation of the Waste Evaporator Reboiler.

b. Component Cooling to provide cooling water for the following:

1. Steam Generator Blowoff Tank Cooler
2. Waste Evaporator Distillate Cooler
3. Waste Evaporator Bottoms Cooler
4. Mechanical seal and cooling water jacket for the Waste Evaporator Reboiler Pump and Waste Evaporator Bottoms Pump.

c. Service Water to provide cooling water for the Steam Generator Blowoff Tank Condensers and the Waste Evaporator Overhead Condenser.
d. Control Air to perform various control functions throughout the system.
e. Ventilation and Purge system to provide the following:

1. Over pressure relief protection for the Steam Generator Blowoff Tank.
2. Vent path for the removal of any gases trapped in the top of the Waste Evaporator Distillate Filter.
3. A constant or automatic thermostatic-type vent for:

a) Steam Generator Blowoff Tank Condensers
b) Aerated Drain Tank
c) Aerated Drain Holdup Tank
d) Waste Evaporator Overhead Condenser
e) Waste Evaporator Distillate Tank
f) Waste Test Tanks

1.2.2.2 Systems dependent on the Liquid Waste System for operation:

a. Waste Disposal System

1.2.3 Precautions and Limitations..

1.2.3.1 All liquid collected and stored in the tankage of the Waste Disposal System must be sampled for radioactivity and solids concentration prior to discharge to the environment.

1.2.3.2 Discharge of any liquid from the Waste Disposal System is authorized only by issuance of a Liquid Radioactive Release Permit.

1.2.3.3 Liquids processed by the Waste Evaporator are to be processed in accordance with the run sheet issued by the Chemistry Department.

1.2.3.4 Radiation levels of drums containing radioactive waste should not exceed established limits (200 mr/hr contact, 10 mr/hr at 1 meter).

SECTION 2 - PURIFICATION SYSTEM

2.1 General Description

The purification system functions to remove impurities from the following areas:

- The reactor coolant system during plant operation
- The reactor coolant system during plant shutdown and depressurization
- The volume control tank and refueling water storage tank water when necessary
- The reactor cavity water during refueling operations
- The spent fuel pit water when necessary

The purification system also provides make-up water to the spent fuel pit and the refueling water storage tank.

The purification system components are located outside of the reactor containment. The system operates at low pressures and temperatures.

Systems Include:

Reactor Coolant System Purification

This system operates to reduce fouling of heat transfer surfaces by maintaining reactor coolant purity. Purification is accomplished by diverting the letdown flow through one or two mixed bed demineralizers for removal of ionic isotopes. The demineralizers can be operated either in parallel or series. The demineralizer effluent is then passed through the reactor coolant filter for removal of resin fines and other insoluble materials.

A deborating demineralizer is also provided for removal of boron from the reactor coolant. This demineralizer may be placed in operation when the reactor coolant system boron concentration is approximately 30 ppm or less.

The demineralizers normally operate at a temperature of 115 F. However, if during operation, the temperature of the incoming liquid exceeds 140 F, the flow is automatically bypassed around the demineralizers and the condition is alarmed in the main control room.

The demineralizer resin beds are designed to reduce the concentration of ionic isotopes in the purification stream by a minimum factor of 10, except for Cs-137, Y-90, Y-91 and MO-99, for which no removal is assumed. This design criterion provides satisfactory performance for the primary plant operation.

Volume Control Tank and Refueling Water Storage Tank Water Purification

The volume control tank and refueling water storage tank water can be subjected to the same purification cycle as that described for the reactor coolant letdown. This is accomplished by using the purification pump to cycle the liquid from one tank, through a mixed bed demineralizer and reactor coolant filter, and back to the tank. The piping arrangement permits simultaneous purification of the reactor coolant letdown and either the volume control tank or refueling water storage tank water. However, one of the two streams must bypass the reactor coolant filter to prevent intermixing at the filter. Normal procedures, however, call for termination of reactor coolant letdown purification during purification of the liquid in one of the two tanks.

Reactor Cavity Water Purification

Piping is provided for purification of the reactor cavity water during refueling operations. This is accomplished by using the purification pump to cycle the water through the mixed bed demineralizers and reactor coolant filter and then back to the reactor cavity.

Spent Fuel Pit Water Purification

Purification of the spent fuel pit water is accomplished by diverting up to 60 gpm of the spent fuel pit cooling pump dicharge flow through the spent fuel pit mixed bed demineralizer and spent fuel pit filter. The demineralizer and filter can be operated in series or with either of the units bypassed. Flow through the spent fuel pit demineralizer and filter provides adequate purification of the water to permit unrestricted access to the working area and to maintain optical clarity of the pit water.

z.2 Spent Resin Handling

There are three mixed bed type purification demineralizers. Each unit is sized for a flow rate of 160 gpm. The vessels are designed for 200 psi gage and 250 F. Normal operating pressure and temperature are 175 psi gage of less and 115 F, respectively. The demineralizer vessels are designed to meet the requirements of the ASME, Section VIII, Unfired Pressure Vessel Code and are code stamped. The vessels are constructed of type 304 austenitic stainless steel.

Each demineralizer vessel has connections which permit sluicing of the spent resins from the vessel to a shipping container in a reinforced concrete shipping cask. Demineralized water is used as the sluicing medium. The sluice water is pumped from the shipping container to the aerated drain tanks for processing by the waste disposal system. Each vessel has a top connection for recharging with new resin.

Each purification demineralizer contains 45 cu ft of nuclear grade resin. The resin is a mixture of one equivalent of anion exchange resin to one equivalent of cation exchange resin. The anion resin is a strongly basic, quaternary ammonium resin having a minimum capacity of 3.5 milliequivalents per dry gram. The cation resin has a minimum capacity of 4.6 milliequivalents per dry gram.