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AUTH.NAME AUTHOR AFFILIATION
MILLS,L.M. Tennessee Valley Authority
RECIP.NAME RECIPIENT AFFILIATION
ADENSAM,E. Licensing Branch 4

SUBJECT: Forwards response to concerns re possible blockage of instrument lines by particles & likelihood of stress corrosion cracking in stainless steel piping due to purge dam matl,per 840402 telcon.

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TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

May 3, 1984

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of	)	Docket Nos. 50-438
Tennessee Valley Authority	)	50-439

As discussed with NRC representatives during an April 2, 1984 telecon, we are formally transmitting a copy of our position concerning the possible blockage of instrument lines by the particles and the likelihood of stress corrosion cracking in the stainless steel piping due to the purge dam material. Enclosed is a copy of our response to these concerns with attached copies of supporting documentation.

If you have any questions concerning this matter, please get in touch with W. T. Watters at FTS 858-2691.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J M Mills

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 3rd day of May 1984

Paulette D. White
Notary Public
My Commission Expires 9-5-84

Enclosure
cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

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ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
INSOLUBLE GLUE USED FOR PURGE DAMS IN STAINLESS STEEL PIPING
SUPPLEMENTAL INFORMATION FOR NRC-NRR EVALUATION

Below is TVA's response to concerns raised by Paul Woo as discussed with him on April 2, 1984.

1. Instrument lines are different from "dead legs" with respect to tendency to trap flow transported particles. TVA has referred to nonflowing branch lines (valved out, or blind flanged or capped off) as "dead legs." Instrument lines, on the other hand, are small diameter (3/8-inch outside diameter) tubing. The potential for dropping off flow transported particles at the branch connection of a dead leg is much greater than at an instrument line connection because of the typical size and geometry of each. Dead legs can be any size and located anywhere. In contrast, the instrument line connections on process pipes are comparatively small, and at BLN are located on the side (not the bottom) of the pipe. Particles could not "drop" into the instrument line branch connection during process pipe flushing or normal operation. Since the instrument lines are stagnant during normal operation and isolated at the root valve during process line flushing (usually the tubing is not yet installed), virtually no migration of particles is expected beyond the immediate vicinity of the branch connection. We also note that the instrument lines are flushed after the process line is flushed. Following the flushing of the instrument lines, there will only be flow in them when they are bled during maintenance. If a blockage occurred as a result of this flow, it would be noticed and corrected during the maintenance activity.

2. TVA does not believe that the small amount of purge dam material left in the piping will cause stress corrosion cracking for the following reasons:

   a. There is not enough purge dam material in the systems to affect water chemistry. We have determined (refer to attachment 1) that if all of the purge paper that has been purchased for BLN to date were put into the reactor coolant system (RCS), the increase in the chloride level of the reactor coolant would be less than 1.0 ppm (note that the chloride limit of ANSI N45.2.1 is 1 ppm). This is a very conservative estimate because much paper was wasted in the process of making the purge dam, the paper was used in both units 1 and 2 (the calculation provided in attachment 1 is based on the RCS of one unit), and most of the paper was flushed out of the sytems during preoperational flushing.

   b. Flushing is performed with demineralized water. TVA procedures require that initial and final flush water be analyzed and must have a chloride concentration less than 0.15 ppm.

c. Any purge d[redacted]residue remaining on the wall [redacted]he pipe is not in the sensitized weld area.

d. Flushing is expected to leach most of the chloride from the residue that remains on the wall of the pipe. Testing by TVA's Singleton Lab has shown that more than 80 percent of the chloride leaches out into ambient temperature demineralized water in 24 hours, and that more than 96 percent leaches out if a second leach is performed with fresh water. Attachment 2 documents the results of the Singleton Lab tests.

e. During hot functional testing and normal plant operation, the oxygen concentration in the reactor coolant will be reduced to less than 0.1 ppm with hydrazine before the temperature is raised above 250°F (refer to B&W Test Specification 5000 - Reactor Coolant System Test; B&W Operating Specification 0132 - Plant Startup; and B&W Operating Specification 11-01 - Plant Limits and Precautions).

ATTACHMENT 1

PAPER PURE CHLORIDE CONCENTRATION CALCULATONS

Purpose

Estimate the increase of the chloride concentration in the reactor coolant system if all purge paper that has been purchased for BLN were placed in the reactor coolant system just prior to hot functional testing.

Given

1. To date, 88 rolls (approximately 1,600 lbs) of purge paper have been purchased for BLN.

2. Volumes:

Reactor coolant piping	- 40,800 gals.
Steam generator (primary side)	- 30,500 gals.
Reactor coolant pumps	- 1,200 gals.
Total	- 72,500 gals.

Assumptions

1. The volume of the reactor vessel is assumed to be 0. The volume of the vessel without internals is 43,100 gal. The volume with internals is not immediately available. Therefore, to be conservative, it is assumed to be 0.

2. The chloride concentration of the glue used to install the purge dams is negligible in comparison with the purge paper and assumed to be 0.

