Amine base Vapor Phase Corrosion inhibitor Alternatives to Hydrazine for Steam Generating System and Power Plants

Behzad Bavarian and Lisa Reiner,
College of Engineering and Computer Science
California State University, Northridge, USA 91330

The presence of dissolved oxygen in boiler feedwater and steam generating systems can present serious problems in a steam generating plant by promoting corrosion and thick scale formation in the feedwater system, the boiler and the steam condensate system. Therefore, it is important to remove oxygen from the feedwater and also from the condensate where in-leakage can occur. The first step in the elimination of oxygen from the boiler feedwater is mechanical deaeration. The second step involves chemical oxygen scavenging to remove the residual oxygen. For many years, sodium sulfite and hydrazine were the chemical oxygen scavengers of choice. However, sodium sulfite contributes solids to the boiler water and hydrazine was found to be extremely toxic.

Hydrazine is generally used as an oxygen scavenger and corrosion inhibitor for corrosion control in steam generating systems. Although hydrazine is very effective in this application, it is a genotoxic carcinogen. The use of alternative chemicals such as nontoxic corrosion inhibitors, oxygen scavengers or new oxygen scavenger-free water treatment technologies is highly recommended. A new amine based vapor phase corrosion inhibitor has been developed and was investigated as an alternative to hydrazine. Long term corrosion tests in the hot steam generating closed loop system showed that the corrosion rate decreased from 8.2-8.9 mpy for the control sample to 0.72-0.74 mpy when the loop was washed with a 500 ppm VCI solution. The closed loop system was subsequently maintained at ~ 100 ppm inhibitor for the remainder of testing. When inhibitor was added from the beginning of the test, average corrosion rate was measured to be 1.09-1.24 mpy for a test conducted in the presence of 100 ppm VCI inhibitor. High resolution XPS analysis showed that the amine based vapor phase corrosion inhibitor promoted and stabilized a very protective Fe3O4, magnetite oxide, on internal surfaces of pipes to lower corrosion rate significantly.

This investigation confirmed that this new vapor phase corrosion inhibitor can be an effective replacement for the toxic hydrazine for steel materials exposed to hot steam/hot environments. The major advantage of this new VCI is its very low toxicity that makes it safe and easy to handle in typical application systems.

Dr. Behzad Bavarian is Mory Ejabat Endowed chair and professor in the Department of Manufacturing Systems Engineering and Management Department at California State University in Northridge, and Director of W. M Keck Advanced Materials Laboratory. Dr. Bavarian received his PhD. degree in Metallurgical Engineering at The Ohio State University in 1980.
He is the author/co-author of 256 journal and conference papers. He is recipient of the 2012 NACE International, Technical Achievement Award for contribution to corrosion and corrosion engineering and 2008 SFV Engineer’s Council Outstanding Instructor of the Year Award, John J. Guarrera Engineering Educator of the Year Award
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|             | East Conference Center-Pasadena Room |
| TIME:       | 6:30pm – Social (snacks & refreshments will be provided)  
|             | 7:00pm – Presentation |
| WHEN:       | Thursday, November 16th, 2017 |
| COST:       | FREE-Donations requested to cover food cost |
| QUESTIONS:  | Ray Engelhardt  
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