STATE OF WISCONSIN
Department of Agriculture,
Trade and Consumer Protection

Approval # 20140001R1
(Revision to 20140001)

Bureau of Weights and Measures
Storage Tank Regulation
P.O. Box 7837
Madison, WI 53707-7837

Wisconsin ATCP 93 Material Approval

Equipment: SiteSentinel Integra and Nano Automatic Tank Gauges, Statistical Leak Detection (SLD), and Model 327 VLLD Electronic Line Leak Sensor

Manufacturer: OPW Fuel Management Systems
6900 Santa Fe Drive
Hodgkins, IL 60525

Expiration of Approval: December 31, 2018

SCOPE OF EVALUATION

The OPW SiteSentinel Integra and Nano Automatic Tank Gauges (ATGs) were evaluated for use in monthly monitoring in accordance with **s. ATCP 93.510 and ATCP 93.515(5)**. The SiteSentinel Integra and Nano Automatic Tank Gauges were also evaluated for use as a tank tightness testing method in accordance with **s. ATCP 93.515(4)**.

The OPW SiteSentinel Integra Statistical Leak Detection (SLD) system was evaluated as a means of continuous statistical leak detection for underground tanks in accordance with **s. ATCP 93.510(3)(a)** and **93.515(5).**

The OPW SiteSentinel Integra Model 327 VLLD Electronic Line Leak Detection System, was evaluated as a means of automatic line leak detection and line tightness testing for both rigid and flexible piping in accordance with **s. ATCP 93.510(4)** and **93.515(8)**. The Model 327 system was also evaluated for use in hybrid systems containing both flexible and rigid piping.

This evaluation summary is condensed to provide the specific installation, application and operational parameters necessary to maintain the subject systems in compliance with the Wisconsin Administrative Code –ATCP 93.

DESCRIPTION AND USE

SiteSentinel Integra and Nano Tank Leak Detection Systems

The SiteSentinel Integra and Nano automatic tank gauges provide complete inventory, delivery, automatic reconciliation, and environmental compliance information for as many as 240 tank probes or 960 external sensing devices, or a combination of both. The color touchscreen display provides access to real-time inventory data, delivery status, alarm conditions, and leak detection information such as, product level, temperature, water level, automatic start times, and alarm levels.

The SiteSentinel Integra and Nano ATGs with the Model 924B or Q0400-4XX magnetostrictive probes may be used for tanks containing gasoline, ethanol blends up to 10%, diesel, biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751, aviation fuel, solvents, and other products that will not physically damage the probe and are of uniform specific gravity.

The ATGs do not determine the level of groundwater above the bottom of the tank. The systems test for water incursion. The minimum water level (threshold) in the tank that the system can detect was found to be 0.75 inches for the 2 "dia. float and 0.848 inches for the 4" dia. float. The minimum change in water level that can be tested by the system was found to be 0.080 inches for the 2 "dia. float and 0.043 inches for the 4" dia. float provided the water level is above the threshold. For ethanol fuels greater than 10% water float detection may be unreliable; optional density measurement sensor may be more reliable for water detection if water content increases to produce a phase separation.

Tank deformation effects are addressed by beginning the test only after the waiting period has passed and the tank is stabilized. The 0.1 "Precision" and 0.2 gph monthly tests have built-in waiting periods after a product drop. Level changes are converted to volume changes using the theoretical ratio calculated from tank geometry or interpolation from the tank manufacturer's chart. Leak rates are calculated using data determined valid through statistical analysis. Test results are considered to be inconclusive if there is too much variability in the data, excessive temperature changes, or tank wall deformation. Lengthening the stabilization period beyond the minimum time is the only acceptable deviation in the standard test protocol.

The actual test time will vary with the tank and the amount of product according to a pre-programmed protocol.

SiteSentinel Integra Leak Detection System w/SLD

The SiteSentinel Integra Automatic Tank Gauging (ATG) System with Statistical Leak Detection (SLD) consist of a console and probe combination (Model 924B or Q0400-4XX) that can be used as a continuous monthly monitoring leak detection system in underground tanks. With the SLD system, up to 3 tanks can be manifolded together.

