UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
Mail Code 5401G

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APR 25 1997

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: ***List of Leak Detection Evaluations for Underground Storage Tank Systems - Third Edition***

FROM: Anna Hopkins Virbick, Director
Office of Underground Storage Tanks

TO: All Interested Parties

The purpose of this cover memo is to transmit the attached list and to provide additional information about its appropriate use and about EPA's involvement with it. Previous editions of the List of Leak Detection Evaluations have been very helpful tools to the underground storage tank (UST) community, and we are pleased to make this new edition available.

The List and Its Use

The List contains information on underground storage tank and piping leak detection system evaluations that have met certain criteria. The evaluations must have been performed by an independent third party, in accordance with EPA or equivalent test procedures, and with leak rates blind to the evaluator. The List includes evaluations that followed either an EPA protocol, a national voluntary consensus standard, or other accepted test procedures developed by an independent third party.

The List of Leak Detection Evaluations is based on reviews by an **independent** work group consisting of state and EPA UST program staff, and therefore is not an EPA list. Furthermore, neither EPA nor the work group approve or will approve leak detection systems. Approval or acceptance of systems is the responsibility of the implementing agency -- in most cases the state environmental agency, which should be contacted regarding the approval or acceptance of leak detection systems in a particular area.

There is an Under Review section that lists evaluations about which the work group has received information, and is either reviewing or has requested additional information needed to clarify the evaluation. **Listing of an evaluation as "under review" in no way implies that the evaluation does or does not meet the review criteria.**

For the first time, this edition includes a separate listing of protocols under which listed evaluations were performed. Also included is a user survey; after familiarizing yourself with the List, please take a moment to provide your feedback. Finally, the first of several optional maintenance checklists have been added; these can help users get the most out of leak detection systems.

We believe that the List will continue to be of great benefit to those throughout the UST community. However, please remember that it has inherent limitations. It is based on evaluations, which are one-time events, often conducted in a lab setting according to protocols that do not test all aspects of a system. Therefore, appearance on the List does not mean that a particular system will work or comply with regulations at any particular site. For these reasons, the List cannot be the final word; you should base your decisions on all available sources of information.

Distribution

The attached List is the Third Edition. Because the second edition was made available only electronically, this is only the Second Printing. The work group updates the List periodically, as new evaluations and information are reviewed.

While paper updates are not frequently distributed, the most recent version is available for downloading in electronic form, in two ways:

* Via the Internet -- http://www.epa.gov/OUST/pubs/index.htm
* Via EPA's Cleanup Information Network -- "CLU-IN" -- electronic bulletin board. Access CLU-IN by modem at (301)589-8366, with settings 8-N-1. Once in, join the UST/LUST Special Interest Group (#3), then go to File Directory 11 (Tanks and Piping). The system operator is at (301)589-8368.

For help with these two means of access, call Hal White at (703)603-7177. The files, which are large, are LDLISTWD.EXE (Microsoft Word 6.0, original version of List) and LDLISTWP.EXE (WordPerfect 5.1). Type the filename to expand these executable compressed files into useable form.

To save paper and expense we limit the distribution of paper copies of this large document. We send paper copies to vendors, associations, EPA UST offices, state UST offices, and others who request it, one copy to each organization at each location. In addition, a limited number of printed copies will be made available through EPA's National Center for Environmental Publications, (800)490-9198; mention document number EPA 510-B-97-004.

Additional information

If you have an evaluation to submit, please see the memorandum from the work group's chair found in Appendix B. If you have comments about a particular listing, please contact the appropriate team leader for that type of evaluation; the members and teams are also in Appendix B. Comments and new information are welcomed.

I hope that this package is helpful to you. If you have questions about our distribution of the List, please contact David Wiley. He may be reached by phone at (703)603-7178, by fax at (703)603-9163, by e-mail at wiley.david@epamail.epa.gov, or by U.S. Mail at the letterhead address above.

Attachment: ***List of Leak Detection Evaluations for Underground Storage Tank Systems - Third Edition***

cc: State UST Contacts
UST/LUST Regional Program Managers
Region 10 Operations Offices' UST/LUST Contacts
Vendors appearing on List of Leak Detection Evaluations
Anthony Tafuri, NRMRL Edison
Members of Work Group on Leak Detection Evaluations
Larry Magni, American Petroleum Institute
Marc Katz, National Association of Convenience Stores
Bob Renkes, Petroleum Equipment Institute
John Huber, Petroleum Marketers Association of America
Mark Morgan, Petroleum Transportation & Storage Association
Service Station Dealers of America
Tom Osborne, Society of Independent Gasoline Marketers of America

cc (cover only):
Regional Program Managers' Supervisors
Kathy Nam, OGC
OUST Program Directions Team
OUST Desk Officers

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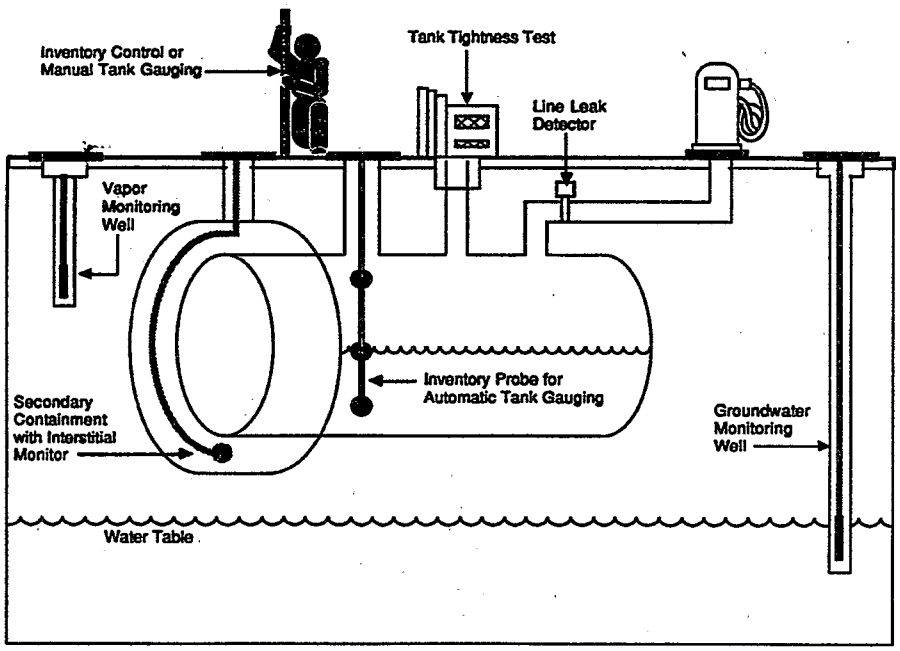
THIRD EDITION

SECOND PRINTING

LIST OF LEAK DETECTION EVALUATIONS FOR UNDERGROUND STORAGE TANK (UST) SYSTEMS

April 18, 1997



DISCLAIMER

This list of Leak Detection Evaluations was prepared by a work group consisting of State and EPA members and is limited to evaluations of leak detection equipment and procedures, or systems, that the work group has completed review of, and that were conducted by an independent third-party evaluator with leak rates blind to the vendor. This list includes evaluations conducted in accordance with either EPA Standard Test Procedures for Evaluating Leak Detection Methods (EPA/530/UST-90/004 through 010) or other acceptable protocols. The list includes an Under Review category, for evaluations which the work group's review could not be finalized prior to publication. The listing of system evaluations as "under review" in no way implies that the evaluations do or do not meet the criteria for which evaluations are reviewed.

LIST OF LEAK DETECTION EVALUATIONS USER SURVEY

1. I work in the following state(s)) _____

2. My main job function is (circle one)
Regulatory (Circle M for manager, I for inspector)
Financial responsibility insurance/assurance agency
Leak Detection Vendor (manufacturer and/or service co.)
Tank owner/operator
Other (specify) _____

3. I have used the list while working with UST systems and release detection. (YES) (NO)

Comments:

4. I have reviewed the national List of Leak Detection Evaluations and find it (circle all that apply)

Easy to follow	Good format	Useful for my work	Up to date	Complete	Accurate
Difficult to follow	Poor format	Of no use for my work	Outdated	Incomplete	Inaccurate

Comments:

5. I would benefit from receiving training on the use and applications of the list. (YES) (NO)

Comments:

6. I feel the National Work Group List of Leak Detection Evaluations has improved upon the quality of leak detection equipment and its use in my state(s). (YES) (NO)

Comments:

7. I would like for the National Work Group on Leak Detection Evaluations to continue to focus on improving the quality of leak detection equipment and services by continuing to review third party evaluations.
(YES) (NO)

Comments:

8. I still have the following concerns about leak detection equipment in my state (circle all that apply).

Equipment quality
Improper equipent installation
Improper equipment servicing/calibration/maintenance (Owner or Service Co.)
Inadequate field services (tank & line tightness testing, sample collection, etc.)
Inadequate regulatory authority for addressing vendors/service companies which provides services of questionable quality.

Comments:

9. I have the following suggestions on how the Work Group could provide further assistance to me in addressing my concerns related to leak detection.

10. I have the following additional comments on the list (negative, positive, and suggestions for improvement are welcomed, attach additional pages if more space is needed).

PLEASE SEND COMPLETED SURVEY TO:
CURT JOHNSON, ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
P.O. BOX 301463, MONTGOMERY, AL 36130-1463

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TABLE OF CONTENTS

PART I - LEAK DETECTION TEST METHODS AND EQUIPMENT 1
(Alphabetical by test method, then by vendor, next by equipment model, and finally by leak rate or operating principle.)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR 2

AUTOMATIC MECHANICAL LINE LEAK DETECTOR 5

AUTOMATIC TANK GAUGING SYSTEM 6

CONTINUOUS IN-TANK LEAK DETECTION SYSTEM 10

DOUBLE WALLED TANK TIGHTNESS TEST 11

LARGE DIAMETER PIPELINE LEAK ETECTOR 12

LARGE TANK AUTOMATIC TANK GAUGING SYSTEM 13

LINE TIGHTNESS TEST METHOD 14

LIQUID-PHASE INTERSTITIAL DETECTOR 15

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR 17

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (TRACER) 19

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE) 20

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM) 21

PRESSURE/VACUUM INTERSTITIAL MONITOR 22

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE) 23

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE) 24

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR 25

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL) 26

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL) (Edison Lab Protocol) 27

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL) 28

TABLE OF CONTENTS

PART II - LEAK DETECTION EQUIPMENT SPECIFICATIONS (Alphabetical by vendor, then by test method, next by equipment model, and finally by leak rate.)	**29**
Absolute Precision Testing Systems	30
Advanced Tank Technology, Inc.	31
Agar Corp.	32
Alert Technologies, Inc.	33
Andover Controls Corp.	37
Arizona Instrument Corp.	40
Armstrong Monitoring Corporation	45
Beaudreau Electronics, Inc.	47
Bell Avon, Inc.	49
Brooks KWK, Inc.	50
Caldwell Systems Corporation	52
Campo/Miller, Inc.	54
Computerizing, Inc.	60
Control Engineers	61
EBW, Inc.	65
EFA Technologies, Inc.	70
Egemin Naamloze Vennootschap	71
Emco Electronics, Tuthill Corp.	73
Engineered Systems, Inc.	83
Entropy Limited	84
Environment and Safety	86
Environmental Fuel Systems, Inc.	87
FCI Environmental, Inc.	88
FDR Services, Inc.	92
FE Petro, Inc.	93
Fluid Containment, Inc.(formerly O/C Tanks Corp.)	96
Gasboy International (formerly William M. Wilson's Sons)	97

TABLE OF CONTENTS

Hasstech	114
Heath Consultants, Inc.	123
Horner Creative Products	126
Ibex Industries	136
IMO Industries Inc., Gems Sensors Division	137
INCON Intelligent Controls, Inc.	138
Keekor Environmental Products	152
Leak Detection Systems, Inc	153
Mallory Controls	154
Marley Pump Co.	157
Mine Safety Appliances	170
NDE Environmental Corp.	172
Omntec/Electro Levels Mfg., Inc.	179
One Plus Corp.	182
Patriot Sensors and Controls Corp. (formerly MagneTek)	183
PermAlert	187
Petro Vend, Inc.	194
Pneumercator Company, Inc.	204
ProTank, Inc.	206
Raychem Corp.	213
Ronan Engineering Co.	214
Schuster Instruments	218
Simmons Sirvey Corp.	219
S.I.R. International, Inc.	221
SIR Monitor (formerly Environmental Management Technologies)	222
Sir Phoenix, Inc.	223
Soiltest, Inc.	224
Syscorp, Inc.	225

TABLE OF CONTENTS

Tank Automation, Inc.	226
Tanknology Corp. International	227
Tidel Engineering, Inc.	229
Tokheim Corp.	248
Tracer Research Corp.	249
Triangle Environmental, Inc.	252
Universal Sensors and Devices, Inc.	256
USTest	261
USTMAN Industries, Inc.	266
Vaporless Manufacturing	269
Veeder-Root	273
Vista Research, Inc.	299
Warren Rogers Associates, Inc.	305
Warrick Controls, Inc.	306
Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)	308
Western Environmental Resources	311
Xerxes Corp.	314

TABLE OF CONTENTS

PART III - LEAK DETECTION EQUIPMENT THIRD PARTY EVALUATION UNDER REVIEW 316
(Alphabetical by vendor, then by test method, next by equipment model.)

PART IV - ACCEPTABLE TEST PROTOCOLS 317
(Alphabetical by test method, then by protocol date.)

PART V - LEAK DETECTION EQUIPMENT MAINTENANCE CHECKLIST 321

APPENDIX A - GLOSSARY OF TERMS 327

APPENDIX B - LETTER TO VENDORS, WORK GROUP MEMBERS, WORK GROUP TEAMS, LEAK DETECTION EQUIPMENT REVIEW, AND DOCUMENT LIST 331

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PART I

LEAK DETECTION TEST METHODS AND EQUIPMENT

ALPHABETICAL BY TEST METHOD,

THEN BY VENDOR,

NEXT BY EQUIPMENT MODEL,

FINALLY BY LEAK RATE OR OPERATING PRINCIPLE

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Campo/Miller, Inc.	LS300 and LS300 N/C	3 gph/2.36 gph/35.36 gallons
Campo/Miller, Inc.	LS300-120 and LS300-120 XLC	3 gph/2.36 gph/35.36 gallons
Campo/Miller, Inc.	LS300-120 PLUS and LS300-120 PLUS A/S	3 gph/2.36 gph/35.36 gallons
Campo/Miller, Inc.	LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL, LSI	3 gph/1.5 gph/163 gallons
Campo/Miller, Inc.	LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL,LSI	0.2 gph/0.1 gph/163 gallons
Campo/Miller, Inc.	LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL,LSI	0.1 gph/0.05 gph/163 gallons
Control Engineers	Line Leak Detector Model LLP2	3.0 gph/1.88 gph/89 gallons
Control Engineers	Line Leak Detector Model LLP2	0.1 gph/0.05 gph/89 gallons
Emco Electronics, Tuthill Corp.	EECO System LLD (Q0011)	0.2 gph/0.1293 gph/67.4 gallons
Emco Electronics, Tuthill Corp.	EECO System LLD (Q0011)	3.0 gph/2.0 gph/67.4 gallons
Emco Electronics, Tuthill Corp.	EECO System LLD (Q0011)	0.1 gph/0.0793 gph/67.4 gallons
Emco Electronics, Tuthill Corp.	EECO System LLD (for Flexible Pipelines)	3.0 gph/2.0 gph/49.6 gallons
Emco Electronics, Tuthill Corp.	EECO System LLD (for Flexible Pipelines)	0.1 gph/0.0793 gph/49.6 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501	3.0 gph/1.5 gph/128 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501	0.2 gph/0.1 gph/128 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501	0.1 gph/0.079 gph/128 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)	3.0 gph/1.5 gph/158.4 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)	0.2 gph/0.1 gph/158.4 gallons
Gilbarco Environmental Products	Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)	0.1 gph/0.079 gph/158.4 gallons
Hasstech	LineTite Pipeline Leak Monitor	3.0 gph/2.0 gph/341 gallons
Hasstech	LineTite Pipeline Leak Monitor	0.1 gph/0.062 gph/341 gallons

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AUTOMATIC ELECTRONIC LINE LEAK DETECTOR (CONTINUED)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Hasstech	LineTite Pipeline Leak Monitor (for Flexible Pipelines)	3.0 gph/2.0 gph/49.6 gallons
Hasstech	LineTite Pipeline Leak Monitor (for Flexible Pipelines)	0.1 gph/0.062 gph/49.6 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector	3 gph/1.5 gph/163 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector	0.2 gph/0.1 gph/163 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector	0.1 gph/0.05 gph/163 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector (for Flexible Pipelines)	3 gph/1.5 gph/49.6 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector (for Flexible Pipelines)	0.2 gph/0.1 gph/49.6 gallons
INCON Intelligent Controls, Inc.	TS-LLD Line Leak Detector (for Flexible Pipelines)	0.1 gph/0.05 gph/49.6 gallons
Marley Pump Co.	Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L	3.0 gph/2.0 gph/55.1 gallons
Marley Pump Co.	Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L	0.2 gph/0.1 gph/55.1 gallons
Marley Pump Co.	Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L	0.1 gph/0.047 gph/55.1 gallons
Ronan Engineering Co.	Ronan X-76 Automatic Line Leak Detector Version X-76 DM-4 Microprocessor and JT-H2 Line Pressure Sensor	3.0 gph/0.831 gph/45 gallons
Ronan Engineering Co.	Ronan X-76 Automatic Line Leak Detector Version X-76 DM-4 Microprocessor and JT-H2 Line Pressure Sensor	0.1 gph/0.066 gph/45 gallons
Tidel Engineering, Inc.	LIPSPC-301-0730-001/LIP-301-0729-001 Line Integrity Probe and Submersible Pump Controller	3.0 gph/2.0 gph/129 gallons
Tidel Engineering, Inc.	LIPSPC-301-0730-001/LIP-301-0729-001 Line Integrity Probe and Submersible Pump Controller	0.1 gph/0.06 gph/129 gallons
Veeder-Root	Pressurized Line Leak Detector, Series 8494	3.0 gph/2.5 gph/100 gallons
Veeder-Root	Pressurized Line Leak Detector, Series 8494	0.2 gph/0.17 gph/100 gallons
Veeder-Root	Pressurized Line Leak Detector, Series 8494	0.1 gph/0.09 gph/100 gallons
Veeder-Root	TLS Line Leak Detector, Series 8484	3.0 gph/1.88 gph/89 gallons
Veeder-Root	TLS Line Leak Detector, Series 8484	0.1 gph/0.05 gph/89 gallons
Veeder-Root	TLS-350 Line Leak Detector , Series 8475	0.1 gph/0.079 gph/128 gallons
Veeder-Root	TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475	3.0 gph/1.5 gph/158.4 gallons
Veeder-Root	TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475	0.2 gph/0.1 gph/158.4 gallons

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AUTOMATIC ELECTRONIC LINE LEAK DETECTOR (CONTINUED)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Veeder-Root	TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475	0.1 gph/0.079 gph/158.4 gallons
Veeder-Root	TLS-350 Line Leak Detector, Series 8475	3.0 gph/1.5 gph/128 gallons
Veeder-Root	TLS-350 Line Leak Detector, Series 8475	0.2 gph/0.1 gph/128 gallons

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AUTOMATIC MECHANICAL LINE LEAK DETECTOR

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
FE Petro, Inc.	STP-MLD Pipeline Leak Detector	3.0 gph/2.0 gph/129.14 gallons
FE Petro, Inc.	STP-MLD-D Pipeline Leak Detector	3.0 gph/2.0 gph/341 gallons
FE Petro, Inc.	STP-MLD-E Line (Flexline) Leak Detector (for Flexible Pipelines)	3.0 gph/2.0 gph/49.6 gallons
Marley Pump Co.	Red Jacket DLD and XLD	3.0 gph/2.0 gph/129 gallons
Marley Pump Co.	Red Jacket FX1/FX2	3.0 gph/2.0 gph/158 gallons
Marley Pump Co.	Red Jacket FX1/FX2 Flexline (for Flexible Pipelines)	3.0 gph/2.0 gph/49 gallons
Marley Pump Co.	Red Jacket FX2/FX2-D and Bigflo	3.0 gph/2.0 gph/362 gallons
Marley Pump Co.	Red Jacket XLP	3.0 gph/2.0 gph/129 gallons
Marley Pump Co.	Red Jacket XLP (for Flexible Pipelines)	3.0 gph/2.0 gph/48.9 gallons
Tokheim Corp.	Tokheim Pressure Monitor, Models PM 101 and 585A-PM	3.0 gph/2.25 gph/78 gallons
Vaporless Manufacturing	Vaporless LD 2000 and LD 2000S	3.0 gph/1.7 gph/129 gallons
Vaporless Manufacturing	Vaporless LD 2000E and LD 2000E-S	3.0 gph/2.0 gph/59.6 gallons
Vaporless Manufacturing	Vaporless LD 2000T and LD 2000T-S	3.0 gph/2.5 gph/129 gallons
Vaporless Manufacturing	Vaporless LD 3000 and LD 3000S	3.0 gph/2.0 gph/320 gallons

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AUTOMATIC TANK GAUGING SYSTEM

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Alert Technologies, Inc.	Alert Model 2000 In-Tank Mass Measurement Probe System (Mass Buoyancy Probe)	0.2 gph/0.1 gph/15,000 gallons
Andover Controls Corp.	Andover Infinity CX9000, CX9200, and CMX240 (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Andover Controls Corp.	Andover Infinity CX9000, CX9200, and CMX240 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Andover Controls Corp.	Versions AC8+/AC256+ (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Arizona Instrument Corp.	Encompass MTS IPAM #17-903 (Magnetostrictive Probe #17-9300)	0.2 gph/0.1 gph/15,000 gallons
Arizona Instrument Corp.	Encompass USF IPAM #17-901 (Ultrasonic Probe #17-9100)	0.2 gph/0.1 gph/15,000 gallons
Caldwell Systems Corporation	Tank Manager (Ultrasonic Probe)	0.2 gph/0.1 gph/20,000 gallons
Caldwell Systems Corporation	Tank Manager (Ultrasonic Probe)	0.1 gph/0.05 gph/20,000 gallons
Control Engineers	CEI 3000 Tank Level Module - Version TLP2 Normal/Rapid Test Mode (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Control Engineers	CEI 3000 Tank Level Module - Version TLP2 Normal/Rapid Test Mode (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
EBW, INC.	Auto-Stik II and Auto-Stik Jr. (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
EBW, INC.	Auto-Stik II and Auto-Stik Jr. (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Egemin Naamloze Vennootschap	E'SPI III (Mass Buoyancy Probe)	0.2 gph/0.075 gph/15,000 gallons
Egemin Naamloze Vennootschap	E'SPI IV (Mass Buoyancy Probe)	0.2 gph/0.1 gph/15,000 gallons
Emco Electronics, Tuthill Corp.	EECO System TLM/0.2 gph Precision Test (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Emco Electronics, Tuthill Corp.	EECO System TLM/0.1 gph Precision Test (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Emco Electronics, Tuthill Corp.	EECO System TLM/0.2 gph Quick Test (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Emco Electronics, Tuthill Corp.	EECO System TLM/0.1 gph Quick Test (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Engineered Systems, Inc.	Image II (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Environment and Safety	EASI Level-Tru (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons

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AUTOMATIC TANK GAUGING SYSTEM (CONTINUED)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Gasboy International (formerly William M. Wilson's Sons)	Gasboy TMS 500 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Gilbarco Environmental Products	EMC Environmental Management Console, EMC Basic Monitoring System Tank Monitor 2, 3, 2.1, and 3.1, PAO238000XXXX (Capacitance Probe)	0.2 gph/0.1 gph/15,000 gallons
Gilbarco Environmental Products	EMC Environmental Management Console, EMC Basic Monitoring System Tank Monitor 2.1,3.1,PAO264XXX0000 (Capacitance Probe)	0.2 gph/0.126 gph/15,000 gallons
Gilbarco Environmental Products	EMC Environmental Management Console, EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO264XXX0000 (Capacitance Probe)	0.1 gph/0.071 gph/15,000 gallons
Gilbarco Environmental Products	EMC Environmental Management Console, EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO265XXX0000 (Magnetostrictive Probe)	0.2 gph/0.093 gph/15,000 gallons
Gilbarco Environmental Products	EMC Environmental Management Console, EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO265XXX0000 (Magnetostrictive Probe)	0.1 gph/0.071 gph/15,000 gallons
Hasstech	Tank Compliance Center, Model 700 (7100 Series Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Hasstech	Tank Compliance Center, Model 700 (7100 Series Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
INCON Intelligent Controls, Inc.	TS 1000 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
INCON Intelligent Controls, Inc.	TS 2000 (Magnetostrictive Probe)	0.2 gph/0.058 gph/15,000 gallons
Keekor Environmental Products	TankTite Leak Detection Kernel Version 1.0 with Keeprobe K7 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Marley Pump Co.	Red Jacket ATM System, Version RLM 5000, 5001, and 9000 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Marley Pump Co.	Sonic Technology (ST) 1400-1800 Series Tank Monitoring System ATG Automatic Tank Gauging Monitor, LLM Series Liquid Level Monitor, FMS Fuel Management Monitor (Ultrasonic Probe)	0.2 gph/0.1 gph/18,000 gallons
Marley Pump Co.	Sonic Technology (ST) 1400-1800 Series Tank Monitoring System ATG Automatic Tank Gauging Monitor, LLM Series Liquid Level Monitor, FMS Fuel Management Monitor (Ultrasonic Probe)	0.1 gph/0.05 gph/18,000 gallons
Omntec/Electro Levels Mfg., Inc.	OEL 8000 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Omntec/Electro Levels Mfg., Inc.	OEL 8000 (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons

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AUTOMATIC TANK GAUGING SYSTEM (CONTINUED)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Patriot Sensors and Controls Corp. (formerly MagneTek)	7021 Digital Tank Gauge (7030 Series Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Patriot Sensors and Controls Corp. (formerly MagneTek)	7021 Digital Tank Gauge (7030 Series Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Patriot Sensors and Controls Corp. (formerly MagneTek)	7021 Digital Tank Gauge (7100 Series Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Patriot Sensors and Controls Corp. (formerly MagneTek)	7021 Digital Tank Gauge (7100 Series Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Petro Vend, Inc.	Petrosonic III, Version 4.05 (Model 613, 4 inch, Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Petro Vend, Inc.	Site Sentinel Model II and III, (Model 613, 2 inch, Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Petro Vend, Inc.	Site Sentinel Model II and III, (Model 613, 4 inch, Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Petro Vend, Inc.	Site Sentinel Model II and III, (Model 613, 4 inch, Magnetostrictive Probe)	0.1 gph/0.06 gph/15,000 gallons
Ronan Engineering Co.	X-76 ETM and X-76 ETM-4X (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons
Ronan Engineering Co.	X-76 ETM and X-76 ETM-4X (Magnetostrictive Probe)	0.1 gph/0.05 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, 3500 Series (Ultrasonic Probes #401-0009, #401-0010 and #401-0023)	0.2 gph/0.1 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 2000, 3000, and 3500 Series (Ultrasonic Probes #401-0009 and #401-0010)	0.2 gph/0.1 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 2000, 3000, and 3500 Series (Ultrasonic Probes #401-0021 and #401-0022)	0.2 gph/0.1 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 4000 (Ultrasonic Probe #312-9000)	0.2 gph/0.1 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 4000 (Ultrasonic Probe #312-9000)	0.1 gph/0.05 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 4000 (Ultrasonic Probe #312-9001)	0.2 gph/0.1 gph/15,000 gallons
Tidel Engineering, Inc.	Tidel Environmental Monitoring System, EMS 4000 (Ultrasonic Probe #312-9001)	0.1 gph/0.05 gph/15,000 gallons
Universal Sensors and Devices, Inc.	TICS-1000 (Magnetostrictive Probe)	0.2 gph/0.1 gph/15,000 gallons

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AUTOMATIC TANK GAUGING SYSTEM (CONTINUED)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
USTest	UST 2001 (Ultrasonic Probe)	0.1 gph/0.05 gph/15,000 gallons
USTest	UST 2001 (Quick Test) (Ultrasonic Probe)	0.2 gph/0.1 gph/15,000 gallons
Veeder-Root	TLS-200/200i/300/400 UST ATGS (7842 Digital Sensing Capacitance Probe)	0.2 gph/0.1 gph/15,000 gallons
Veeder-Root	TLS-200/200i/300/400 UST ATGS (8472 Digital Sensing Capacitance Probe)	0.2 gph/0.126 gph/15,000 gallons
Veeder-Root	TLS-200/200i/300/400 UST ATGS (8472 Digital Sensing Capacitance Probe)	0.1 gph/0.071 gph/15,000 gallons
Veeder-Root	TLS-200/200i/250/250i/300/350/400 UST ATGS (8473 Digital Sensing Magnetostrictive Probe)	0.2 gph/0.093 gph/15,000 gallons
Veeder-Root	TLS-200/200i/250/250i/300/350/400 UST ATGS (8473 Digital Sensing Magnetostrictive Probe)	0.1 gph/0.071 gph/15,000 gallons

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CONTINUOUS IN-TANK LEAK DETECTION SYSTEM

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Veeder-Root	TLS Series 300/400 Monitoring Systems with CSLD versions 8473 and 8493 (Magnetostrictive Probes)	0.2 gph/0.16 gph/38,170 gallons

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DOUBLE WALLED TANK TIGHTNESS TEST

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Fluid Containment, Inc. (formerly O/C Tanks Corp.)	Hydrostatic Precision Tank Test for DWT-Type II Tanks	0.1 gph/0.05 gph/30,000 gallons
Xerxes Corp.	Xerxes Trucheck Hydrostatic Monitoring System	0.1 gph/0.05 gph/30,000 gallons

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LARGE DIAMETER PIPELINE LEAK DETECTOR

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
EFA Technologies, Inc.	LeakNet	3.0 gph/2.2 gph/116,230 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Manual Method	0.2 gph/0.177 gph/3,400 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Manual Method	0.1 gph/0.077 gph/3,400 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Primary Method	0.2 gph/0.148 gph/3,400 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Primary Method	0.1 gph/0.060 gph/3,400 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Segmented Method	0.2 gph/0.174 gph/3,400 gallons
Vista Research, Inc.	Model LT-100 Version 1.0 Segmented Method	0.1 gph/0.074 gph/3,400 gallons

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LARGE TANK AUTOMATIC TANK GAUGING SYSTEM

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Universal Sensors and Devices, Inc.	LTC-1000 (Mass Buoyancy Probe)	1.4 gph/0.7 gph/2,000,000 gallons
Universal Sensors and Devices, Inc.	LTC-2000 (Differential Pressure Probe)	3.0 gph/1.5 gph/2,000,000 gallons

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LINE TIGHTNESS TEST METHOD

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Hasstech	AcuRite	0.1 gph/0.01 gph/75 gallons
Heath Consultants, Inc.	Petro Tite Line Tester	0.1 gph/0.01 gph/129 gallons
Horner Creative Products	EZY-Chek II Automatic Line Leak Detector	0.1 gph/0.05 gph/129 gallons
Horner Creative Products	EZY-Chek Manual Line Leak Detector	0.1 gph/0.05 gph/129 gallons
NDE Environmental Corp.	Proline Test Series III, Version 1.0	0.1 gph/0.05 gph/41 gallons
NDE Environmental Corp.	PTK-88	0.1 gph/0.05 gph/40 gallons
ProTank, Inc.	LTH-5000 Line Tester	0.1 gph/0.05 gph/40 gallons
ProTank, Inc.	LTP-5000 Line Tester	0.1 gph/0.05 gph/41 gallons
Tanknology Corp. International	TLD-1	0.1 gph/0.05 gph/50 gallons
Tracer Research Corp.	Tracer Tight Line Test	0.1 gph/A leak is declared when tracer chemical is detected outside of the pipeline.
Triangle Environmental, Inc.	TEI Model LT-3, Version 1.0	0.1 gph/0.05 gph/80 gallons
Western Environmental Resources	Model PLT-100R	0.1 gph/0.05 gph/80 gallons

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LIQUID-PHASE INTERSTITIAL DETECTOR

