

# Results of Third Party Standard Evaluation Cable Sensor Liquid Contact Product Detectors

This form documents the performance of the cable sensor liquid contact leak detection system described below. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."<sup>1</sup>

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 verify that this form satisfies their requirements.

## Method Description

Name TraceTek TTDM Alarm and Location Module

Version with TT5000 Fuel Sensing Cable

Vendor Raychem Corporation, TraceTek Products Group

300 Constitution Drive

(street address)

Menlo Park

CA

94025 - 1164

(415) 361 - 3333

(city)

(state)

(zip)

(phone)

Detector output type:  Quantitative

Detector operating principle:  Electrical Conductivity  Capacitance Change

Interface Probe  Product Permeable  Product Soluble  Thermal Conductivity

Other \_\_\_\_\_

Detector sampling frequency:  Intermittent  Continuous

## Evaluation Results

The detector described above was tested for its ability to detect test liquids in contact with the cable sensor. The following parameters were determined:

- **Detection Accuracy** - The measure of sensor response to the presence of liquids.
- **Bias** - Whether the method consistently over-estimates or under-estimates leak location. Not applicable to qualitative detectors.
- **Detection Length** - The length of cable in contact with liquid, when the sensor is activated.
- **Response Time** - Amount of time the detector must be exposed to liquid before it responds.
- **Recovery Time** - Amount of time that passes before the detector returns to its baseline reading after the test liquid is removed.
- **Lower Detection Limit** - The smallest liquid concentration that the detector can reliably detect.
- **Maximum Effective Range (MER)** - The longest length of sensor cables that can be connected to form a leak detection network.
- **Precision** - Agreement between multiple measurements of the leak location. Not applicable to qualitative detectors.
- **Product Activation Height** - The height of liquid to cause sensor activation.
- **Relative Accuracy** - A statistical term defining the percent difference between the measured values and the reference values.
- **Specificity** - Indicates the level of response, of the detector, to several different liquids.

<sup>1</sup> Carnegie Mellon Research Institute. Test Procedures for Third Party Evaluation of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems: Final Report - November 11, 1991.

**Evaluation Results (continued)****> Compiled Test Results for Quantitative Detector**Sensor Cable Maximum Effective Range (MER): 5000 ft (1524 m)Test Product Flow Rate: 0.128 ± .002 gal/hr.

	Detection Accuracy %	Product Activation Height cm (in)	Detection Length ft (cm)	Response Time at a Flow Rate of 0.128 gal/hr	Recovery Time
<b>Accuracy and Response Time</b> Regular Unleaded Commercial Gasoline (6 tests at each length)		Product Flow was stopped after <u>1.0 ft (30.5 cm)</u> of sensor cable was covered.			
1/3 MER Cable Test Length <u>1667 ft</u>	100%	0.74 cm (0.29 in)	12 in (30.5 cm)	12.02 ± 1.64 min	not applicable
2/3 MER Cable Test Length <u>3334 ft</u>	100%	0.74 cm (0.29 in)	12 in (30.5 cm)	9.18 ± 3.20 min	not applicable
MER Cable Test Length <u>5000 ft</u>	100%	0.74 cm (0.29 in)	12 in (30.5 cm)	7.51 ± 1.60 min	not applicable
<b>Lower Detection Limit @ MER</b> Unleaded Gasoline (6 tests)	100%	0.74 cm ** (0.29 in)	4 in (10 cm)	11.33 ± 1.82 min	not applicable
<b>Specificity @ MER</b> (3 tests for each liquid)					
Synthetic Fuel	100%	0.74 cm (0.29 in)	[100.0%]* 12 in (30.5 cm)	12.60 ± 1.42 min	not applicable
Diesel Fuel	100%	0.74 cm (0.29 in)	[100.0%]* 12 in (30.5 cm)	106.77 ± 10.19 min	not applicable
Home Heating Oil #2	100%	0.74 cm (0.29 in)	[100.0%]* 12 in (30.5 cm)	93.42 ± 29.72 min	not applicable
Water	0%	not applicable	not applicable	not applicable	not applicable

\*Specificity Reference: Regular Unleaded Commercial Gasoline

\*\* Product Flow was stopped after 4.0 in (10 cm) of sensor cable was covered.