When used for continuous in-tank statistical leak detection (monthly monitoring), the system determines when the tank is stable enough to begin data collection. Data acquisition is performed continuously until enough valid data is acquired to calculate a leak rate on the data collected. If it passes the 0.2 gph test, the test is recorded, and the test cycle is started over. At the end of the 30-day period the last good test result is recorded in the permanent tank testing record. If the leak rate does not pass, or if the data was insufficient for performing the calculation, the testing continues until a passing test occurs. The Systems warns the operator if there are no passing tests completed during the monthly monitoring period; a tank shutdown may be necessary in order for the system to collect enough quiet time data for a valid test. A report can be generated either automatically or manually every 30 days showing the final results.

The SiteSentinal Nano ATG is not approved for Statistical Leak Detection (SDL).

Electronic Line Leak Detector

The Model 327 VLLD Volumetric Line Leak Sensor may be used on pipelines containing gasoline, diesel, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7647, biodiesel B100 meeting ASTM D6751, aviation fuel, fuel oil #4 and #6, alcohols, solvents, used oil, and other liquids with known coefficients of expansion and density after consultation with the manufacturer.

The Model 327 VLLD Volumetric Line Leak Sensor uses a single test at operating pressure conditions to determine if a pipeline is leaking or not. The leak sensor is typically installed in the submersible pump leak detector port. After dispensing operations are completed the pump stays on to perform the catastrophic test; if a leak is present product will flow through the sensor path and be reported to the Integra tank gauge. Optional monthly and annual leak tests can also be performed if the system has enough non-operational time (no dispensing activity). If a leak is detected the system displays a message on the tank gauge, triggers an alarm, and shuts down the dispensing system if programmed for that option.

The SiteSentinal Nano ATG is not approved for electronic line leak detection.

Leak Detection Sensors:

(Note: In addition to the leak detection sensors listed below, the leak detection sensors approved under the legacy ECCO and Site Sentinel automatic tank gauges have been third-party tested and approved for use with the SiteSentinel Integra and Nano automatic tank gauges (ATGs).

Interstitial Level Sensor-Float Switch (P/N 30-0231-S)
The Interstitial Level Sensors are used primarily in the interstitial area of a steel double-walled tank. The sensor contains a float switch that activates in the presence of a liquid.
The sensor is constructed from chemical-resistant non-metallic material. It can also be used in sumps, dispenser pans and other locations where the presence of a liquid could indicate that a leak has occurred. In the event of a break in the cable, the system will activate the alarm. This technology allows the SiteSentinel Integra and VSmart Module to automatically detect sensor connection, sensor type, and sensor status; and will minimize user entry error and identify hardware issues with minimal troubleshooting.

Single-Level Sump Sensor (P/N 30-0231-L)
The Single-Level Sump Sensor is designed to detect the presence of liquid in sumps, dispenser pans and other locations where the presence of a liquid could indicate that a leak has occurred. The sensor contains a normally closed float switch that activates in the presence of liquid. In the event of a break in the cable, the system will activate the alarm.

Liquid-Only Float Sensor (P/N 30-0230-S)
Designed to detect the presence of fluid in the interstitial space of a steel double-wall tank or a containment sump. The sensor which utilizes float technology, activates in the presence of water or fuel and provides an alarm condition. An alarm condition will also occur if the cable is broken.

Discriminating Dispenser Pan Sensor (P/N 30-0232-DH-10)

Discriminating STP Sump Sensor (P/N 30-0232-DH-20)
The Discriminating Dispenser Pan and Discriminating STP Sump Sensor provides the ability to detect a low- and high-liquid level and distinguish whether the fluid is water or hydrocarbons using a polymer strip and float technology. The polymer strip will change resistance showing hydrocarbon detection; if the polymer doesn't change resistance it indicates detection of water. Detection of either will result in an alarm condition. An alarm will also occur if the cable breaks or the sensor malfunctions.

Hydrocarbon Vapor Sensor (P/N 30-0235-V)
The Hydrocarbon Vapor Sensor is designed to detect hydrocarbon vapors in dry Monitoring wells. The presence of these vapors could indicate a potentially dangerous leak that could lead to safety and environmental problems. The sensor is made from a long-life resistive element that increases dramatically in resistance in the presence of hydrocarbon vapors. After the vapors have dissipated, the sensor returns to normal and is ready to detect hydrocarbon vapors again. This process could take up to 30 minutes depending on the saturation factor. In the event of a break in the cable or sensor malfunctions the system will activate the alarm.

