



VMI Manufacturing, LLC


**Quality Petroleum Equipment
Solutions for Over 36 Years**

**Line Leak Detection for Diesel
Power Generator (Genset) Systems**

Presenter: Gregory Young

2022 National Tanks Conference

Pittsburgh, PA 09/13/22



**A review of, and some additional
information on; The
Underground Storage Tank (UST)
Technical Compendium about the
2015 UST Regulation**



The UST Technical Compendium

The 2015 UST regulation removes the deferral for UST systems that store fuel solely for use by emergency power generators (emergency generator tanks)

<https://www.epa.gov/ust/release-detection-underground-storage-tanks-usts#pipe-rd>

Add to Your Reading List

- **Underground Storage Tank (UST) Technical Compendium about the 2015 UST Regulation**
- **Other Types Of Piping That Are Nonoperational Components**
- **Pressurized pipe visible inside a structure or outside is covered: Conditions That Must Be Met to use Visual Based Assessments as Your Release Detection Method**
- **Determining if Emergency Power Generator Systems Must Comply With Federal UST Regulation**

Really, read all.



Add to your reading list

There is no coverage here on Interstitial Monitoring as it applies to Gensets in this presentation. There is new guidance from EPA concerning Interstitial Monitoring / Line Leak Detection as it applies to Gensets. There are recent technology enhancements in Interstitial Monitoring EPA references. I am not current on these changes so this will require other supplementary reading.

J hq vhw#I x h o l q j

Wk hvh#ixholqj#v|vw hp #r rn#g li h u h q w#e x w#e d v l f d o o| #d u h#
w k h#v d p h#v|vw hp v#|r x#d u h#x v h g#w r 1##W k h| #d u h#h l w k h u#
v x f w l r q#r u#s u h v v x u h#v|vw hp v/#e r w k#|r x#d u h#s u r e d e o| #
d o u h d g| #i d p l o d u#z l w k 1##W k h u h#v#d#p d l q#w d q n#z l w k#d#
w d q n#j d j h/#s u r e d e o| #z l w k#d#s x p s#|r x#d u h#i d p l o d u#
z l w k/#x v x d o o| #s u h v v x u h 1##W k h u h#v#d#g l v s h q v h u#w k d w#
f d o o#i r u#i x h o/#r q o| #w#v#f d o o g#d#g d| #w d q n#r u#d#e r l o h u#
v|vw hp 1##

Wk h u h#k r x o g#e h#x p s#v h q v r u v#z k h u h#|r x#h{ s h f w#
w k h p /#d q g#d#w d q n#p r q l w r u#|r x#f d q#p d n h#|r x u#z d|#
d u r x q g 1##O l q h#d n#g h w h f w l r q#s h u i r u p v#d v#|r x#h{ s h f w#
e x w#z h#z l o o g l v f x v v#r p h#g l i h u h q f h v#d v#w k h|#k d y h#d#
g l i h u h q w#r s h u d w l q j#h q y l u r q p h q w/#h y h u|w k l q j#v#g r w#
x q g h u j u r x q g 1#

Obvaxth rth lfn thz h thz h v z

40 CFR § 280.44 Methods of Release Detection for Piping

“Each method of release detection for piping used to meet the requirements of 280.41 must be conducted in accordance with the following:”

Electronic Line Leak Detection (ELLD) Not Mechanical Line Leak Detection

- “Methods which alert the operator to the presence of a leak by restricting or shutting off the flow of regulated substances through piping or triggering an audible or visual alarm.”
- “detect leaks of 3 gallons per hour at 10 psi line pressure within one hour.”
- “An annual test of the operation of the leak detector must be conducted in accordance with the manufacturer’s requirements.” to meet federal / state requirements



ELLD

In addition to providing catastrophic line leak detection, ELLD can provide .2 gph testing

More on this to follow below



Line Leak Detection Designed for Gensets

- **Control the test environment**
 - **Monitor the underground pipe**
 - **Minimize exposed pipe to a secondary environment**
 - **Potential of creating vapor pockets**

