

# Certification Reports

## Results of Performance Evaluation Conducted According to the E.P.A. Test Procedures

### Pressurized Line Leak Detection System and Wireless Pressurized Line Leak Detection System

Manual Number 576013-308, Revision D

#### Contents:

- ☐ Monthly Test: Pressurized Line Leak Detector (Fiberglass Pipeline) Series 8484 (PLLD)
- ☐ Hourly Test: Pressurized Line Leak Detector (Flexible Pipeline) Series 8484 (PLLD)
- ☐ Line Tightness Test: Pressurized Line Leak Detector (Flexible Pipeline) Series 8484 (PLLD)
- ☐ Hourly Test: Pressurized Line Leak Detector (Fiberglass and Steel Pipeline) Series 8484 (PLLD)
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- ☐ Line Tightness Test: Pressurized Line Leak Detector (Fiberglass and Steel Pipeline) Series 8494 (WPLLD)



**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 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*. This full evaluation report includes eight 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: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8484

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office 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 30 psi (the normal operating pressure) in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 0.195 gph (at 30 psi) and it detected 100 % of induced leaks.

## Criterion for Declaring a Leak

3. This system  
☒ (X) 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  
☒ (X) uses a single test *(1 test after accounting for effects of thermals, if any)*  
☐ ( ) 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 0.17 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, 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  
☒ (X) at a special test facility (Option 1)  
☐ ( ) at one or more instrumented operational 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 23 tests was conducted on nonleaking pipeline(s) between 9/23/96 (date) and 9/27/96 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3. *(These tests supplemented a full set of 53 tests conducted earlier on the related Series 8494 system. See Attachment 8 for further testing details.)*

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

8. The pipeline used in the evaluation was 2.22 in. in diameter, 249 ft long and constructed of fiberglass (fiberglass, steel or other).
9. A mechanical line leak detector  
☐ ( ) was  
☒ (X) was not  
present in the pipeline system. *System has a 3 gal/h test mode, whose function replaces that of a mechanical leak detector.*

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  
☐ 6 to 12 h (Not applicable)  
☐ 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
1	2	$\Delta T < -25$
4	4	$-25 \leq \Delta T < -15$
5	4	$-15 \leq \Delta T < -5$
5	2	$-5 \leq \Delta T < +5$
5	4	$+5 \leq \Delta T < +15$
4	2	$+15 \leq \Delta T < +25$
1	2	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used. Also, see Attachment 8.

<sup>b</sup>  $\Delta T$  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 tests 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. *(If not excessive.)*  
( ) 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 38 psi with 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
9	12.0	0.000	Pass
10	12.0	0.196 at 30 psi	Fail
13	0.3	0.000	Pass

## Performance Characteristics of the Instrumentation

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

Quantity Measured:	Pressure (psi)	Volume (ml)	Time(sec)
Resolution:	0.1	0.5	0.01
Precision:	0.1	0.5	0.05
Accuracy:	0.3	1.0	0.01
Minimum Detectable Quantity:	0.1	1.0	0.01
Response Time:	---	---	---

Threshold is exceeded when the flow rate due to a leak exceeds 0.17 gal/h.

## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0.75-1.0 h
- the total data collection time for the test is 0.53, 0.80 h (for pass or fail, respectively)
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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 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 Signal and Noise
- Attachment 8 - Justification for Abbreviated Test Matrix

## 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.

William D. Glauz  
(name of person performing evaluation)

William D. Glauz  
(signature)

November 13, 1996  
(date)

(816) 753-7600  
(telephone number)

Midwest Research Institute  
(organization performing evaluation)

425 Volker Boulevard  
(street address)

Kansas City, MO 64110  
(city, state, zip)





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

**Pipeline Leak Detection System  
Used as an  
Hourly 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.

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**System Evaluated**

System Name: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8484

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office Box 2003

(street address)

Simsbury, CT 06070-2003

(city, state, zip code)

(203) 651-2700

(telephone number)

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**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 3.0 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 3.0 gal/h defined at a pipeline pressure of 10 psi in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 2.67 gph (at 10 psi) and it detected 100 % of induced leaks.

