



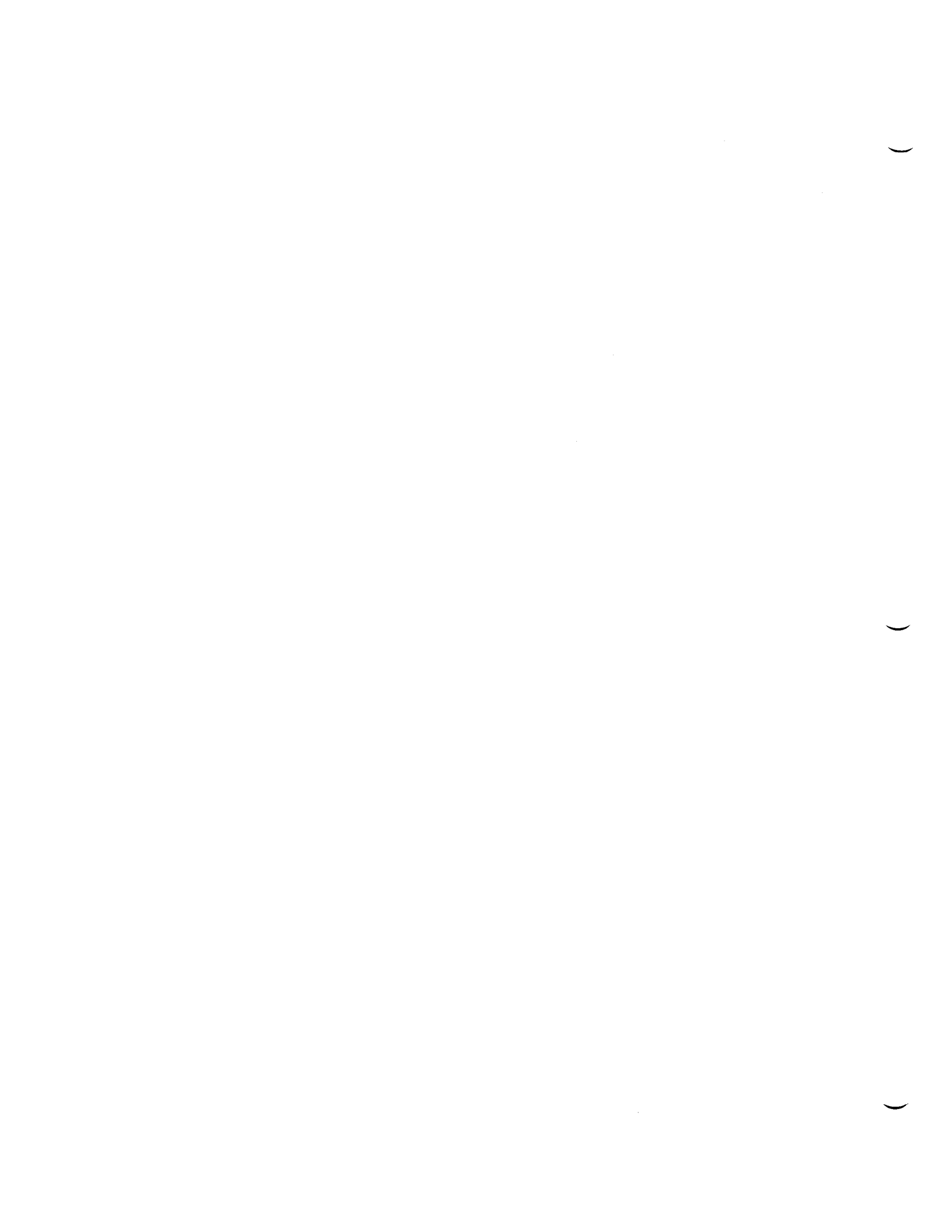
RESULTS OF PERFORMANCE EVALUATION CONDUCTED ACCORDING TO THE E.P.A. TEST PROCEDURES

