DPNI

DRY PIPE NITROGEN INERTING

Complete Corrosion Control.

Project Case Study - Mission Critical Data Center

Corroded Galvanized Main

Project Type:	**Mission Critical Data Center**
Location:	**Missouri, USA**
Sprinkler Systems:	**100,000 sq. ft. facility** **5 Galvanized Preaction Systems** **Multiple Leaks on Mains**
Nitrogen Introduced:	**1st quarter of 2011**
Results:	**No Reported Leaks in 7 Years**

History and Background

The 100,000 square foot data center was originally built and opened in 2002 with double interlock preaction fire sprinkler systems to protect the data halls. Galvanized steel piping was used for all of the preaction fire sprinkler systems. After 8 years of service leaks began to develop in the 3" galvanized schedule 10 main piping. All of the leaks occurred within the main line piping under accumulations of trapped water. The metal loss was characterized by highly localized attack with many deep singular round bottomed pits beneath the trapped pools of water.

Zinc Oxide and Iron Oxide Deposits on Bottom of Main

Under Deposit Accelerated Oxygen Corrosion

Based on the history of leaks occurring in the facility, Engineered Corrosion Solutions was contracted to identify the root cause of the corrosion and develop a corrosion control strategy to prevent future leaks.

Water supply – municipal water supply with fire pump

Fire sprinkler system design configuration

- Five (5) preaction risers protecting the data center
- "Tree" type fire sprinkler design configuration

Fire sprinkler piping materials

- Rolled groove schedule 10 galvanized main piping
- Threaded Schedule 40 galvanized branch lines

Corroded Galvanized Main with Trapped Water

Preliminary Assessment Work

A corrosion assessment survey was performed in July 2010 to determine the extent of damage within the fire sprinkler piping. The video scoping results indicated that there was extensive damage due to oxygen corrosion within the schedule 10 mains at any location that acted to trap water, which was present throughout much of the mains. The schedule 40 galvanized branch lines exhibited minor corrosion and contained only minor amounts of trapped water. Analysis of pipe samples extracted from the system mains revealed oxygen corrosion pitting resulting in wall penetrations of up to 62.5%.

The oxidation reaction of galvanized steel pipe and oxygen produces zinc oxide and iron oxide deposits. Once the protective zinc layer has been breached, oxygen corrosion is liberating iron atoms from the underlying black steel substrate resulting in highly localized corrosion and resultant failures.

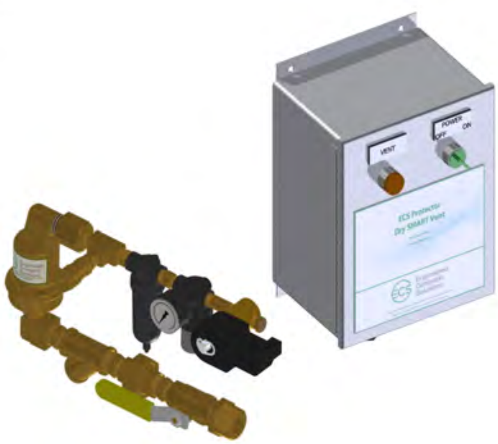
Implementation of ECS Dry Pipe Nitrogen Inerting (DPNI)

In early 2011 the client elected to install the ECS nitrogen generator and employ the patented “fill and purge” breathing technology to remove oxygen from the fire sprinkler piping and provide nitrogen gas for pressure maintenance. The **ECS PGEN-20 Nitrogen Generator** was installed and commissioned to supply nitrogen to the 5 preaction sprinkler systems within the facility.

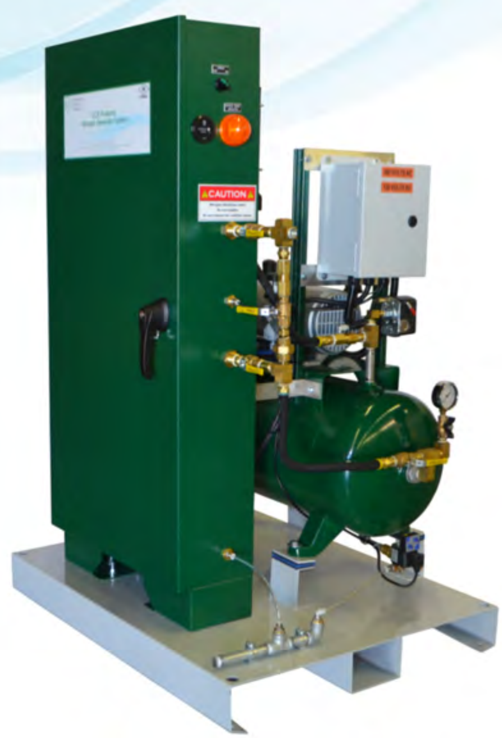
- No pipe replacement was performed
- Installation of ECS Nitrogen Generator (PGEN-20)
- Performed DPNI on all 5 preaction fire sprinkler systems using ECS nitrogen inerting protocol for dry pipe fire sprinkler systems

Results and Conclusions

Despite the significant damage found during the assessment, no fire sprinkler system piping was replaced within the facility prior to the installation of the ECS nitrogen generation system. Under a nitrogen atmosphere the corrosion in the fire sprinkler system piping would be stopped, even in locations with trapped pools of water. Since repair of initial leaks and installation of the ECS PGEN-20 nitrogen generator there have been no recorded additional leaks within the preaction fire sprinkler systems in the facility.



ECS Protector Dry SMART Vent - PSV-D



ECS Nitrogen Generator (PGEN-20)