



## *RELIABLE AND ALTERNATIVE ENERGY SOLUTIONS WITH NON-CHEMICAL WATER TREATMENT SYSTEMS*

One of the biggest concerns in heat transfer systems is controlling the scale build-up and bacterial growth, as well as preventing corrosion in all heat evaporation equipment. Cooling towers are great breeding grounds for bacteria. Inside the tower is have a warm, moist, sunlit environment that bacteria of all sorts thrive in. The inside of chillers also provides a great environment for other types of bacteria to grow. These bacteria can produce a material that can act as an insulating slime barrier to reduce the efficiency of the system.

Through the use of copper-silver ions, and the science of physics, the Scale Free System regulates the time and release of copper-silver ions in the water. Copper-silver ionization is an industrial control and prevention process that has received recognition from the engineering community, worldwide. The process is also approved by the U.S. Environmental Protection Agency (as per its Safe Water Drinking Act, Lead and Copper Rule limits) for biological treatment of domestic water supplies against infections of Legionella, Pseudomonas, M. Avium, E. Coli, Salmonella and a host of other microbes as well.

### **Regulation and Guidelines**

The level of ions generated is well below the levels set forth in the EPA Safe Water Drinking Act Lead and Copper Rule limits. EPA-approved levels of copper and silver in potable water are:

Copper (Cu)	1.3 ppm (parts per million)
Silver (Ag)	0.1 ppm

The Scale Free System copper-silver ionization technology varies at different times in the system depending on release time, but the nominal concentration of copper is 0.4 to 0.8 parts per million (ppm) and the concentration of silver is 40 to 60 parts per billion (ppb), both well below the statutory levels the EPA mandates for drinking water standards. For further clarification, I would recommend visiting the EPA's website <http://www.epa.gov/>. The page referencing regulations for control of lead and copper in drinking water is <http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/>. Attached to this fact sheet are other reference articles on the ionization process.

Because the biological control utilized in Scale Free System is compliant with the EPA standards for drinking water quality set forth in The Safe Drinking Water Act (SDWA), any blowdown water exiting the system is also compliant with the Federal Water Pollution Control Act (known as the Clean Water Act or CWA) which provides the statutory basis for the National Pollutant Discharge Elimination System (NPDES) permit program and the basic structure for regulating the discharge of pollutants from point sources to waters of the United States. See <http://cfpub.epa.gov/npdes/index.cfm>.

### **What is the Copper-Silver Ionization Process??**

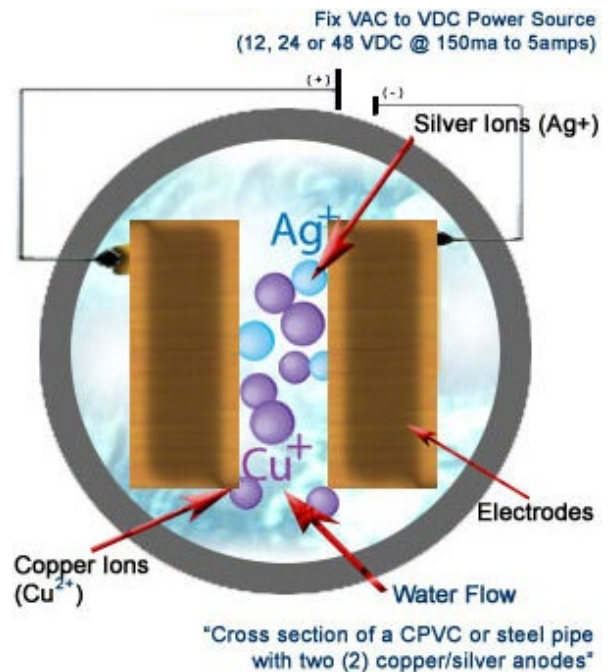
Copper-silver ionization is a dispersive process that introduces long-lived, stable, positively charged copper and silver ions into the water system. The ions bond electrostatically with negative sites on bacterial cell walls and denature proteins. Over the long term, ionization thus disperses and destroys biofilms and slimes that can harbor harmful bacteria.

1- The ionization process of copper and silver is provoked when these metals are electronically stripped of electrons and become positively charged ( $\text{Cu}^{++}$ ,  $\text{Ag}^+$ ).

2- By running a DC voltage between the sacrificial copper and silver electrodes submerged in water, positively charged metallic copper and silver ions are created and released into the water.

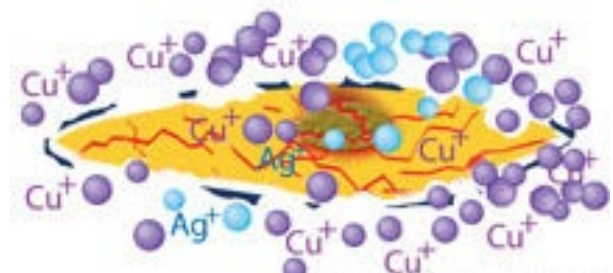
3- Having a water flow between the electrodes carries away the metallic ions into the water system before they can reach the opposite electrode.

4- Once replaced within a water reservoir or distribution network, the positively charged copper and silver ions are attracted to negatively charged particles such as *Legionella* bacteria and commence the biocide process upon contact.



Positively charged copper and silver ions travel within the water system to penetrate the biofilm. These ionic particles bind themselves to negatively charged microorganisms like *Legionella*.

Upon contact with these microorganisms, the copper/silver ions attack in a multiphase process to disrupt the overall cell metabolism causing cellular lysis (death). Safe ionic concentration levels are maintained by monitoring the water system and thus offer additional long-term residual protection.



### **Additional advantages for the owner.**

Utilizing the resource-efficient Scale Free System on your heat exchange equipment will immediately reduce the environmental footprint of a facility by eliminating toxic water treatment chemicals. Use of our system incorporates a sustainable, green technology into facility operations and presents a compelling opportunity to generate operational savings while treating water in an environmentally

friendly manner.

If you so choose, your chemical-free discharge (blow-down) water could be reused for other purposes on site instead of being sent to a treatment facility. You should check with your state or local officials to see if there are any other restrictions for reuse.