More on this to follow



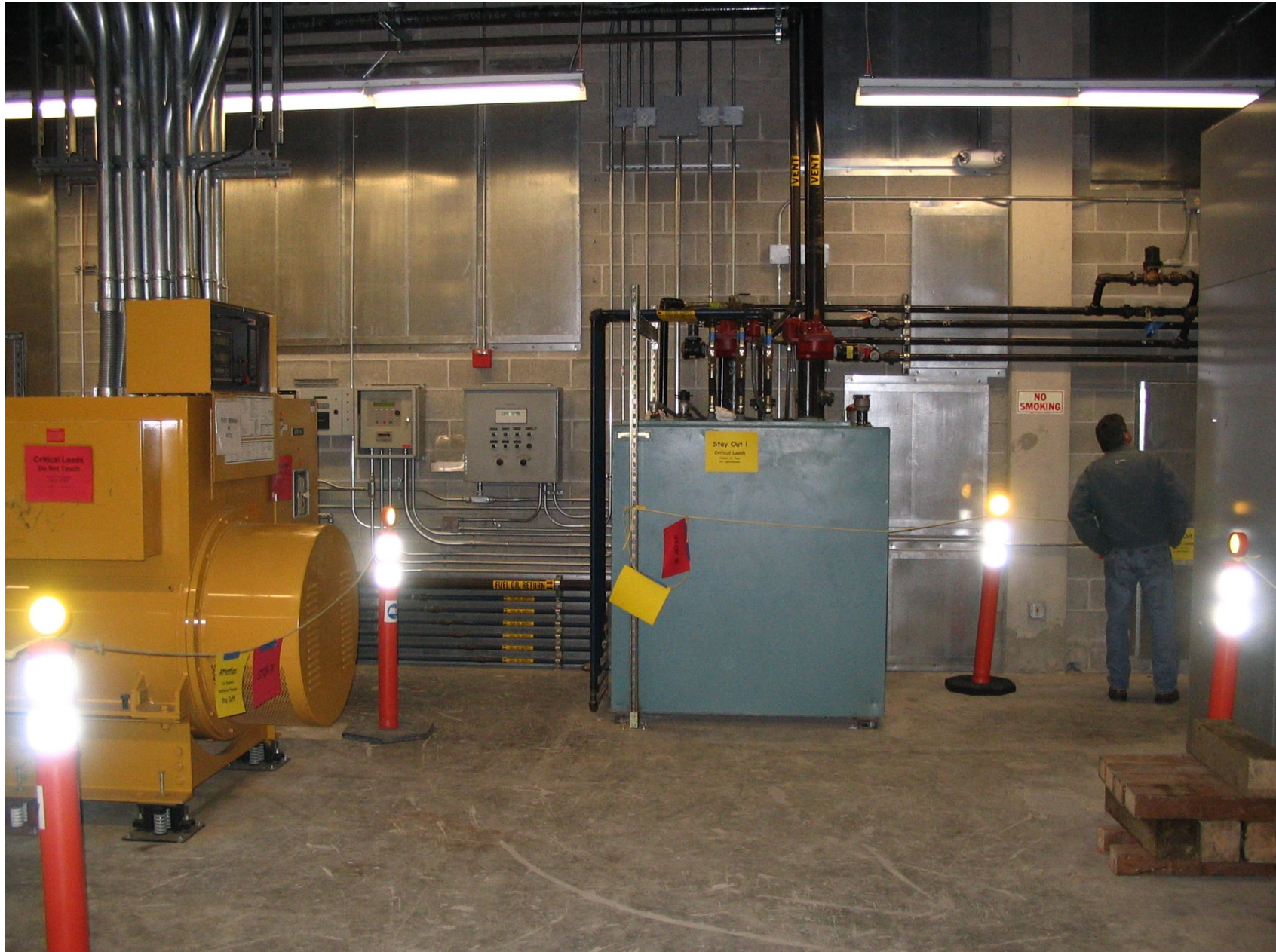
Line Leak Detection Designed for Gensets

“EPA strongly recommends owners and operators use an electronic line leak detector that can sound an alarm instead of restricting or shutting off flow of product to the day tank.”*

Discussion below

* **Underground Storage Tank (UST) Technical Compendium
about the 2015 UST Regulation**