Discriminating Interstitial Sensor (P/N 30-0236-LW)
The Discriminating Interstitial Sensor utilizes a solid-state optical technology to detect the presence of fluid in the annular space of a tank and distinguish whether the fluid is

water or hydrocarbons. This sensor utilizes conductive probes to distinguish between water and hydrocarbons. An alarm will occur on liquid detection, open cable, or sensor malfunction.

Interstitial Hydrocarbon Liquid with Water Indicator (P/N 30-0234-HW-01)
The Interstitial Hydrocarbon Liquid/Water Sensor is designed for use in the interstitial area of a fiberglass double-wall tank. The hydrocarbon liquid/water sensor contains a carbon/polymer material that changes its resistance when exposed to liquid hydrocarbons. Additionally, it contains a conductive strip to detect the presence of water, providing the ability to discriminate between hydrocarbon liquid and water. In the event of a break in the cable, the system will activate the alarm.

Hydrocarbon Liquid with Water Indicator (P/N: 6 feet: 30-0234-HW-06, 15 feet: 30-0234-HW-15 20 feet: 30-0234-HW-20)
The Hydrocarbon Liquid/Water Sensor, which is available in 6-, 15- and 20-foot lengths, is used primarily in monitoring wet wells with fluctuating groundwater tables. The sensor contains a carbon/polymer material that changes its resistance when exposed to liquid hydrocarbons. Additionally, a water sensor that relies on the conductivity of water to detect its presence is utilized, providing the ability to discriminate between hydrocarbon liquid and water. The sensor also alerts the system to the absence of groundwater in a monitoring well. It will alert the system if any fuel enters into the containment area, which would indicate a leak. In the event of a break in the cable the system will activate the alarm.

Dual-Float Dispenser Sump Sensor (P/N 30-0232-D-10)
This Dual-Float Sensor is the same as a Discriminating Dispenser Pan Sensor, Part No. 30-0232-DH-10, but without Belcor inside sensor. This makes it non-discriminating.

Dual-Float STP Sump Sensor (P/N 30-0232-D-20)
This Dual-Float Sensor is the same as Discriminating STP Sump Sensor, Part No. 30-0232-DH-20, but without Belcor inside sensor. This makes it non-discriminating.

Dual-Float Brine Sensor (P/N 30-0232-D-10B or 30-0232-D-20)
The Dual Float Brine sensor is very similar to the 30-0232-D-10 or 30-0232-D-20 but unlike the other dual float sensors it measures a level of liquid that is already present in the tank. The bottom float of the brine sensor will remain in the up position in a normal condition. When in alarm the sensor will have either triggered the upper float or the level has dropped below the bottom float.

Density Measurement Sensor (P/N 30-3232)
The Density Measurement Sensor installs on the pre-existing probe and continuously measures the average density of the fuel in the tank. This provides a measure of changes in product density within the API density range. Fuel-density reports can be displayed real-time on the Integra Console or exported to an external device. The readings can be either nominal or temperature-corrected density.

Note: This sensor is not third-party approved as part of a leak detection system at this time; however, it may be used as a product quality instrument if so desired. When the sensor receives third-party approval, this material approval will be modified to reflect approved usage.

TESTS AND RESULTS

The performance of the SiteSentinel Integra and Nano Automatic tank gauges (ATGs) were determined in accordance with the EPA testing protocol for automatic tank gauging methods. When using leak declaration thresholds of 0.05 gph and 0.10 gph, the probabilities of detection of a leak of 0.10 and 0.20 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Testing of the SiteSentinel Integra Automatic Tank Gauging (ATG) Systems with Statistical Leak Detection (SLD), was conducted in accordance with a modified version of the EPA Automatic Tank Gauging Systems protocol. When using a leak declaration threshold of 0.10 gph, the probabilities of detection and false alarm to a leak rate of 0.20 gph were certified to within the 95-5 ranges required by the EPA protocols.

