White Paper

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CONSULTING SERVICES, INC.

Sprinkler Piping
– Homeyer Company Position –

Situation

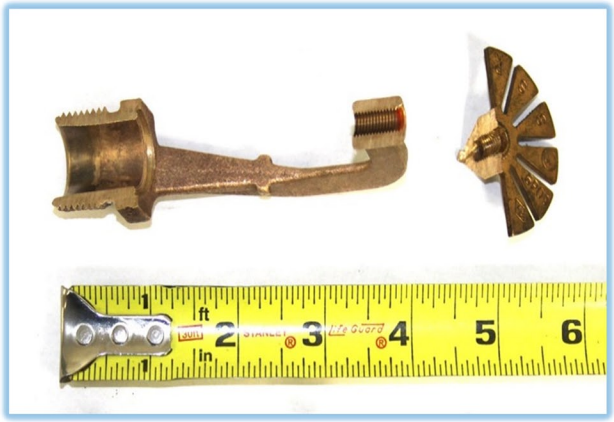
- All piping should be chemically cleaned to remove the oils of manufacture, which are nearly pure carbon. At some point, new piping is exposed to soil organisms. While open pipes sit in a construction site, they are exposed to the atmosphere and contaminated with bacteria.
- Sprinkler piping can now be as low as schedule 10; in the past it was always schedule 40. The thickness of the pipe will determine how long it will take for the bacteria and their acidic secretion products to eat away at the pipe.
- The new fire codes require testing the system on a periodic basis. Testing of the system begins with an introduction of fully oxygenated raw water into the system. The bacteria that comprise the bug population in these systems are a combination of straight anaerobes (live in the absence of oxygen) and facultative anaerobes (can live in the presence or absence of oxygen but prefer oxygen). When oxygen is introduced to these systems, the facultative anaerobes can dramatically increase activity, as they are very efficient when they change to aerobic metabolism. Activity can increase exponentially and the oxygen may remain at viable levels (as far as they are concerned) for months.
- Strong infestations of bacteria in these situations can eat thru schedule 40 piping (2" = 154 mils) in just a few years. It may take the bacteria up to 1 year to breakdown the oils to the extent that it becomes a viable food source but the speed varies according to bacteria type and oxygen content.
- Mild steel corrosion products are 7 times the mass of the original metal. The corrosion products will occlude the sprinkler piping and can mass-move to areas of low flow or dead legs. Flow of course occurs when you test the systems, and dead legs are down coming drops to sprinkler heads.

Solution

The piping should be cleaned with standard pipe cleaning solutions to both remove the oils of manufacture and to passivate the metal. Standard pipe cleaning solutions (available from any water treatment firm) is a solution of phosphate, caustic, chelant, polymer, etc. It is circulated for 24-48 hours and then flushed. The system should be filled with sterilized oxygen-free water, and all treatment must follow NFPA 25 and be discussed with the local Fire Chief.

Recommendations

Sprinkler systems are not "plug and pray". The systems should be evaluated on a regular basis and bacterial populations should be determined. Pipe wall loss should be evaluated via ultrasonic pipe testing of representative areas of the system; pipe occlusion should also be evaluated with the removal of represented sections and tested via destructive testing. Sprinkler head blockage should be evaluated via removal and inspection of representative units.



Methodology

- The pipes are photographed when they arrive.
- The pipes are precision cut.
- The now cut pipes are photographed and photomicrographed.
- 1 gram of representative deposit is removed, photographed, and analyzed for major elemental components.
- Deposits are measured to determine the percent of pipe occlusion.
- A representative sample of the deposits is removed, rehydrated, and tested for both aerobic and anaerobic bacteria.
- The pipes are acid cleaned.
- The now acid cleaned pipes are photographed and photomicrographed.
- The pipes are micrometer measured to determine original pipe wall thickness.
- The pits are micrometer measured to determine depth and calculated wall loss.
- Water samples are analyzed for major constituents and both aerobic and anaerobic bacteria.

Through the Homeyer online store, you may purchase a Fire Protection Water Analysis Kit. This package includes a bottle for normal city water, water from the sprinkler system, and a container to hold any deposits found in the system. The analysis will include the water and biological attributes of the samples. Instructions are included.

Philosophy

- It is generally accepted that a pipe with 50% wall loss or greater is prone to failure and has reached the end of its life cycle. It is also generally accepted that pipes with more than 20% pipe occlusion have undergone severe fouling (deposition and/or corrosion) and should be cleaned or replaced. Ideally, pipes should be free of both deposition and corrosion.
- Over 90% of piping failure in water based systems will be attributed to biologically induced underdeposit corrosion conditions (commonly referred to as MIC).
- Anaerobic bacteria are the main cause for pitting and advanced corrosion in water based systems piping.
- Deposition on piping and/or corrosion products of piping can harbor bacteria
- The oils of manufacture if not suitably removed will in time become food for bacteria. The limiting factor for biological growth is carbon and the oils of manufacture are nearly pure carbon.
- NFPA 25 provides the guidelines for the inspection and treatment of sprinkler piping systems.
- Treatment of water in sprinkler piping systems follows drinking water guidelines and local approval is required. The treatment of sprinkler water is difficult at best. Sprinkler systems are best filled utilizing sterilized water. Chlorine Dioxide is the product of choice since it is drinking water approved, is an excellent bulk water sterilizer, has a short half life, and will penetrate deposits to kill underdeposit bacteria.
- When interpreting data and formulating an action plan on sprinkler piping, you should consider the degree of bacterial involvement, the extent of occlusion, and pipe wall loss.
- The water itself is an indication of the condition of the overall system. This combined with actual pipe data completes the picture.
- Corrective action is chosen based on system conditions, degree of risk, and logistics.