Biofilms

Brief statement of information provided:
Not enough is being done to educate pool operators about biofilm harbored bacteria (only 1 page in the current CPO textbook), and we have not been addressing the issue when considering changes to NSF Standard 50, even though CDC has estimated that “65% of human bacterial infections in aquatic environments involve biofilms”.

Biofilm formation on surfaces is a known hazard in all water delivery and circulation systems using non-sterile water. In the recreational aquatic industry, biofilms are particularly of concern in warm water spas, water play features, and spray grounds, where water often sits in pipes and does not circulating during the night hours. Besides “gunking up” circulation systems, some biofilms can actually eat through the piping and components. But of even greater concern, biofilms can also harbor dangerous, infectious bacteria, including Staphylococcus aureus, Methicillin-resistant Staphylococcus aureus (“MRSA”), Legionella, and Pseudomonas aeruginosa. Serious RWI infections, fatalities from Legionnaires’ Disease, and disfigurement and multiple surgeries from Necrotizing fasciitis (AKA: flesh eating bacteria) are being reported in record numbers from exposure in pools and spas.

Normal disinfectant levels are not effective at preventing extra cellular polysaccharides (EPS) to form on the interiors of filter tanks, skimmers and surge chambers, or inside pipes. EPS is the protective slime layer that forms around the bacteria binding them together allowing them to attach to surfaces, and colonize single or multiple species, organize, communicate and survive as a single organism, and disperse back into the water. Halogen concentrations 100 times higher than what is typically maintained in pool/spa water are needed to break down the EPS layer to get at the bacteria embedded in the slime.

Although commonly utilized in the commercial aquarium industry which uses similar circulation and filtration equipment, foam and plastic “pigs” are not being used to pig the pipes in our recreational water systems because their use is not addressed in the design. By forcing the pigs through the pipes with a blast of water, biofilms and other undesirable growth which attaches to the inside of pipes and harbors pathogenic organisms could be physically scoured away.

Biocides (like Sterilex Ultra-Kleen™ Solution 1) are EPA approved for the removal of biofilm and other organic contaminants. This biocide, silicicide, and algaecides, when used in combination with an activator (Sterilex Activator Solution) is capable of killing or inactivating viral, bacterial and fungal microorganisms on hard, non-porous surfaces, and is being used by a segment of our industry.

Application of antifouling coatings to prevent biofilm adhesion, although widely studied by the marine industry, has not been addressed by manufacturers of products used in the recreational water industry to determine efficacy or effects on bathers.

Products (like Ahh-Some, and Oh Yuk) are advertising their effectiveness at preventing and destroying the formation of biofilms and the microorganisms they harbor. Other products like filter and cartridge cleaners, acidic cleaning solutions that can be used to remove calcium scale, grease and oils from filter cartridges and diatomaceous earth filter elements, and to reduce mud-ball formation and channeling in sand filters, are also being used even though their effectiveness at destroying the EPS matrix and as a biocide has not been tested.

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