Electronic Line Leak Detector

Testing of the OPW SiteSentinel Integra Model 327 VLLD Electronic Line Leak Sensor for hourly, monthly, and annual pipeline tightness testing was conducted in accordance with either the EPA Pressurized Pipeline Leak Detection Systems protocol (rigid piping) or modified versions of same protocol adapted for flexible piping or for a hybrid combination of rigid and flexible piping. When using leak declaration thresholds of 1.5 gph, 0.10 gph, and 0.05 gph, the probabilities of detection for a leak of 3.0, 0.20 and 0.10 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Liquid Sensors

The performance of the OPW leak detection sensors were evaluated in accordance with the EPA standard test procedure for liquid-phase and vapor-phase out-of-tank product detectors by Ken Wilcox Associates, Inc.

The EPA test procedures used only addressed the issue of the method's ability to detect leaks and not safety hazards.

MONITORING SYSTEM OUTPUT

Detailed here are examples of the typical Tank Compliance Report, Tank Leak Report, Sensor Alarm History and VLLD Report. (Site Name/Address is printed on 1ST sheet of report)

OPW *Fuel Management Systems*

1 Sales Demo
6900 Santa Fe Drive
Technical Support Department
Hodgkins IL

Compliance Report
Date/Time: 08/25/2009 3:04:40 PM

Report Type	Leak Test Status Report Details
Tank Name:	TANK 1
Product Name:	DYED DIESEL
Start time	08/17/2009 5:06:04 PM
End time	08/17/2009 7:06:04 PM
Test Type	Static
Leak Test Rate	0.2 Gph
Leak Test Status	Test Failed
Measured Leak Rate	-3.2681 gal/h
Begining Product Temperature	74.5°F
Beginning Product Level	29.27 in
Beginning Product Volume	5853.65 gal
Beginning Product Net Volume	5814.66 gal
Begining Product Volume %	99.5335 %
End product temperature	72.05°F
Ending Product Level	29.27 in
Ending Product Volume	5853.65 gal
End Product Net Volume	5821.24 gal
End Product Volume %	99.5965 %

Tank Compliance Report (Static and SLD Results)

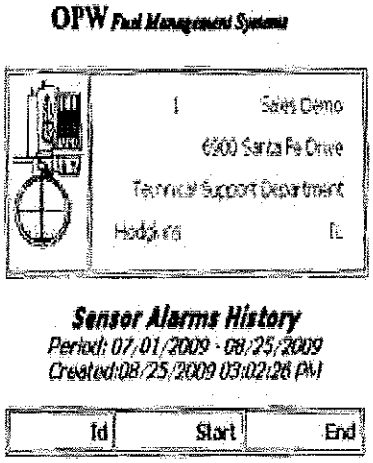
OPW *Fuel Management Systems*

1 Sales Demo
6900 Santa Fe Drive
Technical Support Department
Hodgkins IL

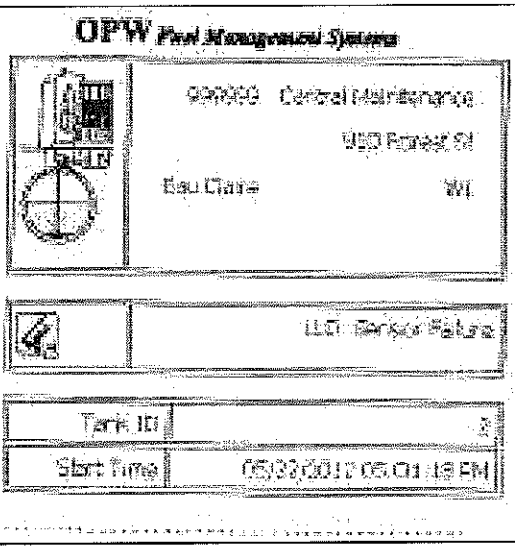
Leak Report, All Tests
Period: 08/01/2009 - 08/25/2009

Tank	1 (TANK 1)
Type of tank leak test	Static
Leak rate	0.2 US Gallons
Begin	08/04/2009 04:20:04 PM
Product Level	29.27 Inch
Product Volume	5853.65 US Gallons
Product Volume TC	5814.21 US Gallons
End	08/04/2009 06:50:04 PM
Product Level	29.27 Inch
Product Volume	5853.65 US Gallons
Product Volume TC	5814.73 US Gallons
Status of leak test	Detected
Measured Leak Rate	-0.3649 US Gallons/h
Tank	1 (TANK 1)
Type of tank leak test	Static
Leak rate	0.2 US Gallons
Begin	08/17/2009 05:06:04 PM
Product Level	29.27 Inch
Product Volume	5853.65 US Gallons
Product Volume TC	5814.66 US Gallons
End	08/17/2009 07:06:04 PM
Product Level	29.27 Inch
Product Volume	5853.65 US Gallons
Product Volume TC	5821.24 US Gallons
Status of leak test	Detected
Measured Leak Rate	-3.2681 US Gallons/h

