NITROGEN GENERATORS FOR DRY PIPE SYSTEMS

EXAMINING N2 MIGRATION AND EFFICACY

MARK HOPKINS, P.E., FSFPE | SUMMIT FIRE CONSULTING

Nitrogen generators are intended to provide nitrogen with 98% purity to mitigate corrosion and provide supervisory gas to ensure fire sprinkler system piping integrity. This article discusses recently completed testing conducted to look at nitrogen migration in sprinkler systems. By examining different nitrogen purge methods and their outcomes, the study offers new insights into the practical performance of these systems and informs on common methods in corrosion control strategies.

BACKGROUND

At this point, most people in the fire protection industry have seen the corrosion triangle presented, and it has been compared to the fire triangle, which makes sense given that both fire and corrosion are oxidation-reduction or re-dox reactions. In general, we understand and easily recognize that corrosion naturally occurs when metal, air (oxygen), and water exist together. Corrosion exists in dry pipe and preaction sprinkler systems primarily due to this simple relationship.

System design and material selections have changed, resulting in trapped water in almost every system. Residual water from hydrostatic testing often cannot be entirely drained and can remain in system piping. Additionally, water vapor (humidity) is carried into the system through the air supply, which condenses in the piping. Both are regular culprits. Corrosion in sprinkler systems is inevitable; it's natural, and it's basic science.

The idea of using nitrogen or some other inert gas to supervise the integrity of sprinkler systems is not a novel concept. The use of nitrogen as a supervisory gas for sprinkler systems has become well-established and broadly an accepted practice throughout the sprinkler industry. This was not always the case; its widely accepted use was met with initial skepticism.

Bottled nitrogen had been introduced to the sprinkler industry in the 1970s. However, its use was somewhat limited and selectively applied, largely influenced by cost and practicality considerations. Air compressors and plant air supplies remained the workhorses for providing supervisory air (gas) in dry pipe and preaction sprinkler systems, and for the most part, still do serve this purpose.

While working on the development of a corrosion investigation and mitigation protocol for a statewide agency in the mid-2000s, a proposal was made for the use of bottled nitrogen as the standardized supervisory gas for all new dry pipe and preaction systems and those requiring remediation. This proposal was met with strong opposition by many of the stakeholders involved. There were rumblings about the availability of nitrogen bottles, the inability to get deliveries when needed, and the cost of its use. Many roadblocks were identified, and few solutions were offered in return. As a result, best practice recommendations were proposed, which included the use of air dryers with bottled nitrogen proposed as an alternative option.[1] Ironically, some of the people voicing the biggest opposition were later involved in producing nitrogen generators a short time later.

NITROGEN GENERATORS IN FIRE PROTECTION

Nitrogen generators entered the fire sprinkler industry approximately 15 years ago. These first-generation systems were installed as approved alternatives to conventional air supplies, with the equipment being installed using the "new technology" provision of NFPA 13, *Standard for the Installation of Sprinkler Systems*,[2] since there were no listing standards

> ## **HIGHER** STANDARDS NOTE
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> For May/June issue of *Sprinkler Age*, the "Higher Standards" column written by AFSA Senior Manager of Engineering & Technical Services Kevin Hall, M.Eng, P.E., ET, CWBSP, PMSFPE, typically serves as a voting guide for the certified amending motions (CAMs) being debated at the NFPA Technical Meeting in June. Due to posting dates set by NFPA, the CAMs were not available at the time of publication. AFSA will still be supplying a voting guide, so visit its booth (#1028) in the NFPA Expo Hall for a copy. Instead of the voting guide, this issue's column space has been given to guest author Mark Hopkins, P.E., FSFPE, who walks us through some new research that will challenge current allowances in NFPA 13 and might necessitate a tentative interim amendment (TIA) to modify when the C Value of 120 can be used in systems using nitrogen. ■

Figure 1. Nitrogen purity observed near ambient levels.

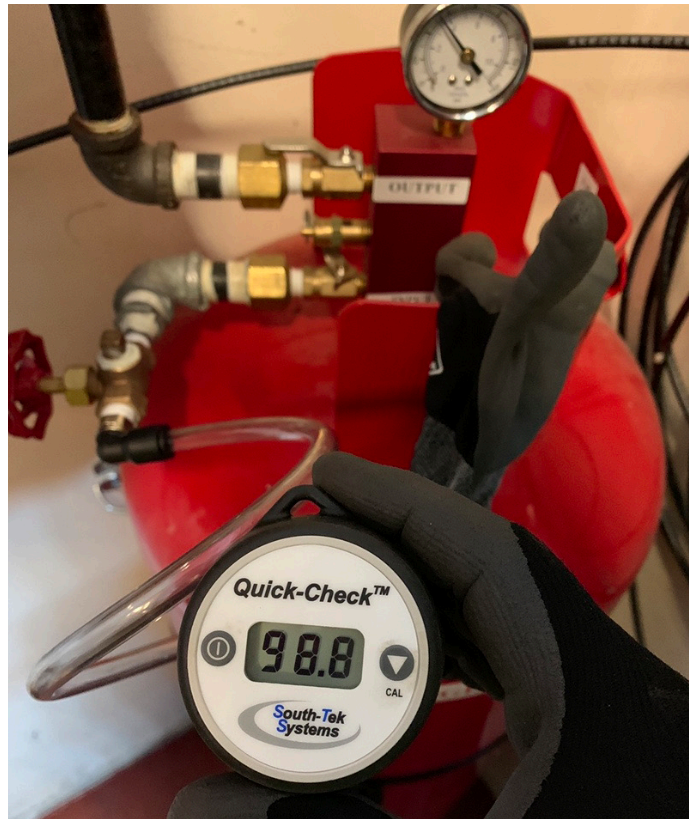


Figure 2. Nitrogen purity at the generator.

available. The new technology section is found in NFPA 13 (2022 edition), section 1.7. In essence, the nitrogen generations were considered a type of air compressor.