VENDOR	EQUIPMENT NAME	OPERATING PRINCIPLE
Arizona Instrument Corp.	Soil Sentry Liquid 330(17-330-A/17-330-B), TLM-830, ENCOMPASS APAM Probes 17-141A, 17-142A, 17-143A, 17-144A	refraction
Beaudreau Electronics, Inc.	Model 404 Pump Cut-Off	float switch
Beaudreau Electronics, Inc.	Model 406 Pump Cut-Off	refractive index of liquids
EBW, Inc.	AUTO-STIK Discriminating Sensors LS-5, LS-35	float switch and product permeability
EBW, Inc.	Liquid Sensor System LS-3A, LS-30A, LS-7	float switch
Emco Electronics, Tuthill Corp.	EECO system, Leak Sensor II, Leak Sensor Jr. Thermistor and Proximity probes	thermal conductivity, proximity switch
Gilbarco Environmental Products	PA02590XXX000	float switch
Gilbarco Environmental Products	PA02591144000	float switch
Gilbarco Environmental Products	PA02592000000	float switch
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000EFI TSP-DIS BriteSensor	opto-electric
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000EFI TSP-HIS Brite Sensor	magnetic switch
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000/TS-2000 TSP-EIS Standard Sensor, TSP-PS Liquid Contact Sensor	opto-electric
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000/TS-2000 TSP-HLS Standard Sensor, TSP-ULS Standard Sensor	magnetic switch
Marley Pump Co.	Red Jacket PPM 4000 with Optical Liquid Discrimination Sensor	optical sensor
Omntec/Electro Levels Mfg., Inc.	L-LL-R-1, LS-ASC, PDS-ASC, PDWS-1, PDWF-1	all: refractive index of liquids; PDS-ASC, PDWS-1, and PDWF-1: electrical conductivity
PermAlert	PAL-AT Models AT20C, AT50C, AT40K PHL Hydrocarbon Sensor	electrical conductivity
PermAlert	TankWatch Models PHM10, PHMS Combination Hydrocarbon/Water Probe	electrical conductivity
PermAlert	TankWatch Models PHM10, PHMS Hydrocarbon Probe	electrical conductivity
Petro Vend, Inc.	Petrosentry IV, Petrosentry VIII, SiteSentinel Liquid Sensor	thermal conductivity
Petro Vend, Inc.	Petrosentry IV, Petrosentry VIII, SiteSentinel Universal Reservoir Sensor	float switch
Petro Vend, Inc.	Petrosentry IV, Petrosentry VIII, SiteSentinel Universal Sump Sensor	float switch

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LIQUID-PHASE INTERSTITIAL DETECTOR (Continued)

VENDOR	EQUIPMENT NAME	OPERATING PRINCIPLE
Pneumercator Company, Inc.	LC1000, E-14-29, E-700-1, LDE-700, LDE-740, TMS 3000 LS600AB, LS600LDBN, LS610, RSU800	float switch
Pneumercator Company, Inc.	LDE 700, LDE 740, LDE 9000 Sensor Probe Models 9-901, 9-902, 9-903	capacitance
Tidel Engineering, Inc.	EMS-3500 with Liquid Discriminatory Probes Part 301-0635	electrical conductivity/hydrocarbon sensitive polymer
Tidel Engineering, Inc.	EMS-3500 with Containment Sump Probes Part 301-0642	magnetic switch/float and hydrocarbon sensitive polymer
Tidel Engineering, Inc.	EMS-3500 Tidel Detector No. 301-0752-001	float switch
Universal Sensors and Devices, Inc.	Leak Alert System Models LAL-100, LA-01, LA-02, LA-04, LA-X4, LA-08, CATLAS Liquid Sensor LALS-1	thermal conductivity
Veeder-Root	TLS-250, TLS 250i Plus, ILS 250, ILS 350, TLS-350 Interstitial Liquid Sensor for Steel Tanks (0794390-420)	float switch
Veeder-Root	TLS-250i, TLS 250i Plus, ILS 250, ILS 350, TLS-350 Interstitial Liquid Sensor for Fiberglass Tanks (0794390-401)	float switch
Veeder-Root	TLS-250i, TLS 250i Plus, ILS 250, ILS 350, TLS-350 Liquid Sensor for Sumps (0794390-206)	float switch
Veeder-Root	TLS-350 Discriminating Insterstitial Liquid Sensor	capacitance change/ultrasonic
Veeder-Root	TLS-350 Dispenser Pan Sensor(794380-320) and Containment Sump Sensor(794380-350)	electrical conductivity/ultrasonic
Veeder-Root	TLS-350 Dual and Single Stage Hydrostatic Sensors	float switch
Veeder-Root	TLS-350 Solid-State Pan/Sump Sensor (794380-321, -351), Piping Sump Sensor (794380-208), Micro Sensor (794380-340)	product permeable/ultrasonic/float switch
Warrick Controls, Inc.	Model DFP-25 Sensor	product solubility

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LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

VENDOR	EQUIPMENT NAME	OPERATING PRINCIPLE
Advanced Tank Technology, Inc.	Leak Tracer Dye (LTD)	product solubility - color development
Agar Corp.	LEAKWISE Groundwater Monitor ID-220 Series Hydrocarbon on Water Detector System	radio frequency (RF) attenuation
Armstrong Monitoring Corporation	ALERTMASTER 5100 Leak Detection Cable AMC-5007	electrical conductivity
Armstrong Monitoring Corporation	ALERTMASTER 5100 Vapor Sensor AMC F4000	metal oxide semiconductor
Brooks KWK, Inc.	Leak Detection Systems, KW-140 / KW-240 Monitors with Type 1 Sensor	product soluble
Brooks KWK, Inc.	Leak Detection Systems, KW-140 / KW-240 Monitors with Type 2 Sensor	product soluble
EBW, Inc.	AUTO-STIK Discriminating Sensors LS-10,LS-15,LS-20	float switch and product permeability
FCI Environmental, Inc.	Analog Hydrocarbon Probe AHP-100	fiber optic chemical sensor
FCI Environmental, Inc.	Digital Hydrocarbon Probe DHP-100	fiber optic chemical sensor
Gilbarco Environmental Products	Environmental Management Console (EMC) Groundwater Sensor, series PA02700XX0001	electrical conductivity
IMO Industries Inc., Gems Sensors Division	Gems Smartwell Portable Monitor model WPM-535 with Groundwater Probe model WP-535	conductive polymer
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000EFI TSP-DDS BriteSensor, TSP-DTS BriteSensor	magnetic switch, float, and hydrocarbon sensitive polymer
INCON Intelligent Controls, Inc.	Tank Sentinel TS-1000EFI TSP-MWS BriteSensor Groundwater Probe	hydrocarbon sensitive polymer
Mallory Controls	Pollulert Probes MD221G/T, MD221G/TRA	electrical conductivity
Mallory Controls	Pollulert Probes MD241R, MD241RRA, MD241G, MD241GRA	electrical conductivity
One Plus Corp.	Leak Edge Models 100-3001, 100-4001	product permeable
PermAlert	PAL-AT Models AT20C, AT50C, AT40K AGW Sensor Cable	impedance change
PermAlert	PAL-AT Models AT20C, AT50C, AT40K TFH Hydrocarbon Sensor Cable	impedance change
PermAlert	PAL-AT Models AT20C, AT50C, AT40K with PHFW Hydrocarbon Probe and Type 1 Sensor	product soluble
PermAlert	PAL-AT Models AT20C, AT50C, AT40K with PHFW Hydrocarbon Probe and Type 2 Sensor	product soluble
Petro Vend, Inc.	SiteSentinel 30-3206, -3207, -3210 Sensors	product permeable
Raychem Corp.	TraceTek Alarm and Locator Modules TT502 Fuel Sensing Cable	electrical conductivity
Tidel Engineering, Inc.	EMS-3500 with Monitoring Well Probes Part 301-0641	conductivity via resistor ladder network

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LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR (CONTINUED)

VENDOR	EQUIPMENT NAME	OPERATING PRINCIPLE
Tidel Engineering, Inc.	EMS-3500 with Sheen Probes Part 301-0687	electrical conductivity/hydrocarbon sensitive polymer
Tidel Engineering, Inc.	EMS-3500 Tidel Detector No. 301-0762	electrical conductivity/hydrocarbon sensitive polymer
Tidel Engineering, Inc.	Tidel Detector No. 301-0324-001 and 301-0325-001	electrical conductivity
Tidel Engineering, Inc.	Tidel Detector No. 301-0326-001 and 301-0326-002	electrical conductivity
Veeder-Root	350 Series UST Monitoring Systems: Models ILS-350, TLS-350, TLS-350R Groundwater Sensor (794380-621, -622, -624)	electrical conductivity

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NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (TRACER)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD
Tracer Research Corp.	Tracer Tight	0.1 gph/A leak is declared when tracer chemical is detected outside of the tank.

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NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Alert Technologies, Inc.	Alert Ullage System Model 1050 (Pressure and Vacuum Test)	0.1 gph/ A leak is declared when the ratio of the ultrasonic signal (when the tank is under pressure or vacuum) to the background signal (prior to pressurization or evacuation) equals or exceeds 1.5 for either 12 kHz or 25 kHz frequency band./6,000 gallons
Alert Technologies, Inc.	Alert Ullage System Model 1050 X (Vacuum Test)	0.1 gph/ A leak is declared when the ratio of the ultrasonic signal (when the tank is under vacuum) to the background signal (prior to vacuation) equals or exceeds 1.5 for either 12 kHz or 25 kHz frequency band. /24,000 gallons
NDE Environmental Corp.	U3 Ullage Test (Vacuum or Pressure Test)	0.1 gph/A leak is declared when the acoustic signal detected is different from the baseline. (Baseline is the acoustic signal before tank is pressurized or evacuated.)/16,500 gallons
NDE Environmental Corp.	UST Ullage Test - Version U2 (Pressure Test)	0.1 gph/A leak is declared when the pressure decay trend equals or exceeds ± 0.016 psi/hr./10,260 gallons
NDE Environmental Corp.	UTS-4T Ullage Test (Pressure Test)	0.1 gph/A leak is declared when the make-up gas flow rate into ullage equals or exceeds 0.275 cubic feet/hour./7,500 gallons
ProTank, Inc.	UTA-5000 Ullage Tester (Vacuum or Pressure Test)	0.1 gph/A leak is declared when the acoustic signal detected is different from the baseline. (Baseline is the acoustic signal before tank is pressurized or evacuated.)/16,500 gallons.
ProTank, Inc.	UTF-5000 Ullage Tester (Pressure Test)	0.1 gph/A leak is declared when the make-up gas flowrate into ullage equals or exceeds 0.275 cubic feet per hour./7,500 gallons
ProTank, Inc.	UTFP-5000 Ullage Tester (Pressure Test)	0.1 gph/A leak is declared when the pressure decay trend equals or exceeds ± 0.016 psi/hr./10,260 gallons.
Triangle Environmental, Inc.	TEI Ullage Test, Version 1.0 (Vacuum Test)	0.1 gph/A leak is declared when an increase in the acoustic noise level (above background) of the tank under vacuum is detected due to air or water ingress./15,000 gallons
USTest	UST 2000/U (Pressure and Vacuum Test)	0.1 gph/A leak is declared when there is a substantial increase in the acoustic noise signal (when the tank is under vacuum or pressure) above the background signal (prior to pressurization or evacuation) in the frequency interval of 10 kHz to 20 kHz/7,550 gallons (pressure), 5,250 gallons (vacuum).

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NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Horner Creative Products	EZY 3	0.1 gph/ A leak is declared when the vacuum decay is more than 1 inch water column pressure for non-volatile products and 10% of the lower determined vapor pressure for volatile products. A leak is also declared if any water ingress is detected. /50,000 gallons
Tanknology Corp. International	VacuTect	0.1 gph/ A leak is declared when: sonic emission of air ingress is detected in ullage area and/or; sonic emission of bubbles formed by air ingress is detected in product-filled portion of the tank and/or; water ingress is detected at the bottom of the tank./75,000 gallons
Triangle Environmental, Inc.	TEI System 5000, Version 1.0	0.1 gph/ A leak is declared when the acoustic noise level of the tank under vacuum is greater than the calibrated background acoustic noise level (prior to evacuation)./20,000 gallons

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PRESSURE/VACUUM INTERSTITIAL MONITOR

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Bell Avon, Inc.	VIGILANT Leak Detection System	0.1 gph/ A leak is declared when changes in interstitial vacuum exceed a predetermined change in slope versus time curve./15,000 gallons

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STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Entropy Limited	Precision Tank Inventory Control System, Version 90	0.1 gph/0.04 gph/15,000 gallons
Horner Creative Products	SIR PRO 1 Version 1.0	0.2 gph/0.1 gph/18,000 gallons
Horner Creative Products	SIR PRO 1 Version 2.0	0.1 gph/0.05 gph/18,000 gallons
Syscorp, Inc.	Store Vision Version E.2	0.2 gph/0.0834 gph/12,000 gallons
USTMAN Industries, Inc.	YES SIR 90	0.2 gph/0.1 gph/15,000 gallons

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STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Computerizing, Inc.	Computank V. 3.0	0.1 gph/0.05 gph/18,000 gallons
Entropy Limited	Precision Tank Inventory Control System Rev. 90	0.1 gph/0.05 gph/21,000 gallons
Homer Creative Products	SIR PRO 1 Version 3.0	0.2 gph/0.1 gph/33,000 gallons
Homer Creative Products	SIR PRO 1 Version 4.0	0.1 gph/0.05 gph/33,000 gallons
S.I.R. International, Inc.	Mitchell's SIR Program v.2.6 12-13-91	0.1 gph/0.05 gph/18,000 gallons
Simmons Sirvey Corp.	SIR 5.7	0.1 gph/0.05 gph/18,000 gallons
Simmons Sirvey Corp.	SIR 5.7 LM	0.1 gph/0.05 gph/45,000 gallons
SIR Monitor (formerly Environmental Management Technologies)	SIR Monitor	0.1 gph/0.05 gph/18,000 gallons
Sir Phoenix, Inc.	SIR PHOENIX	0.1 gph/0.05 gph/18,000 gallons
USTMAN Industries, Inc.	USTMAN SIR 1.91	0.1 gph/0.1 gph/18,000 gallons
USTMAN Industries, Inc.	USTMAN SIR Version 94.1	0.1 gph/0.05 gph/30,000 gallons
Warren Rogers Associates, Inc.	WRA Statistical Inventory Analysis, Version 5.1	0.1 gph/0.05 gph/18,000 gallons
Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)	Enviro Tite SIR (also known as SIRAS 99.6)	0.1 gph/0.05 gph/18,000 gallons
Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)	SIRAS Software System, Version 2.0	0.1 gph/0.05 gph/30,000 gallons
Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)	SIRAS Software System, Version 2.8.3	0.2 gph/0.1 gph/30,000 gallons

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VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

VENDOR	EQUIPMENT NAME	OPERATING PRINCIPLE
Arizona Instrument Corp.	Soil Sentry Twelve-X	metal oxide semiconductor
Arizona Instrument Corp.	Soil Sentry Twelve-X	metal oxide semiconductor
Environmental Fuel Systems, Inc.	Fuel Finder Version IV	adsorption sampling
FCI Environmental, Inc.	Analog Hydrocarbon Probe AHP-100	fiber optic
FCI Environmental, Inc.	Digital Hydrocarbon Probe DHP-100	fiber optic
FDR Services, Inc.	GasPak Vapor Monitoring System	product permeable detector
Gilbarco Environmental Products	PA02660000000	adsistor
Mallory Controls	Pollulert Probes MD221V, MD221VRA, MD210V, MD210VRA	adsistor
Mine Safety Appliances	Tankgard VIII P/N 488803 S/N 00389	metal oxide semiconductor
Mine Safety Appliances	Tankgard P/N 481532 S/N 03095	metal oxide semiconductor
Petro Vend, Inc.	Petrosentry TLD III	metal oxide semiconductor
Petro Vend, Inc.	SiteSentinel Smart Module and Vapor Sensor	metal oxide semiconductor
Tidel Engineering, Inc.	EMS-3000 301-0328-001, 301-0330-001	adsistor
Tidel Engineering, Inc.	EMS-3500 Vapor Sensor Probe Part No. 301-0634	adsistor
Tracer Research Corp.	Tracer Tight	chromatographic (looks for chemical tracer)
Universal Sensors and Devices, Inc.	Leak Alert System Models LAL-100, LA-01, LA-02, LA-04, LA-X4, LA-08, CATLAS LAVS-1 MOS Vapor Sensor	metal oxide semiconductor
Veeder-Root	ILS 350, TLS-350 Adsistor Vapor Probes	adsistor
Warrick Controls, Inc.	Model 5700 Meter PVP-2 Sensor	adsistor

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VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Heath Consultants, Inc.	Petro Comp	0.1 gph/0.05 gph/15,000 gallons
Heath Consultants, Inc.	Petro Tite II	0.1 gph/0.05 gph/15,000 gallons
Horner Creative Products	Horner EZY-Chek I	0.1 gph/0.05 gph/12,000 gallons
Horner Creative Products	Horner EZY-Chek II	0.1 gph/0.05 gph/12,000 gallons
Ibex Industries	Ibex Precision Test System	0.1 gph/0.05 gph/18,000 gallons
Leak Detection Systems, Inc.	Tank Auditor, Version RTD V.2.16	0.1 gph/0.05 gph/15,000 gallons.
Schuster Instruments	Tel-A-Leak 1	0.1 gph/0.05 gph/15,000 gallons
Soiltest, Inc.	Soiltest Ainlay Tank 'Tegrity Tester, S-3	0.1 gph/0.05 gph/15,000 gallons
Tank Automation, Inc.	Automated Precision Tank Testing System (APTT System) R-2	0.1 gph/0.05 gph/15,000 gallons
Western Environmental Resources	AES System II	0.1 gph/0.05 gph/15,000 gallons
Western Environmental Resources	AES System II - (Large Tanks)	0.1 gph/0.05 gph/75,000 gallons

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VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL) (Edison Lab Protocol)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Hasstech	Leak Computer Tank Test System	0.1 gph/0.05 gph/12,000 gallons

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VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

VENDOR	EQUIPMENT NAME	LEAK RATE/THRESHOLD/ MAX VOLUME
Alert Technologies, Inc.	Alert Model 1000	0.1 gph/0.05 gph/30,000 gallons
Hasstech	Leak Computer Tank Test System	0.1 gph/0.05 gph/15,000 gallons
Horner Creative Products	Horner EZY-Chek II	0.1 gph/0.05 gph/12,000 gallons
NDE Environmental Corp.	Computerized VPLT Testing System	0.1 gph/0.05 gph/18,000 gallons
NDE Environmental Corp.	Sure Test - Assured Tight System, Series IV	0.1 gph/0.05 gph/18,000 gallons
ProTank, Inc.	VU-5000 Underfill Tester	0.1 gph/0.05 gph/18,000 gallons
ProTank, Inc.	VUP-5000 Underfill Tester	0.1 gph/0.05 gph/18,000 gallons
Triangle Environmental, Inc.	TEI System 4000, Version 1.0	0.1 gph/0.05 gph/15,000 gallons
USTest	UST 2000/LL	0.1 gph/0.05 gph/15,000 gallons
USTest	UST 2000/P	0.1 gph/0.05 gph/45,000 gallons

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PART II

LEAK DETECTION EQUIPMENT SPECIFICATIONS

ALPHABETICAL BY COMPANY,

THEN BY TEST METHOD,

NEXT BY EQUIPMENT MODEL,

FINALLY BY LEAK RATE

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Absolute Precision Testing Systems

APT/BKG 1000

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.05 gph with P_D=99.2310% and P_{FA}=0.5451%.

Leak Threshold: 0.02587 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, fuel oil #6 and solvents.

Tank Capacity: Maximum of 6,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 36 hours between delivery and testing.
Minimum of 1.5 hours between "topping off" and testing.
Total minimum waiting time is 36 hours.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 48 minutes.
Volume data is collected and recorded by a computer.
Leak rate is calculated from 1 minute of test.
There must be a minimum of 10 tests performed to conclusively declare a tank tight or declare a leak.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a resistance temperature sensor.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a height difference of 6 feet between product and water level.

Calibration: Level sensors are calibrated before each test.
Temperature sensor must be checked and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank system.

Absolute Precision Testing Systems
P.O. Box 6715
Bloomington, IN 47407
Tel: (800) 355-2780

Evaluator: Dixon Consulting Inc.
Tel: (812)332-4144

Date of Evaluation: 12/05/95

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Advanced Tank Technology, Inc.

Leak Tracer Dye (LTD)

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	intermittent
Operating principle:	product solubility - color development

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100 (above 23 ppm)	100 (above 8 ppm)
Detection time (min:sec)	<00:01	<00:01
Fall time (min:sec)	N/A*	N/A
Lower detection limit (cm)	<0.32	<0.32

*See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Manufacturer's specifications: LTD develops color in alcohols, ketones, solvents, and PCBs as well as petroleum products.

Comments: EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is not reusable, and must be replaced after contact with hydrocarbons.
Detector is listed as "intermittent" because it must be checked periodically; it does not automatically alarm when hydrocarbon is detected.

Advanced Tank Technology, Inc.
820 N. Sylvania
Fort Worth, TX 76111
Tel: (817) 831-3246

Evaluator: Scientific Information Services
Tel: Not Available

Date of Evaluation: 02/02/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Agar Corp.

LEAKWISE Groundwater Monitor
ID-220 Series Hydrocarbon on Water Detector System

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	radio frequency (RF) attenuation

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	<00:01	<00:01
Fall time (min:sec)	<00:01	<00:01
Lower detection limits (cm)		
"Standard" setting	0.16	0.32
"Sensitive" setting	0.03	0.03

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s), water.

Manufacturer's specifications:
Operating range:

Resolution : 0.5 mm of hydrocarbon on water or brine
Variation : groundwater fluctuation of +/- 1 meter standard (larger variations optional)
Oil thickness : 0.3 - 25 mm optional (higher ranges available)
Temperature : 0 - 70 degrees C (higher available)

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.
Color coded signal lights indicate the presence of air, water, and hydrocarbon liquid when activated (yellow, green, and red, respectively).

Agar Corp.
P.O. Box 802127
Houston, TX 77280-2127
Tel: (713) 464-4451

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 11/15/91

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Alert Technologies, Inc.

Alert Model 2000 In-Tank Mass Measurement Probe System (Mass Buoyancy Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=95.4% and P_{FA}=4.6% (calculated based on a 1-hour test).

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 15 hours between delivery and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Product measurement not required. System measures product mass (which is not affected by temperature) instead of product volume.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.175 inch (0.27 inch for waste oil).
Minimum detectable change in water level is 0.088 inch (0.031 inch for waste oil).

Calibration: Mass measurement probe and water sensor must be checked and calibrated if necessary in accordance with manufacturer's instructions.
System is battery operated and does not automatically generate a hard copy of the leak test result. However, a hard copy of the results can be obtained by transfer of data to another unit (see manufacturer's instructions for further details).
System is not equipped with any alarms (e.g. high water alarm, or failed leak test alarm).

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
2000-X model (which was certified for use on tanks up to 30,000 gal capacity) and 2000-XB model (which was certified for use on tanks up 72,948 gallons) are still under review.

Alert Technologies, Inc.
5400 NewPort Dr., Suite 13
Rolling Meadows, IL 60008
Tel: (708) 392-0060

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 03/11/91

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Alert Technologies, Inc.

Alert Ullage System Model 1050
(Pressure and Vacuum Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the ratio of the ultrasonic signal (when the tank is under pressure or vacuum) to the background signal (prior to pressurization or evacuation) equals or exceeds 1.5 for either 12 kHz or 25 kHz frequency band.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oils #2 through #6, waste oil, and solvents.

Tank Capacity: Maximum ullage volume is 6,000 gallons.

Waiting time: None between delivery and testing if test is conducted after an underfilled tank tightness test.

Test Period: Minimum of 5 minutes.
Test data are acquired and recorded by a computer.

Test Pressure: Net pressure of 1.5 psi or vacuum of 1.0 psi must be maintained in ullage.
Pressure or vacuum must be maintained in the tank with a loss of less than 0.4 psi.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is present outside ullage, vacuum test in ullage must not be used.
Pressure test must be conducted using a net pressure of 1.5 psi in the ullage.

Calibration: System must be calibrated before each test.

Comments: Manifold tank systems must be isolated prior to test.
Evaluated using unleaded gasoline.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using an underfilled test method.
Vibration due to nearby equipment or dripping condensation may interfere with test.
Microphone was located 25 feet away from leak source during evaluation.
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be detected by vacuum test. A well point in the backfill may help identify presence of this condition.

Alert Technologies, Inc.
5400 NewPort Dr., Suite 13
Rolling Meadows, IL 60008
Tel: (708) 392-0060

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/15/92

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Alert Technologies, Inc.

Alert Ullage System Model 1050 X (Vacuum Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the ratio of the ultrasonic signal (when the tank is under vacuum) to the background signal (prior to evacuation) equals or exceeds 1.5 for either 12 kHz or 25 kHz frequency band.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oils #2 through #6, waste oil, and solvents.

Tank Capacity: Maximum ullage volume is 24,000 gallons.

Waiting time: None between delivery and testing if test is conducted after an underfilled tank tightness test.

Test Period: Minimum of 5 minutes.
Test data are acquired and recorded by a computer.

Test Pressure: Vacuum of 1.5 psi must be maintained in ullage.
Vacuum must be maintained in the tank with a loss of less than 0.4 psi.
Zero pressure (background) must produce a flat line response.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is present outside ullage, test must not be used.

Calibration: System must be calibrated before each test.

Comments: Manifold tank systems must be isolated prior to test.
Evaluated using #4 fuel oil.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using an underfilled test method.
Vibration due to nearby equipment or dripping condensation may interfere with test.
Microphone was located 25 feet away from leak source during evaluation.
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be detected by vacuum test. A well point in the backfill may help identify presence of this condition.

Alert Technologies, Inc.
5400 NewPort Dr., Suite 13
Rolling Meadows, IL 60008
Tel: (708) 392-0060

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/28/94

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Alert Technologies, Inc.

Alert Model 1000

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=98.2% and P_{FA}=1.8% for 2 hr test.
Leak rate of 0.1 gph with P_D=99.8% and P_{FA}=0.2% for 4 hr test.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 30,000 gallons.
Tank must be between 20 and 95% full.

Waiting time: Minimum of 1 hour between delivery and testing.
Minimum of 1 minute between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours to achieve P_D = 98.2% and P_{FA} = 1.8%.
Minimum of 4 hours to achieve P_D = 99.8% and P_{FA} = 0.2%.
Test data are acquired and recorded by a computer.
Leak rate is calculated from the data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: System measures product mass (which is not affected by temperature) instead of product volume.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 2 psi at bottom of tank during test. There must be a difference of at least 73 inches between groundwater level and product level to provide a net pressure of 2 psi at bottom of tank during test.

Calibration: Load cell must be calibrated before each test.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Alert Technologies, Inc.
5400 NewPort Dr., Suite 13
Rolling Meadows, IL 60008
Tel: (708) 392-0060

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/28/94

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Andover Controls Corp.

Andover Infinity
CX9000, CX9200, and CMX240
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA} <0.1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6 and solvents.
Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 3 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the average of subsets of all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 3 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.35 inch.
Minimum detectable change in water level is 0.003 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Andover Controls Corp.
300 Brickstone Square
Andover, MA 01810
Tel: (508) 470-0555

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/24/93

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Andover Controls Corp.

Andover Infinity CX9000, CX9200, and CMX240
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=97.6% and P_{FA}=2.4%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, and solvents.
Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 3 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the average of subsets of all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 3 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.35 inch.
Minimum detectable change in water level is 0.003 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Andover Controls Corp.
300 Brickstone Square
Andover, MA 01810
Tel: (508) 470-0555

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/24/93

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Andover Controls Corp.

Versions AC8+/AC256+
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.5% and P_{FA}=0.5%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 4 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the difference between first and last data collected, divided by elapsed time between first and last volume changes observed.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 3 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.99 inch.
Minimum detectable change in water level is 0.01 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Andover Controls Corp.
300 Brickstone Square
Andover, MA 01810
Tel: (508) 470-0555

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/03/92

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Arizona Instrument Corp.

Encompass MTS IPAM #17-903
(Magnetostrictive Probe #17-9300)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D = 97.80% and P_{FA} = 2.2%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 3 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.29 inches.
Minimum detectable change in water level is 0.0034 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Encompass software provides for remote access capabilities.

Arizona Instrument Corp.
4114 E. Wood St.
Phoenix, AZ 85040-1941
Tel: (800) 528-7411

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/22/94

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Arizona Instrument Corp.

Encompass USF IPAM #17-901
(Ultrasonic Probe #17-9100)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.94\%$ and $P_{FA} = 2.06\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 3 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is obtained by a single temperature sensor that measures change in ultrasonic wave velocity.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.86 inches.
Minimum detectable change in water level is 0.012 inch.

Calibration: Temperature sensor and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Encompass software provides for remote access capabilities.

Arizona Instrument Corp.
4114 E. Wood St.
Phoenix, AZ 85040-1941
Tel: (800) 528-7411

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/22/94

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Arizona Instrument Corp.

Soil Sentry Liquid 330(17-330-A/17-330-B), TLM-830, ENCOMPASS APAM
Probes 17-141A, 17-142A, 17-143A, 17-144A

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	refraction

Test Results:

	unleaded gasoline	synthetic gasoline	diesel fuel	water
Accuracy (%)	100	100	N/D**	N/D
Detection time (min:sec)	00:03	00:03	N/D	N/D
Fall time (hr:min:sec)	Manual reset	Manual reset	N/D	N/D
Lower detection limits (cm)				
17-141A	0.25	0.28	0.15	0.1
17-142A	0.25	0.30	0.18	0.18
17-143A	0.03	0.15	0.03	0.13
17-144A	0.28	0.30	0.30	0.15

** See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene*, xylene(s), water.

*Only 17-143A was tested with toluene.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detectors are listed as interstitial due to intended use.
Test procedures used were a combination of EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990, and EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods," March 1990.
Detector is reusable.
Although ENCOMPASS APAM (Accessory Probe Access Module) was not included in evaluations, according to manufacturer, probes perform in the same manner when connected to any one of these 3 systems.

Arizona Instrument Corp.
4114 E. Wood St.
Phoenix, AZ 85040-1941
Tel: (800)528-7411

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 12/29/92 and 01/08/93

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Arizona Instrument Corp.

Soil Sentry Twelve-X

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type: quantitative
Sampling frequency: continuous
Operating principle: metal oxide semiconductor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel	JP-5 jet fuel
Accuracy* (%)	170	120	120	N/D***
Bias* (%)	60	8.0	1.8	N/D
Precision* (%)	6.3	7.7	18	N/D
Detection time (min:sec)	12:20	12:27	12:33	N/D
Fall time* (min:sec)	11:53	11:53	11:55	N/D
Lower detection limit (ppm)	150	140	60	92**

* For tests conducted with 1000 ppm of test gas.
** Testing was done using a JP-5 jet fuel concentration of 90 ppm in humidified air.
*** See glossary.

Specificity Results:
Percentages:

unleaded gasoline	170
synthetic gasoline	110
n-hexane	110
JP-4 jet fuel	90
toluene	43
xylene(s)	22

Manufacturer's specifications:
Calibration is recommended on an annual basis, or whenever the sensor or the main printed circuit board is replaced.

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.
Please note that the following specification sheet is a separate evaluation for this same system.

Arizona Instrument Corp.
4114 E. Wood St.
Phoenix, AZ 85040-1941
Tel: (800)528-7411

Evaluator: Radian Corp.
Tel: (512) 454-4797

Dates of Evaluation: 12/28/90 and 04/17/91

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Arizona Instrument Corp.

Soil Sentry Twelve-X

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	diesel fuel *	JP-8 jet fuel*
Accuracy (%)	N/D**	N/D
Bias	-20 ppm @ 50 ppm	N/D
Precision	12 ppm	N/D
Detection time (min)	15	15
Fall time (min)	15	15
Lower detection limit	10 ppm	<0.01 gal/hr

* A limited number of tests were conducted to determine the response of the system to diesel and JP-8 jet fuel.
** See glossary.

Specificity Results:
Activated: diesel fuel, JP-8 jet fuel.

Manufacturer's specifications:
Calibration is recommended on an annual basis, or whenever the sensor or the main printed circuit board is replaced.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluation Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors," March 1990, and Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 6, 1990.
Please note that the previous specification sheet is a separate evaluation for this same system.

Arizona Instrument Corp.
4114 E. Wood St.
Phoenix, AZ 85040-1941
Tel: (800)528-7411

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/16/92

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Armstrong Monitoring Corporation

ALERTMASTER 5100
Leak Detection Cable AMC-5007

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:*

	unleaded gasoline
Accuracy (%)	100
Detection time (min:sec)	00:35
Fall time (min:sec)	02:30
Lower detection limit (cm)	0.04

*For tests conducted with 0.32 cm of floating product.

Specificity Results:
Activated: unleaded gasoline.

Manufacturer's specifications:
Operating temperature: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

Armstrong Monitoring Corporation
215 Colonnade Road South
Nepean, Ontario, Canada K2E 7K3
Tel: (613) 225-9531

Evaluator: Environment Canada
Tel: (613) 991-1108

Date of Evaluation: 12/03/92

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Armstrong Monitoring Corporation

ALERTMASTER 5100
Vapor Sensor AMC F4000

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	benzene
Accuracy (%)	100
Detection time (min:sec)	00:10
Fall time (min:sec)	04:02
Lower detection limit (ppm)	300

Specificity Results:
Activated: benzene.