A Day Tank





FUEL OIL SUPPLY

Stay Out !
Critical Loads
Contact CE Team
For Authorization







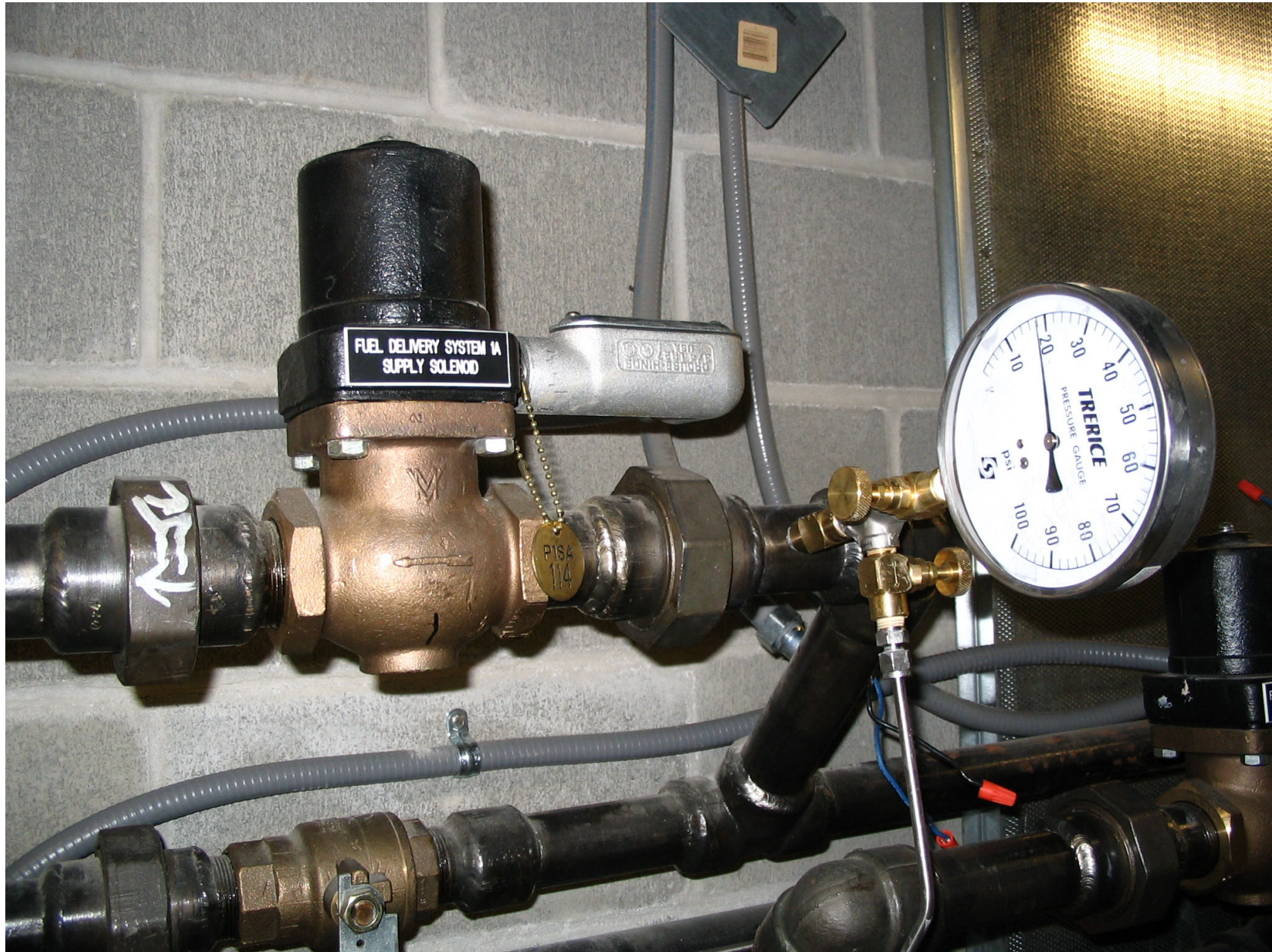
Generator







Solenoid Valve



Valves to Separate Underground Pipe from In-Building, Exposed Pipe

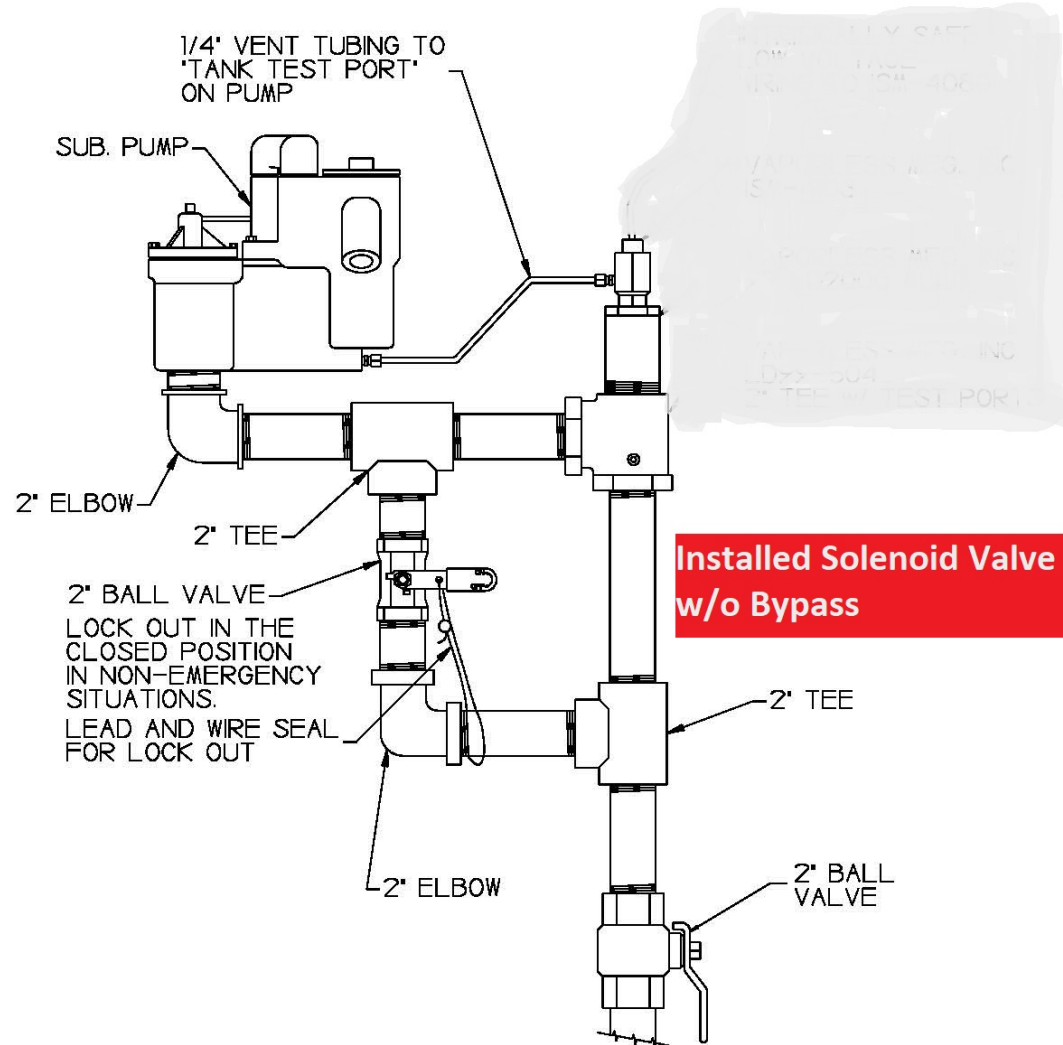
National Fire Protection Association (NFPA), in NFPA 110: Standard for Emergency and Standby Power Systems, section 7.9.13, indicates that “automatically actuated valves shall not be permitted in the fuel oil supply or fuel oil return lines for Level 1 emergency power supply systems” (all other systems have no such restriction).

