EVALUATION OF THE RED JACKET XLP LINE LEAK DETECTOR FOR HOURLY MONITORING

EPA EVALUATION FORMS

PREPARED FOR

MARLEY PUMP COMPANY

DECEMBER 21, 1990

KWA

KEN WILCOX ASSOCIATES, 1312 S 21ST ST, BLUE SPRINGS, MO 64015

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5800 FOXRIDGE DRIVE
MISSION, KANSAS 66202

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Preface

The data contained in this report were obtained from the Red Jacket XLP Line Leak Detector when operated as an Hourly Monitor. The test results are based on data collected using the EPA protocol "Standard Test Procedures for Evaluating Leak Detection Methods: "Pipeline Leak detection Systems", EPA/530/UST-90/010, September, 1990. The work was conducted at the Leak Detection Test Center which is operated by Ken Wilcox Associates. Questions should be directed to Mr. Wayne Hill, Marley Pump Company at (913) 831-5700.

H. Kendall Wilcox, PhD

KEN WILCOX ASSOCIATES

H. Kendall Wilcox

December 21, 1991

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.

System Evaluated

System Name: Red Jacket XLP

Version of System: _____

Manufacturer Name: Marley Pump Co.

5800 Foxridge Drive
(street address)

Mission, KS 66202
(city, state, zip code)

(913) 831-5700
(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 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 10 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:
    (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 ΔT (°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?
    (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.)

- 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 * h *1/60 - 1/4 depending on temperature
- 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: None

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	Ken Wilcox Associates
(name of person performing evaluation)	(organization performing evaluation)
H. Kendall Wilcox	1312 south 21st Street
(signature)	(street address)
12/21/90	Blue Springs, MO 64015
(date)	(city, state, zip)
816-229-0860	
(telephone number)	

Attachment 1

Description

Pipeline Leak Detection System

This form provides supporting information on the operating principles of the leak detection system or on how the equipment works. This form is to be filled out by the evaluating organization with assistance from the manufacturer before the start of the evaluation.

Describe the important features of the system as indicated below. A detailed description is not required, nor is it necessary to reveal proprietary features of the system.

To minimize the time required to complete this form, the most frequently expected answers to the questions have been provided. For those answers that are dependent on site conditions, please give answers that apply in "typical" conditions. Please write in any additional information about the system that you believe is important.

Check all appropriate boxes for each question. Check more than one box per question if it applies. If 'Other' is checked, please complete the space provided to specify or briefly describe the matter. If necessary, use all the white space next to a question to complete a description.

System Name and Version: Red Jacket XLP

Date: Dec. 20, 1990

Applicability of the System

1. With what products can this system be used? (Check all applicable responses.)

   (X) gasoline
   (X) diesel
   (X) aviation fuel
   (X) fuel oil #4
   ( ) fuel oil #6
   (X) solvent (as specified by manufacturer)
   ( ) waste oil
   ( ) other (specify) _____

2. What types of pipelines can be tested? (Check all applicable responses.)

   (X) fiberglass
   (X) steel
   (X) other (specify) Rigid piping w/bulk modulus greater than 20,000psi

3. Can this leak detection system be used to test double-wall pipeline systems?

   (X) yes ( ) no
   inner pipe only

18. Can a test be performed with trapped vapor in the pipeline?

(X) yes ( ) no

19. If trapped vapor is found in the pipeline, is it removed before a test is performed?

( ) yes (X) no

20. Are deviations from this protocol acceptable?

( ) yes (X) no (not possible)

If yes, briefly specify: _____

_____

_____

21. Are elements of the test procedure determined by on-site testing personnel?

( ) yes (X) no

If yes, which ones? (Check all applicable responses.)