3. The chloride concentration of the purge paper is 250 ppm.

Computations

Amount of Cl^- in the purge paper:

$$(1600 \text{ lb paper}) \left(\frac{250 \text{ lb } Cl^-}{10^6 \text{ lb paper}} \right) = 0.4 \text{ lb } Cl^- \text{ in the paper}$$

Amount of water in the reactor coolant system:

$$(72{,}500 \text{ gal})(8.34 \text{ lb/gal}) = 604{,}650 \text{ lb water}$$

Concentration of Cl^- in the water:

$$(0.4 \text{ lb } Cl^-)\left(\frac{1}{604{,}650 \text{ lb } H_2O}\right) = 6.6 \times 10^{-7} \text{ lb } Cl^- \text{ per lb } H_2O$$

or 0.66 ppm Cl^- in the water

Summary of Results

If all of the purge paper that has been purchased for BLN had been placed in the reactor coolant system just prior to hot functional testing, the Cl^- concentration of the reactor coolant would have increased by approximately 0.66 ppm due to the CL^- in the paper.

TVA 64 (CS-3-65)

ATTACHMENT 2

SME 84 0405 002

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : C. E. Roberts, Supervisor, Codes, Standards, and Materials Section, W11C148 C-K

FROM : W. H. Childres, Supervisor, Singleton Materials Engineering Laboratory, SME-K

DATE : April 5, 1984

SUBJECT: BELLEFONTE NUCLEAR PLANT - EVALUATION OF PURGE DAM RESIDUE FOR TOTAL AND LEACHABLE CHLORIDES

In response to request 3-27-84-4, tests have been performed to determine the chloride content of purge dam residue after incubation at ambient temperature (70 to 75°F) in stagnant water. Samples prepared to simulate purge dam residue were tested after drying at ambient temperature and after drying and heating at 400°F.

Samples dried at ambient temperature formed a uniform gelatinous mass when submerged in 150 ml of water. These samples would dissolve completely in larger volumes of water and consequently all chloride would go into solution. Samples dried at 400°F softened but did not dissolve in water. More than 80 percent of the chloride was leached within 24 hours from the samples into quiescent ambient temperature water.

Experimental

Two pieces (~2.5 g each) of purge dam paper were coated on both sides with Elmer's School Glue and pasted together. Most of the samples were heated at 400°F for 1 hour; tests were also run on samples dried at room temperature. The weight of paper, weight of glue after air drying, and weight of sample after the 400°F drying were determined. Samples were cut in ~1/2-in. to 1-in. pieces, immersed in 150-ml deionized water in plastic bottles, and incubated at ambient temperature (70 to 75°F) for initial times of 24, 48, or 72 hours. Second and third leaches were also done in 150-ml aliquots of deionized water. The chloride ion content of the leach solutions was measured with a chloride selective ion electrode.

C. E. Roberts
April 5, 1984

BELLEFONTE NUCLEAR PLANT - EVALUATION OF PURGE DAM RESIDUE FOR TOTAL AND LEACHABLE CHLORIDES

Results

After 24 hours incubation in water at 70 to 75°F, samples dried at ambient temperature were completely solubilized, i.e., the sample plus water was a fairly homogeneous gelatinous mass. Since the entire sample dissolved, removal of chloride from this kind of material on a pipe surface is obviously complete.

The glue plus paper samples dried at 400°F to simulate heated purge dam residue turned dark brown and no longer immediately formed a gel on contact with water. These samples softened when incubated in 70 to 75°F water, but remained almost intact after 72 hours in quiet solutions. However, approximately 80 percent of the leachable chloride was removed from this residue in 24 hours.

There is little difference in the percent chloride removed among 24-, 48-, and 72-hour first leach tests, indicating equilibration between the paper and volume of solution present is nearly complete in 24 hours. In the presence of a larger volume of solution or in a stirred solution, more complete removal of chloride would be expected to occur during the first leach.

These tests show leachable chloride in heated purge dam residue (paper plus glue) is reduced 80 to 90 percent by a 24-hour, 70°F immersion in a limited amount of water. The results show a 96 percent or greater removal of chloride occurs after a second leach.

W. H. Childres

CAC:ASY
Attachments
cc (Attachments):
MEDS, W5B63 C-K

Principally prepared by Carey A. Chambers, extension 2771.

A14096.1

AMBIENT TEMPERATURE LEACH OF CHLORIDE FROM PURGE DAM RESIDUE

SUMMARY OF TEST DATA

Sample	Wt of Paper g	70°F Dried Wt of Paper + Glue g	400°F Dried Wt of Paper + Glue g	Percent CL Removed							
				Leach 1			Leach 2		Leach 3		
				24 h	48 h	72 h	24 h	72 h	72 h	96 h	168 h
2	4.98	6.47	5.75	82	--	--	17	--	1	--	--
11	5.30	6.76	6.03	83	--	--	15	--	2	--	--
4	5.08	7.17	6.37	90	--	--	--	6	--	--	4
13	5.08	7.21	6.49	88	--	--	--	8	--	--	4
5	5.18	7.55	6.63	--	88	--	--	8	--	--	4
10	5.13	9.14	8.19	--	91	--	--	6	--	--	3
9	5.39	8.20	7.31	--	89	--	--	7	--	--	4
17	5.22	7.23	6.42	--	90	--	--	7	--	--	3
18	5.19	7.57	6.84	--	--	89	--	8	--	3	--
20	5.07	6.69	6.08	--	--	89	--	7	--	3	--
22	4.98	7.41	6.69	--	--	89	--	8	--	3	--
24	5.44	7.72	7.01	--	--	88	--	8	--	4	--

Note: Percent chloride removed was calculated from the measured volume and chloride content of leach solution after each leach. After the third leach, chloride content of the leach solution was near the level of the deionized water used. Comparison of these calculations with mass balance calculations (% recovery of total chloride added) shows agreement within experimental error.

A14096.3