Two options:

Solenoid valves that have a built in manual over-ride as above

Manual bypass shown below

LEAK DETECTOR MANUAL EMERGENCY BYPASS DETAIL



PLC-5000 Supplementary Component



Not an MLLD

This is a:

98LD-2000PLC

**2" STP Mounted
Check Valve**

PLC-5000 Main Components

- **Central Control Node (CCN)**
- **Pump & Control Valve**
 - Bypass / Off / Auto
- **Indicator Lights**
 - Run & Alarm Lights



PLC-5000 Main Components

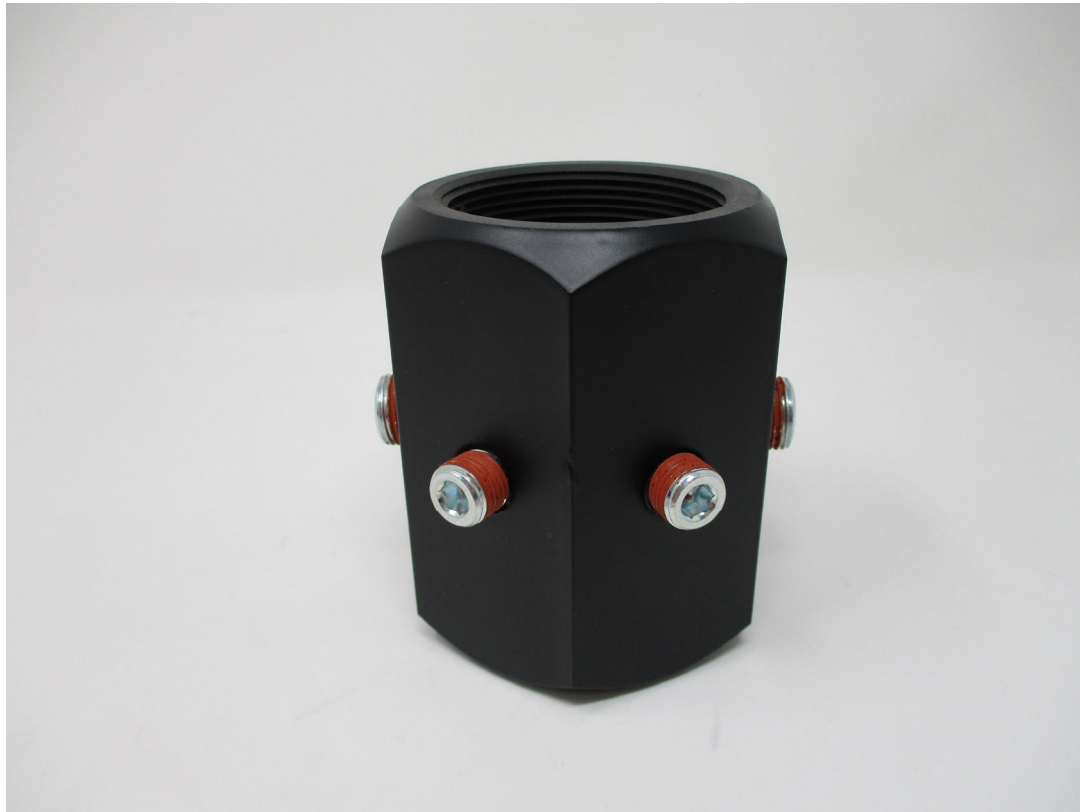
Line Leak Detector Node (LDN)

- **Monitors underground pressurized piping**
 - **Can monitor to the solenoid**
 - **Recommended to monitor between the pump to exposed pipe transition solenoid**



Multi-Port Couplers

- **PLC-5161-2 for Fuel Oil Supply Line**
- **PLC-5161-2R for Fuel Oil Return Line**



PLC-5000

Components

PLC-5161-2

Multi-Port Coupler for FOS Line

- Delivers Fuel to LDN through a Y-Strainer
- SS Braided Flex Hoses
- Pressure Gauge
- Quick Connect Test Fitting

