

Microbiologically Influenced Corrosion in Fire Protection Systems

Pipe failures resulting from microbiologically influenced corrosion (MIC) have been widely recognized in petrochemical, gas and nuclear power industries, but only recently has this mechanism been associated with failures in fire protection systems (FPS). FPS are designed for the life of the structures in which they reside; however, reports of new systems developing MIC associated throughwall leaks within months of installation are becoming more prevalent.

Fire Protection Systems at Risk for MIC

MIC has been reported in wet dry, and deluge FPS composed of cast iron, carbon steel, galvanized steel or stainless steel, as well as copper based systems. FPS makeup waters are typically stagnant, low in hardness, low in pH, and devoid of antimicrobial compounds (biocides). These characteristics predispose FPS to biological fouling (biofouling) and MIC. Regulatory requirements that dictate periodic testing can contribute to development of MIC in FPS when makeup waters are replaced with oxygenated and nutrient rich waters in which microbial communities thrive and form biofilms. Slime associated with biofilm microbes acts as an impermeable barrier to the antimicrobial compounds that are typically used to prevent microbial growth and activity. MIC does not occur in the absence of biofilms.

What Altran Solutions Can Do for Your Fire Protection Systems

Altran Solutions is an independent, consulting engineering firm specializing in materials engineering and failure analysis. Our dedicated staff of microbiologists, corrosion engineers, and metallurgists has significant expertise in FPS deterioration. We have extensive field and laboratory analytical capabilities, including video borescope instrumentation, NDT equipment, and survey instruments for design and installation qualification. In addition to our analytical laboratory support services, Altran designs and implements both proactive and remedial action plans for biofouling and MIC control. Altran Solutions helps facilities to avoid the harmful and costly effects of inappropriate chemical treatments, while ensuring that biofouling control measures are effective and economical. Our multidisciplinary approach to problem solving provides our clients with real world solutions to complex corrosion, biodeterioration, and biofouling issues.



Cells (ovals) of *Thiobacillus ferrooxidans* metabolizing iron by oxidizing ferrous sulfate to ferric hydroxide $Fe(OH)_3$ (white crystals).



Tuberculation in sprinkler pipe caused by microbial activity.

Consequences of MIC in FPS

The most serious consequence of MIC in FPS is mechanical blockage of piping and sprinkler heads. MIC associated organisms can attach to the metallic surfaces of FPS forming corrosion deposits called tubercles that can completely occlude pipes or could potentially shear off and block sprinkler heads. Localized pitting can occur between tubercles and pipe surface (underdeposit pitting) resulting in pinhole leaks.

For more information on this capability,
Please contact us at (617) 204-1000 or
via e-mail at sales@altransolutions.com