

Electrolytically generated silver and copper ions to treat cooling water: an environmentally friendly novel alternative

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Abstract

The effect of electrolytically generated silver and copper ions on the abatement of iron-related bacteria, sulfate-reducing bacteria, slime-forming and coliform bacteria in the cooling systems was investigated in this work. These bacteria, commonly found in cooling tower systems, are usually controlled with chlorine. The effect of chlorine and its combination with these ions was also studied on the microbiology of the water. Silver/copper/chlorine concentration relationships (1.2 mg l^{-1} silver/ 0.6 mg l^{-1} copper/ 0.0 mg l^{-1} chlorine and 0.2 mg l^{-1} silver/ 1.2 mg l^{-1} copper/ 0.3 mg l^{-1} chlorine) proved to be good alternatives to replace or decrease appreciably the chlorine consumption in the cooling systems using relatively low concentrations of silver and copper with a minimum environmental impact. These relationships established a very effective treatment with 99% of control for the iron-related bacteria, sulfate-reducing bacteria and slime-forming bacteria abating more than 99% of such bacteria. Chlorine concentrations of 1.0 and 3.0 mg l^{-1} decreased more than 90% of some of the iron-related bacteria population. These systems have shown to decrease the aggressiveness of bacteria population that promote microbiologically influenced corrosion and biofilm formation to levels that compete with the traditional water treatment of cooling water. Coliform bacteria were also reduced below the levels accepted by the Mexican Official Norm.

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