Why Test for Azole in Cooling Waters

In the water treatment field, “azoles,” such as tolytriazole (TTA) and benzotriazole (BZT), are yellow metal corrosion inhibitors preventing corrosion of copper and its alloys. These compounds have been used for many years, but only recently have they become the subject of discussion for testing and the target of water consultants. Why has this happened?

Standard practices for open cooling water systems had been to add non-oxidizing biocides, like glutaraldehyde and DBNPA, to control microbiological growth. These non-oxidizing biocides did not react with or degrade the performance of the azoles. So with the azoles not having a predator in the waters, it could be assumed that they would remain in the water proportional to the other actives in the cooling water treatment chemicals.

Now enter the world in which we recognize *Legionella* as a risk to peoples’ health. To control against Legionella, and other biological activity, the use of oxidizing biocides, like chlorine and bromine, have become much more popular. Chlorine can degrade azoles and their performance for protecting against copper corrosion. Now the azoles have a predator in the water. This has led to the importance of verifying that the azole compounds are, indeed, present in the cooling waters.

Case in point: I had a cooling tower system that had make-up water coming from a fish farm. You could imagine the “bio-loading” to this cooling tower with the water coming from a place where fish were swimming in it! Quite a bit of chlorine needed to be fed into this water to keep the bacteria levels low. The cooling system cooled a condenser made of copper alloy tubes, so the treatment program supplemented TTA into the water. To add an extra safety net to the system, a continuous corrosion analyzer with copper alloy tips was added to the monitoring station.

During a regular visit my engineer told me the copper corrosion monitor was quite higher than normal. A review of the testing logs determined the cause: it seemed the TTA levels were quite low (>0.5 ppm) while the free chlorine levels were quite high (>1.0 ppm). I printed a chart showing the free chlorine residual against the TTA residual and the corrosion rates. I showed the engineer that when the free chlorine went up, the TTA went down, and the corrosion rates went up. To me, this confirmed everything books had told me: the high chlorine levels were “eating” the TTA and causing higher copper alloy corrosion rates.

So the moral of the story is that periodically the azole corrosion inhibitor needs to be verified. Not doing so is leaving your treatment results to chance.