VOLUMETRIC LINE LEAK DETECTION SYSTEM

Manual No. 576013-866

Contents:

- Hourly Monitoring Test: TLS Line Leak Detector, Series 8475, Thermal stabilization method using volume measurement
- Monthly Monitoring Test: TLS Line Leak Detector, Series 8475, Thermal stabilization method using volume change measurement
- Line Tightness Test: TLS Line Leak Detector, Series 8475, Thermal stabilization method using volume change measurement
- Hourly Monitoring Test: TLS Line Leak Detector, Series 8475, Flexible Pipeline Option
- Monthly Monitoring Test: TLS Line Leak Detector, Series 8475, Flexible Pipeline Option
- Line Tightness Test: TLS Line Leak Detector, Series 8475, Flexible Pipeline Option
- Hourly Monitoring Test: TLS Line Leak Detector, Series 8475, Pumpside Feature (pipeline between pumphead and leak detector)
- Monthly Monitoring Test: TLS Line Leak Detector, Series 8475, Pumpside Feature (pipeline between pumphead and leak detector)
- Line Tightness Test: TLS Line Leak Detector, Series 8475, Pumpside Feature (pipeline between pumphead and leak detector)



**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as an
*Hourly Monitoring Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting an hourly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS ine Leak Detector, Series 8475

Version of System: Thermal stabilization method using volume measurement

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, P.O. Box 2003
(street address)

Simsbury, CT 06070-2003
(city, state, zip code)

(203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
(X) meets or exceeds
() does not meet
the federal standards established by the EPA regulation for hourly monitoring tests.

The EPA regulation for an hourly monitoring test requires that the system be capable of detecting a leak as small as 3 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 3 gal/h defined at a pipeline pressure of 10 psi in this evaluation is 100 %.

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
 4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
 5. This system declares a leak if the output of the measurement system exceeds a threshold of 1.5 gal/h @ 10 psi (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.
-

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
 at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 59 tests were conducted on nonleaking line(s) between 3/22/93 (date) and 4/12/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 3 in. in diameter, 175 ft long and constructed of fiberglass (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector NOT APPLICABLE
 was
 was not
present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)^{**}$
1	3	$\Delta T < -25$
4	9	$-25 \leq \Delta T < -15$
5	12	$-15 \leq \Delta T < -5$
5	12	$-5 \leq \Delta T < +5$
5	12	$+5 \leq \Delta T < +15$
4	9	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?

- no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. (X) According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 () According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional tests)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 10 psi)	Measured Leak Rate (gal/h)
V1L3	-23.81	2.69	leak
V2L3	-0.53	0	tight
V3L3	-0.44	3.25	leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured: _____	Temperature	Volume	Time (ms)
Resolution: _____	0.01 deg F	1%	10
Precision: _____	0.03 deg F	2%	10
Accuracy: _____	0.10 deg F	4%	10
Minimum Detectable Quantity: _____	0.01 deg F	1%	10
Response Time: _____	2 min	N/A	10
Threshold is exceeded when the flow rate due to a leak exceeds <u>1.5</u> gal/h. (@10 psi)			

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and 350 ft or less in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 () is present in
 (X) has been removed from
 the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is 0 h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is variable min (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

April 12, 1993
(date)

(816) 229-0860
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

1200 South Outer Road
(street address)

Blue Springs, Missouri 64015
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Monthly Monitoring Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a monthly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Thermal stabilization method using volume change measurement

Manufacturer Name: Veeder-Root Environmental Products

125 Powder Forest Drive, P.O. Box 2003

(street address)

Simsbury, CT 06070-2003

(city, state, zip code)

(203) 651-2700

(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for monthly monitoring tests.

The EPA regulation for a monthly monitoring test requires that the system be capable of detecting a leak as small as 0.2 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.2 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 100 %.