*Marc P. Hoff*  
(signature)

December 20, 1995  
(date)

Liquid Contact Product Detector TraceTek TTDM Alarm and Location Module

Version \_\_\_\_\_ with TT5000 Fuel Sensing Cable

**Evaluation Results (continued)**

**> Compiled Test Results for Product Location Measurements.**

	Cable Test Length (1/3 MER) <u>1666 ± 0 ft</u>	Cable Test Length (2/3 MER) <u>3333 ± 0 ft</u>	Cable Test Length (MER) <u>4999 ± 0 ft</u>
<b>Product Location Accuracy</b> Regular Unleaded Commercial Gasoline (6 tests at each length)			
<b>Average Observed Value</b>	1663 ft	3331 ft	4997 ft
<b>Standard Deviation</b>	± 1 ft	± 2 ft	± 3 ft
<b>Relative Accuracy (%)</b>	0.22	0.10	0.10
<b>Coefficient of Variation (%)</b>	0.05	0.05	0.05
<b>Bias (%)</b>	- 0.17	- 0.05	- 0.04
<b>Specificity (%) @ MER</b> (3 tests for each liquid)			
Synthetic Fuel	(Average Observed Value)		[100.0]* 4995 ± 2 ft
Diesel Fuel	(Average Observed Value)		[100.0]* 4996 ± 1 ft
Home Heating Oil #2	(Average Observed Value)		[100.0]* 4997 ± 0 ft
Water			No Response

\* Specificity Reference: Regular Unleaded Commercial Gasoline

**> Safety disclaimer:** This test procedure only addresses the issue of the method's ability to detect the presence of liquid product. It does not test the equipment for safety hazards.

**Certification of Results**

I certify that the cable sensor liquid contact product detector was operated according to the vendor's instructions and that the evaluation was performed according to the Third Party Procedures developed according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors."<sup>1</sup> I also certify that the results presented above are those obtained during the evaluation.

Marc Portnoff  
(printed name)

*Marc Portnoff*  
(signature)

December 20, 1995  
(date)

Carnegie Mellon Research Institute \*\*  
(organization performing evaluation)

Pittsburgh, PA 15230  
(city, state, zip)

(412) 268-3495  
(phone number)

\*\* Consultant to the Manufacturer

Liquid Contact Product Detector TraceTek TTDM Alarm and Location Module  
 Version \_\_\_\_\_ with TT5000 Fuel Sensing Cable

At the request of TraceTek an additional set of specificity tests were performed with Jet A Fuel. The results are tabulated below.

**Evaluation Results (added Jet A Fuel tests)**

**Sensor Cable Maximum Effective Range (MER):** 5000 ft (1524 m)

**Test Product Flow Rate:** 0.128 ± .002 gal/hr.

	Detection Accuracy %	Product Activation Height cm (in)	Detection Length ft (cm)	Response Time at a Flow Rate of 0.128 gal/hr	Recovery Time
<b>Specificity @ MER</b> (3 tests for each liquid)					
Jet A Fuel	100%	0.74 cm (0.29 in)	[100.0%]* 12 in (30.5 cm)	55.01 ± 3.25 min	not applicable

<b>Product Location</b>	<b>Cable Test Length (MER)</b> 4999 ± 0 ft
<b>Specificity (%) @ MER</b> (3 tests for each liquid)	
Jet A Fuel  (Average Observed Value)	[100.0]* 4995 ± 1 ft

\* Specificity Reference: Regular Unleaded Commercial Gasoline

Maureen P. Hoff December 20, 1995  
 (signature) (date)

**Test Procedures for Third Party Evaluation of Leak Detection Methods:  
Cable Sensor Liquid Contact Leak Detection Systems**

**Subject: TraceTek TTDM Alarm and Location Module with  
TT5000 Fuel Sensing Cable**

**Date: December 20, 1995**

Carnegie Mellon Research Institute evaluated the above TraceTek system according to the following test protocol:

**CMRI TEST PROCEDURES: Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems, Carnegie Mellon Research Institute, Final Report, November 11, 1991.**

The procedure was modified so that fresh test liquids were used for each test.



Carnegie Mellon Research Institute (CMRI) was selected by Raychem Corporation, TraceTek Products Group, to evaluate its Underground Storage Tank Leak Detection Monitoring System. Their system, listed below, was evaluated using an EPA approved equivalent test protocol.

The TraceTek equipment was properly set up, calibrated, and maintained, according to written instructions provided by TraceTek and as required by the test protocols.

TraceTek TTDM Alarm and Location Module with:

TT5000 Fuel Sensing Cable

Liquid-Contact Protocol

LIQUID-CONTACT TESTING: November 1991, Equivalent test procedure for evaluating leak detection methods for Cable Sensor Liquid Contact product detectors [Carnegie Mellon Research Institute. Test Procedures for Third Party Evaluation of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems: Final Report - November 11, 1991.].

Marc Portnoff  
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