

Biofilm Control

It is clear that controlling the growth of biofilms is critical in providing for the overall prevention of scale, deposition and corrosion in cooling water systems. Traditional microbiological growth control programs have focused on planktonic, or free-swimming bacteria. While monitoring and control of planktonic counts can be of value, particularly if done over time to establish a trend or profile, focusing only on this form of microbe will oftentimes provide less than satisfactory results.

First, planktonic counts are not necessarily an indication of the amount of biofilm present. In addition, free-swimming micro-organisms are not generally responsible for corrosion and fouling of heat exchange equipment. Even *Legionella*, which must be planktonic to infect susceptible individuals, are sustained and amplified by amoebae which are sessile, or part of a biofilm mass.

Biofilms are controlled through the use of microbicides, biodispersants and biofilm cleaners. Oxidizing biocides, such as chlorine, bromine and chlorine dioxide can be effective at providing biofilm control. When these biocides are used, it is critical that sufficient residual be maintained in the recirculating water to completely oxidize the polysaccharide mass. High bromine and chlorine concentrations should be avoided to prevent the corrosion potential in the system. However, chlorine dioxide can be a good alternative.

Several non-oxidizing biocides can be useful in biofilm control. In particular, glutaraldehyde, Tetrakis(hydroxymethyl) Phosphonium Sulfate (THPS) and polyquats are effective at penetrating biofilms and killing the micro-organisms growing there. However, these biocides will have little effect in destroying the biopolymer matrix.

For penetration *and* removal of biofilms, the use of an adjunct treatment is recommended. Biodispersants are largely effective in penetrating and dispersing biomasses. This will often reduce the amount of biocide required to achieve a complete kill of algae and bacteria in the system. By leaving a bare metal surface, it will also allow the corrosion inhibitor to re-establish protection.

The biodispersant should be slug fed to a point in the system where good mixing is assured. The level of biodispersant necessary will be dependent on the amount of biofilm present. As with the biocides themselves, frequency of addition depends on the rate of re-infection, the ambient conditions and the level of nutrients available.