

Dry Pipe Nitrogen Inerting (DPNI) – Case Histories

Engineered Corrosion Solutions

The process of Dry Pipe Nitrogen Inerting (DPNI) for dry and preaction fire sprinkler systems was originally conceived by Engineered Corrosion Solutions to control oxygen corrosion in 2008. Since that time ECS has continued to develop and refine nitrogen inerting technology for the fire sprinkler industry. The equipment and technology developed by ECS leads the industry in this field. At the heart of Dry Pipe Nitrogen Inerting is the patented ‘fill and purge’ breathing process that provides the fastest method for elimination of oxygen within the fire sprinkler system.

DPNI Case History No. 1 – Municipal Library in Indiana

⇒ **No leaks for 7+ years**

Background – A dry pipe fire sprinkler system installed throughout a municipal library facility experienced a catastrophic leak and trip of the fire sprinkler system three years after installation. The leak occurred under trapped water in a 3 inch schedule 10 galvanized main line. Pipe samples taken from the system exhibited significant corrosion with oxygen pitting at the air water interface and at random points at the six o’clock position on the pipe. The leaks occurred after being in service for only 3 years in September 2009.

Dry Pipe Nitrogen Inerting (DPNI) – In March 2010 an ECS **PGEN-40 Nitrogen Generator** was installed to provide nitrogen pressure maintenance gas to the four (4) dry pipe sprinkler systems servicing the library. A single ECS Protector Dry Pipe Vent was installed on each of the fire sprinkler systems. All ECS nitrogen generators employ the patented “fill and purge” breathing technology to remove oxygen from the fire sprinkler piping and provide nitrogen gas for pressure maintenance within the piping.

Results – Several sections of the main piping were replaced just after the leaks occurred on the system. However, at least 90% of the original mains and all of the original branch lines in the four fire sprinkler systems were left in place when the ECS nitrogen generator was installed. There have been no recorded leaks in the fire sprinkler system piping since the DPNI system was installed at the library.



ECS PGEN-40 Nitrogen Generator
Installed with Air Compressor

DPNI Case History No. 2 – Mission Critical Data Center in Missouri

⇒ **No leaks for 6+ years**

Background – 100,000 square foot data center 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 within the facility. 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.

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 mains at the trapped water locations throughout the facility. The schedule 40 galvanized branch lines exhibited minor corrosion and did not contain much trapped water. The average corrosion pit depth from the pipe samples that were extracted from the facility was 45% wall penetration.



**Corroded Galvanized Main
with Trapped Water**

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 fill and purge breathing process is the only approach that can effectively remove oxygen from the system piping before it can react with the pipe metal. A single **ECS PGEN-20 Nitrogen Generator** was installed and commissioned to handle the five (5) preaction sprinkler systems within the facility.

Results – No fire sprinkler system piping was replaced within the facility prior to the installation of the ECS nitrogen generation system. ECS recommended that under a nitrogen atmosphere the corrosion in the fire sprinkler system piping would be stopped, even in locations with trapped pools of water. Since the ECS PGEN-20 nitrogen generator was installed and commissioned, there have been no recorded leaks within the preaction fire sprinkler systems in the facility.

DPNI Case History No. 3 – Garden Center Large Retail Home Improvement Center in Arizona

⇒ **No leaks for 5+ years**

Background – Garden center and front end canopy of a large home improvement retailer experiencing leaks in the dry pipe fire sprinkler system. The fire sprinkler design involved a single 1,500 gallon dry pipe system constructed of schedule 10 galvanized steel piping. During 2011 after 5 years in service, corrosion related leaks began to occur in the main lines under trapped pools of water in the piping. Many of the leaks occurred on the weld seams.

Several pipe samples were collected and analyzed to determine the root cause for the leaks. Under persistently moist, oxygenated conditions galvanized steel piping is very susceptible to oxygen corrosion with highly localized corrosion pits.

Dry Pipe Nitrogen Inerting (DPNI) – In October 2011 an **ECS PGEN-20 Nitrogen Generator** was installed to provide nitrogen pressure maintenance gas to the dry pipe system. All ECS nitrogen generators employ the patented “fill and purge” breathing technology to remove oxygen from the fire sprinkler piping and provide nitrogen gas for pressure maintenance.

Results – There has not been a recorded corrosion related leak within the store on the garden center dry pipe system. Previously, because of the increasing leak frequency within the piping it was often necessary to replace the pressure maintenance air compressor because of the need to run constantly to accommodate the leaking pipes. With no corrosion related leaks, there is no need for the **ECS PGEN-20 Nitrogen Generator** to run constantly. With proper maintenance it should last as long as the structure.

DPNI Case History No. 4 – High End Condominium Attic Space in Colorado

⇒ **No leaks for 6+ years**



**ECS PGEN-20 Skid-Mount
Nitrogen Generator**

Background – Because of the freezing risk associated with unconditioned attic spaces over residential structures, it is common to use dry pipe fire sprinkler systems to provide protection. In this case the black steel mains in the attic began leaking after 10 years of service. All of the leaks that occurred within the systems occurred under pools of trapped water in the main lines. In the case of dry pipe systems, the trip event associated with the leak often results in extensive water damage as large amounts of water can be delivered to the leak. If the leak and trip occur during sub-freezing temperatures, the trip event can cause catastrophic damage to the fire sprinkler system and the structure.

Dry Pipe Nitrogen Inerting (DPNI) – In July 2011 an **ECS PGEN-20 Nitrogen Generator** was installed to provide nitrogen pressure maintenance gas to the four (4) dry pipe systems servicing the condominium complex. All ECS nitrogen generators employ the patented “fill and purge” breathing technology to remove oxygen from the fire sprinkler piping and provide nitrogen gas for pressure maintenance.

Results – Oxygen corrosion cannot occur in trapped pools of water in the main piping under a nitrogen atmosphere. The ECS “fill and purge” breathing approach completely removes the oxygen from the piping and renders the system non-corrosive. There have been no recorded leaks in the system piping since the DPNI process was deployed.