Comments:
Detector is reusable.

Armstrong Monitoring Corporation
215 Colonnade Road South
Nepean, Ontario, Canada K2E 7K3
Tel: (613) 225-9531

Evaluator: Environment Canada
Tel: (613) 991-1108

Date of Evaluation: 12/03/92

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Beaudreau Electronics, Inc.

Model 404 Pump Cut-Off

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline	water	diesel fuel
Accuracy (%)			
Detection time (min:sec)	<00:01	<00:01	<00:01
Fall time (hr:min:sec)	manual reset	manual reset	manual reset
Precision (in.)	0.0124	0.0067	0.0167
Lower detection limit (in)	0.89	0.68	0.72

Specificity Results:
Activated: unleaded gasoline, diesel fuel, water.
Manufacturer and evaluator claim sensor will respond to any liquid.

Manufacturer's Specifications:
Manufacturer states that system requires no calibration.

Comments:
Test procedures used were "Alternative Test Procedures for Evaluation of Leak Detection Methods: Evaluation of Liquid Level Sensors," September 1996, by Ken Wilcox Associates.
Detector is reusable, but must be manually reset after activating.

Beaudreau Electronics, Inc.
23 Industrial Drive
Waterford, CT 06285-9715
Tel: (203)443-6570

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/20/94

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Beaudreau Electronics, Inc.

Model 406 Pump Cut-Off

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	refractive index of liquids

Test Results:

	unleaded gasoline	water	diesel fuel
Accuracy (%)	100	100	100
Detection time (min:sec)	<00:01	<00:01	<00:01
Fall time (hr:min:sec)	manual reset	manual reset	manual reset
Precision (std. dev.)	0.003474	0.005329	0.001923
Lower detection limit (in)	0.357	0.369	0.321
Probability of detection (%)	100	100	100
Probability of false alarm (%)	0	0	0

Specificity Results:
Activated: unleaded gasoline, diesel fuel, water.
Manufacturer and evaluator claim sensor will respond to any liquid.

Manufacturer's Specifications:
Manufacturer states that system requires no calibration.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluation of Leak Detection Methods: Evaluation of Liquid Level Sensors, Liquid-Phase Out-of-Tank Product Detectors," March 1990.
Detector is reusable, but must be cleaned after activating in order to reset.

Beaudreau Electronics, Inc.
23 Industrial Drive
Waterford, CT 06285-9715
Tel: (203)443-6570

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/20/94

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Bell Avon, Inc.

VIGILANT Leak Detection System

PRESSURE/VACUUM INTERSTITIAL MONITOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when changes in interstitial vacuum exceed a predetermined change in slope versus time curve.

Applicability: Gasoline, diesel fuel, aviation fuel, fuel oils #4 and #6, waste oil, and other chemicals compatible with flexible liner.

Tank Capacity: Maximum of 15,000 gallons based on interstitial volume resulting when flexible liner is properly fitted and held in position against rigid tank wall.

Waiting Time: Minimum of 20 minutes between delivery and testing.

Test Period: Minimum of 40 minutes.

Comments: System is located within the interstitial space between a properly fitted and installed flexible liner inside a rigid tank.
Flexible liner is held in position by maintaining a vacuum on interstitial space.
Interstitial vacuum is analyzed continuously by a microprocessor to determine rate of change.
System allows for permeation of vapor from stored substance into interstitial space.
Vapor recovery of product vapor from interstitial space is feasible when required.
Vapors discharged from vacuum pump must meet applicable air quality standards.
Baseline characteristics of tank behavior must be determined during setup of the system.
System detects breaches in either flexible internal liner or rigid tank.
Groundwater may be above bottom of rigid tank.
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods," March 1990.

Bell Avon, Inc.
1200 Martin Luther King, Jr. Blvd.
Picayune, MS 39466-5427
Tel: (601) 799-1217

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/16/95

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Brooks KWK, Inc.

Leak Detection Systems, KW-140 / KW-240 Monitors with Type 1 Sensor

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product soluble

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	00:24	00:09
Fall time (min:sec)	N/A*	N/A
Lower detection limit (cm)	0.01	0.01

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A jet fuel, toluene, xylene(s).

Manufacturer's specifications:
Type 1 sensor is recommended by manufacturer for detecting liquid and vapor gasoline, alcohol-blend fuels, and JP-4 jet fuel in wet or dry monitor wells.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is not reusable, and must be replaced after contact with hydrocarbons.
Formerly manufactured by In-Situ, Inc.

Brooks KWK, Inc.
RR 7, Box 141
Wellsboro, PA 16901
Tel: (717) 724-6448

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/29/91

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Brooks KWK, Inc.

Leak Detection Systems, KW-140 / KW-240 Monitors with Type 2 Sensor

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product soluble

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	14:39	08:45
Fall time (min:sec)	N/A*	N/A
Lower detection limit (cm)	0.01	0.01

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Type 2 sensor is recommended by manufacturer for detecting fuel oils #1 and #2, A2M, JP-4 jet fuel, JP-5 jet fuel, unleaded gasoline, and alcohol blend fuels in wet monitoring wells only.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is not reusable, and must be replaced after contact with hydrocarbons.
Formerly manufactured by In-Situ, Inc.

Brooks KWK, Inc.
RR 7, Box 141
Wellsboro, PA 16901
Tel: (717) 724-6448

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/29/91

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Caldwell Systems Corporation

Tank Manager
(Ultrasonic Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.10 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 20,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 12 hours, 25 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours, 15 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.921 inch.
Minimum detectable change in water level is 0.0315 inch.

Calibration: Probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Water sensor, temperature sensor and product level monitor are contained in a single ultrasonic probe.

Caldwell Systems Corp.
1200 Diamond Circle, Unit K
Lafayette, CO 80026
Tel: (303) 604-6180

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/22/96

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Caldwell Systems Corporation

Tank Manager
(Ultrasonic Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=96.7% and P_{FA}=3.3%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 20,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 12 hours, 25 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours, 15 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.921 inch.
Minimum detectable change in water level is 0.0315 inch.

Calibration: Probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Water sensor, temperature sensor and product level monitor are contained in a single ultrasonic probe.

Caldwell Systems Corp.
1200 Diamond Circle, Unit K
Lafayette, CO 80026
Tel: (303) 604-6180

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/22/96

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Campo/Miller, Inc.

LS300 and LS300 N/C

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with P_D = 96.2% and P_{FA} = 0%.

Leak Threshold: 2.36 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 35.36 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 10 seconds.
Test data are acquired and recorded by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset leak threshold.
Single leak test to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: Manufacturer recommends a weekly self check, activated by the operator, and a full functional test every 30 days, estimated to take 5 minutes to perform.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Jetronix Engineering Laboratories
Tel: (213) 377-4668
Rev. by Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 06/01/91, Rev. 09/09/94

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Campo/Miller, Inc.

LS300-120 and LS300-120 XLC

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with P_D = 96.2% and P_{FA} = 0%.

Leak Threshold: 2.36 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 35.36 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 10 seconds, but can be adjusted between 10 seconds and 2 minutes, 30 seconds depending on the bulk modulus* of the piping system.
Test data are acquired and recorded by a microprocessor.
*See glossary.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset leak threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: Manufacturer recommends a weekly self check, activated by the operator, and a full functional test every 30 days, estimated to take 5 minutes to perform.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Jetronix Engineering Laboratories
Tel: (213) 377-4668
Rev. by Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 06/01/91, Rev. 09/09/94

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Campo/Miller, Inc.

LS300-120 PLUS and LS300-120 PLUS A/S

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with $P_D = 96.2\%$ and $P_{FA} = 0\%$.

Leak Threshold: 2.36 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 35.36 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 10 seconds, but can be adjusted between 10 seconds and 2 minutes, 30 seconds depending on the bulk modulus* of the piping system.
Test data are acquired and recorded by a microprocessor.
*See glossary

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Jetronix Engineering Laboratories
Tel: (213) 377-4668
Rev. by Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 06/01/91, Rev. 09/09/94

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Campo/Miller, Inc.

LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL, LSI

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 10 minutes.
Test data are acquired and recorded by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline every 45 minutes.
Preset threshold.
Triplicate testing to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/23/95

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Campo/Miller, Inc.

LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL,LSI

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
Minimum of 3 hours between dispensing and testing.

Test Period: Minimum of 25 minutes.
Test data are acquired and recorded by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline when pump has been idle for 3 hours.
Preset threshold;
Triplicate testing to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/23/95

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Campo/Miller, Inc.

LS300-120 PLUS, AL; LS300-120 PLUS, AL, A/S and LS300-120 PLUS AL,LSI

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oils #4 and #6, waste oil, kerosene, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
Minimum of 6 hours between dispensing and testing.

Test Period: Minimum of 34 minutes.
Test data are acquired and recorded by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline when pump has been idle for 6 hours.
Preset threshold.
Triplicate testing to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Campo/Miller, Inc.
P. O. Box 1809
Porterville, CA 93258
Tel: (209) 781-6862

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/23/95

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Computerizing, Inc.

Computank V. 3.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.5% and P_{FA}=2%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 30 days of usable product level and flow through data are required.

Comments: Not evaluated using data from manifold tank systems.
Of 41 data sets submitted for evaluation, 17 were not analyzed.
Median monthly throughput of tanks evaluated was 2,340 gallons.
Leak rates of 0.05, 0.1, and 0.2 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Computerizing, Inc.
PO Box 99
Scottsboro, AL 35768
Tel: (205) 259-1805

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 09/17/92

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Control Engineers

Line Leak Detector
Model LLP2

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D = 100% and P_{FA} = 0%.

Leak Threshold: 1.88 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 89 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is approximately 10 seconds.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: No longer manufactured by Control Engineers.

Control Engineers
P. O. Box 9037
Houma, LA 70361
Tel: (504) 872-4541

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 07/18/94

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Control Engineers

Line Leak Detector
Model LLP2

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 89 gallons.

Waiting Time: None between delivery and testing.
Minimum of 15 minutes between dispensing and testing.

Test Period: Minimum of 30 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by a microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: No longer manufactured by Control Engineers.

Control Engineers
P. O. Box 9037
Houma, LA 70361
Tel: (504) 872-4541

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 07/18/94

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Control Engineers

CEI 3000 Tank Level Module - Version TLP2
Normal/Rapid Test Mode
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 95.0\%$ and $P_{FA} = 0.1\%$ in normal test mode.
Leak rate of 0.2 gph with $P_D = 95.0\%$ and $P_{FA} = 5.0\%$ in rapid test mode.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours, 40 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours for normal test mode and 1 hour, 12 minutes for rapid test mode.
Test data are acquired and recorded by a microprocessor.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature resistance detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.49 inch.
Minimum detectable change in water level is 0.05 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Control Engineers no longer manufactures this equipment. The company and rights for this product were sold to Veeder-Root. For product support information, contact Veeder-Root.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 561-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/27/92

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Control Engineers

CEI 3000 Tank Level Module - Version TLP2
Normal/Rapid Test Mode
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with $P_D = 99.2\%$ and $P_{FA} = 0.08\%$ in normal test mode.
Leak rate of 0.1 gph with $P_D = 95.0\%$ and $P_{FA} = 5.0\%$ in rapid test mode.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 95% full.

Waiting Time: Minimum of 6 hours, 40 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours, 23 minutes for normal test mode and 2 hours, 40 minutes for rapid test mode.
Test data are acquired and recorded by a microprocessor.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature resistance detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.49 inch.
Minimum detectable change in water level is 0.05 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Control Engineers no longer manufactures this equipment. The company and rights for this product were sold to Veeder-Root. For product support information, contact Veeder-Root.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 561-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/21/92

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EBW, INC.

Auto-Stik II and Auto-Stik Jr.
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, and solvents.
Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 6 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.49 inch.
Minimum detectable water level change is 0.0052 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Auto Stik Jr. is used with up to 4 magnetostrictive probes and can handle up to 8 input sensors.
Auto Stik II is used with up to 16 magnetostrictive probes and can handle up to 64 input sensors.

EBW, INC.
2814 McCraken Ave.
Muskegon, MI 49443
Tel: (800) 475-5151

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/20/93

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EBW, INC.

Auto-Stik II and Auto-Stik Jr.
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=98.3% and P_{FA}=1.7%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, and solvents.
Other liquids with known coefficients of expansion and density may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.49 inch.
Minimum detectable water level change is 0.0052 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Auto Stik Jr. is used with up to 4 magnetostrictive probes and can handle up to 8 input sensors.
Auto Stik II is used with up to 16 magnetostrictive probes and can handle up to 64 input sensors.

EBW, INC.
2814 McCraken Ave.
Muskegon, MI 49443
Tel: (800) 475-5151

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/20/93

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EBW, Inc.

AUTO-STIK Discriminating Sensors
LS-5, LS-35

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch and product permeability

Test Results:

	LS-5			LS-35		
	unleaded gasoline	diesel fuel	water	unleaded gasoline	diesel fuel	water
Float switch						
Accuracy (%)	100	100	100	100	100	100
Detection time (sec)	<1	<1	<1	<1	<1	<1
Fall time (sec)	<1	<1	<1	<1	<1	<1
Lower detection limit (in)	1.317	1.234	1.516	1.317	1.234	1.156
Polymer strip						
Accuracy (%)	100	100	N/R*	100	100	N/R
Detection time (min)	~7	~60	N/A*	~7	~60	N/A
Fall time (sec)	N/A	N/A	N/A	N/A	N/A	N/A
Lower detection limit (in)	<0.014	<0.014	N/A	<0.014	<0.014	N/A

*See glossary.

Specificity Results:
Activated: unleaded gasoline, diesel fuel, water.
Manufacturer and evaluator claim that sensors will respond to any liquid, except for the polymer strip sensor, which will not respond to water.

Manufacturer's Specifications:
Operating temperatures for LS-5 are -40 degrees F to 150 degrees F (-40 degrees C to 65.5 degrees C).
Operating temperatures for LS-30A are -40 degrees F to 140 degrees F(-40 degrees C to 60 degrees C).
There is no manufacturer's recommended maintenance schedule.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," and from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods," March 1990.
Polymer sensor can be reset by exposing it to air.
Detector is reusable.
Evaluation also included the LS-10, LS-15, and LS-20 liquid-phase out-of-tank product detectors which are listed separately.

EBW, INC.
2814 McCraken Ave.
Muskegon, MI 49443
Tel: (616) 755-1671

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/05/94

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EBW, Inc.

AUTO-STIK Discriminating Sensors
LS-10,LS-15,LS-20

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch and product permeability

Test Results:

	LS-10,LS-15,LS-20		
	unleaded gasoline	diesel	water
Float Switch			
Accuracy (%)	100	100	100
Detection time (sec)	<1	<1	<1
Fall time (sec)	<1	<1	<1
Lower detection limit (in)	2.870	2.822	2.667
Polymer Strip			
Accuracy (%)	100	100	N/R*
Detection time (min)	~7	~60	N/A*
Fall time (sec)	N/A	N/A	N/A
Lower detection limit (in)	<0.014	<0.014	N/A

*See glossary.

Specificity Results:
Activated: unleaded gasoline, diesel fuel, and water.
Manufacturer and evaluator claim sensors will respond to any liquid, except polymer strip will not respond to water.

Manufacturer's specifications:
Operating temperature: -20 degrees F to 150 degrees F(-28.9 degrees C to 65.5 degrees C).
There is no manufacturer's recommended maintenance schedule.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluation Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990, and from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods:Nonvolumetric Tank Tightness Testing Methods," March 1990.
Polymer sensor can be reset by exposing it to air.
Detector is reusable.
This evaluation also included the LS-5 and LS-35 interstitial detectors, which are listed separately.

EBW, INC.
2814 McCraken Ave.
Muskegon, MI 49443
Tel: (616) 755-1671

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/05/94

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EBW, Inc.

Liquid Sensor System
LS-3A, LS-30A, LS-7

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:

	LS-3A N.C. (normally closed)			LS-3A N.O. (normally open)		
	unleaded gasoline	diesel fuel	water	unleaded gasoline	diesel fuel	water
Accuracy (%)	100	100	100	100	100	100
Detection time (sec)	<1	<1	<1	<1	<1	<1
Fall time (sec)	<1	<1	<1	<1	<1	<1
Lower detection limit (cm)	2.59	2.36	2.08	2.59	2.39	2.08

	LS-30A (low level)			LS-30A (high level)			LS-7	
	unleaded gasoline	diesel fuel	water	unleaded gasoline	diesel fuel	water	unleaded gasoline	water
Accuracy (%)	100	100	100	100	100	100	100	100
Detection time (min:sec)	<1	<1	<1	<1	<1	<1	<1	<1
Fall time (hr:min:sec)	<1	<1	<1	<1	<1	<1	<1	<1
Lower detection limit (cm)	8.79	8.48	8.15	23.65	23.04	22.78	1.09	0.81

Specificity Results:
Activated: unleaded gasoline, diesel fuel (except LS-7), water.
Sensors will respond to any liquid which has sufficient depth and density to raise float.

Manufacturer's Specifications:
Operating temperatures for LS-3A are -40 degrees F to 180 degrees F (-40 degrees C to 82.2 degrees C).
Operating temperatures for LS-30A are -40 degrees F to 140 degrees F(-40 degrees C to 60 degrees C).
Minimum specific gravity for LS-7A is 0.70.
There is no manufacturer's recommended maintenance schedule.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990
Detector is reusable.

EBW, Inc.
2814 McCracken Ave.
Muskegon, MI 49443
Tel: (616)755-1671

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/20/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

EFA Technologies, Inc.

LeakNet

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph at 10 psi with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 2.2 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests pressurized bulk material transfer pipelines.
Suitable for all pressurized steel, plastic, fiberglass, or concrete pipelines.
System is used as an equivalent 3 gph line leak detector.
Leak detection flow rates are proportional to pressure in pipeline.
Testing is conducted while the product is not flowing in the pipeline.
Pipeline must be full and under pressure.
Gravity feed pipelines under constant static head pressure may be tested with system.

Pipeline Capacity: Maximum of 116,230 gallons.
System tested on 58,115 gallon pipeline.
Use of pipeline test protocol allows methods to be used on pipelines twice the volume of test pipeline. Contact manufacturer prior to using on pipelines exceeding 58,115 gallons through 116,230 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time ranges from 2 to 5 minutes.
Test data are acquired and recorded by a computer.
Calculations are automatically performed by computer.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline at least once per hour under static conditions.
Continuous operation during flowing conditions (however, thresholds are higher due to hydralic
noise in pipeline).
Declares leak if current changes in pressure exceed tuning parameters, or if pressure fluctuates in a manner that is characteristic of a leak.
Dispensers shutdown, indicator light and alarm activation if leak is declared.

Calibration: System must be checked annually. Standard electronic field instruments used by the system require normal annual inspection and calibration checks.

Comments: Designed to replace a mechanical line leak detector to detect equivalent 3 gph releases at 10 psi on large pipelines at pressures higher than those found at typical service station

EFA Technologies, Inc.
116 20th St.
Sacramento, CA 95814
Tel: (916) 443-8842

Evaluator: Ms. Terri Regan - Naval Facilities Engineering Service Center
Tel: (202) 433-5196
Date of Evaluation: 09/26/95

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Egemin Naamloze Vennootschap

E'SPI III
(Mass Buoyancy Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=97.9% and P_{FA}=1.1%.

Leak Threshold: 0.075 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 7 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 5 hours, 30 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is obtained by a single moving quartz crystal temperature sensor.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.253 inch.
Minimum detectable change in water level is 0.029 inch.

Calibration: Temperature sensor and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Egemin Naamloze Vennootschap
Bredabaan 1201 - 2900
Schoten, Belgium
Tel: 011-32-3-03/645 27 90

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 12/21/90

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Egemin Naamloze Vennootschap

E'SPI IV
(Mass Buoyancy Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=97.2% and P_{FA}=0.3%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours, 15 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.253 inch.
Minimum detectable change in water level is 0.029 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Egemin Naamloze Vennootschap
Bredabaan 1201 - 2900
Schoten, Belgium
Tel: 011-32-3-03/645 2790

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 12/21/90

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Emco Electronics, Tuthill Corp.

EECO System LLD (Q0011)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D= 100% and P_{FA} = 0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 67.4 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 2 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/31/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Emco Electronics, Tuthill Corp.

EECO System LLD (Q0011)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D= 100% and P_{FA} = 0%.

Leak Threshold: 0.1293 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 67.4 gallons.

Waiting Time: None between delivery and testing.
Ranges from 0 to 1 hour, 27 minutes between dispensing and testing.

Test Period: Minimum of 9 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 07/18/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Emco Electronics, Tuthill Corp.

EECO System LLD (Q0011)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with $P_D = 100\%$ and $P_{FA} = 0\%$

Leak Threshold: 0.0793 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 67.4 gallons.

Waiting Time: None between delivery and testing.
Ranges from 0 to 2 hours, 48 minutes between dispensing and testing.

Test Period: Minimum of 31 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/31/93

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Emco Electronics, Tuthill Corp.

EECO System LLD
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with $P_D = 100\%$ and $P_{FA} = 0\%$

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 11 minutes, 24 seconds.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/18/94

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Emco Electronics, Tuthill Corp.

EECO System LLD
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with $P_D = 100\%$ and $P_{FA} = 0\%$

Leak Threshold: 0.0793 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests flexible pipelines.
Tests are conducted at average pressure of 10 psi.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
Minimum of 14 minutes between dispensing and testing.

Test Period: Minimum of 9 hours.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/18/94

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Emco Electronics, Tuthill Corp.

EECO System TLM/0.2 gph Precision Test (Magnetostrictive Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.1\%$ and $P_{FA} = 0.9\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 54 minutes
Test data are acquired and recorded by a microprocessor.
Microprocessor automatically determines test time based on tank size and product level.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.66 inch.
Minimum detectable change in water level is 0.039 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/23/93

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Emco Electronics, Tuthill Corp.

EECO System TLM/0.1 gph Precision Test (Magnetostrictive Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D = 99% and P_{FA} = 1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours, 45 minutes.
During the evaluation, test duration averaged 3 hours, 45 minutes at 95% full and 5 hours, 58 minutes at 50% full.
Test data are acquired and recorded by a microprocessor.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.66 inch.
Minimum detectable change in water level is 0.039 inch.

Calibration: RTDs and probe must be checked regularly and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 02/08/94

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Emco Electronics, Tuthill Corp.

EECO System TLM/0.2 gph Quick Test (Magnetostrictive Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 95.4\%$ and $P_{FA} = 4.6\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Ranges from 1 to 6 hours between delivery and testing depending on tank conditions. There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 53 minutes.
Test data are acquired and recorded by a microprocessor.
Microprocessor automatically determines test time based on tank size and product level.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.66 inch.
Minimum detectable change in water level that can be declared is 0.039 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/23/93

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Emco Electronics, Tuthill Corp.

EECO System TLM/0.1 gph Quick Test (Magnetostrictive Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with $P_D = 96\%$ and $P_{FA} = 4\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 1 hour, 44 minutes.
During the evaluation, test duration averaged 2 hours, 46 minutes at 50% full and 1 hour, 44 minutes at 95% full.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.66 inch.
Minimum detectable change in water level is 0.039 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 02/15/94

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Emco Electronics, Tuthill Corp.

EECO system, Leak Sensor II, Leak Sensor Jr. Thermistor and Proximity probes

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: thermal conductivity, proximity switch

Test Results:

	EECO system		Leak Sensor II		Leak Sensor Jr.	
	unleaded gasoline	synthetic gasoline	unleaded gasoline	synthetic gasoline	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100	100	100	100	100
Detection time (sec)	<5	<5	<5	<5	<5	<5
Fall time (sec)	manual reset	manual reset	manual reset	manual reset	manual reset	manual reset
Lower detection limits (cm)						
Thermistor	1.22	1.12	1.14	1.14	1.24	1.19
Proximity	0.97	1.04	1.12	1.17	1.12	1.17

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s), water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990 and "Standard Test Procedures for Non-Volumetric Tank Tightness Test Methods," March 1990.
Detector is reusable.
Systems alarm if either water or product leaks into interstitial space.

Emco Electronics, Tuthill Corp.
114 MacKenan Dr.
Cary, NC 27511
Tel: (800) 342-6125

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/09/92

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Engineered Systems, Inc.

Image II
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 96.6\%$ and $P_{FA} = 3.4\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 90% full.

Waiting Time: Minimum of 8 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.83 inch.
Minimum detectable water level change is 0.0116 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Engineered Systems Inc.
2001 W. Campus Dr.
Tempe, AZ 85282
Tel: (602) 438-1362

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 08/20/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Entropy Limited

Precision Tank Inventory Control System Rev. 90

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.5% and P_{FA}=<0.5%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4.

Tank Capacity: Maximum of 21,000 gallons for single tanks.
Size limits using an acceptable protocol for manifold tank systems have not been determined.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated for manifolded tank systems using an acceptable protocol.
32% of data sets evaluated were from manifold tank systems.
Of 56 data sets submitted for evaluation, 6 were not analyzed due to unusable data and none were inconclusive.
Median monthly throughput of tanks evaluated was 52,207 gallons.
Leak rates ranging from 0.0497 to 0.203 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Entropy Limited
S. Great Rd.
Lincoln, MA 01773
Tel: (617) 256-8901

Evaluator: Simpson, Gumpertz and Heger, Inc.
Tel: (617) 643-2000

Date of Evaluation: 11/30/93

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Entropy Limited

Precision Tank Inventory Control System, Version 90

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

Certification: Leak rate of 0.1 gph with P_D=97.9% and P_{FA}=0%.

Leak Threshold: 0.04 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4.

Tank Capacity: Maximum of 15,000 gallons.

Data Requirement: Minimum of 64 days of product level and flow through data.

Comments: Not evaluated using data from manifold tank systems.
Of 120 data sets submitted for evaluation, 13 were not evaluated and 16 were inconclusive.
Median monthly throughput of tanks evaluated was 42,835 gallons.
Data sets evaluated were supplied by evaluator.

Entropy Limited
S. Great Rd.
Lincoln, MA 01773
Tel: (617) 256-8901

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 04/02/91

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Environment and Safety

EASI Level-Tru
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=95.4% and P_{FA}=4.6%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, antifreeze, brake fluid, transmission fluid, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 4 hours, 6 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 3 hours, 36 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data collected over the entire range of test period.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.896 inch.
Minimum detectable change in water level is 0.023 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Environment and Safety, Inc.
2075 O'Toole Ave.
San Jose, CA 95131
Tel: (408) 954-9081

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 04/11/91

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Environmental Fuel Systems, Inc.

Fuel Finder Version IV

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	intermittent
Operating principle:	adsorption sampling

Test Results:

	benzene	2-methylbutane
Accuracy (%) [Avg. Reading]	106.8 [1647 ppm]	122.7 [1380 ppm]
Bias (%)	64.5	38.2
Precision (%)	22.3	53.2
Detection time (min:sec)	N/A*	N/A
Fall time (min:sec)	N/A	N/A
Lower detection limit (ppm)	77	116

* See glossary.

Specificity Results:

Percentages:

benzene	147.7
n-butane	90.7
n-hexane	55.7
isobutane	51.1
2-methylpentane	143.7
toluene	66.5

Environmental Fuel Systems, Inc.
P.O. Box 1899
Bandera, TX 78003
Tel: (800) 375-7747

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 04/20/93

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FCI Environmental, Inc.

Analog Hydrocarbon Probe AHP-100

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	fiber optic chemical sensor

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min)	<8	<8
Fall time (min)	<5	<5
Lower detection limit (cm)	<0.01	<0.01

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

FCI Environmental, Inc.
1181 Grier Dr., Bldg. B
Las Vegas, NV 89119
Tel: (800) 510-3627

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/15/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

FCI Environmental, Inc.

Digital Hydrocarbon Probe DHP-100

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	fiber optic chemical sensor

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min)	<8	<8
Fall time (min)	<5	<5
Lower detection limit (cm)	<0.01	<0.01

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

FCI Environmental, Inc.
1181 Grier Dr., Bldg. B
Las Vegas, NV 89119
Tel: (800) 510-3627

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/15/94

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FCI Environmental, Inc.

Analog Hydrocarbon Probe AHP-100

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	continuous
Operating principle:	fiber optic

Test Results:

	EPA March 1990 protocol			Radian June 1990 protocol	
	xylene	benzene	2-methylbutane	unleaded gasoline	synthetic gasoline
Relative accuracy* (%)	2	35	N/R*	12	22
Bias (%)	1	-23	N/R	-7	-2
Precision (%)	1	11	N/R	4	15
Detection time (min)	<1	<1	N/R	<1	<1
Fall time (min)	<1	<1	N/R	<1	<1
Lower Detect. Limit (ppm)	84	519	N/R	137	220

* See glossary.

Lower detection limit for other fuels (ppm):

diesel*	JP-4 jet fuel	JP-8 jet fuel	synthetic fuel	p-xylene	kerosene	unleaded gasoline
1.01	3.08	2.22	3.43	2.60	2.18	2.02

Specificity Results (%) (corrected for sensitivity differences):

EPA March 1990 protocol		Radian June 1990 protocol	
benzene	76	unleaded gasoline	93
toluene	96	synthetic gasoline	98
p-xylene	101	JP-4 jet fuel	105
synthetic gasoline	100	n-hexane	N/R
trimethylbenzene	107	xylene	103
methane	N/R		
butane	N/R		
2-methylbutane	N/R		
pentane	N/R		

Comments:

Test procedures used were a combination of EPA's "Standard Test Procedures for Evaluation Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors, "March 1990, and Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 6, 1990.

FCI Environmental, Inc.
1181 Grier Dr., Bldg. B
Las Vegas, NV 89119
Tel: (800) 510-3627

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/07/94 and 12/05/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

FCI Environmental, Inc.

Digital Hydrocarbon Probe DHP-100

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type: quantitative
Sampling frequency: continuous
Operating principle: fiber optic

Test Results:

	EPA March 1990 protocol			Radian June 1990 protocol	
	xylene	benzene	2-methylbutane	unleaded gasoline	synthetic gasoline
Relative accuracy* (%)	0	17	N/R*	18	29
Bias (%)	0	-9	N/R	1	-12
Precision (%)	0	11	N/R	9	10
Detection time (min)	<1	<1	N/R	<1	<1
Fall time (min)	<1	<1	N/R	<1	<1
Lower Detect. Limit (ppm)	45	280	N/R	73	118

* See glossary.

Specificity Results (%) (corrected for sensitivity differences):

EPA March 1990 protocol		Radian June 1990 protocol	
benzene	89	unleaded gasoline	101
toluene	97	synthetic gasoline	88
p-xylene	100	JP-4 jet fuel	109
synthetic gasoline	92	n-hexane	108
trimethylbenzene	104	xylene	N/R
methane	N/R		
butane	N/R		
2-methylbutane	N/R		
pentane	N/R		

Comments:
Test procedures used were a combination of EPA's "Standard Test Procedures for Evaluation Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors," March 1990, and Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 6, 1990.

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1181 Grier Dr., Bldg. B
Las Vegas, NV 89119
Tel: (800) 510-3627

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/07/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

FDR Services, Inc.

GasPak Vapor Monitoring System

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type: quantitative
Sampling frequency: intermittent
Operating principle: product permeable detector

Test Results: (averages of multiple concentrations)

	benzene	heptane, 3-methyl	hexane	Iso-octane	pentane, 2,4-dimethyl	pentane, 2,3,4-trimethyl	toluene	m-xylene
Accuracy (%)	103	102	107	103	105	104	104	99
Bias (%)	-1	1	2	1	1	1	1	-6
Precision (%)	2	2	4	2	3	3	3	4
Lower detection limit (ppm)	1	1	1	1	3	1	1	4
Specificity (%)	100	100	102	101	101	100	100	94

Specificity Results: See results above.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors," March 1990.
Detection times were not directly measured. However, evaluator states, "experiential evidence predicts that the detector response will reach 'alarm' conditions (30% of maximum fresh fuel response) at a distance of 5 meters in slightly over one day."
Each cartridge is used once, then replaced by another.
GasPak is produced and analyzed by Fayette Environmental Services, Inc., with exclusive marketing and implementation rights assigned to FDR Services, Inc.

FDR Services, Inc.
P.O. Box 3930
Bryan, TX 77805
Tel: (214)506-0588

Evaluator: David G. Bray, Ph.D.
University of Missouri - Columbia
Tel: (573) 882-2439
Date of Evaluation: 07/27/94

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FE Petro, Inc.

STP-MLD Pipeline Leak Detector

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, and some solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 129.14 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is less than 30 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

FE Petro, Inc.
P.O. Box 139
McFarland, WI 53558
Tel: (608) 838-8786

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 07/01/92

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FE Petro, Inc.

STP-MLD-D Pipeline Leak Detector

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Diesel

Specification: System tests steel and fiberglass pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum for rigid system is 341 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Average response time is 1 minute.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

FE Petro, Inc.
P.O. Box 139
McFarland, WI 53558
Tel: (608) 838-8786

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 04/30/94

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FE Petro, Inc.