Leak Report All Tests, including Static and SLD Results



Sensor Alarm History Report Example



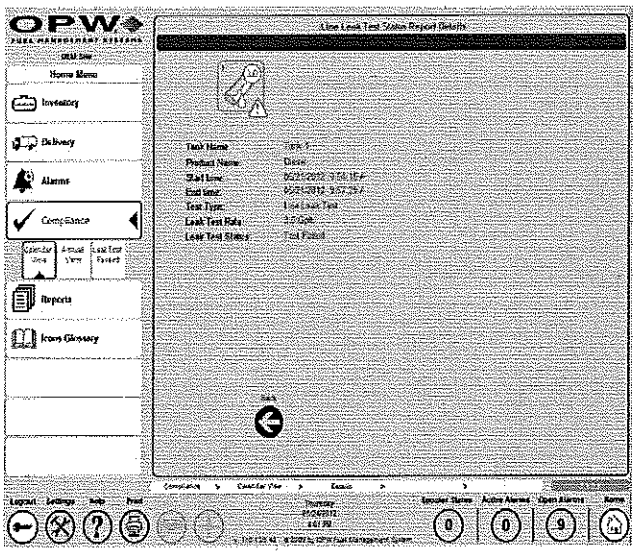
Model 327 VLLD Report Header

LLD:	2
Type of LLD leak test:	Line
Leak rate:	3.0 US Gallons
Begin:	05/22/2012 04:03:08 PM
End:	05/22/2012 04:06:19 PM
Status of leak test:	Passed

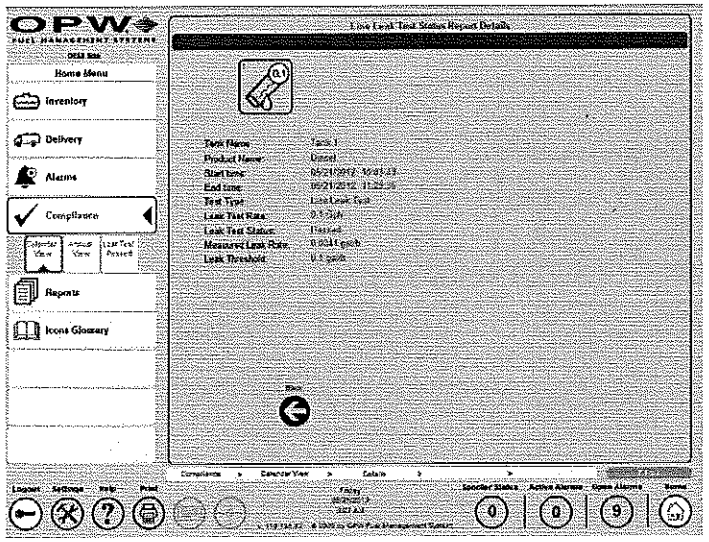
Model 327 VLLD 3.0 gph Report

LLD:	2
Type of LLD leak test:	Line
Leak rate:	0.2 US Gallons
Begin:	05/22/2012 04:03:08 PM
End:	05/22/2012 06:06:19 PM
Status of leak test:	Passed
Measured Leak Rate:	0.0147 US Gallons/h

