Engineered Corrosion Solutions™

Complete Corrosion Control.

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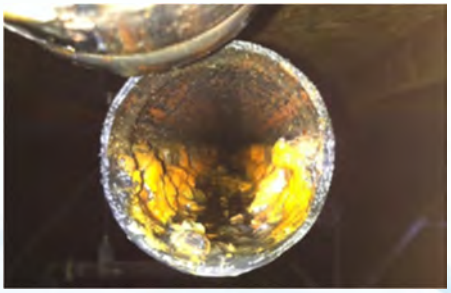
WET PIPE NITROGEN INERTING

Project Case Study - California Mission Critical Manufacturing

Project Type:	**Aerospace Manufacturer**
Location:	**California, USA**
Sprinkler Systems:	**1 million sq. ft. of coverage area, 25 wet pipe risers, average size 1,500 gallons**
Nitrogen Introduced:	**October, 2010**



Corrosion from Trapped Air

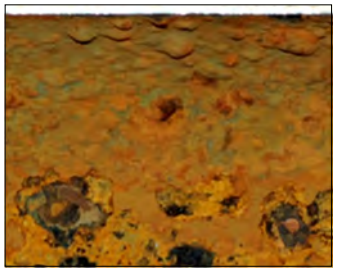
History and Background

Specifics on subject building

- Aerospace manufacturer in California – mission critical high value contents
- 1,000,000 sq. ft. of fire sprinkler system coverage area
- 60 ft. high bay manufacturing areas combined with office space
- 25 wet pipe risers serving the building – average zone volume 1,500 gallons
- Risers nipples with sprinklers protecting roof and drops with sprinklers protecting suspended ceiling

Corrosion related leak history

- Long history of fire sprinkler leak repair and pipe replacement – complete replacement of some zones
- During 2010 the project building averaged one corrosion related leak every three weeks which required repair
- High risk due to fire sprinkler water leak damage



Corroded Main

Under Deposit Accelerated Oxygen Corrosion

Water supply – municipal drinking water feeding a 200,000 gallon fire water storage tank

Fire sprinkler system design configuration

- Fire water loop serving large campus of buildings with fire pump and jockey pump
- External wet pipe risers using a “tree” type fire sprinkler design configuration

Fire sprinkler piping materials

- Threaded schedule 40 black steel piping
- Repair and replacements of piping over 40 year period
- Old and new pipe patchwork throughout the facility

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
- Extensive video scoping of the fire sprinkler piping network

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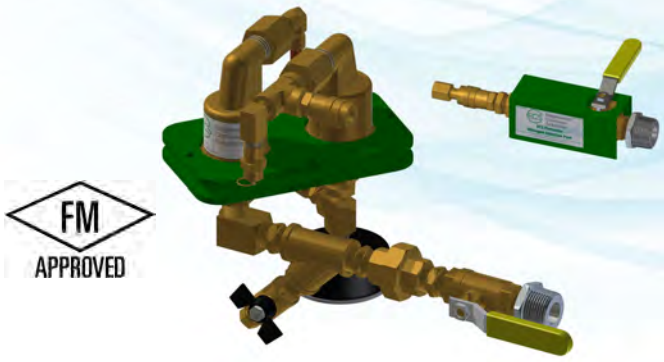
The assessment study determined that the root cause for corrosion within the systems was oxygen attack of the black steel piping. The majority of the damaged piping was found at the air/water interface adjacent to trapped pockets of air within the piping. The large main risers above the control valve were also damaged due to oxygen corrosion. Although bacteria were found throughout the fire sprinkler system, they were determined to be very minor contributors to the corrosion related leaks. Because of the system design, there were areas within the fire sprinkler piping network which trapped large amounts of air after filling the systems with water. Much of the fire sprinkler mains contained large amounts of corrosion by-product (iron oxide-hematite) solids.



ECS Nitrogen Inerting Vent

Recommendations

1. Flush the fire sprinkler mains from the far end of each of the fire sprinkler zones to remove trapped solids from the piping
2. Install ECS Protector Nitrogen Inerting Vents on each of the wet pipe zones
3. Install ECS Protector Nitrogen Injection Ports on each of the wet pipe risers
4. Perform nitrogen inerting of the fire sprinkler systems using the ECS nitrogen inerting protocol for wet pipe fire sprinkler systems
5. Use the ECS Protector Portable Nitrogen Generator to supply the necessary nitrogen gas for the inerting procedure on the fire sprinkler systems

Results and Conclusions

During the month of October 2010 all 25 wet pipe fire sprinkler zones were flushed and inerted with nitrogen gas using the ECS nitrogen inerting protocol. Since that time there **has not been one recorded corrosion related leak** in any of the 25 fire sprinkler zones that were treated with the nitrogen gas.

At one point approximately 12 months after the nitrogen inerting procedure was performed it became necessary to drain one of the fire sprinkler zones to make changes in the zone piping. The water that was drained from the fire sprinkler system piping was crystal clear with no sign of corrosion by-product or the typical black water. After work on the system was completed, the nitrogen inerted atmosphere within the drained system was maintained using the ECS drain and refill protocol. The system was placed back in service with no corrosion related events subsequent to the drain and refill exercise.

Fire Sprinkler Contractor Feedback

Fire sprinkler contractors who have performed the wet pipe nitrogen inerting 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.