STP-MLD-E Line (Flexline) Leak Detector (for Flexible Pipelines)

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and some solvents.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Average response time is 3 minutes.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Enviroflex line with a bulk modulus* of 1,280 was used during evaluation.
*See glossary.

FE Petro, Inc.
P.O. Box 139
McFarland, WI 53558
Tel: (608) 838-8786

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 03/24/94

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Fluid Containment, Inc.
(formerly O/C Tanks Corp.)

Hydrostatic Precision Tank Test for DWT-Type II Tanks

DOUBLE WALLED TANK TIGHTNESS TEST

Certification: Leak rate of 0.1 gph with P_D=99.9% and P_{FA}=1.2% without dispensing.
Leak rate of 0.1 gph with P_D=95% and P_{FA}=5.0% with dispensing.

Leak Threshold: 0.05 gph without dispensing and 0.07 gph with dispensing. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 30,000 gallons.
Tank must be between 0 and 100% full.
Maximum tank diameter is 10 feet.

Waiting Time: Minimum of 24 hours between delivery and testing.
Minimum of 3 hours between "topping off" the annular space with liquid and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 4 hours.
A leak is not declared unless the threshold is exceeded in two tests, separated by at least 8 hours which are performed without dispensing and with minimal changes in groundwater elevation above bottom of tank as described below.

Other Limitations: Volume of trapped vapor must not exceed 20 gallons.
Change in barometric pressure must be less than 0.04 psia over the 4-hour test period.
Annular space must be at least 100% full with either water or antifreeze.
If groundwater is above bottom of tank, and no product is being dispensed during test, total change in groundwater elevation during test must be less than 1.5 inches per hour.
If groundwater is below bottom of tank or not changing during test, total change in product level during test must be less than 0.75 inch per hour.

Fluid Containment, Inc.
Route 20, Box 1380
Conroe, TX 77301
Tel: (409) 756-7731

Evaluator: Vista Research
Tel: (415) 966-1171

Date of Evaluation: 05/15/91

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Gasboy International (formerly William M. Wilson's Sons)

Gasboy TMS 500
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.91\%$ and $P_{FA} = 0.09\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature sensors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.04 inches.
Minimum detectable change in water level is 0.011 inch.

Calibration: Temperature sensors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
System is no longer being manufactured although product support is still available.

Gasboy International
P.O. Box 309
Lansdale, PA 19446
Tel: (215) 855-4631

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/10/91

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 14 seconds.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if a leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Gilbarco Environmental Products
7300 W. Friendly Ave.,
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates, Inc.
Tel: (816) 443-2494
Date of Evaluation: 09/20/91, Rev. 04/12/93

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 6 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Gilbarco Environmental Products
7300 W. Friendly Ave.,
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates, Inc.
Tel: (816) 443-2494
Date of Evaluation: 09/20/91, Rev. 04/12/93

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100.0% and P_{FA}=0%.

Leak Threshold: 0.079 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 14 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates, Inc.
Tel: (816) 443-2494
Date of Evaluation: 09/20/91, Rev. 04/12/93

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 1 minute.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Gilbarco Environmental Products
7300 W. Friendly Ave.,
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=96% and P_{FA}=4%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time ranges from 45 minutes to 8 hours, 51 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Gilbarco Environmental Products
7300 W. Friendly Ave.,
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Gilbarco Environmental Products

Environmental Management Console (EMC) with Line Leak Detector, Series PA02630000501 (for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.079 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time ranges from 1 hour, 12 minutes to 12 hours, 54 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

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Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Gilbarco Environmental Products

EMC Environmental Management Console
EMC Basic Monitoring System Tank Monitor 2, 3, 2.1, and 3.1 PAO238000XXXX (Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There is no dispensing or delivery during waiting time.

Test Period: Minimum of 5 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is obtained by a temperature averaging probe.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.40 inches.
Minimum detectable water level change is 0.040 inch.

Calibration: Temperature averaging probe must be calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Gilbarco Environmental Products

EMC Environmental Management Console
EMC Basic Monitoring System Tank Monitor 2.1,3.1, PAO264XXX0000
(Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=0.2%.

Leak Threshold: 0.126 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.52 inches.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Gilbarco Environmental Products
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Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Gilbarco Environmental Products

EMC Environmental Management Console
EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO264XXX0000
(Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=0.1%.

Leak Threshold: 0.071 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 95% full.

Waiting Time: Minimum of 8 hours, 15 minutes between delivery and testing.
Minimum of 30 minutes between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.52 inches.
Minimum detectable water level change is 0.027 inch.

Calibration: Thermistors and probe must be calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Gilbarco Environmental Products

EMC Environmental Management Console
EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO265XXX0000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=0.1%.

Leak Threshold: 0.093 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.544 inch.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Gilbarco Environmental Products

EMC Environmental Management Console
EMC Basic Monitoring System Tank Monitor 2.1, 3.1, PAO265XXX0000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.071 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 95% full.

Waiting Time: Minimum of 8 hours, 15 minutes between delivery and testing.
Minimum of 30 minutes between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.544 inch.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 03/14/95

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Gilbarco Environmental Products

PA02590XXX000

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:*

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Response time (min)	3.66	3.45
Recovery time (min)	<1	<1
Product activation height (cm)	1.28	1.27
Lower detection limit (cm)	1.84	1.65

*At a flow rate of 0.19 gal/hr in 7.6 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Gilbarco Environmental Products

PA02591144000

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Response time (min)	6.00	6.51
Recovery time (min)	<1	<1
Product activation height (cm)	3.67	3.62
Lower detection limit (cm)	4.05	4.17

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Gilbarco Environmental Products

PA02592000000

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Response time (min)	8.19	8.49
Recovery time (min)	<1	<1
Product activation height (cm)	4.12	3.95
Lower detection limit (cm)	4.67	4.36

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Gilbarco Environmental Products

Environmental Management Console (EMC)
Groundwater Sensor, series PA02700XX0001

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	08:55	06:18
Fall time (min:sec)	54:50	26:02
Lower detection limit (cm)	0.02	0.02

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Calibration:
Sensor must be checked annually for operability or in accordance with manufacturer's instructions and calibrated/replaced if necessary.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

Gilbarco Environmental Products
7300 W. Friendly Ave.,
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 11/20/91

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Gilbarco Environmental Products

PA02660000000

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	0	100
Detection time (min:sec)	7:46	N/A*	17:01
Fall time (min:sec)	2:38	N/A	3:05
Lower detection limit (ppm)	500	>1000	500

*See glossary.

Specificity Results:
Activated: unleaded gasoline, JP-4 jet fuel.
Not activated: synthetic gasoline, n-hexane, toluene, xylene(s).

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Gilbarco Environmental Products
7300 W. Friendly Ave.
Greensboro, NC 27420
Tel: (910) 547-5000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/24/92

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Hasstech

LineTite Pipeline Leak Monitor

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed on the pipeline.

Pipeline Capacity: Maximum of 341 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Ranges from 1 to 26 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 10/15/91 and 04/10/94

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Hasstech

LineTite Pipeline Leak Monitor

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.062 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 341 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Ranges from 1 hour, 30 minutes to 12 hours, 30 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 10/15/91 and 04/10/94

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Hasstech

LineTite Pipeline Leak Monitor
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed on the pipeline.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Ranges from 1 to 6 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

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6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 10/15/91 and 04/10/94

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Hasstech

LineTite Pipeline Leak Monitor
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.062 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Ranges from 2 hours, 18 minutes to 5 hours.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 10/15/91 and 04/10/94

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Hasstech

Tank Compliance Center, Model 700
(7100 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents and other substances with a specific gravity >0.6 and a viscosity <1500 cp.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.186 inch.
Minimum detectable change in water level is 0.0048 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/14/95

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Hasstech

Tank Compliance Center, Model 700
(7100 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99.6% and P_{FA}=0.4%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents and other substances with a specific gravity >0.6 and a viscosity <1500 cp.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.1860 inch.
Minimum detectable change in water level is 0.0048 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/14/95

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Hasstech

AcuRite

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.01 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 75 gallons.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 30 minutes between dispensing and testing.

Test Period: Minimum of 30 minutes.
Test data are acquired and recorded manually.
Manual calculations are performed by the operator on site.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Lamar University
Tel: (409) 880-8788

Date of Evaluation: 03/25/91

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Hasstech

Leak Computer Tank Test System

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL) (Edison Lab Protocol)

Certification: Leak rate of 0.1 gph with P_D=95% and P_{FA}=5%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 12,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Test data are acquired and recorded by a computer that calculates a leak rate every minute, and determines waiting time for satisfactory data (test is finished when the standard deviation of 30 sequential leak rates is less than half of the last leak rate determined).
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 10 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery of product during test.

Temperature: Average for product is determined by a minimum of 7 thermistors.

Groundwater: If depth to groundwater in backfill cannot be determined, tank must pass a two level test with at least a 3 foot difference in product level.
If depth to groundwater in backfill can be determined, a single level test can be conducted provided a minimum net pressure of 1 psi exists at bottom of tank during test.

Calibration: Level sensor must be calibrated before each test.
Thermistors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.
Evaluated at EPA Edison Risk Reduction Engineering Laboratory prior to the EPA standard protocols being written.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: U.S. EPA Risk Reduction Engineering Laboratory
Tel: (201) 321-6631

Date of Evaluation: 11/88

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Hasstech

Leak Computer Tank Test System

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D>99% and P_{FA}<1.0%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 90% full.

Waiting Time: Test data are acquired and recorded by a computer that calculates a leak rate every minute, and determines waiting time for satisfactory data (test is finished when the standard deviation of 30 sequential leak rates is less than half of the last leak rate determined).
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 10 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 7 thermistors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test.

Calibration: Level sensor must be calibrated before each test.
Thermistors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Hasstech
6985 Flanders Dr.
San Diego, CA 92121
Tel: (619) 457-5880

Evaluator: Law Engineering Industrial Services
Tel: (800) 672-6601

Date of Evaluation: 04/17/91

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Heath Consultants, Inc.

Petro Tite Line Tester

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.99% and P_{FA}=0.37%.

Leak Threshold: 0.01 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 1 hour (four 15 minute readings).; A 1 hour pretest at or above test pressure is conducted to eliminate the effects of pipe deflection/stretch on the results.
Test data are acquired and recorded manually.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Heath Consultants, Inc.
9030 Monroe Rd.
Houston, TX 77061
Tel: (713) 947 9292

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/11/91

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Heath Consultants, Inc.

Petro Comp

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=0.98%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, solvents, alcohols and water.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.
An automatic product leveler must be used to maintain a constant product level during test.

Waiting Time: None between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours after the completion of the high level circulation.
Test data are acquired and recorded by a computer after the completion of the high level circulation.
Leak rate is calculated based on cumulative volume change during low level test (generally based on 1 hour average volume change).
Product must be mixed continuously throughout test period.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a single temperature sensor.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 4 psi at bottom of tank during test.

Calibration: Temperature sensor is self calibrating.
Level sensor must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.

Heath Consultants, Inc.
9030 Monroe Rd.
Houston, TX 77061
Tel: (713) 947-9292

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/15/90

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Heath Consultants, Inc.

Petro Tite II

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.
An automatic product leveler must be used to maintain a constant product level during test.

Waiting Time: None between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded manually.
Leak rate calculated based on cumulative volume change during low level test (generally based on 1 hour average volume change).
Product must be mixed continuously throughout test period.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a single DTS-2000 digital sensor.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 4 psi at bottom of tank during test.

Calibration: Sensor calibration must be checked at each use and the DTS-2000 recertified a minimum of once every 3 years.

Comments: Not evaluated using manifold tank systems.

Heath Consultants, Inc.
9030 Monroe Rd.
Houston, TX 77061
Tel: (713) 947-9292

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/01/90

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Horner Creative Products

EZY-Chek Manual Line Leak Detector

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=98.0% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 1 hour, 30 minutes.
Data are collected every 15 minutes.
Testing period consists of a monitor mode and test mode.
Data are collected in the monitor mode until two consecutive records are within 0.01 gallon of each other.
Four data points must be taken in test mode for a final gph result.
Test data are acquired and recorded manually.
Manual calculations performed by the operator on site.

Calibration: No temperature sensors used.
No calibration required.
System must be checked annually in accordance with manufacturer's instructions.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/09/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Horner Creative Products

EZY-Chek II Automatic Line Leak Detector

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours.
Data are collected every 30 seconds.
Testing period consists of a monitor mode and test mode.
Data are collected in monitor mode until two consecutive 15 minute records are within 0.01 gallon of each other. Then an additional 15 minutes is required in monitor mode before start of test mode.
Data are collected in test mode for 1 hour, 7 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

Calibration: Sensors must be calibrated before each test.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/13/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Horner Creative Products

EZY 3

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the vacuum decay is more than 1 inch water column pressure for non-volatile products and 10% of the lower determined vapor pressure for volatile products. A leak is also declared if any water ingress is detected.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Tank Capacity: Maximum of 12,000 gallons if groundwater is not present.
Maximum of 50,000 gallons if groundwater is present and a vacuum of 1.0 to 1.7 psi can be maintained.
For gasoline, ullage volume must be between 800 and 2,500 gallons.
For diesel, ullage volume must be between 500 and 1,500 gallons.

Waiting Time: None between delivery and testing.

Test Period: Minimum of 2 hours, 30 minutes for gasoline (1 hour, 30 minutes vapor equilibrium recirculation time plus 1 hour test period).
Minimum of 1 hour, 30 minutes for diesel and less volatile products (30 minutes vapor equilibrium recirculation time plus 1 hour test period).
The vapor equilibrium recirculation time is the time required to apply a vacuum and to saturate ullage with vapors.
Test data are acquired and recorded manually.

Water Sensor: Conductivity water sensor must be used to detect water ingress and must be calibrated for every test.
Minimum detectable water level is 0.014 inch.
Minimum detectable change in water level is 0.0095 inch.
Minimum water level in the tank must be adjusted to 0.014 inch before sensor calibration begins.
Actual water ingress test period depends on tank size and must be calculated in accordance with manufacturer's instructions, but must be a minimum of 1 hour.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, water sensor must be used and test time extended to ensure water ingress detection during test.

Test Pressure: Vacuum must be maintained between 1.0 to 1.7 psi at bottom of tank.
Vacuum must not be greater than 4.0 psi in ullage.

Comments: Not evaluated using manifold tank systems.
Evaluated using gasoline and diesel.
Test may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be detected by vacuum test. A well point in backfill may help identify presence of this condition.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 08/23/94 and 02/08/95

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Horner Creative Products

SIR PRO 1 Version 1.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated using data from manifolded tanks.
Of 120 data sets submitted for evaluation, 10 were inconclusive.
Median monthly throughput of tanks evaluated was 13,640 gallons.
Leak rate of 0.2 gph was used in evaluation.
Data sets evaluated were supplied by evaluator.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Petro Works
Tel: (913) 681-9379

Date of Evaluation: 04/07/93

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Horner Creative Products

SIR PRO 1 Version 2.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.
Version 2.0 is designed to meet annual test requirements.

Leak Threshold: 0.05 gph. A leak is declared when the leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated using data from manifold tank systems.
Of 120 data sets submitted for evaluation, 9 were inconclusive.
Median monthly throughput of tanks evaluated was 11,828 gallons.
Leak rate of 0.1 gph was used in evaluation.
Data sets evaluated were supplied by evaluator.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Petro Works
Tel: (913) 681-9379

Date of Evaluation: 04/07/93

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Horner Creative Products

SIR PRO 1 Version 3.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.2 gph with P_D>99% and P_{FA}<1%.

Leak Threshold: 0.1 gph. A leak is declared when the leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 33,000 gallons for single tanks. Size limits using an acceptable protocol for manifold tank systems have not been determined.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated for manifold tank systems using an acceptable protocol.
73% of data sets were from manifold tank systems.
Of 41 data sets submitted for evaluation, 4 were inconclusive.
Median monthly throughput of tanks evaluated was 22,370 gallons.
Leak rates ranging from 0.05 to 0.216 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/07/93

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Horner Creative Products

SIR PRO 1 Version 4.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUATITATIVE)

Certification: Leak rate of 0.1 gph with P_D=98% and P_{FA}=2%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 33,000 gallons for single tanks. Size limits using an acceptable protocol for manifold tank systems have not been determined.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated for manifold tank systems using an acceptable protocol.
73% of data sets were from manifold tank systems.
Of 41 data sets submitted for evaluation, 4 were inconclusive.
Median monthly throughput of tanks evaluated was 22,370 gallons.
Leak rates ranging from 0.05 to 0.216 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/18/95

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Horner Creative Products

Horner EZY-Chek I

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Tank Capacity: Maximum of 12,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 3 hours between "topping off" and testing.
Total minimum waiting time is 6 hours.
There must be no product dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 30 minutes (30 minute monitor period, plus 1 hour test period).
Testing must continue until data meets manufacturer's stop test criteria.
Volume data are collected and recorded by a strip chart recorder.
Leak rate is calculated from data of last 1 hour of test period.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a resistance temperature detector (RTD) and displayed on an LCD readout.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of 2-4 psi at bottom of tank.
Groundwater level must be stable prior to and during test.

Calibration: Level sensors must be calibrated before each test.

Comments: Not evaluated using manifold tank systems.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: W. A. Kibbe and Associates
Tel: (517) 797-2425

Date of Evaluation: 10/03/90

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Horner Creative Products

Horner EZY-Chek II

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.95% and P_{FA}=0.05%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Tank Capacity: Maximum of 12,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 3 hours between "topping off" and testing.
Total minimum waiting time is 6 hours.
There must be no delivery or dispensing during waiting time.

Test Period: Minimum of 1 hour, 40 minutes (33 minutes monitor mode and 1 hour, 7 minutes test mode).
At the conclusion of test mode, data are checked for the manufacturer's stop test criteria. If data do not meet the criteria, testing must continue.
Test data are acquired and recorded by a computer.
Leak rate is calculated from last 1 hour, 7 minutes of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a resistance temperature detector (RTD).

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of 2-4 psi at bottom of tank.
Groundwater level must be stable prior to and during test.

Calibration: Load cell must be calibrated before each use.

Comments: Not evaluated using manifold tank systems.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: W. A. Kibbe and Associates
Tel: (517) 797-2425

Date of Evaluation: 09/18/90

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Horner Creative Products

Horner EZY-Chek II

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=95.79% and P_{FA}=4.21%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Tank Capacity: Maximum of 12,000 gallons.
Tank must be between 98 and 100% full.

Waiting Time: Minimum of 8 hours between delivery and testing.
There must be no product dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 40 minutes (33 minutes monitor mode and 1 hour, 7 minutes test mode).
At the conclusion of test mode, data are checked for the manufacturer's stop test criteria. If data do not meet the criteria, testing must continue.
Test data are acquired and recorded by a computer.
Leak rate calculated from last 1 hour, 7 minutes of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a resistance temperature detector (RTD).

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test. If this cannot be accomplished, then the tank cannot be tested using this method.

Calibration: Load cell must be calibrated before each use.

Comments: Not evaluated using manifold tank systems.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Horner Creative Products
212 Morton St.
Bay City, MI 48706
Tel: (517) 893-3360

Evaluator: W. A. Kibbe and Associates
Tel: (517) 797-2425

Date of Evaluation: 06/25/90

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Ibex Industries

Ibex Precision Test System

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.5% and P_{FA}=0.5%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, and solvents.

Tank Capacity: Maximum of 18,000 gallons.
Tank must be between 92 and 100% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
Minimum of 3 hours between "topping off" and testing.
There must be no product dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 6 temperature sensors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of 2-4 psi on bottom of tank during test.

Calibration: Level sensors must be calibrated before each test.
Temperature sensors must be calibrated semi-annually.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.

Ibex Industries
Moved and left no forwarding address
or phone number.

Evaluator: Applied Research Center
Tel: (805) 664-2173

Date of Evaluation: 01/18/91

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IMO Industries Inc., Gems Sensors Division

Gems Smartwell Portable Monitor model WPM-535
with Groundwater Probe model WP-535

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	intermittent*
Operating principle:	conductive polymer

*Although sensor is a polymer strip which is mounted in the monitoring well, monitor is a hand held unit which is typically connected to sensor periodically - hence the "intermittent" designation.

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	09:31	07:05
Fall time (min:sec)	55:42	17:04
Lower detection limit (cm)	0.04	0.08

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

IMO Industries Inc., Gems Sensors Division
Cowles Rd.
Plainville, CT 06062-1198
Tel: (203) 747-3000

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 04/22/93

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 3 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time ranges from 50 minutes to 8 hours for rigid piping.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

Comments: After 28 days have elapsed since the last passing monthly line leak test, system shuts off the submersible pump.
System display will flash number of days since the last passing test.
Operator may reset button to enable dispensing for a 24 hour period.
This procedure may be used for a maximum of 4 days.
After 32 days have elapsed since last monthly test, system will disable dispensing and automatically initiate a test, and system will not authorize dispensing until a test is passed or system is serviced.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 163 gallons.

Waiting Time: None between delivery and testing.
Minimum of 8 hours between dispensing and testing.

Test Period: Response time is 40 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3 gph with P_D = 100% and P_{FA} = 0%.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 3 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 2 hours, 21 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

Comments: After 28 days have elapsed since the last passing monthly line leak test, system shuts off the submersible pump.
System display will flash number of days since the last passing test.
Operator may reset button to enable dispensing for a 24 hour period.
This procedure may be used for a maximum of 4 days.
After 32 days have elapsed since last monthly test, system will disable dispensing, and automatically initiate a test, and system will not authorize dispensing until a test is passed or system is serviced.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.

TS-LLD Line Leak Detector
(for Flexible Pipelines)

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with $P_D = 100\%$ and $P_{FA} = 0\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, and fuel oil #4.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 49.6 gallons.

Waiting Time: None between delivery and testing.
Minimum of 8 hours between dispensing and testing.

Test Period: Response time is 50 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, numerical "fail" code display and LED alarm light activation if leak is declared.

Calibration: System must be checked annually in accordance with manufacturer's instructions.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/06/95

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INCON Intelligent Controls, Inc.
TS 1000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.1 gph. A leak is declared if the measured slope by the system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and motor oil.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 4 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 5 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs)

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.04 inches.
Minimum detectable water level change is 0.011 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/05/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

INCON Intelligent Controls, Inc.
TS 2000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.5%.

Leak Threshold: 0.058 gph. A leak is declared if the measured slope by the system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and waste oil.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.04 inches.
Minimum detectable water level change is 0.011 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/10/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000EFI
TSP-DIS BriteSensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: opto-electric

Test Results:

	unleaded gasoline	water	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100
Detection time (min:sec)	03:13	03:18	03:17	3:00	3:02
Fall time (min)	<01	<01	<01	<01	<01
Lower detection limit (cm) product activation height	1.60	1.92	N/D*	N/D	N/D

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, diesel fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 12/09/94

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INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000EFI
TSP-HIS BriteSensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	magnetic switch

Test Results:

	50 wt% Ethylene glycol in water		30 wt% Calcium chloride in water	
	up	down	up	down
Accuracy (%)	100	100	100	100
Response time (min:sec)	17.41	16:47	17:28	16:56
Recovery time (min)	<1	<1	<1	<1
Lower Detection Limit (cm)				
Product activation height	19.56	2.53	19.40	2.50

Specificity Results:
Activated: 50 wt% Ethylene glycol in water, 30 wt% Calcium chloride in water.

Comments:
Intended to monitor level of either ethylene glycol or calcium chloride solutions in interstitial or annular space of a double-walled tank. Activates if any significant gain or loss of solution occurs.
Test procedures used were modified by evaluator from Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 03/20/95

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INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000/TS-2000
TSP-EIS Standard Sensor, TSP-PS Liquid Contact Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	opto-electric

Test Results:

TSP-EIS	unleaded gasoline	water	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100
Detection time (min:sec)	03:01	03:07	03:17	3:00	3:02
Fall time (min)	<01	<01	<01	<01	<01
Lower detection limit (cm) product activation height	1.50	N/D*	N/D	N/D	N/D

Test Results:

TSP-PS	unleaded gasoline	water	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100
Detection time (min:sec)	01:14	01:25	01:13	01:10	01:16
Fall time (min)	<01	<01	<01	<01	<01
Lower detection limit (cm) product activation height	1.37	N/D	N/D	N/D	N/D

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, diesel fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Dates of Evaluations: EIS - 01/30/96; PS - 07/02/93

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INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000/TS-2000
TSP-HLS Standard Sensor, TSP-ULS Standard Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	magnetic switch

Test Results:

TSP-HLS	unleaded gasoline	water	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100
Detection time (min:sec)	10:09	09.25	10:14	09:55	10:25
Fall time (min)	<01	<01	<01	<01	<01
Lower detection limit (cm)					
product activation height	5.64	N/D*	N/D	N/D	N/D

Test Results:

TSP-ULS	unleaded gasoline	water	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100
Detection time (min:sec)	03:50	03.34	03:49	03:50	03:41
Fall time (min)	<01	<01	<01	<01	<01
Lower detection limit (cm)					
product activation height	2.70	N/D	N/D	N/D	N/D

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, diesel fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluations: 01/30/96

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INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000EFI
TSP-DDS BriteSensor, TSP-DTS BriteSensor

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	magnetic switch, float, and hydrocarbon sensitive polymer

Test Results:

TSP-DDS	unleaded gasoline	water - low level	water - high level	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100	100
Detection time (min:sec)	05:35	06:02	06:09	06:00	38:43	38:16
Fall time (min:sec)	34:27	<01:00	<01:00	28:53	> 60:00	> 60:00
Lower detection limits (cm)						
product activation height	0.50	N/D*	3.16	N/D	N/D	N/D
product thickness on water	0.04	N/D	N/D	N/D	N/D	N/D

Test Results:

TSP-DTS	unleaded gasoline	water - low level	water - high level	synthetic gasoline	diesel fuel	heating oil #2
Accuracy (%)	100	100	100	100	100	100
Detection time (min:sec)	06:02	06:02	06:13	05:59	38:43	38:16
Fall time (min:sec)	22:28	<01:00	<01:00	28:53	> 60:00	> 60:00
Lower detection limits (cm)						
product activation height	0.50	N/D	3.16	N/D	N/D	N/D
product thickness on water	0.04	N/D	N/D	N/D	N/D	N/D

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, diesel fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991. The procedures for lower detection limit for product thickness were EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluations: 12/09/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

INCON Intelligent Controls, Inc.

Tank Sentinel TS-1000EFI
TSP-MWS BriteSensor Groundwater Probe

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	hydrocarbon-sensitive polymer

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	10:13	06:42
Fall time (min:sec)	26:52	14:43
Lower detection limit (cm)	0.04	0.04

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

INCON Intelligent Controls, Inc.
74 Industrial Park Rd.
Saco, ME 04072
Tel: (800) 872-3455

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 02/19/96

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Keekor Environmental Products

TankTite Leak Detection Kernel Version 1.0 with Keeprobe K7 (Magnetostrictive Probe) AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=95.4% and P_{FA}=4.6%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 90% full.

Waiting Time: Minimum of 8 hours, 6 minutes between delivery and testing.
Minimum of 15 minutes after a maximum dispensing rate of 50 gallons per minute.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the average of subsets of all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.41 inch.
Minimum detectable water level change is 0.0013 inch.

Calibration: Execution of Probe Check diagnostic routine is recommended prior to leak detect tests to ensure sensor is fully operational and in calibration.
Annual preventative maintenance should be performed per manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Keekor Environmental Products
14806 N. 74th St.
Scottsdale, AZ 85260
Tel: (602) 443-0001

Evaluator: Arizona State University
Tel: (602) 965-3185

Date of Evaluation: 10/25/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Leak Detection Systems, Inc.

Tank Auditor, Version RTD V.2.16

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.98% and P_{FA}=0.02%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold, except as noted below.
If using two level testing, the level is changed by 3 feet between the two tests and a leak is declared if the net change between the two tests is greater than 0.02 gph.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum is variable depending on site conditions, but not be less than 6 hours between delivery and testing.
Minimum of 1 hour between "topping off" and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a temperature averaging probe.

Groundwater: If depth to groundwater cannot be determined, two tests must be performed with a level change of at least 3 feet between tests. If depth to groundwater in backfill can be determined and it is above bottom of the tank, product level must be adjusted to provide height differential of 3 feet between product and groundwater in backfill during test.

Calibration: Temperature averaging probe and level sensors must be calibrated before each test.

Comments: Not evaluated using manifold tank systems.
Evaluation of system did not include a field evaluation of groundwater compensation by two level testing.

Leak Detection Systems, Inc.
106 Longwater Dr.
Norwell, MA 02061
Tel: (617) 878-7766

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/29/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Mallory Controls

Pollulert Probes MD221G/T, MD221G/TRA

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	4	7	2
Fall time (sec)	3	4	4
Lower detection limit (cm)	0.08-0.32	0.08-0.32	0.08-0.32

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Evaluation was conducted using probe FD221G/TRA.
According to manufacturer, probes beginning with "MD" have identical performance as older probes beginning with "FD."
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Liquid-Phase ASTM-Formatted Methods," June 29, 1990.
Detector is reusable.
Detector has been discontinued by manufacturer.

Mallory Controls
2831 Waterfront Pkwy. E. Dr.
Indianapolis, IN 46214
Tel: Not Available

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Mallory Controls

Pollulert Probes MD241R, MD241RRA, MD241G, MD241GRA

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	2	2	1
Fall time (sec)	1	2	2
Lower detection limit (cm)	0.16-0.32	0.16-0.32	0.16-0.32

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene (s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Evaluation was conducted using probe FD241R.
According to manufacturer, probes beginning with "MD" have identical performance as older probes beginning with "FD."
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Liquid-Phase ASTM-Formatted Methods," June 29, 1990.
Detector is reusable.
Detector has been discontinued by manufacturer.

Mallory Controls
2831 Waterfront Pkwy. E. Dr.
Indianapolis, IN 46214
Tel: Not available

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

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Mallory Controls

Pollulert Probes MD221V, MD221VRA, MD210V, MD210VRA

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	91	65	86
Fall time (min:sec)	5:39	4:23	9:38
Lower detection limit (ppm)	10 to 100	10 to 500	10 to 50

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, JP-4 jet fuel, toluene, xylene(s).
Not Activated: n-hexane.

Comments:
Evaluation was conducted using probe FD221V.
According to manufacturer, probes beginning with "MD" have identical performance as older probes beginning with "FD."
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.
Detector has been discontinued by manufacturer.

Mallory Controls
2831 Waterfront Pkwy. E. Dr.
Indianapolis, IN 46214
Tel: Not available.

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

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Marley Pump Co.

Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 5-10 psi.

Pipeline Capacity: Maximum of 55.1 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 1 minute.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Recording and display of day, date, and time of positive test.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/11/91, Rev. 04/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 5-10 psi.

Pipeline Capacity: Maximum of 55.1 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 10 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Recording and display of day, date, and time of positive test.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/11/91, Rev. 04/94

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Marley Pump Co.

Red Jacket PPM 4000, RLM 9000, RLM 10000, ST 1401L, and ST1801L

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.047 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 5-10 psi.

Pipeline Capacity: Maximum of 55.1 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours, 30 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Recording and display of day, date, and time of positive test.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/11/91, Rev. 04/94

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Marley Pump Co.

Red Jacket DLD and XLD

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines. Tests are conducted at 8-12 psi.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 6 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/21/90

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket FX1/FX2

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and some solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 8-12 psi.

Pipeline Capacity: Maximum of 158 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.
Stabilization time up to 45 minutes may be required after dispensing when temperature extremes are present.

Test Period: Response time is less than 5 minutes.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/14/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket FX1/FX2 Flexline
(for Flexible Pipelines)

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and some solvents.

Specification: System tests pressurized flexible pipelines.

Pipeline Capacity: Maximum of 49 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is less than 3 minutes.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Enviroflex pipeline with a bulk modulus* of 1,280 psi was used during this evaluation. To perform a valid test, time delays must be integrated into electronic dispensing equipment or retrofitted in junction box. Without this delay, there is no guarantee that a nozzle will be closed for sufficient time to allow leak detector to perform pipeline test and provide uninterrupted service.

*See glossary.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/22/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket FX2/FX2-D and Bigflo

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 8-12 psi.

Pipeline Capacity: Maximum of 362 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.
Stabilization time up to 45 minutes may be required after dispensing when temperature extremes are present.

Test Period: Response time is 3 minutes.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 3/15/94 and 6/1/94

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Marley Pump Co.

Red Jacket XLP

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 15-22 psi.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 6 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/21/90

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket XLP
(for Flexible Pipelines)

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 48.9 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is less than 3 minutes.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/19/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Red Jacket ATM System,
Version RLM 5000, 5001, and 9000
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature sensors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.04 inches.
Minimum detectable water level change is 0.011 inch.