11. A mechanical line leak detector
 was
 was not
 present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h (time after completion of circulation and start of test)
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)^{**}$
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	12	$-15 \leq \Delta T < -5$
5	12	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	9	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?
 no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. (X) According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 () According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)
V1L3	23.81	0.196	leak
V2L3	-0.53	0	tight
V3L3	-0.44	0.182	leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 0.1 gal/h. (@ pump press.)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and 350 ft or less in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 is present in
 has been removed from
 the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is variable h (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

April 12, 1993
(date)

(816) 229-0860
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

1312 S. 21st St.
(street address)

Blue Springs, Missouri 64015
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Line Tightness Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a line tightness test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Thermal stabilization method using volume change measurement

Manufacturer Name: Veeder-Root

 125 Powder Forest Drive, P. O. Box 2003
(street address)

 Simsbury, CT 06070-2003
(city, state, zip code)

 (203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for line tightness tests.

The EPA regulation for a line tightness test requires that the system be capable of detecting a leak as small as 0.1 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.079 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 100 %.
(leak rate equivalent to 0.1 gal/hr at 45 psi)

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
5. This system declares a leak if the output of the measurement system exceeds a threshold of 0.079* (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.

* at system operating pressure

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
- at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 53 tests were conducted on nonleaking tank(s) between 3/22/93 (date) and 4/12/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 3 in. in diameter, 175 ft long and constructed of fiberglass (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector

- () was
() was not

NOT APPLICABLE

present in the majority of the pipeline systems used in the evaluation.

12. Please specify how much time elapsed between the delivery of product and the start of the data collection:

- (X) 0 to 6 h
() 6 to 12 h
() 12 to 24 h
() 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)$ **
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	12	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	9	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?

- (X) no
() yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional data)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)
V1L3	+23.81	0.079	Leak
V2L3	-0.53	0	Tight
V3L3	-0.44	0.079	Leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 0.05 gal/h. (@ 1.5X operating pressure)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and up to 350 ft in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 - is present in
 - has been removed from the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of the data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test variable* . (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

 H. Kendall Wilcox
(name of person performing evaluation)

 H. Kendall Wilcox
(signature)

 April 12, 1993
(date)

 (816) 229-0860
(telephone number)

 Ken Wilcox Associates, Inc.
(organization performing evaluation)

 1312 S. 21st St.
(street address)

 Blue Springs, Missouri 64015
(city, state, zip)

Results of the Performance Evaluation Conducted According to EPA Test Procedures

Pipeline Leak Detection System Used as an Hourly Monitoring Test

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting an hourly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Flexible Pipeline Option

Manufacturer Name: Veeder-Root
125 Powder Forest Drive, P.O. Box 2003

(street address)
Simsbury, CT 06070-2003

(city, state, zip code)
(203) 651-2700

(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for hourly monitoring tests.

The EPA regulation for an hourly monitoring test requires that the system be capable of detecting a leak as small as 3 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 3 gal/h defined at a pipeline pressure of 10 psi in this evaluation is 100 %.

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
 4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
 5. This system declares a leak if the output of the measurement system exceeds a threshold of 1.5 gal/h @ 10 psi (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.
-

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
 at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 53 tests were conducted on non-leaking line(s) between 8/6/93 (date) and 15/7/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 270 ft long and constructed of nylon (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector NOT APPLICABLE
 was
 was not
present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)^{**}$
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	13	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?
- no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional tests)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 10 psi)	Measured Leak Rate (gal/h)
1V	-5.10	3.25	leak
2V	-9.75	0	tight
3V	-8.02	2.77	leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 1.5 gal/h. (@10 psi)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of flexible material, and that typically measure 2 or 3 in. in diameter and 540 ft or less in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 - is present in
 - has been removed from
 the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is 0 h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is 1 min
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

- Attachment 1 - Description of the System Evaluated
- Attachment 2 - Summary of the Performance of the System Evaluated
- Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation
- Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation
- Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation
- Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests
- Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, President
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

August 4, 1993
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Highway
(street address)

Independence, Missouri 64055
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Monthly Monitoring Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a monthly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Flexible Pipeline Option

Manufacturer Name: Veeder-Root Environmental Products

125 Powder Forest Drive, P.O. Box 2003
(street address)

Simsbury, CT 06070-2003
(city, state, zip code)

(203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for monthly monitoring tests.