The initial information that circulated through the sprinkler industry regarding the use of nitrogen generators referenced 95% purity (fpsCMI, 2008). Most subsequent literature now references 98% purity. The appeal of nitrogen relates to its ability to slow the rate of corrosion. Some argue that it "stops corrosion," but it is, in my humble opinion, misleading and more appropriately characterized as slowing corrosion to a negligible rate. Corrosion will persist whether 98% or 95% nitrogen purity is targeted. The big difference being that rates of corrosion are drastically different based on the purity. The corrosion rate for 98% purity provides meaningful life expectancy predictions for sprinkler systems, while the use of nitrogen at 95% purity provides a marginal increase beyond the use of compressed air.

The first test standard for nitrogen generators used in fire protection systems was developed by FM Global from 2012 through 2014, with the Approval Standard 1035, Nitrogen Generators, being issued in December 2014. David Fuller of FM Global identified that the need for its development stemmed from clients using nitrogen generators [(FM Global, 2014)]. Fuller also noted that bottled nitrogen or plant-supplied nitrogen had been a suggested supervisory gas for dry pipe and preaction sprinkler systems since 2001 (FM Global, 2001).

Nitrogen generators use compressed air and force it through a membrane to separate and dispel oxygen and retain nitrogen. Because the process is slow and will not meet NFPA 13 fill time requirements, nitrogen generators include a traditional air compressor to meet fill time requirements and replenish with nitrogen over a short period afterwards. There are several different methods used for nitrogen generation and purging.

In the 2022 edition of NFPA 13, the use of nitrogen generation at 98% purity was determined to provide sufficient corrosion control to permit the use of a Hazen-Williams C-Value of 120 to be used in hydraulic calculations as part of the design of dry pipe and preaction systems. This has drawn attention to the use of nitrogen generators, especially given the hydraulic advantage this provides over air compressors.

The use of nitrogen generators has not been a smooth ride for everyone. Contractors, engineers, and owners have identified a variety of issues with nitrogen generation systems. Some installations have been successful, and corrosion is appropriately managed. However, in other instances, corrosion develops (in new systems) or persists (in existing systems). In any regard, it has not been a path filled with sunshine and roses.

There has been anecdotal feedback from owners and maintenance contractors that nitrogen generation systems are not the panacea that was promised. It has been identified that some systems cannot achieve 98% purity, ever. Some systems have even indicated ambient or near ambient levels of nitrogen (78.5-80%). Figure 1 shows nitrogen readings at approximately ambient levels. Nitrogen purity was measured at 98.8% at the nitrogen generator, as shown in Figure 2. There is no bias towards South-Tek Systems. These photos were provided by a maintenance contractor who

Figure 3. The nitrogen efficacy test rig.

indicated that there were similar findings with equipment produced by other manufacturers as well.

As an industry, we are left answering questions like: What is going on with these systems? Is nitrogen ever reaching 98% purity throughout a sprinkler system? What is acceptable performance for these systems? Are these experiences the exception or the rule? But, to answer these questions and the myriad other questions relating to nitrogen system performance and its ability to mitigate corrosion, insight into the performance of these systems was needed.

NITROGEN (N_2) EFFICACY TESTING

To this end, Summit Fire Consulting and TERPconsulting conducted a series of nitrogen efficacy tests in conjunction with General Air Products, Inc. (GAP) at their facility in Exton, Pa. Over the course of the past year or so, three consecutive long-term tests were conducted to look at migration of nitrogen in sprinkler systems and the effect of different purge methods. The questions relating to whether the purge valve must be located at the riser or remotely in the system, whether a nitrogen reserve (reservoir) tank is needed, and is 98% nitrogen achieved throughout the systems in two weeks (or six weeks) as claimed, have been circulating through the industry for over the past decade at minimum. The purpose of this nitrogen efficacy testing was intended to begin answering some of these questions.

THE TEST RIG

GAP had previously conducted nitrogen efficacy tests to look at the performance of the equipment that they manufacture and how it compares to the new Vapor Pipe Shield product. A 1,000-gallon test rig was built in the GAP research and development (R&D) area to examine how vapor phase corrosion inhibitors can move through sprinkler systems. The test rig was configured in a modular arrangement to allow testing of 1,000-gallon, 500-gallon, or 250-gallon dry pipe sprinkler system arrangements. Figure 3 shows the test rig in the GAP R&D space.

To limit the amount of space needed in the R&D area, the system piping had to be configured in a manner to minimize its overall footprint, allow for test measurements to be made throughout, incorporate different pipe diameters, and control specific variables such as leak rate. The test rig is split into two halves, referred to as the serpentine and the ladder systems, which are intended to simulate different system configurations that are actually used in the field. As shown in Figure 3, the test rig has an aisle in the center to allow for access to the equipment and test ports.