Calibration: Temperature sensors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/02/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Sonic Technology (ST) 1400-1800 Series Tank Monitoring System
ATG Automatic Tank Gauging Monitor, LLM Series Liquid Level Monitor
FMS Fuel Management Monitor
(Ultrasonic Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 18,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 10 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours, 21 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a variable number of temperature sensors spaced at approximately 6-inch intervals.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.112 inch.
Minimum detectable water level change is 0.011 inch.

Calibration: Temperature sensors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
System was previously known as LT1 Automatic Product Level Monitor and was manufactured by Level Tech, Inc. (purchased by Marley 9/91).

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: ADA Technologies
Tel: (303) 792-5615

Date of Evaluation: 09/30/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Marley Pump Co.

Sonic Technology (ST) 1400-1800 Series Tank Monitoring System
ATG Automatic Tank Gauging Monitor, LLM Series Liquid Level Monitor,
FMS Fuel Management Monitor
(Ultrasonic Probe)
AUTOMATIC TANK GAUGING SYSTEM

Marley Pump Co.

Certification: Leak rate of 0.1 gph with P_D=99.9% and P_{FA}=0.01%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, and some solvents.

Tank Capacity: Maximum of 18,000 gallons.
Tank must be between 95 and 100% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours, 21 minutes.
Test data are acquired and recorded by a computer.
Leak rate is calculated from all data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a variable number of temperature sensors spaced at approximately 6-inch intervals.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.112 inch.
Minimum detectable water level change is 0.011 inch.

Calibration: Temperature sensors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
System was previously known as LT1 Automatic Product Level Monitor and was manufactured by Level Tech, Inc. (purchased by Marley 9/91).

Marley Pump Co.
5800 Foxridge Dr.
Mission, KS 66202
Tel: (913) 813-5700

Evaluator: ADA Technologies, Inc.
Tel: (303) 792-5615

Date of Evaluation: 09/25/92

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Marley Pump Co.

Red Jacket PPM 4000 with Optical Liquid Discrimination Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: optical sensor

Test Results:

	unleaded gasoline	synthetic fuel	diesel fuel	heating oil #2	water
Accuracy (%)	100	100	100	100	100
Response time (min)	2.19	2.20	1.93	2.23	2.81
Recovery time (min)	< 1	< 1	< 1	< 1	< 1
Product activation height (cm)	1.08	1.10	1.03	1.07	1.20
Lower detection limit (cm)	0.30	N/D**	N/D	N/D	N/D

*At a flow rate of 0.13 gal/hr in a 4.8 cm diameter test chamber.
** See glossary.

Specificity Results:
Activated: unleaded gasoline, diesel fuel, synthetic fuel, heating oil #2, water.

Manufacturer's specifications:
Manufacturer's instructions do not specify procedures or schedules for maintenance or calibration.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is listed as interstitial due to intended use.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Evaluation lists all PPM, RLM, and ST models, including the Multiplexer Unit; however, evaluation procedures were performed using model PPM 4000.
Detector is reusable.

Marley Pump Co.
9650 Alden Rd.
Lenexa, KS 66215
Tel: (913) 541-2985

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 04/28/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Mine Safety Appliances

Tankgard
P/N 481532 S/N 03095

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	benzene	2-methylbutane
Accuracy (%)	100	100
Detection time (sec)	5	16
Fall time (min:sec)	04:12	04:42
Lower detection limit (ppm)	12.5	12.5

Specificity Results:
Activated (100%): benzene, n-butane, n-hexane, 2-methylpentane, toluene, isobutane.

Manufacturer's specifications:

Maximum Wire Distance:	500 ft using 18 AWG
Response Time:	30 seconds
Recover Time:	1 minute maximum
Sensor Life:	2 year warranty

Mine Safety Appliances
P. O. Box 427
Pittsburgh, PA 15230
Tel: (412) 776-8600

Evaluator: Carnegie Mellon Research Institution
Tel: (412) 268-3495

Date of Evaluation: 03/26/91

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Mine Safety Appliances

Tankgard VIII
P/N 488803 S/N 00389

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	benzene	2-methylbutane
Accuracy (%)	100	100
Detection time (sec)	5	16
Fall time (min:sec)	04:12	04:42
Lower detection limit (ppm)	12.5	12.5

Specificity Results:
Activated (100%): benzene, n-butane, n-hexane, 2-methylpentane, toluene, isobutane.

Manufacturer's specifications:

Maximum Wire Distance:	500 ft using 18 AWG.
Response Time:	30 seconds.
Recover Time:	1 minute maximum.
Sensor Life:	2 year warranty.

Mine Safety Appliances
P. O. Box 427
Pittsburgh, PA 15230
Tel: (412) 776-8600

Evaluator: Carnegie Mellon Research Institution
Tel: (412) 268-3495

Date of Evaluation: 03/28/91

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NDE Environmental Corp.

Proline Test Series III, Version 1.0

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=0.1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 41 gallons.

Waiting Time: None between delivery and testing
Minimum of 1 hour between dispensing and testing.

Test Period: Minimum of 1 hour.
Pipe deflection, vapor pockets, and large temperature differences may produce inconsistent readings, testing to continue until stable conditions are present.
Test data are acquired and recorded manually.
Manual calculations are performed by the operator on site.

Calibration: Sensors must be calibrated before each test.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/30/91

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NDE Environmental Corp.

PTK-88

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.8% and P_{FA}=1.3%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 40 gallons.

Waiting Time: None between delivery and testing.
Minimum of 1 hour between dispensing and testing.

Test Period: Minimum of 10 minutes. Repeat 10 minute cycles are necessary if data does not meet the manufacturer's criteria.
Test data are acquired and recorded manually.
Manual calculations are performed by the operator on site.

Calibration: Sensors must be calibrated before each test.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 02/14/91

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NDE Environmental Corp.

UST Ullage Test - Version U2 (Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=95.24% and P_{FA}=0%.

Leak Threshold: A leak is declared when the pressure decay trend equals or exceeds ± 0.016 psi/hr.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oils #2 through #6, and solvents.

Tank Capacity: Maximum ullage volume is 10,260 gallons.

Waiting time: Minimum of 2 hours between delivery and testing.

Test Period: Minimum of 30 minutes (after data trend has been established).

Test Pressure: Total pressure of 4.0 psi must be applied at bottom of tank.

Temperature: Ullage must be monitored during test, and a correction factor is applied to account for temperature changes. If ullage temperature changes exceed 5 degrees F, test must not be conducted.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, net pressure must be maintained at a minimum of 1 psi in the ullage during test.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using a volumetric underfilled test method.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: ADA Technologies, Inc.
Tel: (303) 792-5615

Date of Evaluation: 04/10/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

NDE Environmental Corp.

UTS-4T Ullage Test (Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=95.24% and P_{FA}=0%.

Leak Threshold: A leak is declared when the make-up gas flow rate into ullage equals or exceeds 0.275 cubic feet/hour.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oil #4, and solvents.

Tank Capacity: Maximum ullage volume is 7,500 gallons.

Waiting time: Minimum of 2 hours between delivery and testing.

Test Period: Minimum of 20 minutes, consisting of 2 consecutive 10-minute test periods. Test data are acquired and recorded manually.

Test Pressure: Pressure must be increased in ullage such that total pressure at bottom of tank does not exceed 5.0 psi.
Pressure must be maintained for a minimum of 5 minutes per 1,000 gallons of ullage.
At conclusion of this stabilization period, ullage pressure must be reduced by 0.5 psi for remainder of test.

Temperature: Ullage must be monitored for rate of temperature change, which must not exceed manufacturer's tabulated values.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, net pressure must exceed 1 psi in the ullage during test.
If this requires more than 5 psi total pressure at tank bottom, the ullage test must not be used.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using a volumetric underfilled test method.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 12/04/92

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NDE Environmental Corp.

U3 Ullage Test
(Vacuum or Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the acoustic signal detected is different from the baseline. Baseline is the acoustic signal before tank is pressurized or evacuated.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Tank Capacity: Maximum ullage volume is 16,500 gallons.

Waiting Time: None between delivery and testing

Test Period: A few minutes to determine background noise and a leak.
Depends on background noise at the site and on the size of the leak.
After the desired pressure has been reached, the tank should be allowed to settle for 10 minutes.

Test Pressure: Vacuum of 1 psi must be maintained in ullage by a vacuum blower, or total pressure at bottom of tank of 4 psi must be maintained using nitrogen.

Temperature: Acoustic signal is independent of product temperature.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, vacuum test should not be used.
Pressure test may only be used if net pressure can be maintained at a minimum 1 psi throughout ullage during test. If this requires more than 5 psi total pressure at tank bottom, the ullage test must not be used.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of the tank.
Product-filled portion of tank must be tested with an underfilled test method.
Microphone was 25 feet away from the leak source during evaluation.
If background noise is too high, test is inconclusive.
Noise signals are tape recorded (not digitally recorded).
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be declared by vacuum test. A well point in backfill may help identify presence of this condition.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/15/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

NDE Environmental Corp.

Computerized VPLT Testing System

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, solvents, and other products.

Tank Capacity: Maximum of 18,000 gallons.
Tank must contain minimum 24 inches of product.

Waiting Time: Must be long enough between delivery and testing to ensure a temperature change of less than 0.09 degrees F per hour, typically a minimum of 2 hours.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average over data window.
There must be no dispensing or delivery during test.

Temperature: Average for product is typically determined by 5 thermistors.
A minimum of 1 thermistor is required.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test. (There must be a difference of at least 37 inches between groundwater level and product level to provide a net pressure of 1 psi at bottom of tank during test.)

Calibration: Thermistors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: Ken Wilcox Assoc.
Tel: (816) 443-2494

Date of Evaluation: 02/15/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

NDE Environmental Corp.

Sure Test - Assured Tight System, Series IV

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.99% and P_{FA}=0.005%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 18,000 gallons.
Tank must be between 11 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by temperature probes.
A minimum 12 inches of product must be present for the temperature probes to operate properly.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted during test to provide a minimum net pressure of 1 psi at bottom of tank during test. (There must be a difference of at least 37 inches between groundwater level and product level to provide a net pressure of 1 psi at bottom of tank during test.)

Calibration: Temperature probes and floats must be checked for proper operation prior to each test.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

NDE Environmental Corp.
8906 Wall St., Suite 306
Austin, TX 78754
Tel: (800) 800-4633

Evaluator: ADA Technologies
Tel: (303) 792-5615

Date of Evaluation: 09/09/92

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Omntec/Electro Levels Mfg., Inc.

OEL 8000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours, 30 minutes between delivery and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.055 inch.
Minimum detectable change in water level is 0.011 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Omntec/Electro Levels Mfg., Inc.
1993 Pond Rd.
Ronkonkoma, NY 11779
Tel: (516) 981-2001

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/17/96

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Omntec/Electro Levels Mfg., Inc.

OEL 8000
(Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=97.8% and P_{FA}=2.2%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 6 hours, 30 minutes between delivery and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.055 inch.
Minimum detectable change in water level is 0.011 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Omntec/Electro Levels Mfg., Inc.
1993 Pond Rd.
Ronkonkoma, NY 11779
Tel: (516) 981-2001

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/17/96

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Omntec/Electro Levels Mfg., Inc.

L-LL-R-1, LS-ASC, PDS-ASC, PDWS-1, PDWF-1

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: all: refractive index of liquids; PDS-ASC, PDWS-1, and PDWF-1: also electrical conductivity

Test Results:

	L-LL-R-1 (low level)			L-LL-R-1 (high level)		
	unleaded gasoline	diesel fuel	water	unleaded gasoline	diesel fuel	water
Accuracy (%)	100	100	100	100	100	100
Detection time (sec)	< 1	< 1	< 1	< 1	< 1	< 1
Fall time (sec)	< 1	< 1	< 1	< 1	< 1	< 1
Lower detection limit (cm)	6.63	6.53	6.45	21.7	21.8	21.7

	PDWS-1			PDWF-1		
	unleaded gasoline	diesel fuel	water	unleaded gasoline	diesel fuel	water
Accuracy (%)	100	100	100	100	100	100
Detection time (sec)	< 1	< 1	< 1	< 1	< 1	< 1
Fall time (sec)	< 1	< 1	< 1	< 1	< 1	< 1
Lower detection limit (cm)	1.93	1.85	1.63	1.60	1.67	1.02

	PDS-ASC/LS-ASC		
	unleaded gasoline	diesel fuel	water
Accuracy (%)	100	100	100
Detection time (sec)	< 1	< 1	< 1
Fall time (sec)	< 1	< 1	< 1
Lower detection limit (cm)	2.24	2.11	1.42

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s), water.

Manufacturer's specifications:
LS and PD series responds to any liquid with an index of refraction different than air. PD series responds to any conducting liquid.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detectors are listed as interstitial due to intended use.
Test procedures used were modified from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990, and EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Non-Volumetric Tank Tightness Test Methods," March 1990.
Detector is reusable.

Omntec/Electro Levels Mfg., Inc.
1993 Pond Rd.
Ronkonkoma, NY 11779
Tel: (516) 467-5787

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/12/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

One Plus Corp.

Leak Edge
Models 100-3001, 100-4001

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product permeable

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (hr:min:sec)	00:05:41	00:05:14
Fall time (hr:min:sec)	00:30:39	00:18:36
Lower detection limit (cm)	0.02	0.02

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Operating temperatures: Sensor is -40 degrees C to 74 degrees C; Monitor Module is -20 degrees C to 49 degrees C.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

One Plus Corp.
1955 Shermer Rd., Suite 100
Northbrook, IL 60062
Tel: (708) 498-0955

Evaluator: Underwriters Laboratories Inc.
Tel: (847) 272-8800

Date of Evaluation: 12/17/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Patriot Sensors and Controls Corp. (formerly MagneTek)

7021 Digital Tank Gauge
(7030 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D = 99.96% and P_{FA} = 0.044%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents and other substances with a specific gravity >0.6 and a viscosity <1500 cp.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a 7021 controller (computer).
Leak rate calculated from data determined to be statistically valid.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 1 resistance temperature detector (RTD).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.947 inch.
Minimum detectable water level change is 0.0254 inch.

Calibration: RTD and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
System may also be used to test at a minimum product height of 18 inches or a 14% full tank, whichever is higher, if the leak rate is set at 0.1 gallons per hour (P_D = 95.34% and P_{FA} = 4.66%).

Patriot Sensors and Controls Corp.
1080 N. Crooks Rd.
Clawson, MI 48017-1097
Tel: (810) 435-0700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/07/91

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Patriot Sensors and Controls Corp. (formerly MagneTek)

7021 Digital Tank Gauge
(7030 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D = 95.34% and P_{FA} = 4.66%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents and other substances with a specific gravity >0.6 and a viscosity <1500 cp..

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a 7021 controller (computer).
Leak rate calculated from data determined to be statistically valid.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 1 resistance temperature detector (RTD).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.947 inch.
Minimum detectable water level change is 0.0254 inch.

Calibration: RTD and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
System may also be used to test a minimum product height of 18 inches or a 14% full tank, whichever is higher, if leak rate is set at 0.1 gph.

Patriot Sensors and Controls Corp.
1080 N. Crooks Rd.
Clawson, MI 48017-1097
Tel: (810) 435-0700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/07/91

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Patriot Sensors and Controls Corp. (formerly MagneTek)

7021 Digital Tank Gauge
(7100 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.9\%$ and $P_{FA} = 0.1\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents, and other substances with a specific gravity > 0.6 and a viscosity < 1500 cp.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.186 inch.
Minimum detectable water level change is 0.0048 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Patriot Sensors and Controls Corp.
1080 N. Crooks Rd.
Clawson, MI 48017-1097
Tel: (810) 435-0700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/14/95

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Patriot Sensors and Controls Corp. (formerly MagneTek)

7021 Digital Tank Gauge
(7100 Series Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with $P_D = 99.6\%$ and $P_{FA} = 0.4\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, solvents and other substances with a specific gravity >0.6 and a viscosity <1500 cp solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
Minimum of 2 hours between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.186 inch.
Minimum detectable water level change is 0.0048 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Patriot Sensors and Controls Corp.
1080 N. Crooks Rd.
Clawson, MI 48017-1097
Tel: (810) 435-0700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/14/95

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PermAlert

PAL-AT Models AT20C, AT50C, AT40K
AGW Sensor Cable

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: impedance change

Test Results:*

	unleaded gasoline		
	1/3 MER** 1348 ft.	2/3 MER 2644 ft.	MER 3982 ft.
Accuracy (%)	100	100	100
Response time (min)	9.92	6.25	21.28
Recovery time (min)	1.0	1.0	1.0
Product activation height (cm)	2.03	1.13	5.00
Detection length (cm)	116.3	64.8	286.1
Lower detection limits (cm)			
Product activation height	N/D**	N/D	5.1
Detection length	N/D	N/D	295.6

*At a flow rate of 0.14 gal/hr in test chamber.
** See glossary.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
System can monitor interstitial spaces.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Evaluation also covered quantitative leak location.
Detector is reusable.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 01/17/92

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PermAlert

PAL-AT Models AT20C, AT50C, AT40K with PHFW Hydrocarbon Probe and Type 1 Sensor

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product soluble

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	00:24	00:09
Fall time (min:sec)	N/A*	N/A
Lower detection limit (cm)	0.01	0.01

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Operating temperature range is 0 degrees F to 90 degrees F.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is not reusable; sensor filament must be replaced after contact with hydrocarbons.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 09/15/92

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PermAlert

PAL-AT Models AT20C, AT50C, AT40K with PHFW Hydrocarbon Probe and Type 2 Sensor

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product soluble

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	14:39	08:45
Fall time (min:sec)	N/A*	N/A
Lower detection limit (cm)	0.01	0.01

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Operating temperature range is 0 degrees F to 90 degrees F.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is not reusable.
Sensor filament must be replaced after contact with hydrocarbons.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 09/15/92

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PermAlert

PAL-AT Models AT20C, AT50C, AT40K
PHL Hydrocarbon Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline
Accuracy (%)	100
Response time (min)	1.13
Recovery time (min)	8.83
Product activation height (cm)	0.53
Lower detection limit (cm)	0.38

*At a flow rate of 0.13 gal/hr in a 4.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2.
Not activated: water.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 02/05/92

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PermAlert

PAL-AT Models AT20C, AT50C, AT40K
TFH Hydrocarbon Sensor Cable

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	impedance change

Test Results:

	unleaded gasoline		
	1/3 MER** 1368 ft.	2/3 MER 2685 ft.	MER 4046 ft.
Accuracy (%)	100	100	100
Response time (min)	3.40	7.48	16.21
Recovery time (min)	>60	>60	>60
Product activation height (cm)	0.65	1.33	3.53
Detection length (cm)	27.7	56.8	150.4
Lower detection limits (cm)			
Product act. height	N/D**	N/D	3.6
Detection length	N/D	N/D	152.9

*At a flow rate of 0.16 gal/hr in test chamber.
** See glossary.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2.
Not Activated: water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
System can monitor interstitial spaces.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Evaluation also covered quantitative leak location.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 02/11/92

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PermAlert

TankWatch Models PHM10, PHMS
Combination Hydrocarbon/Water Probe

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:*

	unleaded gasoline	water
Accuracy (%)	100	100
Response time (min)	0.30	<1
Recovery time (min)	1.97	1.68
Product activation height (cm)	0.18	0.80
Lower detection limit (cm)	0.56	1.93

*At a flow rate of 0.13 gal/hr in a 4.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 06/16/92

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PermAlert

TankWatch Models PHM10, PHMS
Hydrocarbon Probe

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline
Accuracy (%)	100
Response time (min)	0.25
Recovery time (min)	2.33
Product activation height (cm)	0.17
Lower detection limit (cm)	0.38

*At a flow rate of 0.14 gal/hr in a 4.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2.
Not activated: water.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

PermAlert
7720 N. Lehigh Ave.
Niles, IL 60714-3491
Tel: (708) 966-2190

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 06/16/92

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Petro Vend, Inc.

Petrosonic III
(Version 4.05 Model 613, 4 inch, Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.07% and P_{FA}=0.93%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.92 inch.
Minimum detectable change in water level is 0.02 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Petrosonic III version 4.04 is an older model automatic tank gauging system, which is no longer being manufactured.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Underwriters Laboratories, Inc.,
Tel: (847) 272-8800

Date of Evaluation: 11/04/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Petro Vend, Inc.

Site Sentinel Model II and III
(Model 613, 2 inch, Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=96.55% and P_{FA}=3.45%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 2.47 inches.
Minimum detectable change in water level is 0.037 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Underwriters Laboratories, Inc.,
Tel: (847) 272-8800

Date of Evaluation: 11/04/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Petro Vend, Inc.

Site Sentinel Model II and III, (Model 613, 4 inch, Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99.82% and P_{FA}=0.18%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.92 inch.
Minimum detectable change in water level is 0.02 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Underwriters Laboratories, Inc.,
Tel: (847) 272-8800

Date of Evaluation: 11/04/94

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Petro Vend, Inc.

Site Sentinel Model II and III, (Model 613, 4 inch, Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99.95% and P_{FA}=0.35%.

Leak Threshold: 0.06 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 90% full.

Waiting Time: Minimum of 12 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated as the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.92 inch.
Minimum detectable change in water level is 0.02 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Underwriters Laboratories, Inc.,
Tel: (847) 272-8800

Date of Evaluation: 11/04/94

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Petro Vend, Inc.

Petrosentry IV, Petrosentry VIII, SiteSentinel
Liquid Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	thermal conductivity

Test Results:

	unleaded gasoline
Accuracy (%)	100
Response time (min)	0.51
Recovery time (min)	<1
Product activation height (cm)	0.35
Lower detection limit (cm)	0.76

*At a flow rate of 0.14 gal/hr in a 4.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 10/15/92

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Petro Vend, Inc.

Petrosentry IV, Petrosentry VIII, SiteSentinel
Universal Reservoir Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:

	50 wt% Ethylene glycol in water		30 wt% Calcium chloride in water	
	Up	Down	Up	Down
Accuracy (%)	100	100	100	100
Response time (min)	19.62	16.86	17.77	15.91
Recovery time (min)	<1	<1	<1	<1
Product activation height (cm)	20.9	5.90	20.5	5.95

*At a flow rate of 0.21 gal/hr in test chamber.

Specificity Results:
Not applicable

Comments:
Intended to monitor level of either ethylene glycol or calcium chloride solutions in the interstitial or annular space of a double-walled tank.
Activates an alarm if any significant gain or loss of solution occurs.
Test procedures used were modified by evaluator from Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 10/15/92

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Petro Vend, Inc.

Petrosentry IV, Petrosentry VIII, SiteSentinel
Universal Sump Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline
Accuracy (%)	100
Response time (min)	8.32
Recovery time (min)	<1
Product activation height (cm)	3.37
Lower detection limit (cm)	3.97

*At a flow rate of 0.20 gal/hr in a 7.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 10/15/92

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Petro Vend, Inc.

SiteSentinel
30-3206, -3207, -3210 Sensors

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product permeable

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (hr:min:sec)	00:01:41	00:05:14
Fall time (hr:min:sec)	07:28:44	00:18:36
Lower detection limit (cm)	0.02	0.02

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Conductive polymer.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Underwriters Laboratories, Inc.
Tel: (847) 272-8800

Date of Evaluation: 12/10/92

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Petro Vend, Inc.

Petrosentry TLD III

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	benzene	2-methylbutane
Accuracy (%)	100	100
Detection time (min:sec)	00:05	00:16
Fall time (min:sec)	04:12	00:42
Lower detection limit (ppm)	12.5	12.5

Specificity Results:
Activated: benzene, n-butane, n-hexane, isobutane, 2-methylpentane, toluene.

Manufacturer's specifications:
Maximum Wire Distance: 500 ft using 18 AWG

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 03/26/91

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Petro Vend, Inc.

SiteSentinel
Smart Module and Vapor Sensor

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy* (%)	100	100	100
Detection time* (min:sec)	00:05	00:07	00:10
Fall time* (min:sec)	06:30	03:35	04:26
Lower detection limit (ppm)	10	10	10

*For tests conducted with 1000 ppm of test gas.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, JP-4 jet fuel, toluene, xylene(s).

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Petro Vend, Inc.
6900 Santa Fe Dr.
Hodgkins, IL 60525-9909
Tel: (708) 485-4200

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 04/16/92

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Pneumercator Company, Inc.

LC1000, E-14-29, E-700-1, LDE-700, LDE-740, TMS 3000
LS600AB, LS600LDBN, LS610, RSU800

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:

	LS600AB			LS600LDBN			LS610		
	unleaded gasoline	diesel	water	unleaded gasoline	diesel	water	unleaded gasoline	diesel	water
Accuracy (%)	100	100	100	100	100	100	100	100	100
Detection time (sec)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fall time (sec)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lower detection limit (in)	3.32	3.28	3.18	0.99	0.97	0.87	0.44	0.43	0.42

	RSU800 (low level)			RSU800 (high level)		
	unleaded gasoline	diesel	water	unleaded gasoline	diesel	water
Accuracy (%)	100	100	100	100	100	100
Detection time (min)	<1	<1	<1	<1	<1	<1
Fall time (min)	<1	<1	<1	<1	<1	<1
Lower detection limit (ppm)	2.57	2.53	2.31	13.31	13.24	13.01

Specificity Results:
Activated: unleaded gasoline, diesel fuel, water.
Manufacturer and evaluator claim sensor will respond to any liquid.

Comments:
Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors" and from EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods."
Detector is reusable.

Pneumercator Company, Inc.
120 Finn Court
Farmingdale, NY 11735
Tel: (516) 293-8450

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/22/96

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Pneumercator Company, Inc.

LDE 700, LDE 740, LDE 9000
Sensor Probe Models 9-901, 9-902, 9-903

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	capacitance

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	<00:01	<00:01
Fall time (hr:min:sec)	Manual reset	Manual reset
Lower detection limit (cm)		
9-901	0.32	0.36
9-902	0.36	0.34
9-903	0.76	0.74

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s), water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were a combination of EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors" and EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods."
Detector is reusable.

Pneumercator Company, Inc.
120 Finn Court
Farmingdale, NY 11735
Tel: (516) 293-8450

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/14/93

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ProTank, Inc.

LTH-5000 Line Tester

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.8% and P_{FA}=1.3%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 40 gallons.

Waiting Time: None between delivery and testing.
Minimum of 1 hour between dispensing and testing.

Test Period: Minimum of 10 minutes. Repeat 10 minute cycles are necessary if data does not meet the manufacturer's criteria.
Test data are acquired and recorded manually.
Manual calculations are performed by operator on site.

Calibration: Sensors must be calibrated before each test.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 02/14/91

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ProTank, Inc.

LTP-5000 Line Tester

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=0.1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4, fuel oil #6, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 41 gallons.

Waiting Time: None between delivery and testing.
Minimum of 1 hour between dispensing and testing.

Test Period: Minimum of 1 hour.
Pipe deflection, vapor pockets, and large temperature differences may produce inconsistent readings.
Testing to continue until stable conditions are present.
Test data are acquired and recorded manually.
Manual calculations are performed by operator on site.

Calibration: Sensors must be calibrated before each test.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/30/91

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ProTank, Inc.

UTA-5000 Ullage Tester
(Vacuum or Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the acoustic signal detected is different from the baseline. Baseline is the acoustic signal before tank is pressurized or evacuated.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Tank Capacity: Maximum ullage volume is 16,500 gallons.

Waiting Time: None between delivery and testing

Test Period: A few minutes to determine background noise and a leak.
Depends on background noise at the site and on the size of the leak.
After the desired pressure has been reached, the tank should be allowed to settle for 10 minutes.

Test Pressure: Vacuum of 1 psi must be maintained in ullage by a vacuum blower, or total pressure at bottom of tank of 4 psi must be maintained using nitrogen.

Temperature: Acoustic signal is independent of product temperature.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, vacuum test should not be used.
Pressure test may only be used if net pressure can be maintained at a minimum 1 psi throughout ullage during test. If this requires more than 5 psi total pressure at tank bottom, the ullage test must not be used.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of the tank.
Product-filled portion of tank must be tested with an underfilled test method.
Microphone was 25 feet away from the leak source during evaluation.
If background noise is too high, test is inconclusive.
Noise signals are tape recorded (not digitally recorded).
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be declared by vacuum test. A well point in backfill may help identify presence of this condition.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/15/93

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ProTank, Inc.

UTF-5000 Ullage Tester
(Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=95.24% and P_{FA}=0%.

Leak Threshold: A leak is declared when the make-up gas flow rate into ullage equals or exceeds 0.275 cubic feet/hour.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oil #4, and solvents.

Tank Capacity: Maximum ullage volume is 7,500 gallons.

Waiting time: Minimum of 2 hours between delivery and testing.

Test Period: Minimum of 20 minutes, consisting of 2 consecutive 10-minute test periods. Test data are acquired and recorded manually.

Test Pressure: Pressure must be increased in ullage such that total pressure at bottom of tank does not exceed 5.0 psi.
Pressure must be maintained for a minimum of 5 minutes per 1,000 gallons of ullage.
At conclusion of this stabilization period, ullage pressure must be reduced by 0.5 psi for remainder of test.

Temperature: Ullage must be monitored for rate of temperature change, which must not exceed manufacturer's tabulated values.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, net pressure must exceed 1 psi in the ullage during test.
If this requires more than 5 psi total pressure at tank bottom, the ullage test must not be used.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using a volumetric underfilled test method.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 12/04/92

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ProTank, Inc.

UTFP-5000 Ullage Tester
(Pressure Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D'=95.24% and P_{FA}=0%.

Leak Threshold: A leak is declared when the pressure decay trend equals or exceeds ± 0.016 psi/hr.

Applicability: Gasoline, diesel, aviation fuel, heavy fuel oils #2 through #6, and solvents.

Tank Capacity: Maximum ullage volume is 10,260 gallons.

Waiting time: Minimum of 2 hours between delivery and testing.

Test Period: Minimum of 30 minutes (after data trend has been established).

Test Pressure: Total pressure of 4.0 psi must be applied at bottom of tank.

Temperature: Ullage must be monitored during test, and a correction factor is applied to account for temperature changes. If ullage temperature changes exceed 5 degrees F, test must not be conducted.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, net pressure must be maintained at a minimum of 1 psi in the ullage during test.

Comments: Not evaluated using manifold tank systems.
Evaluated using diesel fuel.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using a volumetric underfilled test method.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: ADA Technologies, Inc.
Tel: (303) 792-5615

Date of Evaluation: 04/10/92

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ProTank, Inc.

VU-5000 Underfill Tester

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.9% and P_{FA}=0.1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, solvents, and other products.

Tank Capacity: Maximum of 18,000 gallons.
Tank must contain minimum 24 inches of product.

Waiting Time: Must be long enough between delivery and testing to ensure a temperature change of less than 0.09 degrees F per hour, typically a minimum of 2 hours. There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average over data window.
There must be no dispensing or delivery during test.

Temperature: Average for product is typically determined by 5 thermistors.
A minimum of 1 thermistor is required.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test. (There must be a difference of at least 37 inches between groundwater level and product level to provide a net pressure of 1 psi at bottom of tank during test.)

Calibration: Thermistors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/15/93

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ProTank, Inc.

VUP-5000 Underfill Tester

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.99% and P_{FA}=0.005%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 18,000 gallons.
Tank must be between 11 and 95% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by temperature sensor probes.
A minimum 12 inches of product must be present for the temperature probes to operate properly.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted during test to provide a minimum net pressure of 1 psi at bottom of tank during test. (There must be a difference of at least 37 inches between groundwater level and product level to provide a net pressure of 1 psi at bottom of tank during test.)

Calibration: Temperature probes and floats must be checked for proper operation prior to each test.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

ProTank, Inc.
3545 Lomita Blvd., Suite G
Torrance, CA 90505
Tel: (800) 438-1111

Evaluator: ADA Technologies
Tel: (303) 792-5615

Date of Evaluation: 09/09/92

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Raychem Corp.

TraceTek Alarm and Locator Modules
TT502 Fuel Sensing Cable

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline		
	1/3 MER** 334 m	2/3 MER 665 m	MER 995 m
Accuracy (%)	100	100	100
Response time (min)	22.11	17.13	19.42
Recovery time (min)	N/A**	N/A	N/A
Product activation height (cm)	1.53	1.53	1.53
Detection length (cm)	61	61	61
Lower detection limits (cm)			
Product act. height	N/D**	N/D	0.77
Detection length	N/D	N/D	10

*At a flow rate of 0.17 gal/hr in test chamber.
** See glossary.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2.
Not Activated: water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Evaluation also covered quantitative leak location.

Raychem Corp.
300 Constitution Dr.
Menlo Park, CA 94025-1164
Tel: (415) 361-3333

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 05/15/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Ronan Engineering Co.

Ronan X-76 Automatic Line Leak Detector
Version X-76 DM-4 Microprocessor and JT-H2 Line Pressure Sensor

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.831 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 45 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 20 seconds.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Ronan Engineering Co.
21200 Oxnard St.
Woodland Hills, CA 91367
Tel: (818) 883-5211

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 10/04/91

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Ronan Engineering Co.