The EPA regulation for a monthly monitoring test requires that the system be capable of detecting a leak as small as 0.2 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.2 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 96 %.

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
5. This system declares a leak if the output of the measurement system exceeds a threshold of 0.1* (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.

* at system operating pressure

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
- at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 53 tests were conducted on non-leaking tank(s) between 8/6/93 (date) and 15/7/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 270 ft long and constructed of nylon (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used.

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector
 was
 was not
 present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h (time after completion of circulation and start of test)
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)$ **
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	13	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?
- no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)
1V	-5.10	0.190	leak
2V	-8.02	0	tight
3V	-6.61	0.190	leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 0.1 gal/h. (@ pump press.)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of flexible material, and that typically measure 2 or 3 in. in diameter and 540 ft or less in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 is present in
 has been removed from
the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is variable h (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, President
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

August 4, 1993
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Highway
(street address)

Independence, Missouri 64015
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Line Tightness Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a line tightness test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Flexible Pipeline Option

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, P. O. Box 2003
(street address)

Simsbury, CT 06070-2003
(city, state, zip code)

(203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for line tightness tests.

The EPA regulation for a line tightness test requires that the system be capable of detecting a leak as small as 0.1 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.079 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 100 %.
(leak rate equivalent to 0.1 gal/hr at 45 psi)

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
5. This system declares a leak if the output of the measurement system exceeds a threshold of 0.079* (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.

 * at system operating pressure

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
- at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 53 tests were conducted on non-leaking tank(s) between 8/6/93 (date) and 15/7/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 270 ft long and constructed of nylon (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector

was

NOT APPLICABLE

was not

present in the majority of the pipeline systems used in the evaluation.

12. Please specify how much time elapsed between the delivery of product and the start of the data collection:

0 to 6 h

6 to 12 h

12 to 24 h

24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)^{**}$
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	13	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?

no

yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. (X) According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 () According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at 28 psi with 110 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional data)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)
1V	-5.10	0.079	Leak
2V	-8.02	0	Tight
3V	-6.61	0.079	Leak

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 0.05 gal/h. (@ 1.5X operating pressure)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of flexible material, and that typically measure 2 or 3 in. in diameter and up to 540 ft in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 - () is present in
 - (X) has been removed from the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of the data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test variable* . (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

August 4, 1993
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Highway
(street address)

Independence, Missouri 64015
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as an
*Hourly Monitoring Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting an hourly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Pumpside Feature (pipeline between pumphead and leak detector)

Manufacturer Name: Veeder-Root

 125 Powder Forest Drive, P.O. Box 2003
(street address)

 Simsbury, CT 06070-2003
(city, state, zip code)

 (203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 meets or exceeds
 does not meet
the federal standards established by the EPA regulation for hourly monitoring tests.

The EPA regulation for an hourly monitoring test requires that the system be capable of detecting a leak as small as 3 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 3 gal/h defined at a pipeline pressure of 10 psi in this evaluation is 100 %.