The test rig is illustrated in elevation view in Figure 4, showing the two 500-gallon sub systems referred to as the ladder side and the serpentine side along with the interconnecting bridge pipe spanning the center aisle.

The 500-gallon “serpentine” system was used for these nitrogen efficacy tests. It represents a tree system with a single-centered cross main and distributed branch lines. The 500-gallon system size was selected since it aptly represents the majority of dry pipe and preaction sprinkler systems actually designed and installed. Most systems are 500 gallons or less in volume. There are others that are much larger than this, but these are not the norm.

This system was comprised of schedule 10, black steel, roll-grooved pipe, consisting of 4, 3, 2, 1.5, and 1-in. diameter pipe sections. It has a series of piping levels labeled A through H. Each level includes a series of test ports to allow for the sampling of nitrogen through the entire test rig and allow for insight into the migration of nitrogen over time. Each test port has a discrete alpha-numeric designation representing its location in the system (e.g., S-A-4: Serpentine Port A 4).

Figure 5 provides an example of test port locations distributed throughout one of the levels in the serpentine sub-system. This represents level C which includes eight sample ports at intermediate (1, 3, 5 and 7) and end of line (2, 4, 6, and 8) locations.

TEST PROTOCOL AND PURPOSE

The first step was the development of a test protocol for the testing. The purpose of the testing was to evaluate the 98% N_2 saturation and propagation effectiveness of the different purge methods in the mock sprinkler system. This took several months and multiple iterations to complete. The initial plan was to look at two system purge configurations (“standard” and “breathable”), but the final plan included tests to evaluate the three main system purge configurations as follows:

- Test 1 – Standard Purge
- Test 2 – Breathable (a.k.a. “breath and purge” or “fill and purge”)
- Test 3 – Continuous Purge

The actual testing took approximately eight months to complete, with each individual test lasting eight weeks. Nitrogen readings were made either every week (Tests 2 and 3) or every other week (Test 1), beginning two weeks after the start of testing and ending at week eight.

Test 1 – Standard Purge Method This method of purging uses a remotely located purge valve (vent), which has an orifice to automatically bleed oxygen and residual moisture from the

