PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2
Docket Nos. 50-282-LR and 50-306-LR

NRC STAFF EXHIBIT 63

Boric Acid Corrosion Guidebook, Revision 1: Managing Boric Acid Corrosion Issues at PWR Power Stations,
EPRI, Palo Alto, CA (2001) 1000975
Pages 4-25 & 4-26

EPRI

Boric Acid Corrosion Guidebook, Revision 1

Managing Boric Acid Corrosion Issues at PWR Power Stations

Technical Report

Test Ref.: A

Test Type: Immersion – Aerated and Deaerated Boric Acid

Org/Date: Westinghouse (1967)

References: "Materials Behavior Related Issues for Bolting Applications in the Nuclear Industry." Conference: Improved Technology for Critical Bolting Applications, Chicago, Ill., July 20–24, 1986. MPC-Vol. 26 [22].
Absorption of Corrosion Hydrogen by 302B Steel at 70F to 500F. Westinghouse Electric Corporation, 1967, WCAP-7099 [23].

Test Configuration, Procedure, and Results

Westinghouse conducted a series of tests on electrically isolated coupons of A-302 Grade B low-alloy steel in both aerated and deaerated environments. Some experiments involved cases where the low-alloy steel test coupons were coupled to 304 stainless steel. Tests were conducted at 2500 ppm boron at several different temperatures.

Table 4-3 gives the average corrosion rate for long periods of time (40–160 days) for each of the test conditions. The test results plotted in Figure 4-8 show the effect of test duration.

Table 4-3
Average Corrosion Rates in Aerated and Deaerated Water – Westinghouse Tests

Temperature in °F (°C)	Corrosion Rate Deaerated in Inches/Year (mm/yr)		Corrosion Rate Aerated in Inches/Year (mm/yr)	
	Isolated	Coupled to 304	Isolated	Coupled to 304
70 (21)	0.0002 (0.005)	---	0.002 (0.05)	0.002 (0.05)
100 (38)	0.00005 (0.0013)	0.00005 (0.0013)	0.007 (0.18)	0.007 (0.18)
140 (60)	0.00007 (0.0018)	0.00011 (0.0028)	0.015 (0.38)	0.015 (0.38)
500* (260)	---	---	0.24 (6.1)	---

*Provided at meeting with Westinghouse.

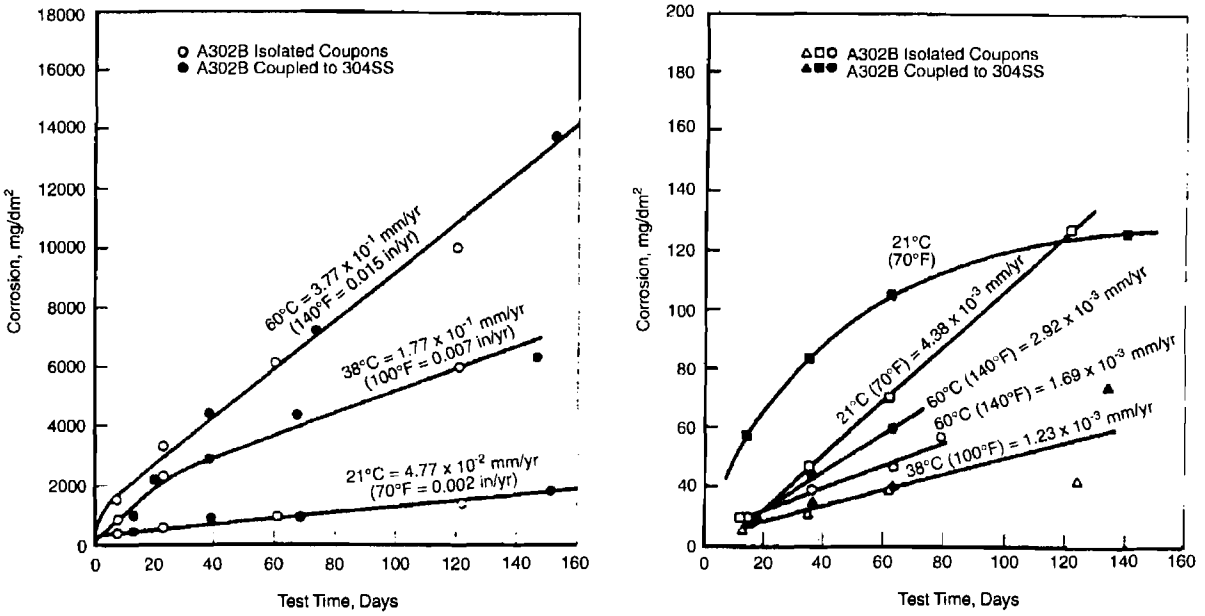
Key observations from these tests are:

- In deaerated water at temperatures less than 140°F (60°C), the corrosion rates are very low.
- In aerated water, the corrosion rates increase with temperature from 70°F to 140°F (21°C to 60°C) with the long-term corrosion rate at 140°F (60°C) being about 0.015 in/yr (0.38 mm/yr).
- The galvanic couple between low-alloy steel and stainless steel has little effect on the corrosion rates of low-alloy steel in borated water.

- Initial corrosion rates can be much higher than long-term corrosion rates.
- The corrosion rate in aerated borated water at 500°F (260°C) is 0.24 in/yr (6.1 mm/yr).

Conclusions

Corrosion rates in low-temperature deaerated water are very low. Corrosion rates in aerated water at temperatures less than 140°F (60°C) are acceptably low to not pose a serious problem with leakage of borated water.



Corrosion as measured in weight loss of A302B in air-saturated boric acid solution containing 2500 ppm boron

Corrosion as A302B in deaerated boric acid solution containing 2500 ppm boron

Figure 4-8
Corrosion Rate in Aerated and Deaerated Water – Westinghouse Tests [22]