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
 4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
 5. This system declares a leak if the output of the measurement system exceeds a threshold of 1.5 gal/h @ 10 psi (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.
-

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
 at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 50 tests were conducted on nonleaking line(s) between 6/14/93 (date) and 7/28/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 1 ft long and constructed of steel (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector NOT APPLICABLE
 was
 was not
present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)$ **
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	10	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?
 no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at _____ psi with _____ ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

VAPOR TESTING NOT APPLICABLE TO THIS LINE

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional tests)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 10 psi)	Measured Leak Rate (gal/h)

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 1.5 gal/h. (@10 psi)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and 350 ft or less in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 - is present in _____
 - has been removed from _____
 the pipeline (check both if appropriate)

the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is 0 h

- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is variable min (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

September 8, 1993
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Highway
(street address)

Independence, Missouri 64055
(city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Monthly Monitoring Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a monthly monitoring test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Pumpside Feature (pipeline between pumphed and leak detector)

Manufacturer Name: Veeder-Root Environmental Products

125 Powder Forest Drive, P.O. Box 2003
(street address)

Simsbury, CT 06070-2003
(city, state, zip code)

(203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 meets or exceeds
 does not meet
the federal standards established by the EPA regulation for monthly monitoring tests.

The EPA regulation for a monthly monitoring test requires that the system be capable of detecting a leak as small as 0.2 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.2 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 100 %.

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold
to determine whether the pipeline is leaking.
4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests)
to determine whether the pipeline is leaking.
5. This system declares a leak if the output of the measurement system exceeds a threshold of 0.1* (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.

* at system operating pressure

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
 at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 50 tests were conducted on nonleaking tank(s) between 6/14/93 (date) and 7/28/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 1 ft long and constructed of steel (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used.

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector
 was
 was not
 present in the majority of the pipeline systems used in the evaluation.
12. Please specify how much time elapsed between the delivery of product and the start of the data collection:
 0 to 6 h (time after completion of circulation and start of test)
 6 to 12 h
 12 to 24 h
 24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)$ **
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	10	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?
 no
 yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at _____ psi with _____ ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

VAPOR TESTING NOT APPLICABLE TO THIS LINE

Table 2. Summary of the Results of Trapped Vapor Tests

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured: _____	Temperature	Volume	Time (ms)
Resolution: _____	0.01 deg F	1%	10
Precision: _____	0.03 deg F	2%	10
Accuracy: _____	0.10 deg F	4%	10
Minimum Detectable Quantity: _____	0.01 deg F	1%	10
Response Time: _____	2 min	N/A	10
Threshold is exceeded when the flow rate due to a leak exceeds <u>0.1</u> gal/h. (@ pump pressure)			

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and 350 ft or less in length. The performance estimates are valid when:

- the system that was evaluated has not been substantially changed by subsequent modifications
- the manufacturer's instructions for using the system are followed
- the mechanical line leak detector
 is present in
 has been removed from
the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test is variable h (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

- Attachment 1 - Description of the System Evaluated
- Attachment 2 - Summary of the Performance of the System Evaluated
- Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation
- Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation
- Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation
- Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests
- Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
 (name of person performing evaluation)

H. Kendall Wilcox
 (signature)

September 8, 1993
 (date)

(816) 795-7997
 (telephone number)

Ken Wilcox Associates, Inc.
 (organization performing evaluation)

19401 E. 40 Highway.
 (street address)

Independence, Missouri 64055
 (city, state, zip)

**Results of the Performance Evaluation
Conducted According to EPA Test Procedures**

**Pipeline Leak Detection System
Used as a
*Line Tightness Test***

This form summarizes the results of an evaluation to determine whether the pipeline leak detection system named below and described in Attachment 1 complies with federal regulations for conducting a line tightness test. The evaluation was conducted according to the United States Environmental Protection Agency's (EPA's) evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems*. The full evaluation report includes seven attachments.

Tank system owners who use this pipeline leak detection system should keep this form on file to show compliance with the federal regulations. Tank system owners should check with state and local agencies to make sure this form satisfies the requirements of these agencies.

System Evaluated

System Name: TLS Line Leak Detector, Series 8475

Version of System: Pumpside Feature (pipeline between pumphead and leak detector)

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, P. O. Box 2003
(street address)

Simsbury, CT 06070-2003
(city, state, zip code)

(203) 651-2700
(telephone number)

Evaluation Results

1. The performance of this system
 (X) meets or exceeds
 () does not meet
the federal standards established by the EPA regulation for line tightness tests.

