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T. C. NICHOLS, JR.
VICE PRESIDENT AND GROUP EXECUTIVE
NUCLEAR OPERATIONS

May 26, 1981

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Radwaste Solidification Process
Control Program.
SER Confirmatory Issue 1.7.17.

Dear Mr. Denton:

In our September 25, 1980 letter, South Carolina Electric and Gas Company submitted the radwaste solidification instruction manual. By this letter, we are submitting the radwaste solidification "Process Control Program". This document, together with the previously supplied instruction manual, provides the details of operation of the radwaste solidification system for the Virgil C. Summer Nuclear Station.

This information, together with the radiological technical specifications which will be transmitted to you in approximately one month, should provide sufficient information to close out SER confirmatory issue 1.7.17.

If you have any questions, please let us know.

Very truly yours,

T. C. Nichols, Jr.

RBC:TCN:pj
Attachment
cc: V. C. Summer w/att.
G. H. Fischer w/att.
T. C. Nichols, Jr. w/att.
Dr. John Ruff w/att.
D. A. Nauman w/att.
W. A. Williams, Jr. w/att.
R. B. Clary w/att.
A. R. Koon w/att.
A. A. Smith w/att.
H. N. Cyrus w/att.
J. B. Knotts, Jr. w/att.
J. L. Skolds w/att.
B. A. Bursey w/att.
O. S. Bradham w/att.
ISEG w/att.
NPCF/Whitaker w/att.
File w/att.
PRS w/att.
H. E. Yocom

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VIRGIL C. SUMMER NUCLEAR STATION

DOCKET NO. 50/395

RADWASTE SOLIDIFICATION SYSTEM

PROCESS CONTROL PROGRAM

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of the Process Control Program is to provide assurance of the satisfactory solidification of wet radioactive waste and of the absence of significant free-standing liquid prior to transport and disposal.

2.0 SYSTEM DESCRIPTION

The radwaste solidification system utilizes urea formaldehyde to convert all types of wet radioactive waste (filter sludges, spent resins, evaporator bottoms, and boric acid) into a solid matrix. The solidification system receives waste in the waste blending tank where it is blended and adjusted for pH. The waste is then transferred to the disposable liner where it is mixed with appropriate quantities of urea formaldehyde concentrates and urea catalyst. Mixing in the blending tank is accomplished mechanically and in the liner by means of an air sparger. Off gas venting and dewatering connections are provided on both the blending tank and the liner.

2.1 Controls

The twelve automatically operated processes are controlled by the Waste and Process Select Control Switches. Once the operator has selected the process and pushed the start button, that process is virtually automatic. When a process is complete, the next process is initiated until the solidification operation is complete.

There are numerous automatic process alarms, switches, and indicators which provide feedback and assurance of proper operation of the system. Among the more important are:

1. Level probe on the liner;
2. Flow detectors on solidification agent, catalyst, dewatering, and radwaste discharge lines;
3. Pressure switches in the solidification agent, catalyst, dewatering, and radwaste discharge lines;
4. Pressure switches in the vent discharges;
5. Radiation monitors in the blending tank and liner areas;
6. Heaters and temperature probe on the blending tank.

2.2 Radiation Monitoring

A radiation monitor is located on the wall of the control cubicle to alert the operator in the event of excessive radiation. Two radiation sensors are located in the fill cubicle. One detects radiation levels at the container or shield surface and the other six feet away. Another radiation sensor detects levels in the waste blending tank area. If excessive radiation levels exist, an alarm sounds and the fill operation automatically terminates.

3.0 SAMPLE COLLECTION

3.1 Sample Frequency

For each new shipment of chemicals and periodically during storage, the urea formaldehyde concentrates and catalyst are to be sampled.

Each fill operation of the waste blending tank is considered to be a batch. Sampling and Test Solidification is to be performed on the first batch and every tenth batch of the same type of waste. If a test sample does not meet the acceptance criteria, alternate solidification

parameters are to be determined until a subsequent test is acceptable. After the alternate solidification parameters are placed into effect, a sample shall be taken and solidified from each of the next batches of that same type of waste. Acceptable test solidification for three consecutive batches of that type of waste will result in the sampling requirement reverting again to every tenth batch.

3.2 Sampling Method and Radiological Considerations

Sampling from the UFC day tank shall be taken after the mixer has had a sufficient time of operation.

Sampling from the waste blending tank shall be performed during the recirculation mode after the batch has been adjusted for pH. Acceptable test solidification shall be obtained before the batch is solidified.

All samples of waste must be handled according to established health physics procedures.

