



Quality Petroleum Equipment
Solutions For Over 30 Years

Environmental Corrosion Control System

NBS - Nitrogen Blanketing System

2016 Component Function and Operating Principals

The **NBS** system is designed to prevent the formation of corrosive, damaging atmospheres in retail and commercial fuel storage tanks. The system is an intrinsically safe Environmental Corrosion Control method that inhibits or prevents the growth of bacteria, molds and yeasts that may occur in the ullage of tanks and produce acidic deposits that cause serious damage and failures to tank equipment.

Typically, retail tanks store routine and custom blends of diesel and biodiesel, gasoline and ethanol, and other commercial liquid hydrocarbon fuels. Additionally, these tanks are usually 50,000 gallon capacity or less, low pressure, and may be installed above or below ground.

Nitrogen gas blanketing of the headspace of tanks has proven to have many benefits. One such benefit is how the **NBS** changes the tank's environment to prevent the conditions that provide water for germination and oxygen for respiration for colonies to grow. Eliminating water and oxygen prevents serious damage that has led to failure of fuel storage containment boundaries – leaking primaries.

API 2000 6th and 7th Editions address environmental corrosion control for large fuel tanks. These protocols are in proven use at refineries, bulk fuel storage facilities, bulk fuel transfer terminals and airports worldwide. The consensus of a group of state regulators, fueling system component manufacturers, and operators of retail and commercial fueling sites is that the conditions causing corrosion damage to fueling system components in retail market fuel storage equipment can best be addressed by adapting API environmental corrosion control (API 2000 6th and 7th editions) protocols. These adapted protocols should be one part of a comprehensive program that seeks to identify corrosive environments and prevent or stop damage to retail fueling equipment.

Other benefits of inerting fuel tanks with nitrogen include:

Reducing or eliminating the Risk Hazards identified in the CRC* Project No. CM-138-12-1

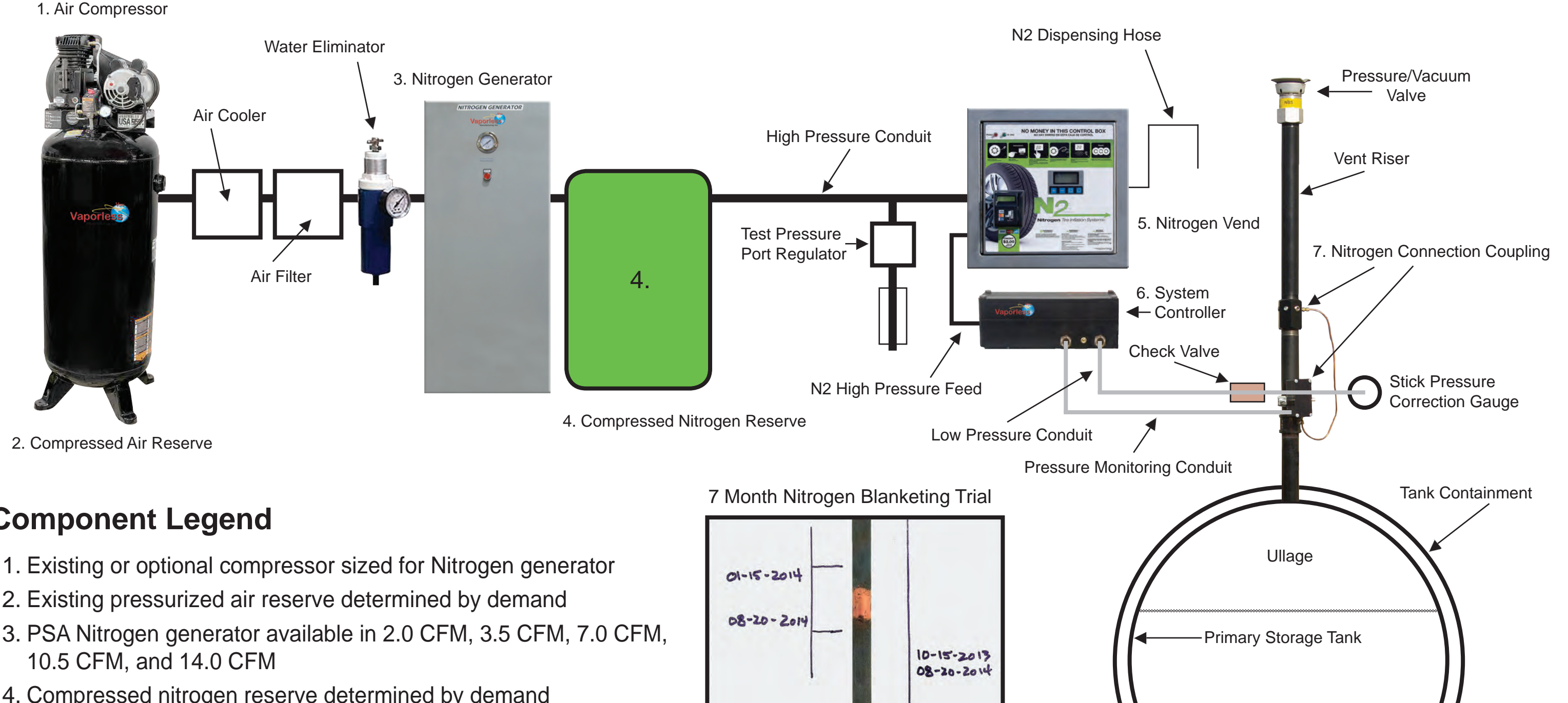
- Ignition of Vent Stack Vapors both into the headspace of the tank and those that could occur on the forecourt as the Stage 1 vapor recovery is overwhelmed, not functioning correctly, or not functioning at all.
- Direct ignition by electrical malfunction or manual tank gauging static discharge.
- Nozzle fire flashback into the fuel tank headspace.