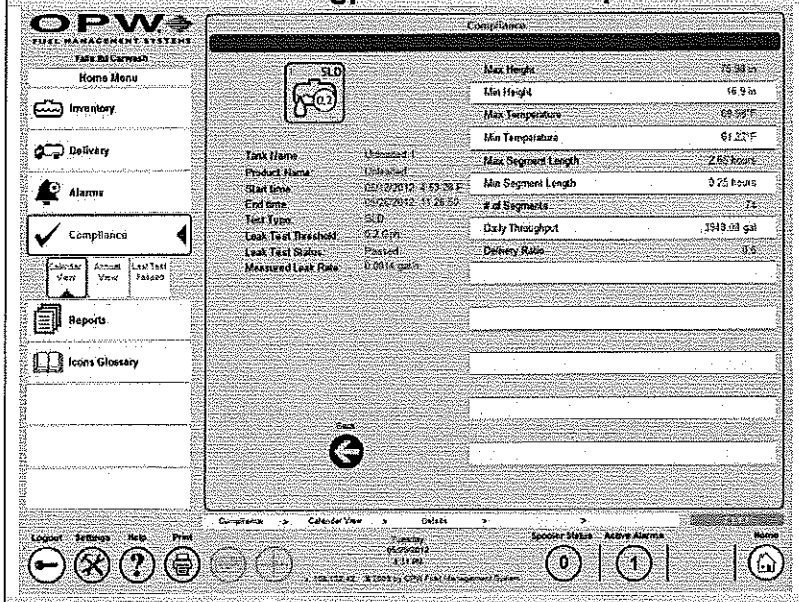
Model 327 VLLD 0.2 gph Report



Model 327 VLLD 3.0 gph On-screen Report



Model 327 VLLD 0.1 gph On-screen Report



SLD On-screen Report

LIMITATIONS / CONDITIONS OF APPROVAL

General

- All monitoring equipment shall be installed, calibrated, operated, and maintained in accordance with the manufacturer instructions, and certified every 12 months for operability, proper operating condition, and proper calibration in accordance with **ATCP 93.510(2)**. Records of sampling, testing, or monitoring shall be maintained in accordance with **ATCP 93.500(9)**.

- The manufacturer shall submit for a revision to this Wisconsin Material Approval application if any of the functional performance capabilities of this equipment are revised. This would include, but not be limited to changes in software, hardware, or methodology.

- While 3rd party testing does determine a required minimum tank level, EPA leak detection regulations require testing of the portion of the tank system which routinely contains product. Consistent testing at low levels could allow a leak to remain undetected.

  During leak testing, a minimum level of product in tank shall be maintained so as to ensure testing of the portion of the tank and/or piping that routinely contains product, regardless of testing system capability. For instance, if product levels are routinely maintained at 60%, but the leak detection system is capable of testing at 15% product level, then testing shall be performed at 60% levels.

- If performing a tank tightness test, minimum tank level shall be 95%, regardless of leak detection system minimum capability, in accordance with **ATCP 93.515(4)**.

- Automatic tank gauges shall be programmed to provide an audible and visual alarm in the event of a tank test fail, periodic monthly tank test not performed within a 30-day interval, or tank interstitial sensor actuation. Silencing of the alarm shall require manual operator action.

- Electronic line leak detection shall be programmed to provide an audible and visual alarm in addition to providing shut-down of the submersible pump in the event of a line test fail. The ELLD shall also be programmed to provide an audible and visual alarm in the event a periodic monthly line test was not performed within a 30-day interval. Silencing of either alarm shall require manual operator action.

- Sensors used for interstitial line monitoring shall be programmed to provide an audible and/or visual alarm in addition to providing shut-down of the submersible pump or individual dispenser(s) in the event of a sump/interstitial monitoring sensor actuation. Silencing of the alarm shall require manual operator action.

- Critical performance parameters for the **2-inch and 4-inch dia. 924B or Q0400-4XX** probe with the **SiteSentinel Integra and Nano** consoles for annual 0.1 gph and monthly 0.2 gph testing: (Magnetostrictive probe)

Parameter	Value
Maximum Tank Size[1]	**Up to 20,000 gallons**
Software Version	**N/A**
Minimum Product Level[2]	**50%** (0.2 gph test) **95%** (0.1gph test)
Waiting time between filling tank and test start[3] (Stabilization time dependant on tank conditions)	**6.0 hours** (0.2 gph test) **6.0 hours** (0.1 gph test)
Waiting time between dispensing and test start	**None**
Minimum Test Period[4]. (Test time determined by microprocessor based on tank size and product level)	**30 minutes**[5] (0.2 gph test- 2" or 4" float w/924B probe only) **1.5 hours** (0.1 gph test- 4" float w/924B probe only) **6.0 hours** (0.1 gph test- 2" float w/924B probe only) **4.0 hours** (0.2 gph test- 4" float w/Q0400-4XX probe only)

1: Monthly and annual testing can only be performed on one tank at a time. If several tanks are manifolded together, an isolation valve will have to be installed so as to separate the tanks individually.
2: Minimum level from probe bottom is same as product level in tank, assuming the typical configuration where the probe touches the bottom of the tank.
3: There must be no delivery during waiting time.
4: There must be no delivery or dispensing during testing.
5: Testing times are approximate; microprocessor determines testing times based on site specific conditions at time of test. Listed time is from 3rd-party testing certification.