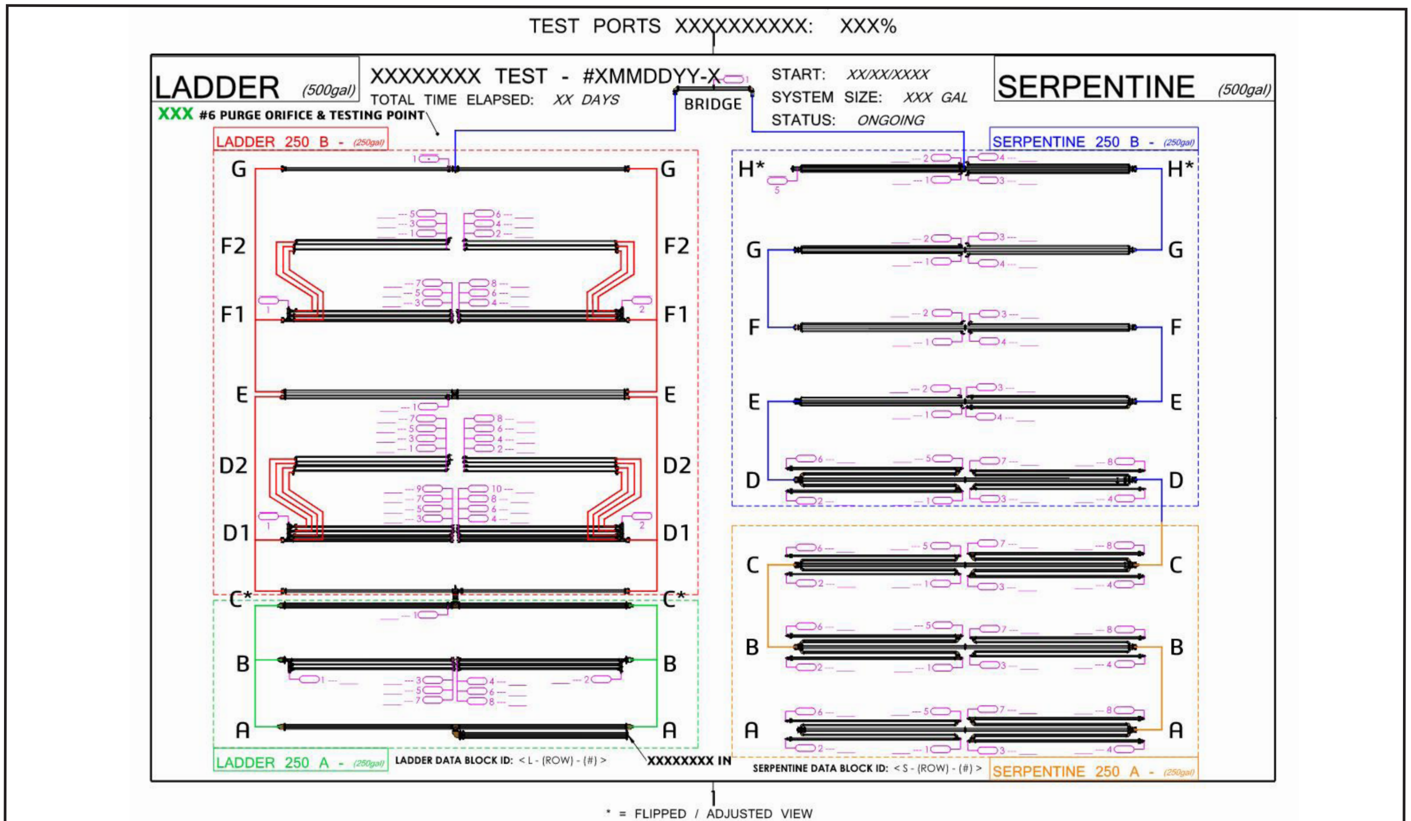


Figure 4. Illustrative representation of the 1,000-gallon test rig.

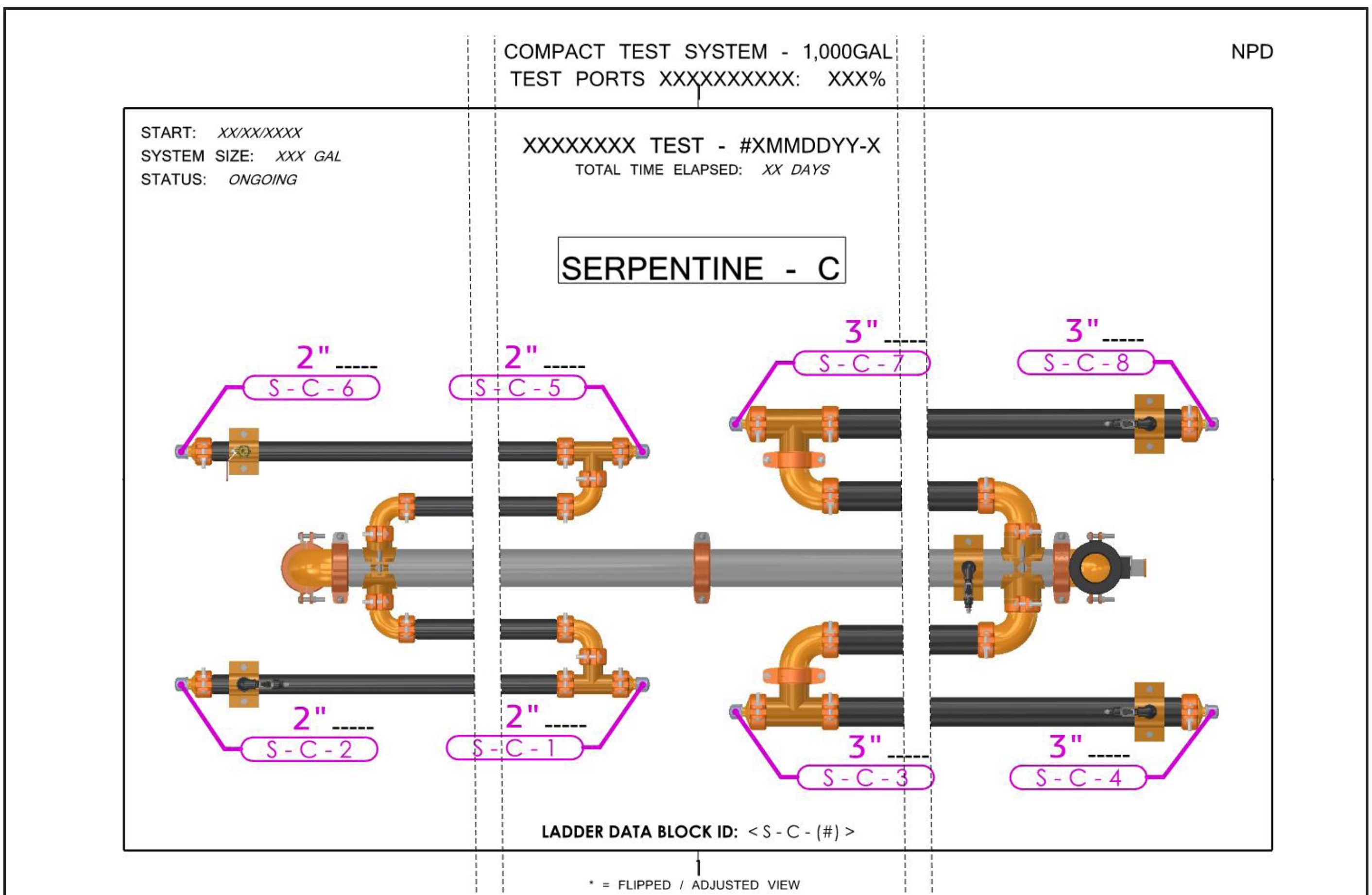


Figure 5. Serpentine system level C test ports.