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## Criterion for Declaring a Leak

3. This system  
☒ (X) 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  
☒ (X) uses a single test *(1 test after accounting for effects of thermals, if any)*  
☐ ( ) 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 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, in the space provided.
- \_\_\_\_\_
- \_\_\_\_\_

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## Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated  
☒ (X) at a special test facility (Option 1)  
☐ ( ) at one or more instrumented operational 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 was conducted on nonleaking pipeline(s) between 5/4/95 (date) and 5/23/95 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3.

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

8. The pipeline used in the evaluation was 1.5 in. in diameter, 220 ft long and constructed of other (fiberglass, steel or other). *(flexible piping of low bulk modulus)*
9. A mechanical line leak detector  
☐ ( ) was  
☒ (X) was not present in the pipeline system. *System has a 3 gal/h test mode, whose function replaces that of a mechanical leak detector.*

*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  
☐ 6 to 12 h (Not applicable)  
☐ 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	12	$-15 \leq \Delta T < -5$
5	11	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used.

<sup>b</sup>  $\Delta T$  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 tests 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.)

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## 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. *(If not excessive.)*  
( ) 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 30 psi with 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
1	-10.0	2.66	Fail
2	-10.0	0.00	Pass
3	-0.3	2.66	Fail

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## Performance Characteristics of the Instrumentation

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

Quantity Measured: \_\_\_\_\_ Pressure (psi) \_\_\_\_\_ Volume (ml) \_\_\_\_\_ Time \_\_\_\_\_  
(sec)

Resolution: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Precision: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.05 \_\_\_\_\_  
Accuracy: \_\_\_\_\_ 0.3 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Minimum Detectable Quantity: \_\_\_\_\_ 0.1 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Response Time: \_\_\_\_\_ --- \_\_\_\_\_ --- \_\_\_\_\_ ---  
Threshold is exceeded when the flow rate due to a leak exceeds 1.5 gal/h.

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## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0.21 h
- the total data collection time for the test is 0.07, 0.1 h (for pass or fail, respectively)
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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: SEE SPECIAL ATTACHMENT 8

*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 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 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.

William D. Glauz  
(name of person performing evaluation)

Midwest Research Institute  
(organization performing evaluation)

\_\_\_\_\_  
(signature)

425 Volker Boulevard  
(street address)

October 6, 1995  
(date)

Kansas City, MO 64110  
(city, state, zip)

(816) 753-7600  
(telephone number)



**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.

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**System Evaluated**

System Name: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8484

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office Box 2003

(street address)

Simsbury, CT 06070-2003

(city, state, zip code)

(203) 651-2700

(telephone number)

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**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 0.1 gal/h defined at a pipeline pressure of 45 psi (1.5 times the normal operating pressure) in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 0.092 gph (at 45 psi) and it detected 100 % of induced leaks.

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## Criterion for Declaring a Leak

3. This system  
☒ (X) 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  
☒ (X) uses a single test *(1 test after accounting for effects of thermals, if any)*  
☐ ( ) 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 0.05 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, in the space provided.
- \_\_\_\_\_
- \_\_\_\_\_

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## Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated  
☒ (X) at a special test facility (Option 1)  
☐ ( ) at one or more instrumented operational 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 was conducted on nonleaking pipeline(s) between 5/4/95 (date) and 5/23/95 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3.

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

8. The pipeline used in the evaluation was 1.5 in. in diameter, 220 ft long and constructed of other (fiberglass, steel or other). *(flexible piping of low bulk modulus)*
9. A mechanical line leak detector  
☐ ( ) was  
☒ (X) was not present in the pipeline system. *System has a 3 gal/h test mode, whose function replaces that of a mechanical leak detector.*

*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  
☐ 6 to 12 h (Not applicable)  
☐ 12 to 24 h  
☐ 24 h or more.

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## 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	12	$-15 \leq \Delta T < -5$
5	11	$-5 \leq \Delta T < +5$
5	10	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used.

<sup>b</sup>  $\Delta T$  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.

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## 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 tests 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.)