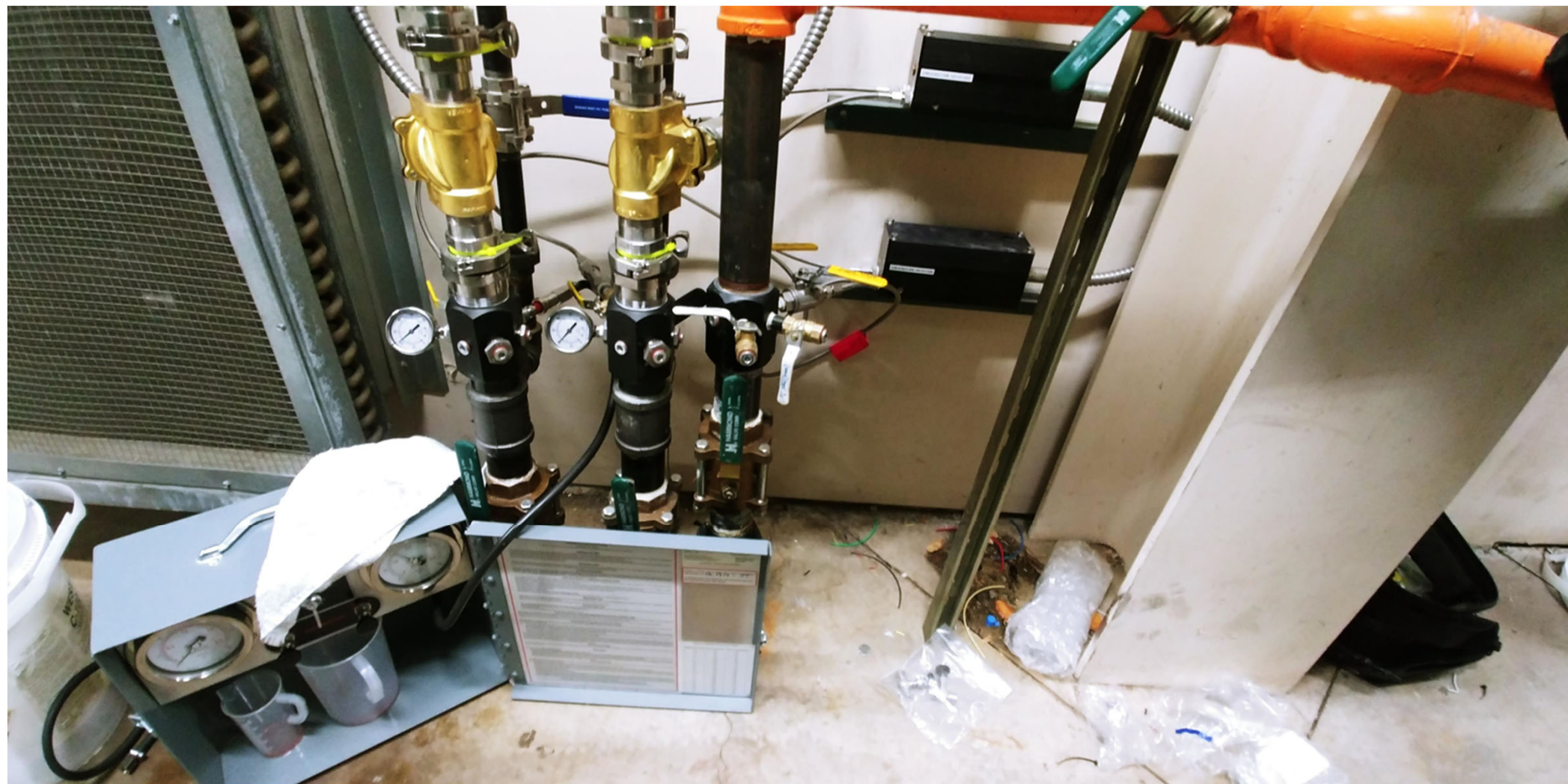
Multi-Port Coupler



Wall Mounted LDNs at Underground to Aboveground Transition



Leak Detector Tester Attached thru Quick Connect in Multi-Port Coupler





PLC-5000 STP Sump Mount



Additional Thoughts for Your State Line Leak Detection Designed for Gensets

- **Control the test environment**
 - **Monitor the underground pipe**
 - **Minimize exposed pipe to a secondary environment**
- **Retest line when pressure falls to low pressure set point (should be 5psi or greater)**
 - **Prevents vapor pockets from forming, ensures quality tests**
- **Repressurize line to meet hourly test requirement**



Additional Thoughts for Your State Line Leak Detection Designed for Gensets

- **Thermal contraction from two different environments or**
 - **Why solenoid valves are important**
- **Why do THESE lines need to be monitored/tested more than just after a dispense cycle**
- **Shutdown for leak detections**
- **Functionality at these types of sites**



Why Solenoid Valves are Important

- **Solenoid valves separate two environments, the underground pipe and the exposed pipe in the building.**
- **Solenoid valves also provide a closed valve to test the underground line against.**

Thermal Contraction from two different environments or

Why Solenoid Valves are Important

In addition to providing Catastrophic line leak detection, ELLD can provide .2 gph testing – with less than 5% of exposed line.