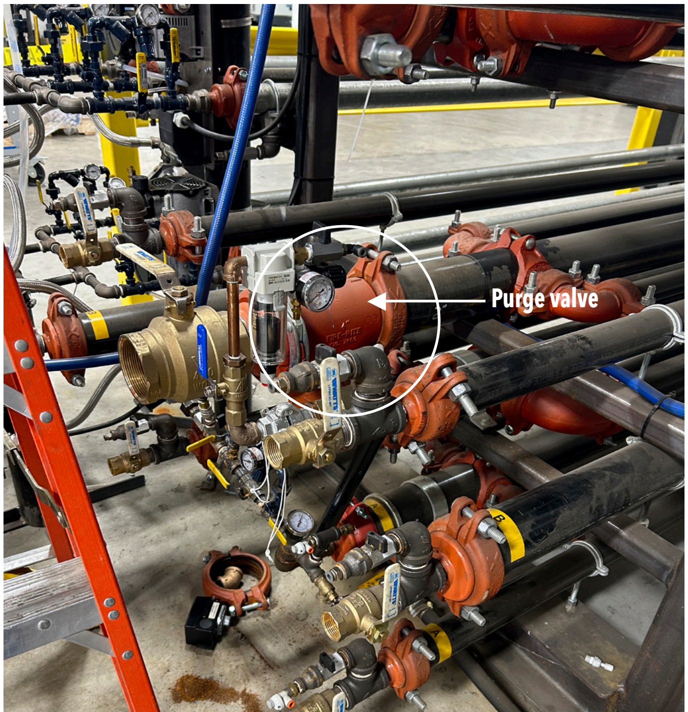


Figure 6. Breathable purge valve for Test 2.

Figure 7. Continuous purge valve for Test 3.

system while the nitrogen generator is in operation. The purge valve is opened and remains operational for two weeks after the system has been pressurized and switched to nitrogen mode. This valve is designed to maintain system pressure while operating and distributing nitrogen to the system. The design also includes a float valve to allow for automatic closing if the dry pipe or preaction valve trips and the purge valve is left open. The purge valve also incorporates a sampling port to allow for the attachment of a portable nitrogen analyzer if the system does not incorporate a feature for automatic measurement (auto purge valve). For the purposes of this testing, the purge valve was located at the bridge sample port at the end of the system.

Some manufacturers using the standard purge method have claimed that a minimum nitrogen concentration of 98% will be

Figure 8. Nitrogen generator used for testing.

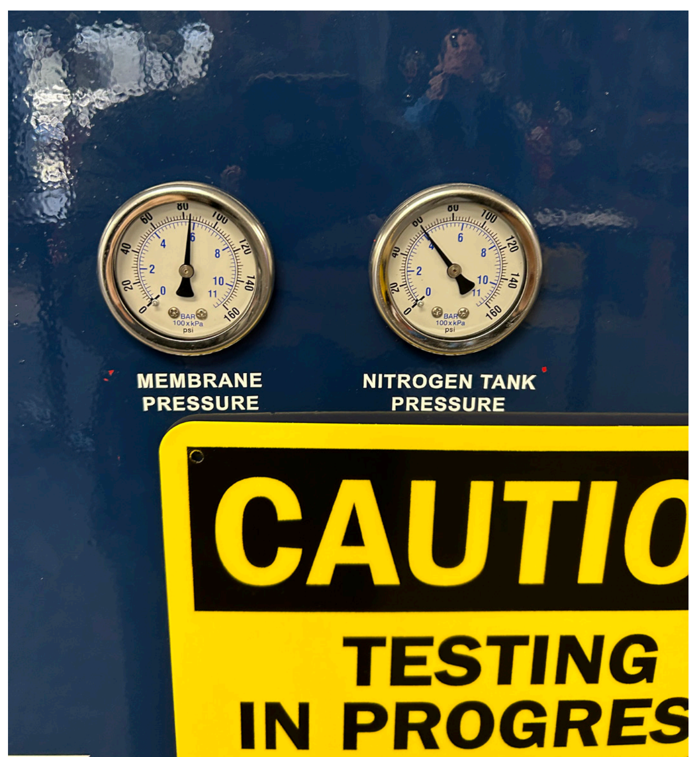


Figure 9. Nitrogen tank pressure at 60 psi.

achieved after two weeks. This was not found to be the case through this testing.

Test 2 – Breathable Purge Method This method of purging uses a process referred to as "breathe and purge" or "fill and purge breathing," requiring "small" fluctuations in the supervisory pressure of approximately three to five (3-5) psi. The manufacturer using this approach recommends locating the purge at the beginning of the system near the riser unless otherwise defined in the engineering design drawings. A backpressure regulator is used to prevent complete system depressurization. Similar to the other purge valves, the breathable purge vent is equipped with a levered float valve to prevent the passage of water through the vent if the dry pipe or preaction valve trips. A small orifice allows for oxygen to be purged from the system to achieve a minimum of 98% nitrogen purity.

The breathe and purge process operates over the first 14 days, with the system pressure fluctuating between the high- and low-end breathing pressures. The purge valve for the breathable purge test was located near the air maintenance device at the system supply on level A of the test rig. Figure 6 shows the purge valve used for Test 2.

The manufacturer using this method of purging has made claims that venting in this manner will result in 98%+ nitrogen concentration or nearly complete removal of oxygen (<2% remaining) from the sprinkler system over a short period of time, typically less than two weeks (14 days). This was also not found to be the case through this testing.

Test 3 – Continuous Purge Method This method of purging is similar to the standard purge method in regard to having the purge valve remotely located in the system. The difference in this method is that the purge valve has an adjustable flow control and letter designations to set a small continuous purge flow while in operation. The flow is determined based on the system volume, in this case 500 gallons. The purge automatically bleeds oxygen and residual moisture from the system while the nitrogen generator is in operation. The purge valve is opened and remains operational for two weeks after the system has been pressurized and switched to nitrogen mode.