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## 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. (*If not excessive.*)  
( ) 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 30 psi with 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
1	-10.0	0.0910 @ 45 psi	Fail
2	-10.0	0.0	Pass
3	-0.3	0.0	Pass

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## Performance Characteristics of the Instrumentation

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

Quantity Measured: \_\_\_\_\_ Pressure (psi) \_\_\_\_\_ Volume (ml) \_\_\_\_\_ Time \_\_\_\_\_  
(sec)

Resolution: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Precision: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.05 \_\_\_\_\_  
Accuracy: \_\_\_\_\_ 0.3 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Minimum Detectable Quantity: \_\_\_\_\_ 0.1 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Response Time: \_\_\_\_\_ --- \_\_\_\_\_ --- \_\_\_\_\_ ---  
Threshold is exceeded when the flow rate due to a leak exceeds 0.05 gal/h.

---

## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 1.7 h
- the total data collection time for the test is .75, 1.25 h (for pass or fail, respectively)
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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: SEE SPECIAL ATTACHMENT 8

---

***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 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 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.

William D. Glauz  
(name of person performing evaluation)

Midwest Research Institute  
(organization performing evaluation)

\_\_\_\_\_  
(signature)

425 Volker Boulevard  
(street address)

October 6, 1995  
(date)

Kansas City, MO 64110  
(city, state, zip)

(816) 753-7600  
(telephone number)



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

**Pipeline Leak Detection System  
Used as an  
*Hourly 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 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.

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**System Evaluated**

System Name: TLS Pressurized Line Leak Detector, Series 8484

Version of System: ----

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 tests.

The EPA regulation for an hourly test requires that the system be capable of detecting a leak as small as 3.0 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 3.0 gal/h defined at a pipeline pressure of 20 psi in this evaluation is 100%.

---

## Criterion for Declaring a Leak

3. This system  
(X) 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  
(X) 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 1.88 gal/hr (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  
(X) 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 <sup>pipeline</sup> ~~wells~~ between 7/8/91 (date) and 7/20/91 (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, 219 ft long and constructed of fiberglass (fiberglass, steel, or other).
9. A mechanical line leak detector  
( ) was  
(X) was not  
present in the pipeline system.

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

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 NA

( ) 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: NA

( ) 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 $\Delta T$ (°F)**
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	10	$-15 \leq \Delta T < -5$
5	8	$-5 \leq \Delta T < +5$
5	12	$+5 \leq \Delta T < +15$
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.

\*\* $\Delta T$  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. (X) According to the vendor, this system can be used even if trapped vapor is present in the pipeline during a test. (if not excessive.)  
( ) 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 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
1	+9.99	2.94 gal/hr @ 10 psi	Fail
2	+6.23	2.91 gal/hr @ 10 psi	Fail
3	-6.07	2.8 gal/hr @ 10 psi	Fail

---

## 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:	Pressure (psi)	Volume (ml)	Time (sec)
Resolution:	0.1	0.5	0.01
Precision:	0.1	0.5	0.05
Accuracy:	0.3	1.0	0.01
Minimum Detectable Quantity:	0.1	1.0	0.01
Response Time:	---	---	---

Threshold is exceeded when the flow rate due to a leak exceeds 1.88 gal/h.

---

## 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 in. in diameter and 150 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)

A mechanical line leak detector is no longer needed because the CEI system performs a 3.0 gph test every time dispensing stops.



- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is .27 h
- the total data collection time for the test is .008 h
- the volume of the product in the pipeline is less than twice the volume of the product in the pipeline system used 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.

William D. Glauz

(name of person performing evaluation)

*William D. Glauz*

(signature)

8/07/91

(date)

(816) 753-7600

(telephone number)

Midwest Research Institute

(organization performing evaluation)

425 Volker Boulevard

(street address)

Kansas City, MO 64110

(city, state, zip)



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

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 Name:	TLS Pressurized Line Leak Detector, Series 8484
Version of System:	----
Manufacturer Name:	Veeder-Root
(street address)	125 Powder Forest Drive, P.O. Box 2003
(city, state, zip code)	Simsbury, CT 06070-2003
(telephone number)	(203) 651-2700

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 0.1 gal/h defined at a pipeline pressure of 20 psi in this evaluation is 100 %.