Line leak detection is problematic if there is 5% or more pipe in different environments (ideally less). Underground fuel is cool in the underground environment, then it comes into a heated room and expands.*

- This is a self imposed VMI operation rule for .2gph ELLD testing

Why do THESE lines need to be monitored/tested more than just after a dispense cycle

- **Gensets operate differently than regular service stations**
- **Service stations pump fuel regularly**
- **Gensets are run for short periods of time once every 2 – 4 weeks unless there is an emergency. Therefore...**

Boat Dock lines need Solenoids as they have similar problems and need similar treatment

Changing Line Resiliency

- When a line is inactive for long periods of time the pressure can fall due to:
 - Thermal contraction
 - Weeps that allow pressure to bleed back into the tank
- When line pressure falls vapor pockets form



Changing Line Resiliency

- When vapor pockets form, the line resiliency changes, it gets larger
- When line resiliency goes up, the sensitivity of ELLD leak detection goes down
- ELLDs will miss leaks or under-report the leak rate when resiliency is higher than the ELLD is programmed for

Continuously:

- Monitor for leaks through pressure drops, checking the line if pressure falls below a preset pressure, ideally 5psi or greater
- Retest triggered at low pressure set point
- Ensure hourly tests through constant monitoring
- Ensure equipment and line has no leaks (also meets hourly test requirement)
- Prevent vapor pockets from forming

Another Benefit of Constant Line Pressure Monitoring

- Constant line pressure monitoring finds problems as they occur, allowing repairs before mission critical fueling events
- Mission critical fueling events are a bad time to discover a line leak or equipment failure to deliver fuel in a Mission Critical Site!



Line Leak Detection Designed for Gensets

“EPA strongly recommends owners and operators use an electronic line leak detector that can sound an alarm instead of restricting or shutting off flow of product to the day tank.”*

***Underground Storage Tank (UST) Technical Compendium about the 2015 UST Regulation**

Pump Shutdown at Line Leak Detection

When a Line Leak System is monitored by a Building Monitoring System

- In the event of a line leak alarm, shut down the pump, initiate Alarm
- Site maintenance personnel walk interior portion of line to identify if the leak is inside the building
- Prevent diesel from flooding a generator room or running down a hallway, etc. Both happen
 - Perform emergency repairs
 - Place containment under leak or absorbents to contain leak

Emergency restart / override of the system when it is determined to be safe

Pump Shutdown at Line Leak Detection

- The sites that implement this have day tanks designed to hold enough fuel for the generators to run for hours without refueling
 - Gensets are all different, but may use 6 to 25 gph with 100 to 500gl day tanks
- The sites that use this have day tank(s) that have multilevel alarms to determine:
Emergency Low @ about 25% of tank volume

Mission Critical Fueling

There are times components fail, naturally or by power surges. Some equipment is designed to provide fuel without a controller

Mission Critical Fueling

- ❑ Pumps will run and solenoids will open even if electronic control boards fail or are destroyed by a power surge
- ❑ They create a direct pass-through of authorization to energize the pump starter coil when a daytank calls for fuel
- ❑ They energize the transition solenoid

Functionality

- **Is the equipment suitable for the site pressures**
 - High pressure pumps
 - Able to test against extreme elevation change
- **Test line and equipment**
 - Valves also leak
 - At startup does the leak detection system test if system is able to build pressure and alarm?
 - Possible line or equipment damage



Determining If Emergency Power Generator Systems Must Comply With Federal UST Regulation

Dealing with % of fuel system underground

This section was already identified above as an area to read to determine compliance of a site. I point out that the math used determines the site with a UST needs line leak detection.

If the site had the main fuel tank **above ground**, and all other parts as described, the same pressurized line would not need line leak detection for the pressurized fuel line.

How is this line less likely to leak than the other?



For More Information

- **800-367-0185**
- **www.vaporless.com**
- **sales@vaporless.com**

Greg Young

C. 928.710.1830