Ronan X-76 Automatic Line Leak Detector
Version X-76 DM-4 Microprocessor and JT-H2 Line Pressure Sensor

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.066 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 45 gallons.

Waiting Time: None between delivery and testing.
Minimum of 2 hours between dispensing and testing.

Test Period: Response time is 20 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Ronan Engineering Co.
21200 Oxnard St.
Woodland Hills, CA 91367
Tel: (818) 883-5211

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 10/04/91

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Ronan Engineering Co.

X-76 ETM and X-76 ETM-4X
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.96\%$ and $P_{FA} = 0.044\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full if the system leak threshold is set at 0.1 gph.
System may also be used to test at a minimum product height of 12 inches or a 14% full tank, whichever is higher, if the leak threshold is set at 0:049 gph. This threshold is calculated based on $P_D = 95\%$ and $P_{FA} = 5\%$.

Waiting Time: Minimum of 2 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined to be statistically valid.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 1 resistance temperature detector (RTD).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.947 inch.
Minimum detectable water level change is 0.0254 inch.

Calibration: RTD and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
X76ETM-4X console has different housing which allows it to be mounted outside.

Ronan Engineering Co.
21200 Oxnard St.
Woodland Hills, CA 91367
Tel: (818) 883-5211

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/07/91

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Ronan Engineering Co.

X-76 ETM and X-76 ETM-4X
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D = 95.34% and P_{FA} = 4.66%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate calculated from data determined to be statistically valid.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 1 resistance temperature detector (RTD).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.947 inch.
Minimum detectable water level change is 0.0254 inch.

Calibration: RTD and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
X76ETM-4X console has different housing which allows it to be mounted outside.

Ronan Engineering Co.
21200 Oxnard St.
Woodland Hills, CA 91367
Tel: (818) 883-5211

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/21/91

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Schuster Instruments

Tel-A-Leak 1

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.86% and P_{FA}=0.14%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, waste oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
Minimum of 1 hour between "topping off" and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour.
Test data are acquired and recorded manually and by a computer.
Leak rate calculated from average of the last 10 consecutive 6 minute readings.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 10 temperature sensors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of 2-4 psi at bottom of tank during test.

Calibration: Temperature sensors must be checked annually and calibrated annually.

Comments: Not evaluated using manifold tank systems.

Schuster Instruments
211 E. Grove St.
Kawkawlin, MI 48631
Tel: (517) 684-6638

Evaluator: W. A. Kibbe and Associates
Tel: (517) 797-2425

Date of Evaluation: 11/26/90

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Simmons Sirvey Corp.

SIR 5.7

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=1.0%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Motor vehicle fuels.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated using manifold tank systems.
Of 41 data sets submitted for evaluation, all were analyzed with conclusive results.
Median monthly throughput of tanks evaluated was 7,000 gallons.
Leak rates ranging from 0.05 to 0.2 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Simmons Sirvey Corp.
106 E. Main Street
Richardson, TX 75081-3327
Tel: (800) 848-8378

Evaluator: S.S.G. Associates
Tel: (601) 234-1179

Date of Evaluation: 12/15/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Simmons Sirvey Corp.

SIR 5.7 LM

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=1.0%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Motor vehicle fuels.

Tank Capacity: Maximum of 45,000 gallons for single tank or for manifold tank systems with no more than 4 tanks in system.

Data Requirement: Minimum of 29 days of product level and flow through data.

Comments: Evaluated for manifolded tank systems using an acceptable protocol.
59% of datasets evaluated were from manifold tank systems.
7% of datasets evaluated used data collected by ATGs.
Of 41 datasets submitted for evaluation, all were analyzed with conclusive results.
Median monthly throughput of tanks evaluated was 40,165 gallons.
Leak rates of 0.05, 0.01 and 0.2 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Simmons Sirvey Corp.
106 E. Main Street
Richardson, TX 75081-3327
Tel: (800) 848-8378

Evaluator: S.S.G. Associates
Tel: (601) 234-1179

Date of Evaluation: 10/28/95

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S.I.R. International, Inc.

Mitchell's SIR Program v.2.6 12-13-91

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=98% and P_{FA}=2%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 32 days of product level and flow through data.

Comments: Not evaluated using manifold tank systems.
Of 41 data sets submitted for evaluation, 24 "best" analyses were returned and 17 data sets were not analyzed.
Median monthly throughput of tanks evaluated was 6313 gallons.
Leak rates of 0.049 to 0.21 gph were used in evaluation.
Data sets used in this evaluation were supplied by evaluator.

S.I.R. International, Inc.
11210 Steeplecrest Dr., Suite 120
Houston, TX 77065
Tel: (713) 897-0224

Evaluator: Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 01/27/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

SIR Monitor (formerly Environmental Management Technologies)

SIR Monitor

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 90 days of product level and flow through data are required before making the first evaluation. Following the first evaluation, subsequent evaluations are made based on minimum of 30 days of data.

Comments: Not evaluated using data from manifold tank systems.
Of 41 data sets submitted for evaluation, 5 were inconclusive.
Median monthly throughput of tanks evaluated was 14,600 gallons.
Leak rates of 0.05, 0.1, and 0.2 gph were used in evaluation.
Data sets evaluated were supplied by vendor.

SIR Monitor
P.O. Box 2791
Murfreesboro, TN 37133
Tel: (615) 895-2872

Evaluator: Nathan Adams, Middle TN State Univ.
Tel: (615) 898-2644

Date of Evaluation: 11/05/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Sir Phoenix, Inc.

SIR PHOENIX

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.0% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 90 days of product level and flow through data are required before making the first evaluation. Following the first evaluation, subsequent evaluations are made based on minimum of 30 days of data.

Comments: Not evaluated using manifold tank systems.
Of 41 data sets submitted for evaluation, 5 were inconclusive.
Median monthly throughput of tanks evaluated was 14,600 gallons.
Leak rates of 0.05, 0.1, and 0.2 gph were evaluated.
Data sets evaluated were supplied by vendor.

Sir Phoenix, Inc.
9 Ford Rd., P.O. Box 229
Leoma, TN 38468
Tel: (615) 852-4121

Evaluator: Nathan Adams, Middle TN State Univ.
Tel: (615) 898-2644

Date of Evaluation: 11/05/92

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Soiltest, Inc.

Soiltest Ainlay Tank 'Tegrity Tester, S-3

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 10 hours between delivery and testing.
Minimum of 2 hours between "topping off" and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour, 30 minutes.
Test data are acquired and recorded manually and by a strip chart recorder.
Leak rate is calculated from last 1 hour, 30 minutes of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 3 thermistors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide net pressure of 2-4 psi at the bottom of tank during test.

Calibration: Level sensors must be calibrated before each test.
Thermistors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.

Soiltest, Inc.
86 Albrecht Dr., P. O. Box 8004
Lake Bluff, IL 60044-8004
Tel: (800) 323-1242

Evaluator: Law Engineering Industrial Services
Tel: (800) 672-6601

Date of Evaluation: 11/28/90

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Syscorp, Inc.

Store Vision Version E.2

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

Certification: Leak rate of 0.2 gph with P_D=95.7% and P_{FA}=0%.

Leak Threshold: 0.0834 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 12,000 gallons.

Data Requirement: Minimum of 29 days of product level and flow through data.

Comments: Not evaluated using manifold tank systems.
Of 120 data sets submitted for evaluation, 32 were inconclusive.
Median monthly throughput of tanks evaluated was 8,097 gallons.
Leak rate of 0.2 gph was used in evaluation.
Data sets evaluated were supplied by evaluator.

Syscorp, Inc.
1513 Huffman Rd., Suite 202
Birmingham, AL 35215
Tel: (205) 853-0004

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 09/30/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tank Automation, Inc.

Automated Precision Tank Testing System (APTT System)
R-2

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, solvents, and other compatible products.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 10 hours, 30 minutes between delivery and testing.
Minimum of 2 hours, 30 minutes between "topping off" and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 1 hour.
Test data are acquired and recorded manually for level measurement and by computer for temperature measurement.
Leak rate is calculated from last 1 hour of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 10 thermistors.

Groundwater: Groundwater presence must be determined to a depth of 5 feet below grade in backfill. Product level must be a minimum of 5 feet 6 inches above grade to ensure a minimum net pressure of 1 psi at bottom of tank during test.

Calibration: Thermistors and level sensors must be checked annually and calibrated if necessary.

Comments: Not evaluated using manifold tank systems.

Tank Automation, Inc.
P.O. Box 1395
Wall, NJ 07719
Tel: (908) 280-2233

Evaluator: Wildwood Engineering
Tel: Not Available

Date of Evaluation: 11/14/90

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Tanknology Corp. International

TLD-1

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=99.5% and P_{FA}=0.5%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 50 gallons.

Waiting Time: Testing may begin immediately after test system is installed in the line.

Test Period: Ranges from 30 minutes to 6 hours.
Test may not be ended until pass/fail criteria set by manufacturer has been met.
Pipe deflection, vapor pockets, and large temperature differences may produce inconsistent readings. Testing must continue until stable conditions are present.
Test data are acquired and recorded manually.

Tanknology Corp.
5255 Hollister
Houston, TX 77040
Tel: (800)888-8563

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/29/91

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Tanknology Corp. International

VacuTect

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when:
sonic emission of air ingress is detected in ullage area and/or;
sonic emission of bubbles formed by air ingress is detected in product-filled portion of the tank and/or;
water ingress is detected at the bottom of the tank.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, and waste oil.
Water miscible products limit the effectiveness of water ingress detection.

Tank Capacity: Maximum of 75,000 gallons.
The test is generally conducted with tank between 60 and 90% full.
The test may be performed at minimum 5% full if the total ullage volume does not exceed 20,000 gallons.

Waiting Time: None between delivery and testing.

Test Period: Minimum of 1 hour to declare a tank tight (after vacuum is reached) if backfill is dry (no water is detected in backfill prior to or at the conclusion of test). No specified minimum to declare a tank "non-tight". If water is present in backfill, minimum test period for declaring a tank tight is calculated based on the tank size, amount of water present in the tank prior to test, tank tilt, type of the water sensor and its location. Manufacturer's time charts should be checked for appropriate test periods.
When test relies on detection of water ingress, minimum test period to declare a tank tight (if the measurements are taken at the low end of the tank) is 4 hours for the printed circuit board water sensor (test period may be shorter for tanks smaller than 1500 gallons) and 1 hour for the magnetostrictive water sensor. When water is present in backfill, an inclinometer must be used to determine and record tank tilt. Tank tilt may also be determined by taking readings at both ends of the tank. Water sensor should always be used at the low end of the tank. If water measurements are not taken at the low end of tank, extended test periods may be required to detect any water ingress.

Water Sensor: Must be used at the low point of the tank to detect water ingress.
Magnetostrictive sensor minimum detectable water level is 0.017 inch, and minimum detectable water level change is 0.001 inch.
Printed circuit board sensor minimum detectable water level is 0.022 inch, and minimum detectable water level change is 0.016 inch.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, test time must be extended to allow sufficient time to detect water ingress of 0.1 gph.

Test Pressure: Vacuum must not be greater than 0.5 psi at bottom of tank.

Comments: Evaluated for manifold tank systems using two 20,000 gallon tanks during the 02/20/96 evaluation.
Evaluated using gasoline, diesel, and JP-4 .
Microphone should be located within 60 feet from any possible leak source.
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be detected by vacuum test.
A well point in backfill may help identify presence of this condition.

Tanknology Corp.
5255 Hollister
Houston, TX 77040
Tel: (800) 888-8563

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Dates of Evaluation: 09/08/92, 02/20/92, 01/18/94, 10/28/91 and 02/23/96

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Tidel Engineering, Inc.

LIPSPC-301-0730-001/LIP-301-0729-001
Line Integrity Probe and Submersible Pump Controller

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 1 minute.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/02/93

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Tidel Engineering, Inc.

LIPSPC-301-0730-001/LIP-301-0729-001
Line Integrity Probe and Submersible Pump Controller

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.06 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 1 hour, 30 minutes.
Test data are acquired and recorded by a permanently installed microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display, and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/02/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tidel Engineering, Inc.

Tidel Environmental Monitoring System, 3500 Series
(Ultrasonic Probes #401-0009, #401-0010 and #401-0023)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 95.3\%$ and $P_{FA} = 4.7\%$ for 2 hour test.
Leak rate of 0.2 gph with $P_D = 99.5\%$ and $P_{FA} = 0.5\%$ for 4 hour test.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours, 29 minutes between delivery and testing.
Minimum of 15 minutes after dispensing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours to achieve $P_D = 98.6\%$ and $P_{FA} = 1.4\%$.
Minimum of 4 hours to achieve $P_D = 99.5\%$ and $P_{FA} = 0.5\%$.
Test data are acquired and recorded by the microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.48 inches.
Minimum detectable water level change is 0.035 inch.

Calibration: Temperature sensors and ultrasonic probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: The water sensor, temperature sensor, and product level monitor are contained in a single ultrasonic probe.
Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/16/95

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 2000, 3000, and 3500 Series (Ultrasonic Probes #401-0009 and #401-0010)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 96.2\%$ and $P_{FA} = 3\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature sensors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.48 inches.
Minimum detectable water level change is 0.035 inch.

Calibration: Temperature sensors and ultrasonic probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
EMS 2000 and 3000 Series are no longer manufactured by Tidel.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/07/93

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Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 2000, 3000, and 3500 Series (Ultrasonic Probes #401-0021 and #401-0022)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.91\%$ and $P_{FA} = 0.09\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature sensors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.48 inches.
Minimum detectable water level change is 0.035 inch.

Calibration: Temperature sensors and ultrasonic probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
EMS 2000 and 3000 Series are no longer manufactured by Tidel.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/07/93

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Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 4000
(Ultrasonic Probe #312-9000)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 97.4\%$ and $P_{FA} = 2.6\%$ for 2 hour test.
Leak rate of 0.2 gph with $P_D = 99.9\%$ and $P_{FA} = 0.1\%$ for 4 hour test.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours, 29 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours to achieve $P_D = 97.4\%$ and $P_{FA} = 1.8\%$.
Minimum of 4 hours to achieve $P_D = 99.9\%$ and $P_{FA} = 0.1\%$.
Test data are acquired and recorded by the microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.045 inches.
Minimum detectable water level change is 0.053 inch.

Calibration: Gain adjustment on probe must be checked annually and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
This is a longer version of model #312-9001.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/16/95

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Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 4000
(Ultrasonic Probe #312-9000)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with $P_D = 98.6\%$ and $P_{FA} = 1.4\%$ for a 5 hour test.
Leak rate of 0.1 gph with $P_D = 99.7\%$ and $P_{FA} = 0.3\%$ for a 6 hour test.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours, 29 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 5 hours to achieve $P_D = 98.6\%$ and $P_{FA} = 1.4\%$.
Minimum of 6 hours to achieve $P_D = 99.7\%$ and $P_{FA} = 0.3\%$..
Test data are acquired and recorded by the microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.045 inches.
Minimum detectable water level change is 0.053 inch.

Calibration: Gain adjustment on probe must be checked annually and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
This is a longer version of model #312-9001.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/16/95

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Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 4000
(Ultrasonic Probe #312-9001)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 99.9\%$ and $P_{FA} = 0.1\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours, 23 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.045 inches.
Minimum detectable water level change is 0.053 inch.

Calibration: Gain adjustment on probe must be checked annually and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
This is a shorter version of model #312-9000.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/16/95

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Tidel Engineering, Inc.

Tidel Environmental Monitoring System, EMS 4000
(Ultrasonic Probe #312-9001)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with $P_D = 97.9\%$ and $P_{FA} = 2.1\%$.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil. Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 2 hours, 23 minutes between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by the microprocessor contained within the EMS console.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.045 inches.
Minimum detectable water level change is 0.053 inch.

Calibration: Gain adjustment on probe must be checked annually and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
This is a shorter version of the model #312-9000.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/16/95

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Tidel Engineering, Inc.

EMS-3500
with Liquid Discriminatory Probes Part 301-0635

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity/hydrocarbon sensitive polymer

Test Results:*

	unleaded gasoline	water
Accuracy (%)	100	100
Response time (min)	3.59	0.96
Recovery time (min)	13.18	<1
Product activation height (cm)	1.76	0.49
Lower detection limit (cm)	4.19	1.52

* At a flow rate of 0.04 gal/hr in a 2.54 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel (at liquid height of 1.78 cm), synthetic fuel (at 2.30 cm), heating oil #2 (at 2.30 cm).

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 01/29/93

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Tidel Engineering, Inc.

EMS-3500
with Containment Sump Probes Part 301-0642

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: magnetic switch/float and hydrocarbon sensitive polymer

Test Results:*

	unleaded gasoline	water	
		low	high
Accuracy (%)	100	100	100
Response time (min)	6.39	4.76	4.12**
Recovery time (min)	>60	<1	<1
Product activation height (cm)	2.27	4.31	19.22
Lower detection limit (cm)	2.32	4.31	N/A***

* At a flow rate of 0.89 gal/hr in test chamber of diameter 12.6 cm.
** Larger test chamber and flow rate of 1.51 gal/hr.
*** See glossary.

Specificity Results:
Activated at 2.27 cm height: diesel fuel, synthetic fuel, heating oil #2.

Comments:
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Probe was tested to determine its capability of detecting hydrocarbons floating on water.
A Lower detection limit thickness of 0.04 cm was declared, on average, in 16 minutes, 41 seconds with recovery time averaging 12 minutes, 55 seconds.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 02/17/93

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Tidel Engineering, Inc.

EMS-3500
Tidel Detector No. 301-0752-001

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:*

	50 wt% Ethylene glycol in water		30 wt% Calcium chloride in water	
	up	down	up	down
Accuracy (%)	100	100	100	100
Response time (min)	21.91	30.10	22.27	31.08
Recovery time (min)	<1	<1	<1	<1
Product activation height (cm)	28.92	2.75	28.82	2.48

* At a flow rate of 0.26 gal/hr in test chamber.

Specificity Results:
Not applicable

Comments:
Intended to monitor the level of either ethylene glycol or calcium chloride solutions in interstitial or annular space of a double-walled tank.
Activates an alarm if any significant gain or loss of solution occurs.
Test procedures used were modified by the evaluator from Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 04/20/93

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Tidel Engineering, Inc.

EMS-3500
with Monitoring Well Probe Part 301-0641

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	conductivity via resistor ladder network

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	00:04	00:07
Fall time (min:sec)	<01:00	<01:00
Lower detection limit (cm)	0.32	0.32

Specificity Results:
Activated (100%): unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 02/02/93

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Tidel Engineering, Inc.

EMS-3500
with Sheen Probes Part 301-0687

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity/hydrocarbon sensitive polymer

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	07:45	03:35
Fall time (min:sec)	18:01	16:57
Lower detection limit (cm)	0.02	0.04

Specificity Results:
Activated (100%): unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is resuable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 01/31/93

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Tidel Engineering, Inc.

EMS-3500
Tidel Detector No. 301-0762

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity/hydrocarbon sensitive polymer

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	9:31	7:05
Fall time (min:sec)	55:42	17:04
Lower detection limit (cm)	0.04	0.08

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Manufacturer's specifications:
Groundwater probe used to detect free floating hydrocarbons in monitoring wells.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 03/18/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tidel Engineering, Inc.

Tidel Detector No. 301-0324-001 and 301-0325-001

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	2	2	1
Fall time (sec)	1	2	2
Lower detection limit (cm)	0.16-0.32	0.16-0.32	0.16-0.32

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Manufacturer's specifications:

Detector No.301-0324-001

Application:	Liquid sensor, water, used in 4" monitoring well.
Sensor:	Magnetism and conductivity pins.
Detection Range:	1/8" floating product on groundwater or 1.5" free product.

Detector No.301-0325-001

Application:	Liquid sensor, water or hydrocarbon used in reservoir, sump or pipeline trench.
Sensor:	Magnetism and conductivity pins.
Detection Range:	1/8" floating product on groundwater or 1.5" free product.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tidel Engineering, Inc.

Tidel Detector No. 301-0326-001 and 301-0326-002

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	4	7	2
Fall time (sec)	3	4	4
Lower detection limit (cm)	0.08-0.32	0.08-0.32	0.08-0.32

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, JP-4 jet fuel, toluene, xylene(s).

Manufacturer's specifications:

Detector No.301-0326-001

Application:	Liquid sensor, water, used in 2" monitoring well.
Sensor:	Magnetism and conductivity pins.
Detection Range:	1/8" floating product on groundwater or 2.5" free product.

Detector No.301-0326-002

Application:	Liquid sensor, water, used in annulus of double wall steel tanks.
Sensor:	Magnetism and conductivity pins.
Detection Range:	1/8" floating product on groundwater or 2.5" free product.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tidel Engineering, Inc.

EMS-3000
301-0328-001, 301-0330-001

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (sec)	91	65	86
Fall time (min:sec)	5:39	4:23	9:38
Lower detection limit (ppm)	10 to 100	10 to 500	10 to 50

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, JP-4 jet fuel, toluene, xylene(s)
Not Activated: n-hexane.

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Radian Corp.
Tel: (512) 454-4797

Date of Evaluation: 07/08/91

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Tidel Engineering, Inc.

EMS-3500
Vapor Sensor Probe Part No. 301-0634

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy* (%)	100	100	100
Detection time* (min:sec)	2:46	1:41	1:50
Fall time* (hr:min:sec)	>1:00:00**	>1:00:00**	>1:00:00**
Lower detection limit (ppm)	100	500	100

* For tests conducted with 1000 ppm of test gas.
** The vapor sensor probe was recalibrated when it did not recover after 1 hour, from exposure to test vapors.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, JP-4 jet fuel, toluene, xylene(s).

Manufacturer's specifications:
Vapor sensor probe for use in normally dry monitoring wells to detect hydrocarbon vapors.
Can be used in monitoring wells up to 20 feet deep.
The probe will alarm if it comes in contact with water and must be removed immediately to prevent damage to probe.

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Tidel Engineering, Inc.
2615 E. Belt Line Rd.
Carrollton, TX 75006
Tel: (800) 678-7577

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 03/18/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Tokheim Corp.

Tokheim Pressure Monitor, Models PM 101 and 585A-PM

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.25 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and alcohols.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.

Pipeline Capacity: Maximum of 78 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 4 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Restricted flow to dispenser if leak is declared.

Calibration: System must be checked semi-annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: No longer manufactured by Tokheim Corporation.

Tokheim Corp.
10501 Corporate Dr.
Fort Wayne, IN 46801-0360
Tel: (219) 423-2552

Evaluator: Vista Research
Tel: (415) 966-1171

Date of Evaluation: 11/02/90

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Tracer Research Corp.

Tracer Tight Line Test

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0.0%.

Leak Threshold: A leak is declared when tracer chemical is detected outside of the pipeline.

Applicability: All fluid petroleum products and any other fluid with which an acceptable tracer is compatible.

Waiting Time: Minimum is normally 2 weeks after injection of the tracer into the tank, but must be no less than 1 week, and no more than 4 weeks. For very large systems, several days or weeks may be required to circulate tracer-labeled fuel through all parts of the system. Under these circumstances the 1 week waiting time begins after the tracer reaches the pipeline being tested.

Tracer Dosage: Dosage of tracer is a factor of tank size and frequency of tank refills according to manufacturer's recommendations.
Tracer labeled product should be circulated through the pipeline before test period begins.
Pressurized pipeline must be brought up to operating pressure or operated on a daily basis.

Permeability: Soil permeability must be sufficient for transport of tracer through backfill (greater than 1 Darcy).

Probe: Radius of influence of each probe is 10 feet. Locating pipelines should be done according to manufacturer's operating procedures for pipeline test results to be valid.

Comments: Presence of frozen, saturated soil surrounding the pipeline may limit effectiveness of test method.
Presence of groundwater surrounding pipeline may also reduce effectiveness of test method (e.g. when applied to pipelines containing water-miscible products or products whose specific gravity is greater than 1).

Tracer Research Corp.
3755 N. Business Center Dr.
Tucson, AZ 85705
Tel: (800) 989-9929

Evaluator: Ken Wilcox Associates (1991)
Tel: (816) 443-2494
Control Strategies Engineering (1992)
Tel: (602) 682-8726
Dates of Evaluation: 10/04/91 and 05/92

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Tracer Research Corp.

Tracer Tight

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (TRACER)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when tracer chemical is detected outside of the tank.

Applicability: All fluid petroleum products and any other fluid with which an acceptable tracer is compatible.

Tank Capacity: This test method is not limited by capacity, however only portions of the tank system within 10 feet of sample collection point are tested.

Waiting Time: Ranges from 7 to 30 days (generally two weeks) after injection of the tracer into the tank.

Tracer Dosage: Dosage of tracer is a factor of tank size and frequency of tank refills according to manufacturer's recommendations.

Permeability: Soil permeability must be sufficient for transport of tracer through backfill (greater than 1 Darcy).

Probe: Radius of influence of each probe is 10 feet. Probes must be placed such that all possible locations and orientations are within the circle of influence.

Groundwater: Depth to groundwater in backfill must be determined. In order for a leak below groundwater to be indicated by the release of the tracer compound, the hydrostatic pressure of product in tank must exceed the hydrostatic pressure of groundwater during test. This is done by maintaining product level at least 6 inches over groundwater for a minimum 17 hours during first three days following addition of tracer to tank.
In high groundwater situations, this method may be supplemented with measurement of water ingress, at the discretion of the regulatory agency.

Comments: Presence of frozen, saturated soil above bottom of tank may limit effectiveness of test method.
Presence of groundwater above bottom of tank may also limit effectiveness of test method (e.g. when applied to tanks containing water-miscible products or products whose specific gravity is greater than 1).

Tracer Research Corp.
3755 N. Business Center Dr.
Tucson, AZ 85705
Tel: (800) 989-9929

Evaluator: Ken Wilcox Associates (1990)
Tel: (816) 443-2494
Control Strategies Engineering (1992)
Tel: (602) 682-8726
Dates of Evaluation: 10/04/90 and 05/92

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Tracer Research Corp.

Tracer Tight

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	intermittent
Operating principle:	chromatographic (looks for chemical tracer)

Test Results:

Hydrocarbon detector (GC/FID)

	xylene	benzene	2-methylbutane	gasoline	Tracers
Accuracy (%)	<20	<20	<20	<20	N/R*
Bias (%)	0	0	0	0	N/R
Detection time (min)	<0.01	<0.01	<0.01	<0.01	N/R
Fall time (min)	<0.01	<0.01	<0.01	<0.01	N/R
Lower detection limit (ppm)	20	20	20	20	N/R

Tracer Detector

	xylene	benzene	2-methylbutane	gasoline	Tracers
Accuracy (%)	N/R	N/R	N/R	N/R	<20
Bias (%)	N/R	N/R	N/R	N/R	0
Detection time (min)	N/R	N/R	N/R	N/R	<0.01
Fall time (min)	N/R	N/R	N/R	N/R	<0.01
Lower detection limit (ppm)	N/R	N/R	N/R	N/R	10^{-5}

* See glossary.

Specificity Results:
See above.

Manufacturer's specifications:
Soil permeability at the site must exceed 1 Darcy.

Comments:
Test procedures used were a combination of EPA's "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods," March 1990 and "recognized national standard of GC/FID hydrocarbon measurements."
Method utilizes a chromatographic measurement of a vapor sample collected monthly from the site. Hydrocarbon vapors and the added chemical tracer can be measured independently.
During evaluations, the tracer chemical was declared 159 out of 161 trials.
System evaluation included detectors, analytical procedures, sample containers, sampling procedures, sampling system, monitoring well materials and installations, and tracer mobility.

Tracer Research Corp.
3755 N. Business Center Dr.
Tucson, AZ 85705
Tel: (800)989-9929

Evaluator: Control Strategies Engineering
Tel: (602) 682-8726

Date of Evaluation: 05/05/92

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Triangle Environmental, Inc.

TEI Model LT-3, Version 1.0

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=100.0% and P_{FA}=0%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #4 and #6, waste oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.

Pipeline Capacity: Maximum of 80 gallons.

Waiting Time: None between delivery and testing.
Minimum of 15 minutes between dispensing and testing.

Test Period: Minimum of 15 minutes
Test data are acquired and recorded manually.
Manual calculations are performed by the operator on site.

Temperature: Product change per hour must be less than 4 degrees F.

Calibration: Sensors must be checked annually and calibrated semi-annually in accordance with manufacturer's instructions.

Triangle Environmental, Inc.
172 W. Verdugo Ave.
Burbank, CA 91502-2132
Tel: (818) 840-7020

Evaluator: United States Testing Company
Tel: (213) 723-7181

Date of Evaluation: 03/03/92

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Triangle Environmental, Inc.

TEI Ullage Test, Version 1.0 (Vacuum Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when an increase in the acoustic noise level (above background) of the tank under vacuum is detected due to air or water ingress.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, solvents, and light liquids.

Tank Capacity: Maximum ullage volume is 15,000 gallons.
Microphone should be located within 24 feet of all points within the ullage.

Waiting Time: None if test is conducted after the underfilled tank test.

Test Period: Minimum of 1 minute.

Test Pressure: Vacuum of 1 psi must be maintained in ullage.
If vacuum cannot be maintained, see manufacturer's instructions.

Temperature: Acoustic signal is independent of product temperature.

Groundwater: Depth to the groundwater in backfill must be determined. If groundwater is above product level, vacuum must be adequate to detect an ingress of groundwater.

Calibration: Sensors must be calibrated before each test.

Comments: Manifold tank systems must be isolated prior to test.
Evaluated using unleaded gasoline.
Tests only ullage portion of tank.
Product-filled portion of tank must be tested using an underfilled test method.
Microphone was 24 feet away from the leak source during evaluation.
Headphones are used during test to listen for the signal of air ingress.
Noise signals are tape recorded (not digitally recorded).
Test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be declared by vacuum test. A well point in backfill may help identify presence of this condition.

Triangle Environmental, Inc.
172 W. Verdugo Ave.
Burbank, CA 91502-2132
Tel: (818) 840-7020

Evaluator: United States Testing Co. Inc.
Tel: (213) 723-7181

Date of Evaluation: 05/05/93

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Triangle Environmental, Inc.

TEI System 5000, Version 1.0

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when the acoustic noise level of the tank under vacuum is greater than the calibrated background acoustic noise level (prior to evacuation).

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, solvents and light liquids.

Tank Capacity: Maximum of 20,000 gallons.
Tank must be minimum 14% full.
Microphone should be located within 24 feet of all points within the tank.

Waiting Time: None between delivery and testing.

Test Period: Minimum of 1 minute.

Test Pressure: Vacuum of 1 psi must be maintained in ullage.
If vacuum cannot be maintained, see manufacturer's instructions.

Temperature: Acoustic signal is independent of product temperature.

Groundwater: Depth to groundwater in backfill must be determined.
This method cannot be used if groundwater is above bottom of tank.

Calibration: Sensor must be calibrated before each test.

Comments: Manifold tank systems must be isolated prior to test.
Evaluated using unleaded gasoline.
Microphone was 24 feet away from the leak source during evaluation.
Headphones are used during test to listen for the signal of air ingress.
Noise signals are tape recorded (not digitally recorded).
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be declared by vacuum test. A well point in backfill may help identify presence of this condition.

Triangle Environmental, Inc.
172 W. Verdugo Ave.
Burbank, CA 91502-2132
Tel: (818) 840-7020

Evaluator: United States Testing Co., Inc.
Tel: (213) 723-7181

Date of Evaluation: 02/04/93

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Triangle Environmental, Inc.

TEI System 4000, Version 1.0

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=4.8%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 100% full.

Waiting Time: Minimum of 6 hours between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum is determined by a computer.
Average was 4 hours during the evaluation.
Leak rate is calculated from last 2 hours of test period data.
Test data are acquired and recorded by computer.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 3 thermistors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test.

Calibration: Thermistors must be calibrated before each test.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
May also be used as an overfill test method.

Triangle Environmental, Inc.
172 W. Verdugo Ave.
Burbank, CA 91502-2132
Tel: (818) 840-7020

Evaluator: United States Testing Company, Inc.
Tel: (213) 723-7181

Date of Evaluation: 04/02/91

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Universal Sensors and Devices, Inc.

TICS-1000
(Magnetostrictive Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with $P_D = 96.6\%$ and $P_{FA} = 3.4\%$.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 90% full.

Waiting Time: Minimum of 8 hours between delivery and testing.
None between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 6 hours.
Test data are acquired and recorded by a microprocessor.
Leak rate is calculated from average of subsets of all collected data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 resistance temperature detectors (RTDs).

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.83 inch.
Minimum detectable water level change is 0.0116 inch.

Calibration: RTDs and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Universal Sensors and Devices, Inc.
9205 Alabama Ave., Unit C
Chatsworth, CA 91311
Tel: (818) 988-7121

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/20/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Universal Sensors and Devices, Inc.