---

## Criterion for Declaring a Leak

3. This system  
☒ (x) 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  
☒ (x) 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 0.05 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, in the space provided.  
After accounting for effects of thermals, if any.
- 

## Evaluation Approach

6. There are five options for collecting the data used in evaluating the performance of this system. This system was evaluated  
☒ (x) 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 <sup>pipeline</sup> ~~lines~~ between 7/8/91 (date) and 7/20/91 (date). A description of the pipeline configuration used in the evaluation is given 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, 219 ft long and constructed of fiberglass (fiberglass, steel, or other).
9. A mechanical line leak detector  
☐ ( ) was  
☒ (x) was not present in the pipeline system. } System has a 3 gph test mode, whose function replaces that of a mechanical leak detector.

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

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 NA  
☐ 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 NA  
☐ 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 $\Delta T$ (°F)**
1	2	$\Delta T < -25$
4	8	$-25 \leq \Delta T < -15$
5	11	$-15 \leq \Delta T < -5$
5	8	$-5 \leq \Delta T < +5$
5	14	$+5 \leq \Delta T < +15$
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.

\*\* $\Delta T$  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. (If not excessive)  
 ( ) 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 100 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6.  
 \* (approximately 1.5 times operating pressure)

Table 2. Summary of the Results of Trapped Vapor Tests

Test No.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
1	+8.56	0.0 gal/hr	PASS
2	+6.23	0.097 gph @ 40 psi	FAIL
3	-10.18	0.099 gph @ 40 psi	FAIL

## Performance Characteristics of the Instrumentation

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

Quantity Measured:	Pressure (psi)	Volume (ml)	Time (sec)
Resolution:	0.1	0.5	0.01
Precision:	0.1	0.5	0.05
Accuracy:	0.3	1.0	0.01
Minimum Detectable Quantity:	0.1	1.0	0.01
Response Time:	--	--	--
Threshold is exceeded when the flow rate due to a leak exceeds <u>0.05</u> gal/h.			

## 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 in. in diameter and 200 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
  - a mechanical line leak detector
    - ( ) is present in
    - (x) has been removed from the pipeline (check both if appropriate)
- { System has a 3 gph test mode, whose function replaces that of a mechanical line leak detector.

- the waiting time between the last delivery of product to the underground storage tank and the start of data collection for the test is NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 2.5 h
- the total data collection time for the test is 0.3 h
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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

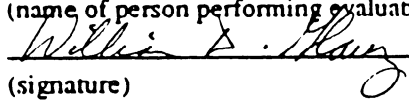
Attachment 5 - Data Sheet Summarizing the Test Results and the Leak Rates Used in the Evaluation

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.

<u>William D. Glauz</u>	<u>Midwest Research Institute</u>
(name of person performing evaluation)	(organization performing evaluation)
<u></u>	<u>425 Volker Boulevard</u>
(signature)	(street address)
<u>August 7, 1991</u>	<u>Kansas City, MO 64110</u>
(date)	(city, state, zip)
<u>(816) 753-7600</u>	
(telephone number)	





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

**Pipeline Leak Detection System  
Used as an  
Hourly 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: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8494 Line Leak Detector for TLS-350/350R and LLD-300

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office 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 an hourly line tightness test requires that the system be capable of detecting a leak as small as 3.0 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 3.0 gal/h defined at a pipeline pressure of 10 psi in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 2.962 gph (at 10 psi) and it detected 100 % of induced leaks.

---

## Criterion for Declaring a Leak

3. This system  
☒ (X) 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  
☒ (X) 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 2.5 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, 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  
☒ (X) at a special test facility (Option 1)  
☐ ( ) at one or more instrumented operational 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 57 tests was conducted on nonleaking pipeline(s) between 3/6/96 (date) and 3/14/96 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3.