This purge valve is designed to maintain system pressure while operating and distributing nitrogen to the system. The design also includes a float valve to allow for automatic closing if the dry pipe or preaction valve trips and the purge valve is left open. The purge valve also incorporates a sampling port to allow for the attachment of a portable nitrogen analyzer if the system does not incorporate a feature for automatic measurement (auto purge valve). For this test, the purge valve was located at the bridge sample port at the end of the serpentine sub-system. Figure 7 shows the purge valve for Test 3.

The manufacturer using the continuous purge method has claimed that a minimum nitrogen concentration of 98% will be achieved in approximately six weeks. This is longer than the other claims and appears to be closer to actual system performance. However, 98% nitrogen purity was not actually achieved using this purge method.

Figure 10. Nitrogen purity at 99.2%.

THE NITROGEN SUPPLY

The nitrogen generator used for these tests was the NGP-1000D-M3 with a 30-gallon N_2 reserve tank. This generator has both an air reserve tank and a nitrogen reserve tank. It has a maintenance capacity of 6,500 gallons and a fill capacity of 925 gallons at 40 psi. Figure 8 shows the nitrogen generator used for the testing.

The generator was set up to have a pressure of approximately 60 psi in the nitrogen tank, and the air maintenance device was set to provide a pressure of 40 psi to the system. Figure 9 shows a pressure of 60 psi in the nitrogen tank for the tests. It also shows a nitrogen membrane pressure of approximately 80 psi.

The nitrogen generator was connected to the test rig through a 30-ft long $^1/_2$-in. hose and an air maintenance device (AMD) calibrated to 40 psig.

The nitrogen purity was set at approximately 99.2 to 99.5% to provide the maximum possible opportunity for achieving 98% purity throughout the duration of all tests. Figure 10 shows a nitrogen purity of 99.2% measured at the supply.

THE RESULTS

After the system was set up and configured in nitrogen mode, it was left alone for two weeks. A technician and an engineer met each morning to observe and log the test rig pressure, the nitrogen pressure, and purity at the generator.

Test 1 – Standard Purge Method A summary of the results for Test 1, Standard Purge Method, is provided in Table 1. The standard purge method achieved an average nitrogen purity of approximately 93.5% after two weeks and an average nitrogen purity of approximately 97.3% after eight weeks.

	2 weeks		8 weeks	
N2 Generator	98.5%		99.3%	
Purge	98.7%		98.4%	
Inlet	99.4%		99.3%	
	N_2 Purity	Test Port	N_2 Purity	Test Port
A Level	98.1%	A2	96.6%	A6
B Level	98.2%	B6	97.4%	B3
C Level	97.1%	C1	98.1%	C4
D Level	90.4%	D3	96.3%	D8
E Level	98.1%	E4	96.6%	E1
F Level	82.9%	F4	98.8%	F2
G Level	92.3%	G4	95.9%	G1
H Level	91.0%	H4	98.6%	H2
High	98.2%		98.8%	
Average	93.5%		97.3%	
Low	82.9%		95.9%	

Table 1. Standard purge method results at two and eight weeks.

	2 weeks		8 weeks	
N2 Generator	98.5%		99.2%	
Purge	98.3%		99.1%	
Inlet	97.3%		99.1%	
	N_2 Purity	Test Port	N_2 Purity	Test Port
A Level	89.4%	A2	97.5%	A7
B Level	87.5%	B6	96.6%	B5
C Level	85.7%	C1	92.9%	C2
D Level	82.6%	D3	91.1%	D4
E Level	79.3%	E4	87.8%	E1
F Level	79.1%	F4	84.8%	F3
G Level	79.2%	G4	83.8%	G3
H Level	79.2%	H4	80.8%	H1
High	89.4%		97.5%	
Average	82.8%		89.4%	
Low	79.1%		80.8%	

Table 2. Breathable purge method results at two and eight weeks.

Test 2 – Breathable Purge Method A summary table of the results for Test 2 is provided in Table 2. The breathable purge method achieved an average nitrogen purity of approximately 82.8% after two weeks and an average nitrogen purity of approximately 89.4% after eight weeks.

Test 3 – Continuous Purge Method A summary table of the results for Test 3 is provided in Table 3. The continuous purge method achieved an average nitrogen purity of approximately 86.3% after two weeks and an average nitrogen purity of approximately 97.3% after eight weeks.

Comparison of Results Figure 9 shows a comparison of the average nitrogen purity levels for each of the purge methods after two weeks. The comparison of test results after two weeks demonstrates that the standard purge method provides the best initial performance. The continuous purge method provides moderate initial performance. However, the breathable purge only provides minimal benefit after two weeks.

Figure 10 shows a comparison of the average nitrogen purity levels for each of the purge methods after eight weeks.

The results of the tests show that both the standard purge and continuous purge methods achieve an average nitrogen purity of approximately 97.3% after eight weeks. However, the breathable purge method only achieved an average nitrogen purity of approximately 89.4% after eight weeks.