One other known benefit is the reduced loss of product as nitrogen is vented out of the tank, rather than fuel vapors. The reduction of lost fuel is, in fact, gained product. We will be working to quantify this as per throughput.

* Coordinating Research Council



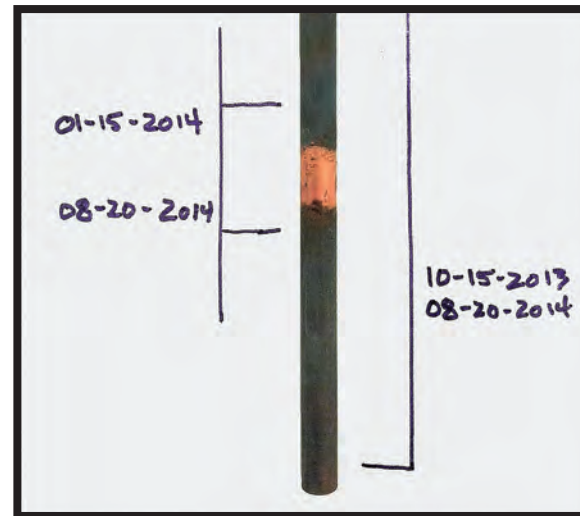
Vmi Nitrogen Blanketing System 2016



Component Legend

1. Existing or optional compressor sized for Nitrogen generator
2. Existing pressurized air reserve determined by demand
3. PSA Nitrogen generator available in 2.0 CFM, 3.5 CFM, 7.0 CFM, 10.5 CFM, and 14.0 CFM
4. Compressed nitrogen reserve determined by demand
5. Nitrogen vending option with or without revenue stream
6. Controller system CPU - N2 tank blanketing pressure regulator
7. Nitrogen connection manifold

7 Month Nitrogen Blanketing Trial



10/15/13: Copper coupon (with wrapped section) installed in ULSD tank.
 01/15/14: Wrapping removed. Start of Nitrogen Blanketing.
 08/20/14: Copper coupon removed from tank.

MINIMAL CORROSION OVER 7+ MONTHS TO UNWRAPPED SECTION OF COPPER COUPON!!!

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1. Air compressor produces the pressurized air needed for the nitrogen generator.
2. The compressed air reserve tank reduces the need for the air compressor to run continuously, saving electricity.
Compressed air from the compressed air reserve tank is cooled and filtered prior to use with the nitrogen generator.
3. Nitrogen generator(s) functions to separate nitrogen under pressure from atmosphere.
Compressed nitrogen generated by the nitrogen generator is on demand or continuous to maintain a volume of compressed nitrogen at a set and determined pressure in the nitrogen reserve storage tank
4. The pressurized nitrogen reserve tank's primary function is to hold a sufficient volume of inert nitrogen gas to continuously blanket, at a determined pressure, the empty spaces of associated fuel storage tanks.
The pressurized nitrogen reserve tank can also provide sufficient volumes of inert nitrogen gas to:
 - A. Continuously inert associated fuel storage tank interstitial spaces.
 - B. On a select or programmed schedule, leak test associated tank ullage or head space (C.A.R.B.TP-201, ST-27, ST-30, VMI-10).
 - C. Provide an adequate volume of sufficiently pure nitrogen for scheduled and unscheduled third party testing of associated or unassociated fuel storage tanks (C.A.R.B TP-201, ST-27, ST-30, VMI-10)
 - D. Provide adequate volumes at sufficient pressure to enable vending of nitrogen, allowing motorists to check and inflate tires with nitrogen (up to 80 PSI).
5. Nitrogen vending. Vending of excess inert nitrogen gas provides additional site retail or equipment reimbursement revenue streams.
6. The **NBS** Controller is responsible for detecting fuel movement and adding nitrogen to replace the fuel. The controller is also responsible for head space or ullage testing if testing is desired or required at the site. The controller gives notification if there is a failure of the nitrogen generator to deliver nitrogen.