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

8. The pipeline used in the evaluation was 2.22 in. in diameter, 250 ft long and constructed of fiberglass (fiberglass, steel or other).
9. A mechanical line leak detector  
☐ ( ) was  
☒ (X) was not  
present in the pipeline system. *System's 3 gal/h test mode, being tested, is a function that replaces that of a mechanical leak detector.*

*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  
☐ 6 to 12 h (Not applicable)  
☐ 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
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	12	$+5 \leq \Delta T < +15$
4	8	$+15 \leq \Delta T < +25$
1	2	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used.

<sup>b</sup>  $\Delta T$  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 tests 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. *(If not excessive.)*  
( ) 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 20-25 psi with 100 ml of vapor trapped in the line at a pressure of 0 psi. The data and test conditions are reported in Attachment 6. Two additional tests were performed with a large amount of vapor accidentally placed in the line. Although the system performed correctly, the results are not included in these forms as they were not in accordance with the test protocol.

**Table 2. Summary of the Results of Trapped Vapor Tests**

Test No.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
35	-10.6	0.00	Pass
36	-10.6	0.00	Pass
53	0.0	2.950	Fail

---

## Performance Characteristics of the Instrumentation

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

Quantity Measured: \_\_\_\_\_ Pressure (psi) \_\_\_\_\_ Volume (ml) \_\_\_\_\_ Time (sec) \_\_\_\_\_  
Resolution: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Precision: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.05 \_\_\_\_\_  
Accuracy: \_\_\_\_\_ 0.3 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Minimum Detectable Quantity: \_\_\_\_\_ 0.1 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Response Time: \_\_\_\_\_ --- \_\_\_\_\_ --- \_\_\_\_\_ ---  
Threshold is exceeded when the flow rate due to a leak exceeds 2.5 gal/h.

---

## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0.0 h
- the total data collection time for the test is 0.033 h
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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 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 Signal and Noise

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## 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.

William D. Glauz  
(name of person performing evaluation)

William D. Glauz  
(signature)

May 8, 1996  
(date)

(816) 753-7600  
(telephone number)

Midwest Research Institute  
(organization performing evaluation)

425 Volker Boulevard  
(street address)

Kansas City, MO 64110  
(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: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8494 Line Leak Detector for TLS-350/350R and LLD-300

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office 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 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 31 psi (the normal operating pressure) in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 0.195 gph (at 31 psi) and it detected 100 % of induced leaks.

---

## Criterion for Declaring a Leak

3. This system  
☒ (X) 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  
☒ (X) uses a single test (*1 test after accounting for effects of thermals, if any*)  
☐ ( ) 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 0.17 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, 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  
☒ (X) at a special test facility (Option 1)  
☐ ( ) at one or more instrumented operational 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 was conducted on nonleaking pipeline(s) between 3/6/96 (date) and 3/14/96 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3.

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

8. The pipeline used in the evaluation was 2.22 in. in diameter, 250 ft long and constructed of fiberglass (fiberglass, steel or other).
9. A mechanical line leak detector  
☐ ( ) was  
☒ (X) was not present in the pipeline system. *System has a 3 gal/h test mode, whose function replaces that of a mechanical leak detector.*

*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  
☐ 6 to 12 h (Not applicable)  
☐ 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
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	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used.

<sup>b</sup>  $\Delta T$  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 tests 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. *(If not excessive.)*  
( ) 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 31 psi with 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
35	-10.6	0.194 @ 31 psi	Fail
36	-10.6	0.0	Pass
53	0.0	0.0	Pass

---

## Performance Characteristics of the Instrumentation

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

Quantity Measured: \_\_\_\_\_ Pressure (psi) \_\_\_\_\_ Volume (ml) \_\_\_\_\_ Time (sec) \_\_\_\_\_  
Resolution: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Precision: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.05 \_\_\_\_\_  
Accuracy: \_\_\_\_\_ 0.3 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Minimum Detectable Quantity: \_\_\_\_\_ 0.1 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_  
Response Time: \_\_\_\_\_ --- \_\_\_\_\_ --- \_\_\_\_\_ ---  
Threshold is exceeded when the flow rate due to a leak exceeds 0.17 gal/h.

