

Halogen Resistant Azole (HRA) Improves Corrosion Results, Lowers Treatment Costs and Helps Improve the Environment

Challenge

A Southeastern nuclear power plant wanted to improve their copper alloy corrosion rates, which have traditionally been higher than preferred.

The plant shot-feeds sodium hypochlorite (bleach) daily to effectively control microbiological activity in both their recirculating and service water systems. Unfortunately, the bleach also degrades the organic molecule, tolyltriazole (TTA), which is used to inhibit corrosion of their copper alloy equipment, such as condenser tubes and heat exchangers. The degradation of TTA has led to copper alloy corrosion rates above the 0.2 mpy (0.005 mm/y) specifications and, consequently, led to mild steel pitting caused by galvanic corrosion when the copper corrosion products plate out on the mild steel transfer pipes. To adequately control the mild steel pitting, zinc and phosphate levels were elevated which, in turn, affects the environmental impact of the direct discharge blowdown water.

Solution

The TTA in the treatment program was replaced with the Halogen Resistant Azole. The HRA program is more resistant to oxidizing biocides, such as chlorine and bromine, and is, therefore, a more effective copper alloy corrosion inhibitor for systems that use oxidizing biocides.

Results

- Copper alloy corrosion rates decreased from an average of 0.2 to 0.3 mpy (0.005 to 0.0075 mm/y) to an average of 0.15 mpy (0.0038 mm/y). Corrosion spikes decreased from 1.2 mpy to 0.3 mpy (0.036 to 0.0075 mm/y).
- Zinc and phosphate treatment levels were reduced 30% and 20%, respectively, with reduced mild steel pitting.
- Bleach feed was reduced 20% due to the elimination of TTA (which created a demand on the oxidizing biocide).

This power plant also benefitted by copper alloy and mild steel equipment savings, treatment cost savings associated with reduced bleach and corrosion inhibitor feedrates, and improved environmental conditions with reduced zinc and phosphate in direct discharge water.



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