

Certification Reports

Results of U.S. E.P.A. Standard Evaluations

Liquid-Phase Product Detectors

**Modified Procedure
Results of U.S. EPA Standard Evaluation
Liquid-Phase Product Detectors**

This form documents the performance of the liquid-phase product detector described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluation Leak Detection Methods: Liquid-Phase Out-of-tank Liquid Product Detectors". The modifications to the procedure were made to accommodate the specialized requirements of interstitial monitors.

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

Method Description

Name Dispenser Pan Sensor and Differentiating Dispenser Pan Sensor with Dispenser

Control Interface _____

Version number Models 847990-001 and 847990-002

Vendor Veeder Root Environmental Products

125 Powder Forest Drive, P.O. Box 2003

(street address)

Simsbury, CT 06070-2003 (203) 651-2700

(city) (state) (zip) (phone)

Detector output type: () Quantitative (X) Qualitative

Detector operating principle: () Electrical Conductivity () Thermal Conductivity () Interface Probe (X) Product Permeable () Product Soluble (X) Other reed switch/float

Detector sampling frequency: () Intermittent (X) Continuous

Evaluation Results

The detectors listed above were tested for their ability to detect a layer of liquid (hydrocarbon or water) in a tank or a sump. The following parameters were determined:

Lower Detection Limit - The smallest product thickness that the detector can reliably detect.

Specificity - Whether or not the sensor responds to various products.

Precision - Agreement between multiple measurements of the same product level

Detection Time - Amount of time the detector must be exposed to product before it responds.

Evaluation Results (continued)

> **Compiled Test Results** (for tests conducted at the lower detection limit)

Dispenser Pan Sensor

Probe Model	<u>847990-001</u>		
Product Type	<u>Gasoline</u>	<u>Diesel</u>	<u>Water</u>
Minimum Product Level (in)	<u>1.71</u>	<u>1.66</u>	<u>1.62</u>
Precision	<u>0.006</u>	<u>0.004</u>	<u>0.008</u>
Detection Time (hh:mm:ss)	<u>< 00:00:01</u>	<u>< 00:00:01</u>	<u>< 00:00:01</u>

Differentiating Dispenser Pan Sensor

Probe Model	<u>847990-002</u>		
Product Type	<u>Gasoline</u>	<u>Diesel</u>	<u>Water**</u>
Minimum Product Level (in)	<u>1/32</u>	<u>1/16</u>	<u>6.39</u>
Precision	<u>N/A*</u>	<u>N/A*</u>	<u>0.008</u>
Detection Time (hh:mm:ss)	<u>00:06:30</u>	<u>00:19:50</u>	<u>< 00:00:01</u>

* tested at discrete levels only

** float switch for water only

Product Sensitive Sensor (floating product)

Probe Model	<u>847990-002</u>	
Product Type	<u>Gasoline</u>	<u>Diesel</u>
Minimum Product Thickness (in)	<u>1/16</u>	<u>1/16</u>

Specificity Results (%)*

Commercial gasoline	<u>100</u>
Synthetic gasoline	<u>100</u>
Diesel fuel	<u>100</u>
Jet-A jet fuel	<u>not tested</u>
n-Hexane	<u>100</u>
Toluene	<u>100</u>
Xylene(s)	<u>100</u>
Water	<u>100**</u>

* The float switches will respond to any liquid which has reached the minimum detectable product level. The product sensitive sensors will respond to virtually any hydrocarbon that reaches the minimum detectable product level.

** Float switches only

> **Safety disclaimer: This test procedure only addresses the issue of the interstitial monitors ability to detect leaks. It does not test the equipment for safety hazards.**

Certification of Results

I certify that the interstitial monitor was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed using the procedures described in the modified test protocol.

H. Kendall Wilcox, Ph.D., President
(printed name)

H. Kendall Wilcox
(signature)

November 15, 1993 (Revised: 11/2/98)
(date)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

Grain Valley, Missouri 64029
(city, state, zip)

(816) 443-2494
(phone number)

Procedure for Testing Liquid Sensors for Interstitial Monitors and Sumps

Application

This procedure applies to liquid sensors that are used in confined areas such as interstitial spaces and sumps. It does not apply to external groundwater monitoring detectors. Each sensor should be tested in the products for which they are to be used. For a typical gasoline station this would include gasoline, diesel fuel, and water.

Procedure

1. Mount the sensor in a vertical cylinder with a known, uniform diameter from top to bottom. The sensor should be securely fastened so that it is in its normal orientation relative to the bottom of the cylinder.
2. Add liquid (product or water) to the cylinder from a buret capable of reading volume to the nearest 0.2 ml. Liquid should be added in increments until the sensor responds to the liquid. Adequate time should be allowed between increments to allow the sensor to respond if the response time is not instantaneous.
3. When the approximate threshold has been determined, the sensor should be removed and the cylinder dried for a repeat measurement.
4. For subsequent measurements, liquid may be added quickly to just below the threshold level.
5. Liquid should then be added very slowly until the sensor responds.
6. Steps 3 through 5 should be repeated a minimum of 6 times for each liquid.
7. Record all information in an appropriate manner.

Calculations

The cross sectional area of the test cylinder and the sensor must both be determined. The difference in cross section is used in the calculations.

The test cylinder cross section is determined from the equation

$$A_c = \pi r^2$$

where A_c is the cross section of the cylinder and r is the radius of the cylinder.

If the geometry of the sensor is uniform, it may be possible to calculate the cross sectional area using the appropriate equations. If the geometry is irregular, the displacement of the sensor must be empirically determined before the calculations can be completed. It is usually preferable to calculate the cross section when possible.

To measure the displacement of an irregular sensor, immerse the sensor in a graduated cylinder to the alarm depth. The volume before and after the immersion should be recorded. The difference in volume (V_D) is the displacement of the sensor at the threshold level. This displacement volume should be added to the test volume obtained from the buret before the calculations are conducted.

The alarm level can then be calculated from the equation

$$L = (V_B + V_D) * C$$

where L is the level at which alarm first occurs, V_B is the volume of the buret, V_D is the displacement volume of sensor at alarm level, and C is the conversion factor to convert volume to height (e.g., ml/in) for the test cylinder.

The threshold is calculated from the equation

$$\text{Threshold} = \text{Mean} + 4.414 * \text{STD}$$

where the mean is the average alarm level for each test set, and STD is the standard deviation for each data set. The tolerance coefficient for six data points (95% confidence) is 4.414.



For technical support, sales or
other assistance, please visit:
www.veeder.com