Disposal of all solidified test samples is to be under the direction of Health Physics.

3.3 Solidification Documentation

Data sheets (see Attachments 1 and 2) will be used to collect and maintain data from each test sample. The following information is required on each test sample.

1. Waste Type
2. Batch Number
3. Waste Received in Blending Tank

4. Initial pH
5. Sodium Hydroxide Added
6. Sulfuric Acid Added
7. Final pH
8. Waste Oil Content (percent visual from sample)
9. Total UFC Added
10. Waste/UFC Ratio
11. Total Catalyst Added
12. Catalyst/UFC Ratio
13. Liner Mixing Time (if not 8 minutes)
14. Quantity of FSL

A batch number will range from 1 through 10 and on the tenth batch of each type of waste, the solidification parameters will be confirmed again by sample solidification.

4.0 TEST SOLIDIFICATION AND ACCEPTANCE CRITERIA

4.1 General Requirements

For standard ratios of waste, solidification agent, and catalyst, refer to the operational instruction manual.

If visual oil checks indicate concentration greater than one percent, attempts to remove the oil are to be initiated.

4.2 Test Solidification

The waste sample is to be maintained at the same temperature as the waste in the blending tank during data collection and preliminary tests.

The test vessel is to have some means of mixing.

The appropriate ratios of solidification agent and catalyst are to be added to the waste sample with mixing to continue until solidification begins.

If any free-standing liquid is noted, transfer and measure its quantity. Calculate and record the amount of free liquid.

4.3 Solidification Acceptability

The sample solidification will be considered acceptable if the amount of free liquid is equal to or less than 0.5 percent by volume or one gallon equivalent for the liner, whichever is less. (Note: sample solidification is acceptable if free liquid amounts to 1 percent or less when using a high integrity container.)

The waste solidification will be considered acceptable from a solid mass standpoint if it is evident from its physical appearance that the solidified waste will maintain its shape if removed from the vessel.

4.4 Alternate Solidification Parameter Selection

If one or more of the above criteria is not met, additional solidification parameters must be determined through additional tests. During subsequent tests, solidification parameters are adjusted and recorded until an acceptable test is obtained. The new parameters are then instituted for the solidification of all that type of waste.

ATTACHMENT I

DATA SHEET PCP-1

Shipment # _____
Date Received _____

Solidification chemical test and acceptance criteria: Complete and sign below.

1.0 Urea Formaldehyde Concentrate

1.1 Specific Gravity _____
(acceptable if between 1.280 and 1.310)

1.2 Urea Formaldehyde pH _____
(acceptable if between 7.4 and 7.7)

2.0 Urea Catalyst

2.1 Specific Gravity _____
(acceptable if $\geq$ 1.83)

2.2 Urea Catalyst Color _____
(acceptable if clear)

Operator _____ Date _____

ATTACHMENT II

DATA SHEET PCP-2

Waste Type _____ Batch Number _____
Liner Shipment Number _____

Solidification test and acceptance criteria; complete and sign below:

1.0 Batch pH adjustment
- 1.1 Initial pH _____
- 1.2 Sodium Hydroxide Added _____
- 1.3 Sulfuric Acid Added _____

2.0 Test Sample
- 2.1 Sample pH _____ (acceptable if between 5.5 and 6.5)
- 2.2 Sample Volume _____ ml
- 2.3 Temperature _____ oF (must be above 110oF)
- 2.4 Waste Oil Content _____ % (must be less than 1%)

3.0 Test Solidification
- 3.1 Volume Urea Formaldehyde Concentrates _____ ml
- 3.2 Volume Urea Catalyst _____ ml
- 3.3 Total Test Volume _____ ml
- 3.4 Waste/Urea Formaldehyde Ratio _____
- 3.5 Urea Formaldehyde/Catalyst Ratio _____

4.0 Free-Standing Liquid
- 4.1 Volume of Decanted Liquid _____ ml
- 4.2 Liquid/Total Test Volume _____ %
- 4.3 Equate Test Liquid Volume to Liner Type and Volume _____
  _____

5.0 Physical Appearance
Verify Physical Appearance _____
_____

6.0 Liner Solidification
- 6.1 Total Volume of Waste _____ gal.
- 6.2 Urea Formaldehyde Concentrates Added _____
- 6.3 Urea Catalyst Added _____
- 6.4 Sparging Air Pressure _____
- 6.5 Sparging Time _____

7.0 Verify Solidification has gone to completion and residual free-standing liquid limits are acceptable.

Operator _____ Date _____