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Consumers  
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Company

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April 6, 1971

Re: Docket No. 50-255

Dr. Peter A. Morris, Director  
Division of Reactor Licensing  
US Atomic Energy Commission  
Washington, DC 20545

Dear Dr. Morris:

The following summary description of a demineralizer resin chloride release is forwarded for your use. This problem has been discussed with Region III Compliance and this report is forwarded for informational purposes.

General

During the fourth hot functional test run from February 2, 1971, to February 14, 1971, a routine water analysis sample at 0830 of February 10, 1971, indicated the presence of 0.35 ppm of chlorides in the primary coolant. The purification demineralizer was subsequently found to be the source of the chlorides and it was cut out of service. Feed and bleed restored the primary system chloride concentration to 0.075 on February 13, 1971.

The A purification demineralizer was originally placed in service on February 8, 1971, during the fourth hot functional test. Routine samples on the 8th, 9th and 10th of February 1971 indicated a maximum chloride concentration of 0.04 ppm in the primary coolant. At 0830 of February 10, 1971, a routine water analysis was performed with .35 ppm of chlorides found present in the primary coolant (Sample Point SX-1023). This was the first indication of a problem and the first time the chloride concentration exceeded the technical specification limit of 0.12 ppm of chlorine. The reactor was at 2106 psi and the temperature was 532°F.

At 1515 of February 10, 1971, the A purification demineralizer was removed from service and the B demineralizer was put into service since the purification demineralizer was identified as the source of chlorides. The B demineralizer was also ineffective in removing chlorides.

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New resins were installed in the A purification demineralizer on February 11, 1971. The demineralizer was put into service at approximately 2105 hours of February 11, 1971. Additional samples were taken at 2100, 2125, 2150, 2235 and 2305 hours. The results indicated that shortly after being placed in service the demineralizer was ineffective in removing chlorides from the system.

On February 12, 1971, a feed and bleed operation was instituted with the primary coolant chloride concentration reduced to 0.075 at 1530 on February 13, 1971.

#### Chemistry Tests

The occurrence of the chloride increase during the fourth hot functional test indicated a demineralizer resin source and an extensive series of tests was conducted by Combustion Engineering and Consumers Power Company to determine the problem. A series of test columns containing 25 cc of resin was prepared and eluted with the following solutions:

	Boron ppm	Ammonia ppm	Lithium ppm	Conductivity umho/cm
1.	0	0	0	0.45
2.	1080	2	0	15.2
3.	1880	20	0	150.0
4.	2500	0	2	22.0
5.	2500	0	15	150.0
6.	5000	0	0	29.0
7.	5000	10	0	86.0

Of the seven solutions tested, chlorides were eluted with solutions 3, 5 and 7 and no chlorides were eluted with solutions 1, 2, 4 and 6.

In all cases where chlorides were leached from the resin, the leach solution had a high conductivity, due to the presence of dissociated ammonium or lithium borate. This high conductivity is caused by the addition of a base to the normally weakly ionized boric acid. When a base is present in solution with boric acid, a borate salt is formed which is more highly ionized than pure boric acid. This is evidenced by the conductivity of the combined solution which is greater than the sum of the conductivities if each were in separate solutions (eg, a 1000 ppm boron solution containing no ammonia has a conductivity of 5.0 umhos while a 20 ppm ammonia solution containing no boron has a conductivity of about 40 umhos. If the two are combined into one solution containing 1000 ppm boron and 20 ppm ammonia, the resulting conductivity is approximately 100 umhos).

This increased conductibility means there are more available borate ions in solution which increases the probability that chloride ions on the resin bed can be replaced with borate ions. When this exchange does occur and the resin bed is saturated with borate ions, the chlorides are eluted from the resin.

It is noted that the above conditions where chlorides were eluted correspond to the conditions present during the hot functional testing with boron concentrations greater than 1800 ppm and ammonia concentrations of the order of 20 ppm due to the excess hydrazine. These conditions should not exist during normal operations since the boron will be down to less than 1000 ppm and the hydrazine used for oxygen scavenging during heatup will not be present.

#### Corrective Action

To prevent a recurrence of the above problem we have incorporated a test for chlorides in the resin purchase specification which is as follows:

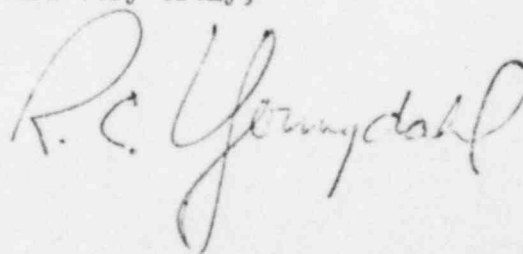
"A resin column containing 25 cc of the anion resin shall be regenerated to the borate form using a 1.7% boric acid ( $3000 \pm 25$  ppm boron) solution with 10 ppm to 15 ppm ammonia added. After each of three successive flushes consisting of 1 liter, 5 liters and 10 liters, a separate 100 ml sample of the column effluent should be analyzed and must contain less than 0.1 ppm chloride as determined by ASTM-D-512-67 or equivalent method."

This specification will ensure that no leachable chlorides are present in sufficient quantities to cause a chloride release problem. In addition, during the interim period prior to procurement of new resins to the low chloride specification, the coolant ammonia concentration is limited to less than 5 ppm to prevent leaching of chlorides. This is accomplished by controlling the excess hydrazine used during heatup for oxygen scavenging. Also, if ammonia concentration should approach 5 ppm, purification flow can be stopped until the ammonia concentration decreases.

#### Conclusion

The source of the chloride problem has been determined and measures have been taken to ensure no future recurrence. The magnitude of the chloride transients during this incident is not considered detrimental to the primary system particularly due to the short time period involved and the absence of dissolved oxygen.

Yours very truly,



RCY/lb