N2 Generator	99.3%		99.3%	
Purge	84.6%		99.0%	
Inlet	94.4%		99.2%	
	N_2 Purity	Test Port	N_2 Purity	Test Port
A Level	87.6%	A2	97.3%	A7
B Level	86.7%	B6	98.7%	B5
C Level	87.5%	C1	95.8%	C2
D Level	86.3%	D3	95.4%	D4
E Level	86.0%	E3	98.1%	E4
F Level	85.7%	F4	99.0%	F2
G Level	85.4%	G3	95.0%	G1
H Level	85.1%	H3	98.9%	H4
High	87.6%		99.0%	
Average	86.3%		97.3%	
Low	85.1%		95.0%	

Table 3. Continuous purge method results at two and eight weeks.

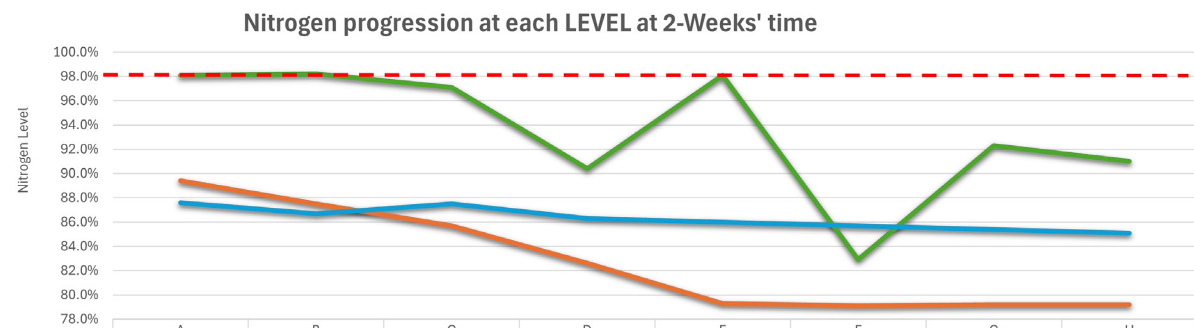
Purely looking at the purge valve port measurements after two weeks, both the standard purge and breathable purge methods provide 98+% nitrogen purity measurements. All three methods achieve 98+% nitrogen purity at the purge valve test port after five weeks. However, there is a disconnect between the actual performance of the systems as a whole from simply measuring nitrogen purity at the purge valve test port and claiming the system is achieving the same level of nitrogen purity throughout the system.

Fick's Laws of Diffusion establishes that nitrogen (any gas) will move from areas of high concentration to areas of low concentration. The testing shows that this holds true but how long it takes for nitrogen to reach all areas of the systems is the real question.

Nitrogen follows the path of least resistance between the system fill and the purge valve. If the purge valve is located remotely, nitrogen with 98% purity is established along the path from the fill through the main to the remotely located purge valve. However, the branch lines are left sitting at lower levels of nitrogen purity for extended periods of time (e.g., nitrogen percentages in the 80s and low 90s). This was demonstrated through Tests 1 and 3. This is also why purging at the beginning of the system is a problem; 98% purity is reached along the path of least resistance between the fill and the purge valve locations, but nitrogen migration throughout the rest of the system takes much longer, as demonstrated in Test 2. In some parts of the system, the nitrogen purity was marginally above ambient level after eight weeks.

SUMMARY

In no way, shape, or form does this testing answer every question, but it provides insight into the performance of nitrogen systems, which purge configurations perform better



	A	B	C	D	E	F	G	H
Standard Purge Efficacy Test 1	98.1%	98.2%	97.1%	90.4%	98.1%	82.9%	92.3%	91.0%
Breathable Purge Efficacy Test 2	89.4%	87.5%	85.7%	82.6%	79.3%	79.1%	79.2%	79.2%
Continuous Purge Efficacy Test 3	87.6%	86.7%	87.5%	86.3%	86.0%	85.7%	85.4%	85.1%

System Level

Figure 11. Comparison of nitrogen purity levels after two weeks.

than others, and whether 98% is being achieved throughout the systems, not just at the point of purge.

There is credibility to locating the purge valve remotely in the system. The results for the tests using the standard and continuous purge methods demonstrate that there is a benefit over having the purge near the system riser using the breathable purge method.

Where do we go from here? A full test report documenting these tests is currently in development and will be available in the next couple of months. Additional articles relating to this testing will be prepared and issued to call attention to the important findings observed through this testing. There is discussion of conducting additional tests to look at how long it actually takes to reach 98% nitrogen purity levels throughout the entire system. ■

FOOTNOTES:

[1] Recommendations also included the use of schedule 40 black steel pipe with cut grooves, the recommendation for back pitching all dry pipe preaction system piping regardless of the potential for freezing, the installation of low point drains with enforcement of periodic draining, and others.

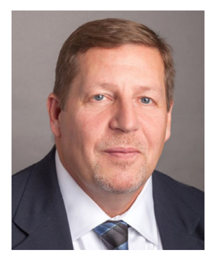
[2] The New Technology section was added to the 2002 edition of NFPA 13, *Standard for the Installation of Sprinkler Systems.*

BIBLIOGRAPHY:

FM Global. (2001). FM Global Property Loss Prevention Data Sheet 2-1. Prevention and Control of Internal Corrosion in Automatic Sprinkler Systems. Norwood, MA, USA: FM Global.