( ) waiting period between filling the tank and the beginning of data collection for the test
( ) length of test
( ) determination of the presence of vapor pockets
( ) determination of "outlier" (or anomalous) data that may be discarded
( ) other (Describe briefly.) _____

Data Acquisition

22. How are the test data acquired and recorded?

( ) manually
( ) by strip chart
( ) by computer
( ) by microprocessor

(X) not applicable

23. Certain calculations are necessary to reduce and analyze the data. How are these calculations done?

( ) manual calculations by the operator on site
( ) interactive computer program used by the operator
( ) automatically done with a computer program
( ) automatically done with a microprocessor

(X) not applicable

Detection Criterion

24. What threshold is used to determine whether the pipeline is leaking?

2 gal/h (in the units used by the measurement system)
2 gal/h (in gal/h)

25. Is a multiple-test sequence used to determine whether the pipeline is leaking?

( ) yes (If yes, answer the three questions below)
(X) no (If no, skip the three questions below)

How many tests are conducted? _____
How many tests are required before a leak can be declared? _____
What is the time between tests? _____
(Enter 0 if the tests are conducted one after the other.)

Calibration

26. How frequently are the sensor systems calibrated?

( ) never
( ) before each test
( ) weekly
( ) monthly
( ) semi-annually
(X) yearly or less frequently (minimum annual maintenance check)

Attachment 2

Summary of Performance Estimates

Pipeline Leak Detection System Used as an *Hourly Test*

Complete this page if the pipeline leak detection system has been evaluated as an hourly test. Please complete the first table. Completion of the last three tables is optional. (The last three tables present the performance of the system for different combinations of thresholds, probabilities of false alarm, and probabilities of detection. They are useful for comparing the performance of this system to that of other systems.)

Performance of the Pipeline Leak Detection System as Evaluated

Description	Leak Rate (gal/h)	P_D	P_{FA}	Threshold (gal/h)
Evaluated System	3.0	1.0	0.0	N/A
EPA Standard	3.0	0.95	0.05	N/A

Probability of False Alarm as a Function of Threshold

Threshold (gal/h)	Probability of False Alarm
Not determined in this	0.10
evaluation	0.075
	0.05
	0.05

Probability of Detection as a Function of Threshold for a Leak Rate of 3.0 gal/h

Threshold (gal/h)	Probability of Detection
Not determined in this	0.95
evaluation	0.90
	0.80
	0.50

Smallest Leak Rate that Can Be Detected with the Specified Probability of Detection and Probability of False Alarm

Leak Rate (gal/h)	Probability of Detection	Probability of False Alarm
Not determined in	0.95	0.10
this evaluation	0.95	0.075
	0.95	0.05
	0.90	0.05
	0.80	0.05
	0.50	0.05

Attachment 3

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

Pipeline Leak Detection System
Options 1, 2, and 5

Specialized Test Facility, Operational Storage Tank System, or Computer Simulation	
Inside diameter of pipeline (in.)	3"
Length of pipeline (tank to dispenser) (ft)	176'
Volume of product in line during testing (gal)	64.6 gal.
Type of material (fiberglass, steel, other[1])	fiberglass
Type of product in tank and pipeline (gasoline, diesel, other[2])	gasoline
Was a mechanical line leak detector present? (yes or no)	yes
Was trapped vapor present? (yes or no)	yes
Bulk Modulus (B) (psi)	34,250
B/V_o (psi/ml)	0.14
Storage tank capacity (gal)	560 gal

[1] Specify type of construction material.
[2] Specify type of product for each tank.

Attachment 7 *

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

Pipeline Leak Detection System
Options 1 and 5

First Check		
Test No.	**Actual Leak Rate* (gal/h)**	**Measured Leak Rate (gal/h)**
1		
2		
3		
4		
5		
6		

* Recommended leak rates for monthly monitoring tests and line tightness tests: 0.0, 0.05, 0.10, 0.20, 0.30 and 0.40 gal/h. Recommended leak rates for hourly tests: 0.0, 2.0, 2.5, 3.0, 3.5, and 4.0 gal/h.

Second Check		
Test No.	**Actual Leak Rate* (gal/h)**	**Measured Leak Rate (gal/h)**
A		
B		
C		
A + B*		

* A + B is the summation of the results of Tests A and B using the manufacturer's relationship for combining the signal and the noise.

* Testing was conducted at both zero and leak conditions.