Does MIC or Corrosion Exist Within Fire Sprinkler Systems?

...Are There Initiatives That Protect These Systems?

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Fire sprinkler systems are vulnerable to attack from microbiological influenced corrosion (MIC) and corrosion. Owners and managers need to take responsibility to learn about MIC and corrosion within systems. Controlling microbiological growth and eliminating corrosion can save dollars and lives. Many fire sprinkler systems are lost each year because of corrosion. This invasion has destroyed both new and old fire sprinkler systems.

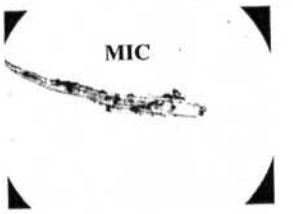
The rusting process within fire sprinkler systems occurs frequently. The water, high in oxygen, reacts with iron. It starts rusting and the pipe becomes damaged. Rust is the start of the problem. Then, chemical acids start either as a by-product of bacteria and/or the by-product of reduced oxygen. Tubercles are formed and "telltale" signs of the impending disaster appear. The deposits formed consist of red-brown ferric hydroxide and greenish black ferrous hydroxide, to include other mineral deposits. These deposits are called tubercles and, at times, are a combination of "microbiological attack" and/or "oxygen cell" corrosion.

Dry systems are especially vulnerable because they operate with a pressurized moist air source. Air with high humidity is trapped within the system. The constant daily temperature variance within these systems causes moisture to condense on the internal portions of the piping. The natural deterioration of metal that occurs within these dry type systems poses an additional problem. The moisture that condenses is very aggressive to the zinc coating, and rapidly dissolves it, producing "white rust," a chemical reaction very similar to iron rusting.

Understanding the corrosion process and microbiological effects on pipes, and aggressively treating fire sprinkler systems, are critical to extending the life span of systems.

What is MIC?

Microbial corrosion, or bacterial corrosion, is corrosion caused or promoted by microorganisms (bacteria). Microbiological influenced corrosion (MIC) refers to corrosion and ensuing loss of metal caused by biological acid producing organisms. Sulfate-reducing bacteria are common in areas where there is a lack of oxygen. Sulfate-reducing bacteria produce a sulfur acid, and that can cause stress cracking.



In the presence of oxygen, some bacteria directly oxidize iron-to-iron oxides and hydroxides, and other bacteria can react with sulfur to produce sulfuric acid. Bacterial cells can form in the deposits of corrosion products, causing and enhancing their rate of destruction.

MIC can occur in any aqueous environments. MIC is a common problem in fire sprinkler systems due to the presence of microbes, water, adequate nutrients, and corrosive by-products. These microorganisms form colonies on the surface of a metal, producing slimes that collect and glue deposits to the metal. They do not form uniform layers, but local "community centers." Once a colony has formed, it tends to attract other biological and non-biological species (metals and chlorides) to the colonization sites. All this leads to the formation of crevices, allowing corrosion to proceed. Ninety percent of MIC is seen as pitting-type corrosion because the site or colonies become "fixed."

Microbiological influenced corrosion, known as MIC, can plug sprinkler heads, and be a cause of tuberculation, resulting in thinning of the metal pipes to include the cause of pinhole leaks. This destruction can lead to ineffective sprinkler operations and losses of goods and services within a building.

The NFPA Ruling

The National Fire Protection Association (NFPA) requires that systems be tested for MIC and, if it exists, those systems must be treated. Following are significant tests that reveal the presence of corrosion.