Solving Blue-Green Water

What it is and How to Deal with It

By Larry Henke

Summary: *A common frustration for water conditioning dealers is that of blue/green staining. Although usually caused by corrosion of water pipe and fixtures, its remedies are complex and often elusive. But remedies nonetheless do exist.*

Among the more vexing customer complaints is that of blue-green tinted water or blue-green staining on fixtures. Determining the cause, and establishing a cure, can be among the most frustrating challenges for both the water treatment specialist and the customer alike. Part of the problem lies in its complex nature, in the many likely chemical processes and because, in many instances, more than one mechanism is at work and the solution to one may not be a solution to another.

Lacking however, in the water treatment field, has been a systematic and comprehensive approach to the problem and it's with this in mind that we offer the following discussion.

The symptoms

Although a natural blue hue exists in water, the green, blue or "aqua" staining is most often the result of copper. When copper tainted water evaporates on white tile or fixtures it leaves behind a green/blue stain, copper oxide. Copper-tainted water reacts with soap to form a "copper soap," a greasy, blue-green residue similar to calcium soap scum, that accumulates near shower stalls and bathtubs. Moreover, copper-laden water can react with shampoo and bath soaps to cause objectionable reactions in hair.

The hazards

Copper is listed by the U.S. Environmental Protection Agency (USEPA) along with lead as a contaminant in its Lead Copper Rule. Although lead is more harmful, copper is considered a hazard when it exceeds 1.3 milligrams per liter (mg/L) in water. Lead pipe isn't as common as in the past, but lead-based solders were used in plumbing until the mid-'80s and some brass fixtures have low levels of lead in the alloy that can leach into drinking water under certain conditions. The solvency of lead in water is similar to that of copper in water. Although many of the remedies and analytical techniques are applicable to lead as well, this study will focus on copper. It's important to note though, that unlike copper, lead will show no visible evidence of its presence and is hence more difficult to detect and eliminate.

Copper is a necessary trace element for human health. Excess levels are excreted from the body, however, when high levels are ingested, liver or kidney damage and/or gastrointestinal disorders may result.

Few locations have copper naturally occurring in groundwater, and those regions customarily have a history of copper-tainted water and, thus, people are aware of its presence. Copper can be introduced in water treatment processes when used as an algaecide. Our focus is on the unnatural introduction of copper into the water, usually the dissolution of copper piping or fixtures into water. This process of copper solvency is called corrosion and involves very sophisticated chemistry.

Defining corrosion

Corrosion is divided into several categories—any one of which, or a combination of two or more, can contribute to the process. It's safe to say all piping—metal, plastic and concrete included—undergoes some level of corrosion and, to some degree, all piping processes are affected. Corrosion of iron or copper can be thought of as the metal reacting with the environment to return to its natural form—that of an ore. Among the more common mechanisms of corrosion in water pipe are the following:

Galvanic corrosion—when dissimilar metals come in contact, an electric current can allow the less noble metal to dissolve into the water. By "noble" we mean the cathodic end of a series or list of metals, both pure and in alloy, that react with each other (see Table 1). A full discussion of electrochemical principles on which this list is based is