The EPA regulation for a line tightness test requires that the system be capable of detecting a leak as small as 0.1 gal/h with a probability of detection (P_D) of 95% and a probability of false alarm (P_{FA}) of 5%.

2. The estimated P_{FA} in this evaluation is 0 % and the estimated P_D against a leak rate of 0.079 gal/h defined at a pipeline pressure of 28 psi in this evaluation is 100 % (leak rate equivalent to 0.1 gal/hr at 45 psi)

Criterion for Declaring a Leak

3. This system
 uses a preset threshold
 measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
4. This system
 uses a single test
 uses a multiple-test sequence consisting of _____ tests (specify number of tests required) separated by _____ hours (specify the time interval between tests) to determine whether the pipeline is leaking.
5. This system declares a leak if the output of the measurement system exceeds a threshold of 0.079* (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). If more detail is required, please specify in the space provided.

* at system operating pressure

Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated
 at a special test facility (Option 1)
 at one or more instrumented operational storage tank facilities (Option 2)
 at five or more operational storage tank facilities verified to be tight (Option 3)
 at 10 or more operational storage tank facilities (Option 4)
 with an experimentally validated computer simulation (Option 5)
7. A total of 50 tests were conducted on nonleaking tank(s) between 6/15/93 (date) and 7/28/93 (date). A description of the pipeline configuration used in the evaluation is summarized in Attachment 3.

Answer questions 8 and 9 if Option 1, 2, or 5 was used.

8. The pipeline used in the evaluation was 2 in. in diameter, 1 ft long and constructed of steel (fiberglass, steel, or other).
9. A mechanical line leak detector
 was
 was not
present in the pipeline system.

Answer questions 10 and 11 if Option 3 or 4 was used. NOT APPLICABLE

10. The evaluation was conducted on _____ (how many) pipeline systems ranging in diameter from _____ in. to _____ in., ranging in length from _____ ft to _____ ft, and constructed of _____ (specify materials).

11. A mechanical line leak detector

was

NOT APPLICABLE

was not

present in the majority of the pipeline systems used in the evaluation.

12. Please specify how much time elapsed between the delivery of product and the start of the data collection:

0 to 6 h

6 to 12 h

12 to 24 h

24 h or more

Temperature Conditions

This system was evaluated under the range of temperature conditions specified in Table 1. The difference between the temperature of the product circulated through the pipeline for 1 h or more and the average temperature of the backfill and soil between 2 and 12 in. from the pipeline is summarized in Table 1. If Option 1, 2 or 5 was used, a more detailed summary of the product temperature conditions generated for the evaluation is presented in Attachment 4. If Option 3 or 4 was used, no artificial temperature conditions were generated.

Table 1. Summary of Temperature Conditions Used in the Evaluation

Minimum Number of Conditions Required	Number of Conditions Used*	Range of $\Delta T(^{\circ}F)$ **
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	10	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > 25$

*This column should be filled out only if Option 1, 2, or 5 was used.

** ΔT is the difference between the temperature of the product dispensed through the pipeline for over an hour prior to the conduct of a test and the average temperature of the backfill and soil surrounding the pipe.

Data Used to Make Performance Estimates

13. The induced leak rate and the test results used to estimate the performance of this system are summarized in Attachment 5. Were any test runs removed from the data set?

no

yes

If yes, please specify the reason and include with Attachment 5. (If more than one test was removed, specify each reason separately.)

Sensitivity to Trapped Vapor

14. According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test.
 According to the vendor, this system *should not be used* if trapped vapor is present in the pipeline.
15. The sensitivity of this system to trapped vapor is indicated by the test results summarized in Table 2. These tests were conducted at _____ psi with _____ ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.

