

## Copper Protection

– Understanding the facts from fiction –

### Introduction

Water treatment suppliers will tell you that all you need is a little copper corrosion inhibitor (generally Tolyltriazole or Benzotriazole) to every drum of steel corrosion inhibitor product, and you should be all set. – This is not true. You need a healthy free-residual.

### Homeyer Findings

Our findings have shown that most customers would rather replace 100 feet of mild steel than one inch of copper, and this is because the one inch is going to be in the middle of your chiller.

Major issues arise due to the introduction of internally enhanced condenser tubes and pitting beginning in the first year with some failing in as little as 2 ½ years. However, it is not just the enhanced tubes, but the smooth tubes that are also failing prematurely at many sites across the country.

Many of our commercial accounts have large convoluted systems. Many of the designs allow for long-runs, low-flow or no-flow areas, and many have hundreds of package units aside from the large central plant. To make the situation worse, these same sites with hundreds of package units are replacing the steel low-flow runs with copper.

Most water treatment programs are designed for the ideal system: this means 3-5 feet per second flows, a large central plant, large diameter steel piping, and a short distance from the tower to the condenser. However, many systems are not ideal and are filled with copper. This places a huge demand on the copper corrosion inhibitor.

### The Situation

There is not enough testing being performed to ensure adequate copper protection and these situations are worsening.

The water treatment suppliers are currently looking for up to \$850 per service hour. This means less time on-site and less time spent testing.

In order to determine if there is enough copper corrosion inhibitor in a system, you must first run a copper test. To do this, multiply the copper residual by two in order to find out the demand of the water for copper corrosion inhibitor. Then, run a copper corrosion inhibitor test and subtract the demands. If the result is positive, you have protection.

### Things to Keep In Mind

The replacement costs for improperly treated systems can easily soar into the millions of dollars.

On the topic of testing copper corrosion inhibitors, water treatment suppliers generally will have many excuses, such as that there is enough azole in the drum, the copper corrosion coupons look great, the field tests take too much time/that they do not have the necessary field equipment, or that the azole tests are inaccurate.

Tolyltriazole is absorbed by the system at a different rate than the steel corrosion inhibitor. Halogens and UV degrade the azole. The chemistry at the hotter condenser tube is different than the chemistry in the cooler bulk water, and the field test for azole is accurate enough.

Homeyer Consulting continues to conduct research on copper issues. One of our current studies at a major university shows that the main issue is the copper test, not the field azole test. In order to mass balance, you need a total copper reading, and this requires complete digestion. The digestions are not taking place.

We monitor our customers on a quarterly basis in order to find the seasonal fluctuations in systems. Our copper testing is done via ICP with a flame temperature of 5,000 degrees C.

Customers are also having us pull their samples, or they are sending in their own samples on a monthly basis to ensure proper copper protection.