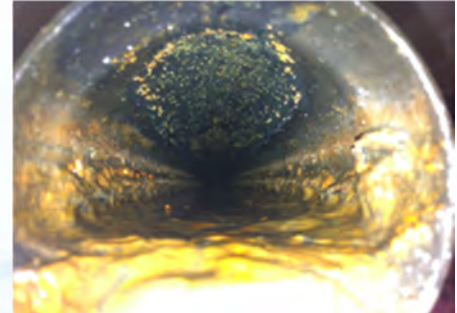


Project Case Study - Indiana Warehouse

Project Type:	Large Warehouse Facility
Location:	Indiana, USA
Sprinkler Systems:	12 Black Steel Wet Pipe Systems for 450,000 sq. ft. of Coverage
Nitrogen Introduced:	January, 2013
Results:	No Reported Leaks in 5 Years
Cost Savings:	Savings of \$810,000



Tuberculation and resulting Iron Oxide Deposits

Project Background

Large warehouse located in Indiana, open floor construction with stacked storage racks. 450,000 sq. ft. of fire sprinkler system coverage area with 12 individual wet pipe risers serving the building. Average zone volume 1,800 gallons. 6" mains with 2" branch lines following the roof pitch to the center of the building; 4" floating main at far end of branch lines. Building age approximately 14 years.

Corrosion related leak history:

- Leaks occurring in branch lines at apex of building in four of the twelve zones
- Material damage risk due to fire sprinkler water leak
- **\$90,000** in emergency repair expenses during year prior to assessment

Fire sprinkler piping materials:

- Schedule 10 black steel mains, rolled groove fittings
- Schedule 7 Dyna-Flow black steel branch lines, rolled groove fittings.

Water supply - municipal water supply



Oxygen Corrosion Pitting on Branch Line



General Under Deposit Metal Loss

Preliminary Assessment Work

In order to determine the root cause for the corrosion related leaks within the fire sprinkler system a corrosion assessment study was performed.

The assessment included:

- Elemental analysis of the supply water and deposits from the systems
- Profile of microbial contamination throughout the systems
- Failed pipe analysis – extent of damage, pit depth, metal loss characteristics
- Video scoping of the fire sprinkler piping system

The assessment study determined that the root cause for corrosion within the systems was oxygen attack of the black steel piping. The majority of the damaged piping was found at the air/water interface adjacent to trapped pockets of air at the high points at the apex of the building. The mains contained no evidence of trapped air and were free of corrosion. Although bacteria were found within the fire sprinkler system, they were determined to be very minor contributors to the corrosion related leaks. Those sections of the branch lines that contained pockets of trapped air contained large amounts of iron oxide solids, which have led to under deposit corrosion resulting in pin-hole leaks.



Recommendations:

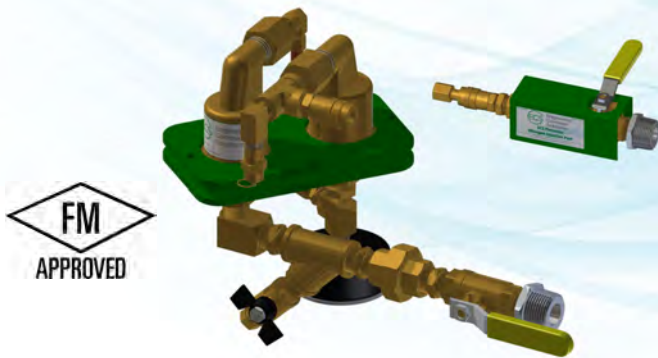
- Perform limited pipe replacement of the 2" branch lines on either side of the roof apex, approximately 60 feet of pipe on each branch line
- Install ECS Protector Nitrogen Inerting Vents on each of the wet pipe zones
- Install ECS Protector Nitrogen Injection Ports on each of the wet pipe risers
- Perform nitrogen inerting of the fire sprinkler systems using the ECS nitrogen inerting protocol for wet pipe fire sprinkler systems
- Use nitrogen cylinders to supply the necessary nitrogen gas for the inerting procedure on the fire sprinkler systems

The video scoping evidence proved conclusively that the corrosion was localized to those sections of pipe that contained trapped air. Only these sections were selected for replacement, leaving approximately 85% of the original system intact.

During the month of January 2013 nitrogen inerting vents and injection ports were installed on each of the zones. The approximate cost to the owner for the selective pipe replacement and installation of nitrogen inerting equipment was \$90,000, equal to the costs incurred by emergency leak repairs during the previous year. To date, there have been no recorded corrosion related leak in any of the fire sprinkler zones that were treated with nitrogen gas.

Fire Sprinkler Contractor Feedback

Fire sprinkler contractors who have performed the wet pipe nitrogen inerting (WPNI) procedures report that the entire process is very manageable and significantly easier than applying chemical corrosion control agents. The entire wet pipe nitrogen inerting procedure can easily be performed on a typical 1,000 gallon sprinkler system within 2-3 hours. It is also possible to perform the procedure on several zones at the same time. Once the fire sprinkler contractor has been certified by the ECS Nitrogen Inerting Team, the contractor does not require on-site support or supervision.



ECS Nitrogen Inerting Vent

Financial Analysis of Repair Options

The most common response to escalating leak frequency and increasing fire sprinkler system repair costs is to completely remove and replace the fire sprinkler system piping. Estimated replacement cost of the fire sprinkler piping for this facility was \$2 per square foot for a total of approximately \$900,000.

Results and Conclusions

The owner and fire sprinkler contractor decided to apply the Engineered Corrosion Solutions wet pipe nitrogen inerting technology based on the results achieved from other WPNI applications in similar conditions.



Pressurized Cylinders Provide Nitrogen Gas