VAPOR TESTING NOT APPLICABLE TO THIS LINE

Table 2. Summary of the Results of Trapped Vapor Tests (see Attachment 6 for additional data)

Test No.	ΔT (°F)	Induced Leak Rate (gal/h @ 20 psi)	Measured Leak Rate (gal/h)

Performance Characteristics of the Instrumentation

16. State below the performance characteristics of the primary measurement system used to collect the data. (Please specify the units, for example, gallons, inches.)

Quantity Measured:	Temperature	Volume	Time (ms)
Resolution:	0.01 deg F	1%	10
Precision:	0.03 deg F	2%	10
Accuracy:	0.10 deg F	4%	10
Minimum Detectable Quantity:	0.01 deg F	1%	10
Response Time:	2 min	N/A	10

Threshold is exceeded when the flow rate due to a leak exceeds 0.05 gal/h. (@ 1.5X operating pressure)

Application of the System

17. This leak detection system is intended to test pipeline systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and up to 350 ft in length. The performance estimates are valid when:
- the system that was evaluated has not been substantially changed by subsequent modifications
 - the manufacturer's instructions for using the system are followed
 - the mechanical line leak detector
 - is present in
 - has been removed from the pipeline (check both if appropriate)

- the waiting time between the last delivery of product to the underground storage tank and the start of the data collection for the test is N/A h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0 h
- the total data collection time for the test variable* . (depends on line characteristics)
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system using in the evaluation, unless separate written justification for testing larger pipeline systems is presented by the manufacturer, concurred with by the evaluator, and attached to this evaluation as Attachment 8
- please give any other limitations specified by the vendor or determined during the evaluation: _____

Disclaimer: This test procedure only addresses the issue of the system's ability to detect leaks in pipelines. It does not test the equipment for safety hazards or assess the operational functionality, reliability or maintainability of the equipment.

Attachments

Attachment 1 - Description of the System Evaluated

Attachment 2 - Summary of the Performance of the System Evaluated

Attachment 3 - Summary of the Configuration of the Pipeline System(s) Used in the Evaluation

Attachment 4 - Data Sheet Summarizing Product Temperature Conditions Used in the Evaluation

Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

Attachment 6 - Data Sheet Summarizing the Test Results and the Trapped Vapor Tests

Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining the Signal and Noise

Certification of Results

I certify that the pipeline leak detection system was operated according to the vendor's instructions. I also certify that the evaluation was performed according to the procedure specified by the EPA and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

(signature)

September 8, 1993
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Highway
(street address)

Independence, Missouri 64055
(city, state, zip)

Sales Offices

Veeder-Root has offices around the world to serve you.

Headquarters

Veeder-Root Company
125 Powder Forest Drive
Simsbury, CT 06070-2003 U.S.A.
203-651-2700 FAX: (203) 651-2719 TECH SUPPORT (203) 651-2753

England

Veeder-Root Environmental Systems Limited
Hydrex House, Garden Road
Richmond, Surrey TW9 4NR ENGLAND
44-81-392-1355

Brazil

Veeder-Root do BRASIL
Rua ado Benatti, 92
Caixa Postal 8343
01051 Sao Paulo BRAZIL
55-11-861-2155

Germany

Veeder-Root GmbH
Postfach 1110
D73761 Neuhausen/Filder GERMANY
49-7158-90030

France

Veeder-Root SARL
8 Place de la Loire
Silic 422
94583 Rungis, Cedex FRANCE
33-1-4687-0981

Canada

Veeder-Root Canada
151 Superior Boulevard, Suite 24
Mississauga, Ontario, L5T 2L1 CANADA
905-670-2755

Singapore

Veeder-Root Singapore
#2 Kallang Pudding Road
#06-16 Mactech Industrial Building
SINGAPORE 1334
(65) 745-0368 FAX: (65) 745-0636

Mexico

Veeder-Root Mexico
Prado de las Camelias
No. 4483-4
Praddos Tepeyac C.P. 45500
Zapopan, Jal., MEXICO
(52) 36-47-3750