FM Global. (2014). Nitrogen Generator Standard Nears Completion. Approved Product News, 30(2), 12-15.

fpsCMI. (2008). White Paper. Using Nitrogen Gas in Dry and Preaction Fire Sprinkler Systems. St. Louis, MO, USA: Fire Protection Systems Corrosion Management, Inc. (fpsCMI).



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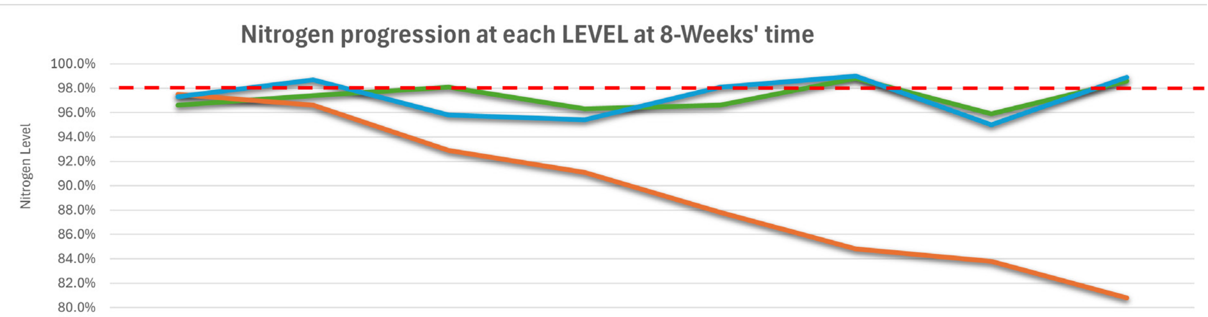

	A	B	C	D	E	F	G	H
Standard Purge Efficacy Test 1	96.6%	97.4%	98.1%	96.3%	96.6%	98.8%	95.9%	98.6%
Breathable Purge Efficacy Test 2	97.5%	96.6%	92.9%	91.1%	87.8%	84.8%	83.8%	80.8%
Continuous Purge Efficacy Test 3	97.3%	98.7%	95.8%	95.4%	98.1%	99.0%	95.0%	98.9%

System Level

Figure 12. Comparison of nitrogen purity levels after eight weeks.

VAPOR Pipe Shield

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VAPOR Pipe Shield

Simplifying corrosion prevention in dry & pre-action fire sprinkler systems.

For use under Patent No. US 11,371,643 B2

Model Number	30 Min. Fill Capacity (Single System or Largest Riser)	Total System Capacity (Up to 4 Risers)	Inlet / Outlet Connections	Max Pressure	Dimensions (in)			Unit Weight (lbs)
					L	W	H	
VPS-500A	500 gal.	2000 gal.	½" FNPT	150 PSI	26	6.5	20.25	20
VPS-1000A	1000 gal.	4000 gal.	½" FNPT	150 PSI	26	6.5	28.25	26
VPS-1500A	1500 gal.	6000 gal.	½" FNPT	150 PSI	26	6.5	36.25	32
VPS-2000A	2000 gal.	8000 gal.	½" FNPT	150 PSI	26	6.5	44.25	38

Minimum Temperature: 40°F. / Maximum Temperature: 150°F.

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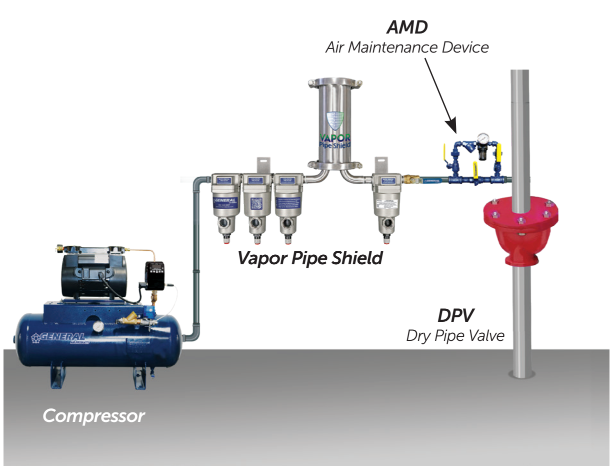
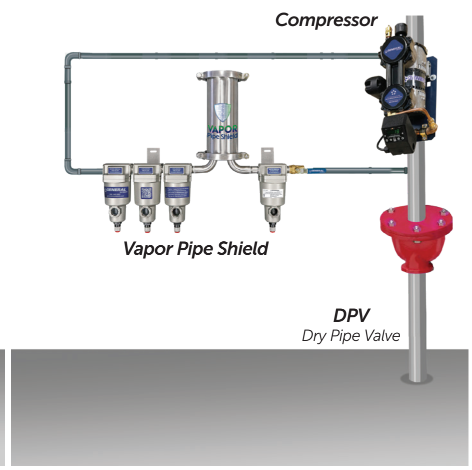
- No Purge Required

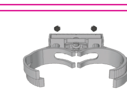




Included with Every Vapor Pipe Shield Unit

Fully Assembled Vapor Pipe Shield Unit

VpCI® Cartridge(s) and Filters pre-installed



Wall Mounting Upper Clamp

Vapor Indicator Test Port (Testing Optional)

Two (2) Vapor Indicator Tests (VITs) (Testing Optional)

30" Stainless Steel Braided Flex Hose & 1/2" NPT Union