LTC-1000
(Mass Buoyancy Probe)

LARGE TANK AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 1.4 gph with $P_D = 97.2\%$ and $P_{FA} = 2.8\%$.
This leak rate does not meet EPA requirements for monthly monitoring (0.2 gph) or tank tightness testing (0.1 gph).

Leak Threshold: 0.7 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 2,000,000 gallons. Application of this method for larger tanks is currently under review to determine correct scalling factors for leak rate, threshold and test time versus tank size.
Tank must be minimum 90% full.

Waiting Time: Minimum of 3 hours, 42 minutes between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 49 hours.
Test data are acquired and recorded by a computer.
There must be no dispensing or delivery during test.

Temperature: System does not require measurement of product temperature.

Water Sensor: System does not use a water probe.
Water ingress is detected by an increase in total mass of product in the tank.
To monitor water continuously, a separate water sensing probe must be installed.

Calibration: The mass bouyancy probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Universal Sensors and Devices, Inc.
9205 Alabama Ave., Unit C
Chatsworth, CA 91311
Tel: (818) 988-7121

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/17/96

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Universal Sensors and Devices, Inc.

LTC-2000
(Differential Pressure Probe)

LARGE TANK AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 3.0 gph with P_D = 98.8% and P_{FA} = 1.2%.
This leak rate does not meet EPA requirements for monthly monitoring (0.2 gph) or tank tightness testing (0.1 gph).

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds the threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil #4, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 2,000,000 gallons.
Application of this method for larger tanks is currently under review to determine correct scaling factors for leak rate, threshold and test time versus tank size.
Tank must be minimum 90% full.

Waiting Time: Minimum of 3 hours, 30 minutes between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 48 hours, 18 minutes.
Test data are acquired and recorded by a computer.
There must be no dispensing or delivery during test.

Temperature: System does not require measurement of product temperature.

Water Sensor: System does not use a water probe.
Water ingress is detected by a change in pressure at the bottom of the tank.
To monitor water continuously, a separate water sensing probe must be installed.

Calibration: The differential pressure probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: To detect losses or gains in the tank, the system uses a differential pressure probe to measure changes in pressure at the bottom of the tank.
Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Universal Sensors and Devices, Inc.
9205 Alabama Ave., Unit C
Chatsworth, CA 91311
Tel: (818) 988-7121

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 05/17/96

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Universal Sensors and Devices, Inc.

Leak Alert System Models LAL-100, LA-01, LA-02, LA-04, LA-X4, LA-08, CATLAS
Liquid Sensor LALS-1

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	thermal conductivity

Test Results:*

	unleaded gasoline
Accuracy (%)	100
Response time (min)	1.24
Recovery time (min)	<1
Product activation height (cm)	0.61
Lower detection limit (cm)	0.76

* At a flow rate of 0.04 gal/hr in a 2.6 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Universal Sensors and Devices, Inc.
9205 Alabama Ave., Unit C
Chatsworth, CA 91311
Tel: (818) 988-7121

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 06/01/94

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Universal Sensors and Devices, Inc.

Leak Alert System Models LAL-100, LA-01, LA-02, LA-04, LA-X4, LA-08, CATLAS LAVS-1 MOS Vapor Sensor

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	metal oxide semiconductor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	100	100
Detection time (min:sec)	00:31	00:40	00:42
Fall time (min:sec)	4:43	4:25	4:30
Lower detection limit (ppm)	100	N/D*	N/D

* See glossary.

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, JP-4 jet fuel, n-hexane, toluene, xylene(s).

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Universal Sensors and Devices, Inc.
9205 Alabama Ave., Unit C
Chatsworth, CA 91311
Tel: (818) 988-7121

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 06/01/94

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USTest

UST 2001 (Quick Test)
(Ultrasonic Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=97.5% and P_{FA}=2.5%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 4 hours between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 30 minutes. (see Comments section below)
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
water is declared via an ultrasonic signal ranging to the water interface.
Minimum detectable water level in the tank is less than 0.1 inch.
Minimum detectable change in water level is 0.046 inch.

Calibration: Probe must be checked regularly in accordance with manufacturer's instructions.

Comments: With a test period of 1 hour, method has a P_D = 99.9% and a PFA = 0.1%.
Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

USTest
2727 Kaliste Saloom Rd.
Lafayette, LA 70508
Tel: (318) 981-9421

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/06/95

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USTest

UST 2001
(Ultrasonic Probe)
AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=95.2% and P_{FA}=4.8%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, and aviation fuel.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 4 hours between delivery and testing.
Minimum of 15 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 1 hour. (see Comments section below)
Test data are acquired and recorded by a computer.
Leak rate is calculated from data determined to be valid by statistical analysis.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Water Sensor: Must be used to detect water ingress.
water is declared via an ultrasonic signal ranging to the water interface.
Minimum detectable water level in the tank is less than 0.1 inch.
Minimum detectable change in water level is 0.046 inch.

Calibration: Probe must be checked regularly in accordance with manufacturer's instructions.

Comments: With a test period of 2 hours, method has a P_D = 98.6% and a PFA = 1.4%.
Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

USTest
2727 Kaliste Saloom Rd.
Lafayette, LA 70508
Tel: (318) 981-9421

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/06/95

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USTest

UST 2000/U
(Pressure and Vacuum Test)

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (ULLAGE)

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: A leak is declared when there is a substantial increase in the acoustic noise signal (when the tank is under pressure or vacuum) above the background signal (prior to pressurization or evacuation) in the frequency interval of 10 kHz to 20 kHz.

Applicability: Gasoline, diesel, aviation fuel, fuel oils #2 through #6, waste oil, and solvents. Equipment is not in contact with the product.

Tank Capacity: Maximum ullage volume is 7,550 gallons for pressure test and 5,250 gallons for vacuum test.

Waiting Time: None if test is conducted after an underfilled tank tightness test.

Test Period: Minimum of 15 minutes (includes collection of background information).

Test Pressure: Net pressure of 2.0 psi or vacuum of 1.0 psi must be maintained in ullage.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above product level, vacuum test must not be used. Pressure test must be conducted using net pressure exceeding 2.0 psi in the ullage.

Calibration: Test equipment must be checked by tester before each test.

Comments: Not evaluated using manifold tank systems.
Evaluated using unleaded gasoline as test product.
Tests only ullage portion of tank.
Product-filled portion of the tank must be tested using an underfilled test method.
Microphone was less than 8 feet, 6 inches from the leak source during evaluation.
If the background noise is too high, test is inconclusive.
Vibration due to nearby equipment or dripping condensation may interfere with test.
Vacuum test method may not be effective in some backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be declared by vacuum test. A well point in backfill may help identify presence of this condition.

USTest
2727 Kaliste Saloom Rd.
Lafayette, LA 70508
Tel: (318) 981-9421

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/24/92

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USTest

UST 2000/LL

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=98.12% and P_{FA}=1.88%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, water, and kerosene.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 15% full.There must be at least 20 inches and not more than 67 inches of product in the tank.

Waiting Time: Ranges from 3 to 12 hours between delivery and testing.
Testing may begin when the rate of product temperature change does not exceed 0.1 degree F per hour.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by a computer, which does a regression analysis to determine the leak rate.
An ultrasonic device is used to measure changes in product level.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of tank during test. (There must be a difference of at least 37 inches between groundwater level and product level to provide a net pressure of 1 psi at bottom of tank during test.)

Calibration: Temperature sensors and probes must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

USTest
2727 Kaliste Saloom Rd.
Lafayette, LA 70508
Tel: (318) 981-9421

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 06/09/94

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USTest

UST 2000/P

VOLUMETRIC TANK TIGHTNESS TEST METHOD (UNDERFILL)

Certification: Leak rate of 0.1 gph with P_D=99.9% and P_{FA}=0.1% for tanks up to 15,000 gallons, Leak rate of 0.1 gph with P_D=99.7% and P_{FA}=0.3% for tanks from 15,000 gallons up to 45,000 gallons.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, waste oil, water, and kerosene.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 45,000 gallons.
Tank must be minimum 78.6% full.

Waiting Time: Minimum for tanks up to 45,000 gallons must be determined from the manufacturer's chart of "Wait Time versus Tank Volume." This chart must be included in the tank test report.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum for tanks between 10,000 and 45,000 gallons is determined from the manufacturer's chart of Differential Volume versus Test Duration.
Line labeled P_D = 99.9% must be used. This chart must be included in the tank test report.
Test data are acquired and recorded by a computer, which does a regression analysis to determine the leak rate.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined from the measurement of the change in the speed of sound.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 1 psi at bottom of the tank during test.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

USTest
2727 Kaliste Saloom Rd.
Lafayette, LA 70508
Tel: (318) 981-9421

Evaluators: Midwest Research Institute
Tel: (816) 753-7600
and Ken Wilcox Associates
Tel: (816) 443-2494
Dates of Evaluation: 12/05/90 (1000-10000 gallons), and 08/04/92 (10000-45000 gallons)

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USTMAN Industries, Inc.

USTMAN SIR 1.91

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=98.4% and P_{FA}=1.6%.

Leak Threshold: 0.1 gph. A leak is declared when a continuous loss equals or exceeds this threshold at the 5% level of significance.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 42 days of product level and flow through data.

Comments: Not evaluated using data from manifold tank systems.
Of 41 data sets submitted for evaluation, 4 data sets were not analyzed and 7 were inconclusive.
Median monthly throughput of tanks evaluated was 10,978 gallons.
Leak rates ranging from 0.048 to 0.201 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

USTMAN Industries Inc.
12265 W. Bayaud Ave., Suite 110
Lakewood, CO 80228
Tel: (303) 986-8011

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 10/31/91

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USTMAN Industries, Inc.

USTMAN SIR Version 94.1

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=>99% and P_{FA}=<1.0%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 30,000 gallons.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Evaluated using some data from manifold tank systems.
Of 53 data sets submitted for evaluation, all were analyzed with conclusive results.
Median monthly throughput of tanks evaluated was 25,408 gallons.
Leak rates of 0.05, 0.1, and 0.2 gph were used in evaluation.
Data sets evaluated were supplied by evaluator. Some data sets used USTMAN SIR 1.91 (0.1 gph) analysis as documentation that tanks were tight.

USTMAN Industries Inc.
12265 W. Bayaud Ave., Suite 110
Lakewood, CO 80228
Tel: (303) 986-8011

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 03/31/94

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USTMAN Industries, Inc.

YES SIR 90

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUALITATIVE)

Certification: Leak rate of 0.2 gph with P_D=96.3% and P_{FA}=3.9%.

Leak Threshold: 0.1 gph. A leak is declared when a consistent loss equals or exceeds this threshold that is statistically significant from zero at the 5% confidence level.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 15,000 gallons.

Data Requirement: Minimum of 35 days of product level and flow through data.

Comments: Not evaluated using manifold tank systems.
Of 120 data sets submitted for evaluation, 15 were inconclusive.
Median monthly throughput of tanks evaluated was 15,867 gallons.
Data sets evaluated were supplied by evaluator.

USTMAN Industries Inc.
12265 W. Bayaud Ave., Suite 110
Lakewood, CO 80228
Tel: (303) 986-8011

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 12/17/90

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Vaporless Manufacturing

Vaporless LD 2000 and LD 2000S

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 1.7 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass or steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between dispensing and testing.
None between delivery and testing.

Test Period: Response time is 5 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
LD2000 - restricted flow to dispenser if leak is declared.
LD2000S - pump shutoff if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Vaporless Manufacturing
9234 E. Valley Rd., Suite C
Prescott Valley, AZ 86314
Tel: (602) 775-5191

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 11/19/90

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Vaporless Manufacturing

Vaporless LD 2000E and LD 2000E-S

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests flexible pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 59.6 gallons.

Waiting Time: None between dispensing and testing.
None between delivery and testing.

Test Period: Response time is 30 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
LD2000E - restricted flow to dispenser if leak is declared.
LD2000ES - pump shutoff if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Enviroflex piping with a bulk modulus* of 1,352 psi was used during evaluation.

*See glossary.

Vaporless Manufacturing
9234 E. Valley Rd., Suite C
Prescott Valley, AZ 86314
Tel: (602) 775-5191

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/11/92

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Vaporless Manufacturing

Vaporless LD 2000T and LD 2000T-S

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 129 gallons.

Waiting Time: None between dispensing and testing.
None between delivery and testing.

Test Period: Response time is 1 minute.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
LD2000T - restricted flow to dispenser if leak is declared.
LD2000T-S - pump shutoff if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Vaporless Manufacturing
9234 E. Valley Rd., Suite C
Prescott Valley, AZ 86314
Tel: (602) 775-5191

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 07/13/93

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Vaporless Manufacturing

Vaporless LD 3000 and LD 3000S

AUTOMATIC MECHANICAL LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.0 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel and solvents.

Specification: System tests pressurized steel and fiberglass pipelines.
Tests are conducted at operating pressure.

Pipeline Capacity: Maximum of 320 gallons.

Waiting Time: None between dispensing and testing.

Test Period: Response time is 9 seconds.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
LD3000 - restricted flow to dispenser if leak is declared.
LD3000S - pump shutoff if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Vaporless Manufacturing
9234 E. Valley Rd., Suite C
Prescott Valley, AZ 86314
Tel: (602) 775-5191

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/20/93

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Veeder-Root

TLS-350 Line Leak Detector, Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 14 seconds.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates
Tel: (816) 443-2494
Date of Evaluation: 09/20/91, Rev. 04/12/93

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Veeder-Root

TLS-350 Line Leak Detector, Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=100.0% and P_{FA}=0%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 6 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates, Inc.
Tel: (816) 443-2494
Dates of Evaluation: 09/20/91, Rev. 04/12/93

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Veeder-Root

TLS-350 Line Leak Detector , Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.079 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 128 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 14 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600
Rev. by Ken Wilcox Associates, Inc.
Tel: (816) 443-2494
Date of Evaluation: 09/20/91, Rev. 04/12/93

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Veeder-Root

TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 1.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time is 1 minute.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Veeder-Root

TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=96% and P_{FA}=4%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time ranges from 45 minutes to 8 hours, 51 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Veeder-Root

TLS-350 Line Leak Detector for Flexible Pipelines, Series 8475

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.079 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized flexible pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 158.4 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing depends on volume of product and temperature gradient which is determined by the system's computer.

Test Period: Response time ranges from 1 hour, 12 minutes to 12 hours, 54 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 08/04/93

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Veeder-Root

TLS Line Leak Detector, Series 8484

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100.0% and P_{FA}=0%.

Leak Threshold: 1.88 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 89 gallons.

Waiting Time: None between delivery and testing.
Minimum of 16 minutes between dispensing and testing.

Test Period: Response time is 28.8 seconds.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/07/91

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Veeder-Root

TLS Line Leak Detector, Series 8484

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100.0% and P_{FA}=0%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 89 gallons.

Waiting Time: None between delivery and testing.
Minimum of 2 hours, 30 minutes between dispensing and testing.

Test Period: Response time is 18 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Dispenser shutdown, message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/07/91

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Veeder-Root

Pressurized Line Leak Detector, Series 8494

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 3.0 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 2.5 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure, not to exceed 50 psi.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 100 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Response time is 2 seconds.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Message display and alarm activation if leak is declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/08/96

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Veeder-Root

Pressurized Line Leak Detector, Series 8494

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.17 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure, not to exceed 50 psi.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 100 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing is 15 minutes.

Test Period: Response time is 45 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Automatic testing of pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Message display,alarm activation, and dispensing shut-down if leak is declared.

Calibration: Equipment must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/08/96

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Veeder-Root

Pressurized Line Leak Detector, Series 8494

AUTOMATIC ELECTRONIC LINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.09 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Specification: System tests pressurized fiberglass and steel pipelines.
Tests are conducted at operating pressure, not to exceed 50 psi.
System will not function with a mechanical line leak detector installed in the pipeline.

Pipeline Capacity: Maximum of 100 gallons.

Waiting Time: None between delivery and testing.
Minimum between dispensing and testing is 2 hours.

Test Period: Response time is 32-48 minutes.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: Permanent installation on pipeline.
Preset threshold.
Single test to determine if pipeline is leaking.
Message display and alarm activation if leak is detected.

Calibration: Equipment must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Testing of pipeline at this leak rate is normally initiated manually, but may be set to activate automatically.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/08/96

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Veeder-Root

TLS-200/200i/300/400 UST ATGS
(7842 Digital Sensing Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.1 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 5 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a temperature averaging probe.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.40 inches.
Minimum detectable change in water level is 0.040 inch.

Calibration: Temperature averaging probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Veeder-Root

TLS-200/200i/300/400 UST ATGS
(8472 Digital Sensing Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=0.2%.

Leak Threshold: 0.126 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.52 inches.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Veeder-Root

TLS-200/200i/300/400 UST ATGS
(8472 Digital Sensing Capacitance Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=0.1%.

Leak Threshold: 0.071 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 95% full.

Waiting Time: Minimum of 8 hours, 15 minutes between delivery and testing.
Minimum of 30 minutes between dispensing and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 1.52 inches.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.
Capacitance probes do not work with oxygenated fuels.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Veeder-Root

TLS-200/200i/250/250i/300/350/400 UST ATGS (8473 Digital Sensing Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.2 gph with P_D=99% and P_{FA}=0.1%.

Leak Threshold: 0.093 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be between 50 and 95% full.

Waiting Time: Minimum of 8 hours, 18 minutes between delivery and testing.
There must be no delivery during waiting time.

Test Period: Minimum of 2 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.544 inch.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 05/14/93

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Veeder-Root

TLS-200/200i/250/250i/300/350/400 UST ATGS
(8473 Digital Sensing Magnetostrictive Probe)

AUTOMATIC TANK GAUGING SYSTEM

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.071 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and waste oil, and solvents.
Other liquids may be tested after consultation with the manufacturer.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 95% full.

Waiting Time: Minimum of 8 hours, 15 minutes between delivery and testing.
Minimum of 30 minutes between dispensing and testing.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 3 hours.
Test data are acquired and recorded by the system's computer.
Leak rate is calculated from the difference between the first and last data collected.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.544 inch.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be checked and calibrated in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.
Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head pressure). Consistent testing at low levels could allow a leak to remain undetected.
EPA leak detection regulations require testing of the portion of the tank system which routinely contains product.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 03/14/95

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Veeder-Root

TLS Series 300/400 Monitoring Systems with CSLD versions 8473 and 8493 (Magnetostrictive Probes)

CONTINUOUS IN-TANK LEAK DETECTION SYSTEM

Certification: Leak rate of 0.2 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.16 gph for single tanks at 99% operating mode.
0.15 gph for manifold tank systems at 99% operating mode.
A leak is declared and a message is printed for the operator if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, waste oil, and solvents.

Tank Capacity: Maximum of 38,170 gallons for single tanks and for all tanks manifolded together.
Contact manufacturer for tank system applications if total tank capacity exceeds 30,000 gallons.

Throughput: Monthly maximum of 221,890 gallons.

Waiting Time: Minimum of 3 hours between delivery and testing.

Temperature: Average for product is determined by a minimum of 5 thermistors.

Water Sensor: Must be used to detect water ingress.
Minimum detectable water level in the tank is 0.54 inch.
Minimum detectable change in water level is 0.027 inch.

Calibration: Thermistors and probe must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.
System set-up menu must be checked to verify that the 99% operating mode option has been selected.

Comments: During installation, the set-up menu provides a choice between a 99% or a 95% operating mode. This evaluation covers only the 99% operating mode. At this time, there is no evaluation covering the 95% mode.
System reports a quantitative result of pass or fail.
Evaluated using both single and manifold tank systems.
System collects data at naturally occurring product levels without interfering with normal tank operation, and discards data from unstable periods when system performs test.
Data can be collected at any level above 12 inches of product.
Leak rates above 1 gph are either reported as "fail" or as "no idle."
For valid monthly testing, a conclusive test report must be produced for each tank every month. Systems warns the operator if there are no " passing" tests completed during the month. For very active tanks, a tank shut down may become necessary in order for the system to collect enough quiet-time data for a test.
Test procedure used was Midwest Research Institute's "Evaluation of Continuous In-Tank Leak Detection Systems," April 17, 1995.
Constant and variable leaks were mathematically induced into tight tank test records which were collected by systems installed at various active tank sites.
The data base for evaluation of the system included sites with vapor recovery and blending dispensers.
Tanks used in this evaluation contained gasoline and diesel.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 06/10/96

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Veeder-Root

TLS-250i, TLS 250i Plus, ILS 250, ILS 350, TLS-350
Interstitial Liquid Sensor for Fiberglass Tanks (0794390-401)

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:*

	unleaded gasoline**	synthetic gasoline***
Accuracy (%)	100	100
Response time (min)	3.66	3.45
Recovery time (min)	<1	<1
Product activation height (cm)	1.28	1.27
Lower detection limit (cm)	1.84	1.65

* At a flow rate of 0.19 gal/hr in 7.6 cm diameter test chamber.
** TLS-250, TLS 250i Plus, ILS 250
*** ILS 350, TLS-350

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Veeder-Root

TLS-250, TLS 250i Plus, ILS 250, ILS 350, TLS-350
Interstitial Liquid Sensor for Steel Tanks (0794390-420)

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline*	synthetic gasoline**
Accuracy (%)	100	100
Response time (min)	6.00	6.51
Recovery time (min)	<1	<1
Product activation height (cm)	3.67	3.62
Lower detection limit (cm)	4.05	4.17

* TLS-250, TLS 250i Plus, ILS 250, at a flow rate of 0.13 gal/hr in 4.8 cm diameter test chamber.
** ILS 350, TLS-350, at a flow rate of 0.12 gal/hr in 4.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Veeder-Root

TLS-250i, TLS 250i Plus, ILS 250, ILS 350, TLS-350
Liquid Sensor for Sumps (0794390-206)

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	float switch

Test Results:

	unleaded gasoline*	synthetic gasoline**
Accuracy (%)	100	100
Response time (min)	8.19	8.49
Recovery time (min)	<1	<1
Product activation height (cm)	4.12	3.95
Lower detection limit (cm)	4.67	4.36

* TLS-250, TLS 250i Plus, ILS 250, at a flow rate of 0.15 gal/hr in 5.8 cm diameter test chamber.
** ILS 350, TLS-350, at a flow rate of 0.14 gal/hr in 5.8 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel, synthetic fuel, heating oil #2, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/17/92

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Veeder-Root

TLS-350 Discriminating Insterstitial Liquid Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	capacitance change/ultrasonic

Test Results:*

	unleaded gasoline	water
Accuracy (%)	100	100
Response time (min)	0.46	1.36
Recovery time (min)	<1	<1
Product activation height (cm)	0.23	0.69

* At a flow rate of 0.94 gal/hr in 14.4 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel (at liquid height of 0.37 cm), synthetic fuel (at 0.35 cm), heating oil #2 (at 0.43 cm).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Detectors are listed as interstitial due to intended use.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 06/30/93

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Veeder-Root

TLS-350
Dispenser Pan Sensor(794380-320) and Containment Sump Sensor(794380-350)

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity/ultrasonic

Test Results:*

	unleaded gasoline	water	
		low	high
Accuracy (%)	100	100	100
Response time (min)	6.59	4.60	5.00
Recovery time (min)	17.17	<1	<1
Product activation height (cm)	3.40	2.45	20.3

* At a flow rate of 0.17 gal/hr in a 6.0 cm diameter test chamber.

Specificity Results:
Activated: diesel fuel (at liquid height of 4.75 cm), synthetic fuel (at 2.58 cm), heating oil #2 (at 4.67 cm).

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring.
Test procedures used were Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 05/26/93

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Veeder-Root

TLS-350
Dual and Single Stage Hydrostatic Sensors

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type: qualitative
Sampling frequency: continuous
Operating principle: float switch

Test Results:*

	50 wt% Ethylene glycol in water		30 wt% Calcium chloride in water	
	up	down	up	down
Accuracy (%)	100	100	100	100
Response time (min)	22.52	35.75	20.46	37.07
Recovery time (min)	<1	<1	<1	<1
Product activation height (cm)	33.1	3.9	32.2	4.0

* At a flow rate of 0.33 gal/hr in a test chamber of 7.8 cm diameter.

Specificity Results:
Not applicable

Comments:
Intended to monitor level of either ethylene glycol or calcium chloride solutions in interstitial or annular space of a double-walled tank.
Activates alarm if any significant gain or loss of solution occurs.
Test procedures used were modified by evaluator from Carnegie Mellon Research Institute's "Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems": Final Report - November 11, 1991.
Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 12/07/92

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Veeder-Root

TLS-350
Solid-State Pan/Sump Sensor (794380-321, -351), Piping Sump Sensor (794380-208), Micro Sensor (794380-340)

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product permeable/ultrasonic/float switch

Test Results:

	unleaded gasoline	diesel fuel	water
Piping Sump Sensor (794380-208)			
Min. product level (cm)	3.51	3.40	3.03
Precision	0.011	0.011	0.011
Detection time (sec)	<1	<1	<1
Solid-State Pan/Sump Sensor (794380-321, -351)			
Min. product thickness (cm)	2.60	2.50	2.60
Precision	0.010	0.010	0.010
Detection time (sec)	<1	<1	<1
Micro Sensor (794380-340)			
Min. product thickness (cm)	0.51	0.46	0.48
Precision	0.011	0.007	0.007
Detection time (sec)	<1	<1	<1

Specificity Results:
unleaded gasoline, diesel fuel, water.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Test procedures used were modified by evaluator from EPA's "Standard Test Procedures for Evaluation Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors," March 1990.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 10/20/94

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Veeder-Root

350 Series UST Monitoring Systems: Models ILS-350, TLS-350, TLS-350R Groundwater Sensor (794380-621, -622, -624)

LIQUID-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	electrical conductivity

Test Results:

	unleaded gasoline	synthetic gasoline
Accuracy (%)	100	100
Detection time (min:sec)	08:55	06:18
Fall time (min:sec)	54:50	26:02
Lower detection limit (cm)	0.02	0.02

Specificity Results:
Activated: unleaded gasoline, synthetic gasoline, n-hexane, diesel fuel, jet-A fuel, toluene, xylene(s).

Calibration:
Sensor must be checked annually for operability or in accordance with manufacturer's instructions and calibrate/replaced if necessary.

Comments:
EPA and many states require detection of 1/8 inch (0.32 cm) of product for groundwater monitoring. Detector is reusable.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495
Dates of Evaluation: 11/20/91 (TLS-350) and 07/28/92

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Veeder-Root

ILS 350, TLS-350
Adsistor Vapor Probes

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	100	0	100
Detection time (min:sec)	7:46	N/A*	17:01
Fall time (min:sec)	2:38	N/A	3:05
Lower detection limit (ppm)	500	>1000	500

*See Glossary.

Specificity Results:
Activated: unleaded gasoline, JP-4 jet fuel
Not Activated: synthetic gasoline, n-hexane, toluene, xylene(s).

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Veeder-Root
125 Powder Forest Dr.
Simsbury, CT 06070-2003
Tel: (203) 651-2700

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 07/24/92

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Vista Research, Inc.

Model LT-100 Version 1.0 Manual Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with $P_D = 96\%$ and $P_{FA} \leq 4\%$.

Leak Threshold: 0.177 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded manually.
Calculations are performed by tester.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line tightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of a 1-hour monitoring period at operating pressure and a 1-hour monitoring period at atmospheric pressure.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Vista Research, Inc.

Model LT-100 Version 1.0 Manual Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D = 96% and P_{FA} = 4%.

Leak Threshold: 0.077 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded manually.
Calculations are performed by tester.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line tightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of a 1-hour monitoring period at operating pressure and a 1-hour monitoring period at atmospheric pressure.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Vista Research, Inc.

Model LT-100 Version 1.0 Primary Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with $P_D = 97\%$ and $P_{FA} \leq 3\%$.

Leak Threshold: 0.148 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Maximum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line lightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of a 1-hour monitoring period at operating pressure, and a 1-hour monitoring period at atmospheric pressure.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Vista Research, Inc.

Model LT-100 Version 1.0 Primary Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D = 97% and P_{FA} = 3%.

Leak Threshold: 0.060 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line tightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of a 1 hour monitoring period at operating, and a 1 hour monitoring period at atmospheric pressure.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Vista Research, Inc.

Model LT-100 Version 1.0 Segmented Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.2 gph with P_D = 97% and P_{FA} = 3%.

Leak Threshold: 0.174 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line tightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of two 5-minute monitoring segments at atmospheric pressure spaced 25 minutes apart, and two 5-minute monitoring segments at operating pressure spaced 25 minutes apart.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Vista Research, Inc.

Model LT-100 Version 1.0 Segmented Method

LARGE DIAMETER PIPELINE LEAK DETECTOR

Certification: Leak rate of 0.1 gph with P_D = 97% and P_{FA} = 3%.

Leak Threshold: 0.074 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuels, fuel oil #4, waste oil, and solvents.

Specification: System tests fiberglass or steel piping.
Tests are conducted at operating pressure to a maximum of 200 psi.

Pipeline Capacity: Maximum of 3,400 gallons.

Waiting Time: None between delivery and testing.
None between dispensing and testing.

Test Period: Minimum of 2 hours after setup and after pipeline is fully isolated.
Test data are acquired and recorded by a microprocessor.
Calculations are automatically performed by the microprocessor.

System Features: System may be permanently installed on pipeline to perform monthly monitoring or line tightness testing, or may be transported and set up to perform line tightness testing.
A single 2-hour test is required consisting of two 5-minute monitoring segments at atmospheric pressure spaced 25 minutes apart, and two 5-minute monitoring segments at operating pressure spaced 25 minutes apart.
Preset threshold.
Printed message and alarm activation if leak is declared.

Calibration: System must be calibrated in accordance with manufacturer's instructions during system setup.

Vista Research, Inc.
100 View St.
Mountain View, CA 94042
Tel: (415) 966-1171

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 04/15/96

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Warren Rogers Associates, Inc.

WRA Statistical Inventory Analysis, Version 5.1

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.98% and P_{FA}=0.02%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 30 days of product level and flow through data.

Comments: Not evaluated using manifold tank systems.
Of 41 data sets submitted for evaluation, all were analyzed with conclusive results.
Median monthly throughput for tanks evaluated was 1000 gallons.
Leak rates of 0.05, 0.1, and 0.20 gph were used in evaluation.
A portion of data sets evaluated was supplied by vendor.

Warren Rogers Associates, Inc.
747 Aquidneck Ave.
Middletown, RI 02840
Tel: (401) 846-4747

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 12/18/90

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Warrick Controls, Inc.

Model DFP-25 Sensor

LIQUID-PHASE INTERSTITIAL DETECTOR

Detector:

Output type:	qualitative
Sampling frequency:	continuous
Operating principle:	product solubility

Test Results:

	unleaded gasoline	diesel	water
Detection time (hr:min:sec)	00:06:50	04:14:40	N/A
Fall time (min:sec)	N/A*	N/A	N/A
Lower detection limit (cm)	≤2.54	≤2.54	N/A

* See glossary.

Specificity Results:
Activated: unleaded gasoline, #2 diesel.
Not Activated: water (in 12 hours).

Comments:
Sensor is activated when hydrocarbon-sensitive wax is dissolved, releasing a spring that activates an alarm.
Detector is not reusable, and must be replaced after contact with hydrocarbons.
Fall time is not applicable, since sensor must be replaced after activating.
Evaluator claims that this sensor will respond to any material that is capable of dissolving the hydrocarbon-sensitive wax, but will not respond to water.
Liquid level was set at 1 inch (2.54 cm) during test.
Test procedures used were Ken Wilcox Associates' "Alternative Test Procedures for Evaluating Leak Detection Methods: Evaluation of Liquid Level Sensors," September 1996.

Warrick Controls, Inc.
4237 Normandy Court
Royal Oak, MI 48073
Tel: (810) 549-4900

Evaluator: Ken Wilcox Associates, Inc.
Tel: (816)443-2494

Date of Evaluation: 11/18/96

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Warrick Controls, Inc.

Model 5700 Meter
PVP-2 Sensor

VAPOR-PHASE OUT-OF-TANK PRODUCT DETECTOR

Detector:

Output type:	quantitative
Sampling frequency:	continuous
Operating principle:	adsistor

Test Results:

	unleaded gasoline	synthetic gasoline	JP-4 jet fuel
Accuracy (%)	25.4	-100.0	157.1
Bias (%)	14.4	-100.0	108.3
Precision (%)	7.6	N/D*	20.4
Detection time (min)	>60	N/A*	>60
Fall time (min)	38	N/A	>60
Lower detection limit (ppm)	1353.3	N/D	N/D

* See glossary.

Specificity Results:
Not Activated: unleaded gasoline, synthetic gasoline, n-hexane, JP-4 jet fuel, toluene, xylene(s).

Comments:
Test procedures used were Radian Corporation's draft report "Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods," June 29, 1990.