Lower Detection Limits for SiteSentinal Integra and Nano Probes

Probe Model	Unleaded Gasoline (E10)	Unleaded Gasoline (E15)	Unleaded Gasoline (E85)
30-0231-S, 30-0230-S, (30-3221-1A/1B, Q0003-0009)	0.803 in.	0.995 in.	0.942 in.
30-0231-L (30-3221-1)	1.405 in	1.518 in	1.518 in
30-0232-D-10/D-20/D-10B/D-20B (Q0003-001/002)	0.02 in.	0.125 in.	0.125
924B Sump Sensor	4.029 in.	4.029 in.	4.029 in.

Integra ATG SLD (24-hour, 0.2 gph monthly monitoring)

- Critical performance parameters for the **2-inch and 4-inch dia. 924B or Q0400-4XX** probe with the **SiteSentinel Integra with SLD** for monthly 0.2 gph testing:

Parameter	Value
Maximum Tank Size[1]	**Up to 30,258 gallons**
Maximum Number of Manifolded Tanks	**3**
Software Version	**108.132.42 or higher**
Minimum Tank Level[2]	**14.7%**
Maximum Monthly Throughput	**397,883 gallons**

1: For single or aggregate capacity of manifolded tanks.
2: The SLD system will automatically check the tank level, and not perform a test if the tank level is below the minimum.

- **The SiteSentinal Nano ATG is not approved for statistical leak detection (SLD).**

Electronic Line Leak Detector

- The OPW SiteSentinel Integra Model 327 VLLD Electronic Line Leak Sensor is approved for use on pipeline systems for underground storage tank facilities that contain gasoline, diesel, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7647, biodiesel B100 meeting ASTM D6751, aviation fuel, fuel oil #4 and #6, alcohols, solvents, used oil, and other liquids with known coefficients of expansion and density after consultation with the manufacturer. It is approved for use on rigid or flexible piping or a hybrid combination of rigid and flexible piping.

- An annual test of the operation of the leak detector shall be conducted in accordance with the manufacturer requirements for testing to the recognized leak thresholds by inducing a physical line leak as required by **s. ATCP 93.515(8)(d)**. The individual performing the test must be qualified by the equipment manufacturer.

- The system may be used with trapped vapor present in the line.

- **Mechanical line leak detectors cannot be installed in the same line as the electronic line leak detector.**

- **The SiteSentinal Nano ATG is not approved for electronic line leak detection.**

- Critical performance parameters for the **Model 327 VLLD Electronic Line Leak Sensor:**

Parameter	Value
Total maximum allowable volume of product in any **flexible** test pipeline	**109.8 gallons or less**
Total maximum allowable volume of product in any **rigid** test pipeline	**425.8 gallons or less**
Total maximum allowable volume of product in any **Hybrid** (rigid and flexible piping combination) test pipeline	**535.7 gallons or less[1]**

1: Not to exceed the above individual capacity limitations for rigid (425.8 gallons) or flexible (109.8 gallons) pipelines.

Note: All critical parameters are pre-programmed into the software and are not accessible for viewing.

Liquid Sensors

- All equipment shall be installed, operated, and maintained in accordance with procedures specified by OPW Fuel Management Systems.
- All sensors shall be placed in the lowest point of the interstice or sump and be able to detect a leak in any portion of the primary containment that routinely contains product.

This approval will be valid through December 31, 2018, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The Wisconsin Material Approval Number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The Department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement unless specified in this document.

Effective Date: March 14, 2018

Reviewed by: 3/14/18
Erik Otterson
Environmental Engineering Specialist
Storage Tank Plan Review
Bureau of Weights and Measures

Approved by: Date: 3/14/18
Greg Bareta, P.E.
Storage Tank Regulation Section Chief
Bureau of Weights and Measures