A common saying in the water treatment industry is that cooling tower manufacturers do not know (or care) about water treatment. Likewise, the cooling tower manufacturer says he knows how to cool water and does not address water treatment. Cooling towers cool water by evaporation, and cooling tower manufacturers know how to get their towers to provide maximum cooling.

Well, ideally, it is important to have both water treatment and cooling tower suppliers understand each other’s products and how they interface or interact with each other. This is for the benefit of the end user or owner of the cooling tower water system to obtain good protection of all his water-contacted equipment. Both the cooling tower and the water treatment industries have made changes in their products that have hurt each other as well as cost to the end user, at times excessively.

The best way to describe what has happened to both industries during the last 20 or so years is to provide a little history. First, the water treatment has changed substantially from using chromate-based corrosion inhibitors with acid for pH and scale control plus chlorine for microbiological control to currently used phosphate/nitrogen based products with little or no acid, thus high pHs (in the range of 8 to 9.5) and non-chlorine microbiocides.

Chromate protects all metals while not contributing to deposits. Phosphate/nitrogen-based products contribute to deposits and biological growth and can attack galvanized steel and copper. The scale inhibitors that replaced acid often can attack copper and galvanized and mild steel. Even some of the chlorine-replacement microbiocides are known to cause corrosion of galvanized and mild steel and even copper alloys.

So how has the cooling tower industry changed? Also substantially! Cooling towers with both Redwood structural members and fill have often been replaced with preservative-impregnated Douglas fir for structural members and plastic fill. Now, fiberglass is replacing the wood structural members. Galvanized steel towers are still being used but with thinner and less resistant galvanized often with plastic coatings. Stainless towers are still being used. Plastic and fiberglass towers are quite prevalent. And, concrete is being used much more. Fill is now plastic honeycomb design vs. splash for greater efficiency per cubic foot — thus smaller towers. Even more effective ceramic fill is used in the concrete towers.

So, with all these changes in each industry, what can — and has — happened?

Probably the most common problem is the rapid corrosion of galvanized cooling towers, causing “white rust.” White rust, or zinc oxide, on galvanized steel is the equivalent of red rust, or iron
oxide, on mild steel.

White rust often is caused by the water quality and water treatment. If the pH is not in the range of 7.0 to 8.2, white rust occurs without proper galvanized steel corrosion inhibitors. If the pH is 8.5 to 9.5, white rust will occur rapidly without effective corrosion inhibitors.

A greater contributor of white rust is the lack of initial effective galvanized steel passivation on new towers by the water treater. If certain scale and corrosion inhibitors are improperly utilized and below or above their effective dosages, white rust can rapidly form. Even certain microbiocides can cause white rust to form. Plus, if copper enters via the makeup water, white rust can occur via galvanic corrosion (copper plating on the galvanizing).

Can white rust be prevented? Absolutely, with initial and continuing effective water treatment. Can existing white rust be removed and galvanizing be protected? Absolutely, again with specific water treatment.

Have the galvanized cooling tower manufacturers contributed to white rust? Again, absolutely, by using a surface treatment more sensitive to corrosion than galvanizing and half the thickness of the galvanizing. Also the surface-treatment change to a less-effective method (chromate to a nitrite passivation) has increased the risk of white rust.

What can you do with a galvanized cooling tower to prevent white rust? Learn what water treatment works to provide protection both initially and continuously.

Another major change has been the use of high efficiency film fill by the cooling tower manufacturers in place of splash fill. This advancement has resulted in more cooling. Film fill initially introduced over 10 years ago was with small torturous passages. They were made of PVC. When clean, they were very effective — but keeping them clean from deposits and plugging was not fully understood by the water treatment suppliers, particularly how rapid plugging can occur resulting in loss of cooling efficiency and even the collapse of the fill into the cooling tower basin. Much more deposit and biological control was needed to minimize this problem, but unfortunately, in some industries such as utility power stations, water treatment biological control is limited.

Both the cooling tower manufacturer and the water treatment suppliers acted to minimize this problem. The cooling tower manufacturer by producing low clogging film fill and the water treatment supplier developing more effective deposit control. Does this problem still occur? Absolutely, but not nearly as bad as before.

So, what is needed is cooperation rather than hostility between the cooling tower manufacturer and the water treatment supplier. Still, the end user must control the water chemistry and treatment as well as provide good cooling tower maintenance as their responsibility. All three must work together.
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