Warrick Controls, Inc.
4237 Normandy Court
Royal Oak, MI 48073
Tel: (810) 549-4900

Evaluator: Carnegie Mellon Research Institute
Tel: (412) 268-3495

Date of Evaluation: 09/10/91

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)

Enviro Tite SIR
(also known as SIRAS 99.6)

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with P_D=99.6% and P_{FA}=0.4%.

Leak Threshold: 0.05 gph. A leak is declared when leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 18,000 gallons.

Data Requirement: Minimum of 31 days to make an SIR evaluation with minimum 95% confidence at the rate of 0.1 gph; 45 to 60 days for greater confidence.

Comments: Not evaluated using manifold tank systems.
Of 41 data sets submitted for evaluation, 5 were not analyzed due to unusable data.
Median monthly throughput for tanks evaluated was 16,700 gallons.
Leak rates ranging from 0.0500 to 0.2043 were used in evaluation.
Data sets evaluated were supplied by evaluator.

Watson Systems, Inc.
4501 Madison
Kansas City, MO 64111
Tel: (816) 756-0774

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 04/03/92

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Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)

SIRAS Software System, Version 2.0

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.1 gph with $P_D = 99.3\%$ and $P_{FA} = 0.7\%$
Version 2.0 is designed to meet annual tests requirements.

Leak Threshold: 0.05 gph. A leak is declared when the calculated leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 30,000 gallons.
Size limits using an acceptable protocol for manifold tank systems have not been determined.

Data Requirement: Minimum of 30 days of usable product level and flow through data.

Comments: Not evaluated for manifold tank systems using an acceptable protocol.
27% of data sets evaluated were from manifold tank systems.
Of 56 data sets submitted for evaluation, 6 were not analyzed due to unusable data.
Median monthly throughput for tanks evaluated was 73,518 gallons.
Leak rates ranging from 0.0458 to 0.2500 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Watson Systems, Inc.
4501 Madison
Kansas City, MO 64111
Tel: (816) 756-0774

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/23/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Watson Systems, Inc. (formerly EnviroQuest Technologies Limited)

SIRAS Software System, Version 2.8.3

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification: Leak rate of 0.2 gph with $P_D = 99.999\%$ and $P_{FA} = 0.01\%$.
Version 2.8.3 is designed to meet monthly monitoring requirements.

Leak Threshold: 0.1 gph. A leak is declared when the calculated leak rate equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 30,000 gallons.
Size limits using an acceptable protocol for manifold tank systems have not been determined.

Data Requirement: Minimum of 30 days of usable product level and flow through data.

Comments: Not evaluated for manifold tank systems using an acceptable protocol.
27% of data sets evaluated were from manifold tank systems.
Of 56 data sets submitted for evaluation, 6 were not analyzed due to unusable data.
Median monthly throughput for tanks evaluated was 73,518 gallons.
Leak rates ranging from 0.0458 to 0.2500 gph were used in evaluation.
Data sets evaluated were supplied by evaluator.

Watson Systems, Inc.
4501 Madison
Kansas City, MO 64111
Tel: (816) 756-0774

Evaluator: Midwest Research Institute
Tel: (816) 753-7600

Date of Evaluation: 08/23/93

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Western Environmental Resources

Model PLT-100R

LINE TIGHTNESS TEST METHOD

Certification: Leak rate of 0.1 gph with P_D=100% and P_{FA}=0%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Specification: System tests fiberglass and steel pipelines.
Tests are conducted at 150% operating pressure.
Mechanical line leak detector must be removed from pipeline for duration of test.

Pipeline Capacity: Maximum of 80 gallons.

Waiting Time: None between delivery and testing.
Minimum of 1 hour between dispensing and testing.

Test Period: Minimum of 30 minutes.
Test data are acquired and recorded manually.
Two tests with no time between tests are required before a leak can be declared.

Calibration: System must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Western Environmental Resources
PO Box 37
Bakersfield, CA 93302
Tel: (805) 326-0173

Evaluator: Vista Research
Tel: (415) 966-1171

Date of Evaluation: 11/21/90

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Western Environmental Resources

AES System II

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=97.7% and P_{FA}=2.3%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 15,000 gallons.
Tank must be minimum 100% full.

Waiting time: Between delivery and the beginning of test, waiting time is included in the waiting time after "topping off".
Between "topping off" and beginning test, waiting time is computer-dictated by real-time analysis of level and temperature data.
Total waiting time is approximately 4 to 12 hours.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 2 hours (two 1-hour tests).
Test data are acquired and recorded by a computer.
Leak rate is calculated from the last 1 hour, 30 minutes of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 5 temperature sensors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 2 psi at bottom of the tank during test.

Calibration: Level sensors must be calibrated before each test in accordance with manufacturer's instructions.
Temperature sensor must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.

Western Environmental Resources
PO Box 37
Bakersfield, CA 93302
Tel: (805) 326-1073

Evaluator: Vista Research
Tel: (415) 966-1171

Date of Evaluation: 12/20/90

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Western Environmental Resources

AES System II - (Large Tanks)

VOLUMETRIC TANK TIGHTNESS TEST METHOD (OVERFILL)

Certification: Leak rate of 0.1 gph with P_D=98.9% and P_{FA}=1.1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, fuel oil, waste oil, and solvents.

Tank Capacity: Maximum of 75,000 gallons.
Tank must be minimum 100% full.

Waiting Time: Minimum of 24 hours after delivery.
Between "topping off" and beginning test, waiting time is computer-dictated by real-time analysis of level and temperature data and must be minimum of 1 hour.
There must be no dispensing or delivery during waiting time.

Test Period: Minimum of 4 hours.
Test data are acquired and recorded by a computer.
Leak rate is calculated from the last 3 hours of test period data.
There must be no dispensing or delivery during test.

Temperature: Average for product is determined by a minimum of 12 thermistors.

Groundwater: Depth to groundwater in backfill must be determined. If groundwater is above bottom of tank, product level must be adjusted to provide a minimum net pressure of 2 psi at bottom of the tank during test.

Calibration: Level sensors must be calibrated before each test in accordance with manufacturer's instructions.
Thermistors must be checked annually and calibrated if necessary in accordance with manufacturer's instructions.

Comments: Not evaluated using manifold tank systems.

Western Environmental Resources
PO Box 37
Bakersfield, CA 93302
Tel: (805) 326-0173

Evaluator: Ken Wilcox Associates
Tel: (816) 443-2494

Date of Evaluation: 02/28/92

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Xerxes Corp.

Xerxes Trucheck Hydrostatic Monitoring System

DOUBLE WALLED TANK TIGHTNESS TEST

Certification: Leak rate of 0.1 gph with P_D=99% and P_{FA}=1%.

Leak Threshold: 0.05 gph. A leak is declared if the output of the measurement system equals or exceeds this threshold.

Applicability: Gasoline, diesel, aviation fuel, and fuel oil #4.

Tank Capacity: Maximum of 30,000 gallons.
Tank must be between 0 to 100% full.

Waiting Time: None between delivery and testing.

Test Period: Minimum of 10 hours.

Groundwater: Depth to groundwater in backfill must be determined before and after test.
When groundwater level is above bottom of tank but below top, test should be repeated if groundwater level increases by more than 7 inches during test.
When groundwater level is above tank, test should be repeated if groundwater level increases by more than 5 inches during test.

Xerxes Corp.
7901 Xerxes Ave.
Minneapolis, MN 55431
Tel: (612) 887-1890

Evaluator: Robert Plunkett, Ph.D.
Tel: (612) 338-0945

Date of Evaluation: 01/07/93

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

PART III

LEAK DETECTION EQUIPMENT THIRD PARTY EVALUATIONS UNDER REVIEW

ALPHABETICAL BY VENDOR,

THEN BY TEST METHOD,

FINALLY BY EQUIPMENT MODEL,

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Test Method	Vendor	Equipment Model	Evaluator/Date of Evaluation
Automatic Tank Gauge (0.1 and 0.2 gph)	Alert Technologies	2000X and 2000XB	Ken Wilcox Associates 02/28/94 and 06/22/94
Continuous ATG	Alert Technologies	3000 and 4000	Ken Wilcox Associates 02/20/92
Line Tightness Test Method	Campo/Miller, Inc.	PL400	Jetronix Radio Engineering Laboratories 05/16/91
Automatic Tank Gauge (0.1 and 0.2 gph)	ENRAF B.V. Delft Instruments	STIC 818	Ken Wilcox Associates 01/02/94
Vapor-Phase Product Detector	HNU	DL-101; HW-101; ISPI-101; PI-101	Carnegie Mellon Research Institute 11/28/91,02/05/92, 03/05/92
Automatic Tank Gauge (0.1 gph)	INCON Intelligent Controls, Inc.	TS 1000	Ken Wilcox Associates 08/05/92
Automatic Tank Gauge (0.1 gph)	INCON Intelligent Controls, Inc.	TS 2000	Ken Wilcox Associates 05/10/91
Continuous Automatic Tank Gauge	INCON Intelligent Controls, Inc.	SCALD (Applies to Incon Controller Models TS 1000, TS 2000, TS 1001,TS 2001 Sensor Model TS-DLP)	Ken Wilcox Associates 09/14/95
Continuous Automatic Tank Gauge	Marley Pump	ST1400-1800, ATG, FMS, LLM	ADA Technologies 10/12/92
Vapor-Phase Product Detector	Mine Safety Appliances	Tank-Check	Carnegie Mellon Research Institute 05/31/91
Non-Volumetric Tank Tightness Test (Vacuum)	NDE Environmental Corp.	U3 Vacuum	Ken Wilcox Associates 06/25/96
Statistical Inventory Reconciliation (0.2 gph)	SIR International, Inc.	Mitchell's SIR Program (Version 2.7)	Ken Wilcox Associates 6/8/95
Statistical Inventory Reconciliation (0.1 gph)	SIR International, Inc.	Mitchell's SIR Program (Version 2.6)	Ken Wilcox Associates 6/8/95
Statistical Inventory Reconciliation (Qualitative)	Teledata, Inc.	Tankmate Version 3.12	PB Com. Co. 9/29/95
Automatic Tank Gauge (0.1 gph)	Tidel Engineering, Inc.	EMS 3500	Ken Wilcox Associates 03/16/95
Statistical Inventory Reconciliation (0.2 gph)	Triangle Environmental, Inc.	TRI SIR (Version 1.01)	Ken Wilcox Associates 8/23/95
Statistical Inventory Reconciliation (0.2 gph)	USTMAN Industries, Inc.	USTMAN SIR 95.2A	Ken Wilcox Associates 12/12/95
Statistical Inventory Reconciliation (0.1 gph)	USTMAN Industries, Inc.	USTMAN SIR 95.2	Ken Wilcox Associates 12/12/95
Non-Volumetric Tank Tightness Test (Vacuum)	SDT-USA	SDT Model 150	Ken Wilcox Associates 03/01/96
Statistical Inventory Reconciliation (0.1 gph)	Warren Rogers Assoc.	SIRA Version 5.2	Ken Wilcox Associates 09/01/96

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PART IV

ACCEPTABLE TEST PROTOCOLS

ALPHABETICAL BY TEST METHOD, THEN BY PROTOCOL DATE

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

Automatic Tank Gauging Systems
"Standard Test Procedures for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems", EPA/530/UST-90/006, March 1990

Bulk Tank Testing
"Alternative Test Procedures for Evaluating Leak Detection Methods: Evaluation of Bulk Field-constructed Tanks", Ken Wilcox Associates, February 1996

Continuous In-Tank Leak Detection Systems
"Evaluation Protocol for Continuous In-Tank Leak Detection Systems", Midwest Research Institute, April 1995

Large Pipeline Leak Detection Systems
"Modified Third-Party Testing Protocol for Large Pipeline Leak Detection", EFA Technologies, Inc., August 1995

Liquid-Phase Out-of-Tank and Interstitial Product Detectors
"Standard Test Procedures for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors", EPA/530/UST-90/009, March 1990

"Development of Procedures to Assess the Performance of External Leak Detection Devices: Liquid-Phase ASTM-Formatted Methods - Revised Draft to Include JP-4 Jet Fuel", Radian Corporation, June 29, 1990

"Test Procedures for Third Party Evaluation Of Leak Detection Methods: Cable Sensor Liquid Contact Leak Detection Systems", Carnegie Mellon Research Institute, November 11, 1991

"Test Procedures for Third Party Evaluation of Leak Detection Methods: Point Sensor Liquid Contact Leak Detection Systems", Carnegie Mellon Research Institute - Advanced Devices and Materials Group, November 11, 1991

Non-volumetric Tank Tightness Testing Methods
"Standard Test Procedures for Evaluating Leak Detection Methods: Non-volumetric Tank Tightness Testing Methods", EPA/530/UST-90/005, March 1990

Pipeline Leak Detection Systems
"Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems", EPA/530/UST-90/010, September 1990

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Statistical Inventory Reconciliation Methods
"Standard Test Procedures for Evaluating Leak Detection Methods: Statistical Inventory Reconciliation Methods", EPA/530/UST-90/007, June 1990

"Protocol for Determining Applicability of a SIR Method for Manifolded Tanks and Determining Size Limitation", Developed under coordination by the SIR team of the National Work Group on Leak Detection Evaluations, November 1996

Vapor-Phase Out-of-tank Product Detectors
"Standard Test Procedures for Evaluating Leak Detection Methods: Vapor-Phase Out-of-Tank Product Detectors", EPA/530/UST-90/008, March 1990

"Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods", Radian Corporation, June 6, 1990

"Development of Procedures to Assess the Performance of External Leak Detection Devices: Vapor-Phase ASTM-Formatted Methods", Radian Corporation, June 29, 1990

Volumetric Tank Tightness Testing Methods
"Standard Test Procedures for Evaluating Leak Detection Methods: Volumetric Tank Tightness Testing Methods", EPA/530/UST-90/004, March 1990

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PART V

LEAK DETECTION EQUIPMENT MAINTENANCE CHECKLISTS

Appearance on this list is not to be construed as an endorsement by any regulatory agency nor is it any guarantee of the performance of the method or equipment. Equipment should be installed and operated in accordance with all applicable laws and regulations.

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ATG MAINTENANCE CHECKLIST Magnetostrictive and Ultrasonic Probes Minimum procedures to be conducted by a *qualified service technician.*		
Has all input wiring been inspected for proper entry and termination, including testing for ground faults?	Yes	No
Have the probe and sensors been checked for visible damage such as residue buildup, cracks, or breaks? [1,2]	Yes	No
Has the accuracy of the level sensor been tested? [3]	Yes	No
Has the accuracy of the water sensor been tested? [4]	Yes	No
Has the appropriateness of the high water level alarm setting been verified? [5]	Yes	No
Are all alarms activated and functioning properly?	Yes	No
Comments:		

1. Damaged probes must be cleaned or replaced as appropriate. Probes used in heavier products such as waste oil should be checked more frequently. Heavier products can leave deposits on the probe shaft and float assemblies that may restrict the measurement capacity of the probe.
2. Because the magnetostrictive probe consists of moving parts, its sensors can be damaged by excessive frictional wear as well as residue build-up. Residue build-up can affect the weight of the sensor as well as inhibit its ability to slide freely along the guide tube. Inaccuracies in the product level measurements could indicate a problem with the probe sensors. For additional testing of the probe sensors, perform the following test:
    a. Remove the probe from the tank and place it carefully on the ground.
    b. Place the water sensor flush with the bottom of the probe shaft and place the product float near the middle of the probe shaft.
    c. Check the height reading on the tank gauge monitor (after allowing sufficient time for the monitor to respond).
    d. Measure the distance from the bottom of the probe to the bottom of the product float and compare it with the reading on the monitor.
3. To test the accuracy of the product sensor:
    a. Using the tank console monitor, take an initial fuel level reading.
    b. Dispense one gallon of product into a calibrated container.
    c. Using the tank console monitor, take a second fuel level reading.
    d. Verify that the change in tank volume is one gallon.
4. To test the accuracy of the water sensor:
    a. Remove probe from the tank.
    b. By hand, move the water float up the probe to a point higher than the high-water alarm set point.
    c. The monitor should respond with a high water alarm report. (The water height may also appear on the tank monitor display console.
    d. Check this height against its actual location.
5. The high water level alarm should not be set so high that water ingress into the tank goes undetected for long periods of time.

Disclaimer: *This checklist is not intended to tell the technician how to perform the maintenance and system check. Technicians should follow manufacturers' detailed instructions while making sure that all of the items on this checklist have been covered.*

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ATG MAINTENANCE CHECKLIST Mass Buoyancy Probes Minimum procedures to be conducted by a *qualified service technician.*		
Has all input wiring been inspected for proper entry and termination, including testing for ground faults?	Yes	No
Has the probe been checked for visible damage (such as residue buildup or cracks)? [1]	Yes	No
Has the battery been tested within the last 3 months?	Yes	No
Has the accuracy of the product sensor been tested? [2]	Yes	No
Has the accuracy of the water sensor been tested? [3]	Yes	No
Has the appropriateness of high-water level alarm setting been verified? [4]	Yes	No
Are all alarms activated and functioning properly?	Yes	No
Comments:		

1. Damaged probes must be cleaned or replaced, as appropriate. The mass displacement probe is very susceptible to dirt and residue build-up and should be checked semi-annually and cleaned, if necessary. Mass displacement probes used in viscous products such as waste oil should be checked more frequently. Products of this type can leave heavy deposits on the probe which may inhibit the accuracy of the probe. Checking a reconciliation report and/or manual sticking could verify the system's accuracy.

2. To test the accuracy of the product sensor:
   a. Using the tank console monitor, take an initial fuel level reading.
   b. Dispense one gallon of product into a calibrated container.
   c. Using the tank console monitor, take a second fuel level reading.
   d. Verify that the change in tank volume is one gallon.

3. To test the accuracy of the water sensor: (Note: water sensor is separator from the mass buoyancy probe.)
   a. Remove the probe from the tank.
   b. By hand, move the water float up the probe to a point higher than the high water limit.
   c. The monitor should respond with a high water alarm. (The water height may also appear on the tank monitor display console.)
   d. Check this height against its actual location.

4. The high water level alarm should not be set so high that water ingress into the tank goes undetected for long periods of time.

Disclaimer: *This checklist is not intended to tell the technician how to perform the maintenance and system check. Technicians should follow manufacturer's detailed instructions while making sure that all of the items on this checklist have been covered.*

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APPENDIX A

GLOSSARY OF TERMS

Accuracy:
The degree to which the measured leak rate agrees with the induced leak rate on the average. If a method is accurate, it has a very small or zero bias.

Activated:
Refers to the state of a qualitative detector's response when indicating the presence of product.

Bias:
An indication of whether the device's measured leak rate consistantly overestimates (positive bias) or underestimates (negative bias) the actual induced leak rate.

Bulk Modulus (of Elasticity):
The ratio of hydrostatic pressure to the relative change it produces in volume.

Continuous Automatic Tank Gauging Systems (Continuous ATGS):
These systems use an ATG probe to collect data continually and combine this with software to identify time intervals when there is no activity in the tank and the data are stable enough for analysis. An algorithm then combines data from a number of such periods until there is enough evidence to make a determination about the leak status of the tank. This type of system functions like an ATGS except that it does not require that the tank be taken out of service for a set period of several hours whenever a test is to be done. Instead, it uses data from shorter stable time periods and combines the results to estimate a leak rate and perform a test. The system may default to a standard or shut down ATG test (requiring the tank to be out of service for a few hours) at the end of the month if sufficient good quality have not been obtained over the month. These systems are designed to meet the monthly monitoring performance standard of detecting a leak of 0.20 gallon per hour or 150 gallons per month with 95% probability of detection and 5% probability of false alarm. They test the tank vessel itself.

Continuous Detector:
Detectors that operate continuously, are always present and are never turned off.

Continuous In Tank Leak Detection Systems (CITLDS):
These systems are designed to allow the tank to operate continuously or nearly continuously without interruption for leak detection tests. They typically have some sensors permanently installed in the tank, combined with a microprocessor in a console. In addition, they may be connected to the dispensing meters, allowing for automatic recording and use of dispensing data. There may also be a provision for direct input of data from a keyboard or pad, to allow for entry of deliverry receipts, for example.

Currently there are three types of such continuous systems that are reaching the market. These three types are referred to as "Continuous ATGS," "Continual Reconciliation," and "Automatic Monthly Inventory Control."

Detection time:
The sum of rise time and lag time.

Fall time:
The elapsed time after a detector has responded to a test hydrocarbon and is removed and has recovered to 95% of its original baseline level or there is no detectable signal output.

False Alarm:
Declaring a tank to be leaking when in fact it is tight.

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GLOSSARY OF TERMS CONTINUED

Groundwater:
Water table or water within the excavation around a tank.

Induced Leak Rate:
The actual leak rate, in gallons per hour (gph), used during the evaluation against which the results from a given test device will be compared.

Intermittent Detector:
Detectors that monitor on a regular basis. An intermittent detector may be a hand held device that is portable or a permanently installed device that is used to periodically test for the presence of product.

Lag Time:
The elapsed time from the detector's first contact with test product to the first detectable signal.

Leak threshold:
The measured leak rate at which the test method detects the tank to be leaking. This leak rate will always be less than or equal to the leak rate requirement for the various release detection methods given in 40 CFR § 280 Subpart D-Release Detection. (Please note that some states and other regulatory authorities may have different requirements). The minimum leak threshold for declaring a leak is experimentally determined from the results of the evaluation of the release detection method.

Manifold tank systems:
Tanks connected by piping that allow the tank system to function as a single tank. A typical manifolded tank system usually consists of two tanks connected by a siphon tube that permits the product in the tanks to be at the same level while product is being pumped out of only 1 tank.

Measured Leak Rate:
A positive number in gallons per hour (gph), measured by test device that indicates the amount of product leaking out of the tank. A negative number would indicate that something was being added to the tank. The performance of a method is based on how well the measured leak rate compares to the actual induced leak rate.

MER:
The Maximum Effective Range, the longest length of sensor cables and/or jumper cables that can be connected to form a leak detection network.

N/A:
Not Applicable

N/D:
Not Determined

N/R:
No Response

Net Pressure:
In this document this term refers to a pressure difference between the pressure in the tank and the pressure related to the groundwater. If the net pressure is positive, the pressure in the tank is greater than that due to groundwater. If net pressure is negative, the pressure in the tank is less than that due to groundwater.

Nominal Leak Rate:
The set or target leak rate to be achieved as closely as possible during the evaluation of a leak detection method. It is a positive number expressed in gallons per hour (gph).

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Precision:
The degree of agreement of repeated measurements of the same parameter. Precision estimates reflect random error and are not affected by bias.

Pressure:
In this document this term refers to a pressure which is at or above atmospheric. Any pressure reading at or above atmospheric is listed as positive; any pressure reading less than atmospheric (vacuum) is listed as negative.

Probability of Detection, P(D):
The probability of detecting a leak of a given size, usually expressed as a percentage.

Probability of False Alarm, P(FA):
The probability of declaring a tank to be leaking when it is tight, usually expressed as a percentage.

Probe:
A component of a detection system that must come into contact with product before product can be declared or measured.

Qualitative Responses:
The type of detector response that indicates only the presence or absence of product without determining the specific product concentration or thickness.

Quantitative Response:
A type of detector response that quantifies the concentration or thickness of product present.

Relative Accuracy:
A function of systematic error, or bias, and random error, or precision. Smaller values indicate better accuracy. See entry for "Accuracy."

Resolution:
The smallest change in the quantity being measured which the measurement system is capable of detecting.

Response Time:
A general term that refers to the more specific terms of lag time, rise time, and fall time.

Rise Time:
The elapsed time from a detector's first detectable signal in response to the presence of product to an output that is 95% of full scale for a quantitative detector or activated for a qualitative detector.

Specificity:
Specificity applies to vapor and liquid sensors and lists products or components of products that these sensors can detect. Specificity for quantitative sensors is the ratio of sensor output, or measured concentration, to the actual concentration of hydrocarbon test gas expressed as a percentage. Specificity for qualitative sensors is reported as activated if the sensor responds within 24 hours. Otherwise, specificity is reported as inactivated.

Total Pressure:
In this document this term equals the sum of the pressure in ullage space and the pressure due to product head.

Ullage:
The un-wetted portion of the tank, i.e. that portion of the tank not in contact with product.

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GLOSSARY OF TERMS CONTINUED

Vacuum:
In this document this term refers to any pressure that is less than atmospheric.

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APPENDIX B

April 18, 1997

MEMORANDUM

TO: Vendors of Leak Detection Equipment/Procedures

FROM: Curt D. Johnson, Chairperson

RE: National Work Group on Leak Detection Evaluation's List of Third-Party Evaluated Leak Detection Equipment/Procedures

If you are reading this memo, you have received our latest edition of the list. We would appreciate any comments you have concerning the list. Please comment to me at the address, phone number, fax number or e-mail address listed on the next page.

If you need to contact other members in the work group, the same information is included for them on the next page. Also, the work group team and team leaders are listed on the page following the member list to help you determine who you may need to contact.

Please send new evaluations and/or protocols to be evaluated by the work group to **my attention** at the address on the following page. To enable the work group to properly review the third-party tests, **three (3) copies** of all applicable information indicated in the enclosed "Leak Detection Equipment Review - Document List" must be included.

Since the draft list was sent out back in January of 1995, the list has sometimes been referred to as the "EPA work group list of approved leak detection equipment". The work group and EPA are concerned that similar statements may begin to appear in sales literature distributed by vendors. We request that you do not refer to the list in this way for the following reasons.

1. **This is not an EPA or EPA work group list.** This draft list was prepared by an **independent** work group consisting of state and EPA members.

2. **Neither EPA nor the work group approve leak detection equipment or procedures.** The draft list does not include "approved" leak detection equipment/procedures. It includes leak detection equipment/procedures that the work group reviewed and confirmed, were third-party tested in accordance with either an EPA or other acceptable test protocol, and the test confirmed that the equipment/procedures meet EPA performance standards. Approval or acceptance of leak detection equipment and procedures is the responsibility of the implementing agency, which in most cases is the state environmental agency.

We try to send only 1 copy of the list per company per location. If you received more than 1 copy at your location, or if the copy needs to be sent to another person, please notify me and we will make the necessary corrections.

Enclosure: Work Group Members, Work Group Teams, Leak Detection Equipment Review-Document List

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WORK GROUP MEMBERS

MEMBER	ADDRESS	PHONE/FAX/E-MAIL
Curt D. Johnson	Alabama Department of Environmental Management PO Box 301463 Montgomery, AL 36130-1463	(334) 271-7986 Fax (334) 270-5631 cdj@adem.state.al.us
Mike Kadri	Michigan Department of Environmental Quality UST Division PO Box 30157 Lansing, MI 48909-7657	(517) 335-7204 Fax (517) 335-2245 funkhoup@deq.state.mi.us
Beth DeHaas	Maine Department of Environmental Protection Statehouse Station No. 17 Augusta, ME 04333	(207) 287-2651 Fax (207) 287-7826 beth.dehaas@state.me.us
Russ Brauksieck	New York State Department of Environmental Conservation 50 Wolf Rd., Room 360 Albany, NY 12233-3750	(518) 457-4351 Fax (518) 457-4332 russ.brauksieck@dec.mailnet.state.ny.us
David Wiley	USEPA 401 M St. Southwest 5402G Washington, DC 20460	(703) 603-7178 Fax (703) 603-9163 wiley.david@epamail.epa.gov
Lamar Bradley	Tennessee Department of Environment and Conservation UST Division, 4th Floor L and C Tower 401 Church St. Nashville, TN 37243-1541	(615) 532-0952 (615) 532-0945 Fax (615) 532-0938 lbradley2@mail.state.tn.us
Jeff Tobin	State of Montana Department of Environmental Quality Box 200901 Helena, MT 59620-0901	(406) 444-1417 Fax (406) 444-1902 jtobin@mt.gov
Ellen Van Duzee	USEPA Idaho Operations 1435 N. Orchard St. Boise, ID 83706-2239	(208) 378-5762 Fax (208) 378-5744 vanduzee.ellen@epamail.epa.gov
Shahla Farahnak	California State Water Resource Control Board Division of Clean Water Program PO Box 944212 Sacramento, CA 94244-2120	(916) 227-4350 Fax (916) 227-4349 sfarahna@ix.netcom.com
Bill Faggart	USEPA 401 M St. Southwest 5402G Washington, DC 20460	(703) 603-7151 Fax (703) 603-9163 faggart.billy@epamail.epa.gov

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WORK GROUP TEAMS

TEAM	LEADER	MEMBERS
Automatic Tank Gauging (ATG) Systems and Large Tank ATG Systems	Ellen Van Duzee	Russ Brauksieck Beth DeHaas
Continuous In-Tank Leak Detection Systems	Shahla Farahnak	Mike Kadri Bill Faggart
List Administration and Other Leak Detection Methods	Curt Johnson	David Wiley
Non-Volumetric Tank Tightness Test Methods	Shahla Farahnak	Russ Brauksieck Jeff Tobin
Pipeline Leak Detection Systems and Large Pipeline Leak Detection Systems	Mike Kadri	Shahla Farahnak Jeff Tobin
Statistical Inventory Reconciliation (SIR) Methods	Lamar Bradley	Mike Kadri Bill Faggart
Vapor/Liquid Sensors for Interstitial/External Monitoring Methods and Other Interstitial Monitoring Methods	David Wiley	Mike Kadri
Volumetric Tank Tightness Test (VTTT) Methods and Large Tank VTTT Methods	Beth DeHaas	Russ Brauksieck

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LEAK DETECTION EQUIPMENT REVIEW - DOCUMENT LIST

This information lists the documentation required for review of third-party evaluation of underground storage tank and line leak detection equipment or test methods.

1. A complete third-party evaluation report, including:

   ☐ a. Details of the evaluation procedure if the EPA standard procedure was not used for the evaluation. If the EPA evaluation procedure was used, list any deviations or modifications to the procedure.

   ☐ b. Complete set of all the EPA required attachment sheets.

   ☐ c. Individual test logs and/or field notes.

   ☐ d. Statistical calculations and any applicable graphs or charts generated during the evaluation.

   ☐ e. A statement from the evaluator confirming that all equipment at the test site was properly maintained and calibrated to the level of accuracy necessary for a valid evaluation.

☐ 2. An outline of the manufacturer's operating procedures for the equipment/method. The summary procedure must be dated and include a revision number, if applicable. A copy of the summary procedure must be provided to the third-party evaluator for enclosure in the report. Also required is a statement from the manufacturer confirming the use of the submitted procedure during the evaluation.

☐ 3. Complete installation/operations manual for the equipment/method.

☐ 4. A sample of the test report (including field work-sheets) which will be submitted to the owner/local implementing agency.

☐ 5. Outline of the test procedures in high groundwater areas. These procedures should be reviewed for adequacy by the third-party evaluator and a statement to that effect should be included with the report.

☐ 6. Outline of the test procedures for manifold tank systems. These procedures should be reviewed for adequacy by the third-party evaluator and a statement to that effect should be included with the report.

☐ 7. An affidavit from the manufacturer confirming that there are no mutual financial interests between the equipment manufacturer and the third-party evaluator.

☐ 8. A resume, including all applicable formal training and experience, from personnel who conducted the evaluation.

☐ 9. Equipment calibration procedures and manufacturer recommended schedule of calibration.

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☐10. The name, address, and phone number of the technical personnel serving as the manufacturer's representative for the response to the regulatory agency questions on the equipment or test method.

☐11. Correspondence letters from state agencies who have reviewed the equipment/method.

12. Following documentation for all permanently-installed leak detection equipment:

☐a. A list of installers authorized by the manufacturer to install the leak detection equipment.

☐b. A list of service personnel authorized by the manufacturer to conduct the annual functional test (required for all leak detection equipment).

☐c. An outline of the maintenance procedure (including a list of the parts or functions of the system to be checked, calibrated, or programmed) for the annual functional test by authorized service personnel.

☐d. An outline (1-2 pages) "Equipment Check Guidelines for Inspectors" prepared by the manufacturer. This summary should guide local agency inspectors on proper field procedures to follow when inspecting equipment for proper operation, for attempting to access the stored history (for alarms or failed tests) to determine compliance with state requirements.

☐e. A sample of the reports generated and/or printed by the equipment (for all equipment models), and an explanation of the items in the report, if not self-explanatory.

☐f. Information on how the control panel modules connected to the various probes are labeled. The information on the panel should be directly comparable to the equipment name, model/part/probe number which will be included in the committee's list. If necessary, a permanent label containing that information should be affixed to the panel.

13. Following documentation for the methods using tracer analysis:

☐a. Name and certification of the laboratory analyzing vapor samples.

☐b. Quality Assurance Manual of the laboratory.

☐c. Method and amount of tracer injection.

☐d. Vapor sample collection method and chain of custody records.

☐e. Third-party certification for capability of the test-method to detect leaks from the ullage portion of the tank.

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☆ U.S. GOVERNMENT PRINTING OFFICE: 1997 518-869/83712

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