---

## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 0.75 h
- the total data collection time for the test is 0.50, 0.75 h (for pass or fail, respectively)
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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 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

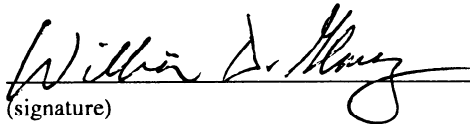
Attachment 7 - Data Sheet Summarizing the Test Results Used to Check the Relationship Supplied by the Manufacturer for Combining Signal and Noise

## 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.

William D. Glauz

(name of person performing evaluation)



(signature)

May 8, 1996

(date)

(816) 753-7600

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425 Volker Boulevard

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**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 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: Veeder-Root Pressurized Line Leak Detector

Version of System: Series 8494 Line Leak Detector for TLS-350/350R and LLD-300

Manufacturer Name: Veeder-Root

125 Powder Forest Drive, Post Office 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 0.1 gal/h defined at a pipeline pressure of 45 psi (1.5 times the normal operating pressure) in this evaluation is 100 %. The system was actually tested at an average calibrated leak rate of 0.096 gph (at 45 psi) and it detected 100 % of the induced leaks.

---

## Criterion for Declaring a Leak

3. This system  
(X) 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  
(X) uses a single test (*1 test after accounting for effects of thermals, if any*)  
( ) 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 0.09 (specify flow rate in gal/h) in 1 out of 1 tests (specify, for example, 1 out of 2, 2 out of 3). Please give additional details, if necessary, 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  
(X) at a special test facility (Option 1)  
( ) at one or more instrumented operational 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 was conducted on nonleaking pipeline(s) between 6/25/96 (date) and 7/5/96 (date). A description of the pipeline configuration used in the evaluation is given in Attachment 3.

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

8. The pipeline used in the evaluation was 2.22 in. in diameter, 249 ft long and constructed of fiberglass (fiberglass, steel or other).
9. A mechanical line leak detector  
( ) was  
(X) was not present in the pipeline system. *System has a 3 gal/h test mode, whose function replaces that of a mechanical leak detector.*

*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  
☐ 6 to 12 h (Not applicable)  
☐ 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 the 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 <sup>a</sup>	Range of $\Delta T$ (°F) <sup>b</sup>
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	$\Delta T > +25$

<sup>a</sup> This column should be filled out only if Option 1, 2, or 5 was used.

<sup>b</sup>  $\Delta T$  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 tests 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. *(If not excessive.)*  
( ) 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 38 psi with 100 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.	$\Delta T$ (°F)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)
35	-11.9	0.095 at 45 psi	Fail
36	-11.9	0.0	Pass
53	-0.7	0.095 at 45 psi	Fail

---

## Performance Characteristics of the Instrumentation

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

Quantity Measured: \_\_\_\_\_ Pressure (psi) \_\_\_\_\_ Volume (ml) \_\_\_\_\_ Time (sec) \_\_\_\_\_

Resolution: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.01 \_\_\_\_\_

Precision: \_\_\_\_\_ 0.1 \_\_\_\_\_ 0.5 \_\_\_\_\_ 0.05 \_\_\_\_\_

Accuracy: \_\_\_\_\_ 0.3 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_

Minimum Detectable Quantity: \_\_\_\_\_ 0.1 \_\_\_\_\_ 1.0 \_\_\_\_\_ 0.01 \_\_\_\_\_

Response Time: \_\_\_\_\_ --- \_\_\_\_\_ --- \_\_\_\_\_ ---

Threshold is exceeded when the flow rate due to a leak exceeds 0.09 gal/h.

---

## 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 in. in diameter and 200 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
  - a mechanical line leak detector  
( ) is present  
(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 NA h
- the waiting time between the last dispensing of product through the pipeline system and the start of data collection for the test is 2.0 h
- the total data collection time for the test is 0.53, 0.80 h (for pass or fail, respectively)
- the volume of the product in the pipeline system is less than twice the volume of the product in the pipeline system used in the evaluation, unless a 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
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- 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 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.

William D. Glauz  
(name of person performing evaluation)

William D. Glauz  
(signature)

September 13, 1996  
(date)

(816) 753-7600  
(telephone number)

Midwest Research Institute  
(organization performing evaluation)

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(city, state, zip)

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