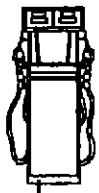


Evaluation of the Tanknology VacuTect Testing of European/Safer Suction Pipelines

PREPARED FOR:

Tanknology Corporation International

February 8, 1995

KWA

KEN WILCOX ASSOCIATES, INC. - 19401 E. 40 Highway, Suite 100
INDEPENDENCE, MO 64055 - (816) 795-7997

Evaluation of the Tanknology VacuTect Testing of European/Safer Suction Pipelines

PREPARED FOR:

Tanknology Corporation International
5225 Hollister
Houston, TX 77040

February 8, 1995

Preface

This evaluation presents the results of testing that was conducted on the Tanknology VacuTect Testing of Europeon/Safer Suction Pipelines. The work was conducted at the Leak Detection Test Center which is operated by Ken Wilcox Associates, Inc. Questions regarding this evaluation should be directed to Mr. Kevin Keegan, Tanknology Corporation International, at (800) 666-0288.

KEN WILCOX ASSOCIATES

H. Kendall Wilcox

H. Kendall Wilcox, President

Introduction

Tanknology Corporation International has developed a method for detecting leaks in Europeon/Safer Suction Pipeline Systems. This report presents the results of a field evaluation of this device.

In 1992, the Tanknology VacuTect System was evaluated according to the EPA protocol "Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods", EPA/530/UST-90/005, March, 1990. The results of the evaluation found the system to have a probability of detecting a 0.10 gallon per hour leak (P_D) of 100% and a corresponding probability of false alarm for a 0.10 gallon per hour leak (P_{FA}) of 0%.

The Environmental Protection Agency has implemented regulations requiring all Underground Storage Tanks and Pressurized Pipeline Systems to install Leak Detection Systems. The Environmental Protection Agency has also developed a set of protocols requiring leak detectors for underground storage tanks and pipelines to meet certain performance requirements. However, because there are no EPA regulations pertaining to Europeon/Suction Pipeline Systems, a protocol for evaluating Europeon/Safer Suction Pipeline Leak Detectors was never developed. It was therefore necessary to develop a protocol (based on the existing EPA protocols) to evaluate the Tanknology VacuTect Testing of European/Safer Suction Pipeline Systems.

Description of the Tanknology VacuTect Testing System

The VacuTect Testing System operates by creating a vacuum of -0.5 psig at the bottom of the tank. This vacuum would extend to include a European/Safer Suction Pipeline System if it was present in the system. A sensitive hydrophone is located below the product level which detects the sonic signal produced when air is pulled through a leak into the tank. Leaks which are below the water table are detected by monitoring water level changes which result from drawing water into the tank.

The VacuTect Testing procedure was developed to test suction lies that employ a single check valve directly beneath the suction pump. This is the standard procedure that the vendor follows when testing these systems in the field.

1) Perform all safety procedures.
2) Pull a vacuum on the tank until it reaches test pressure.
3) Loosen union or test port to allow all product to be drawn out of the line. All product is out of the line when bubble is audible in tank. If no bubbles are evident in the tank after the product line drain is attempted, then perform a volumetric tightness test on the line.
4) Document the line identification on the audio tape ie. "Line 1A testing under vacuum."
5) Tighten the union, test plug, or cap the line until all air ingress is stopped.
6) Monitor the audio for bubbles. Any bubbling from the line while the vacuum pump is off

may indicate a failed line. Monitor the bubbling for any indications that it may slow down and stop. This may take up to ten minutes. If bubbling does not stop, fail the line.

7) If no bubbling is indicated between pump cycles, the line is tight.
8) Repeat steps 3-5 for all suction lines on the tank.

Description of Evaluation Procedure

A diagram of the evaluation setup can be seen in Figure 1. The evaluation procedure was developed by Ken Wilcox Associates, Inc. and was implemented at the Leak Detection Test Center in Kansas City, MO. A 10,000 gallon tank containing gasoline with a European/Safer Suction Pipeline System was used to evaluate the VacuTect system. The pipeline was a 2-inch diameter Ameron FRP fiberglass pipeline that was approximately 50 feet in length. The testing procedure was as follows:

1) Fill the suction line with product.
2) Seal the tank and establish a vacuum.
3) Determine that the tank system is tight.
4) Introduce a leak of 0.05 gal/hr into the far end of the suction line near the pump.
5) Record whether or not a leak was detected by the vendor.
6) Repeat until a total of 10 tests have been conducted.

It is important to note that the pipeline was completely full of product before Tanknology began testing and that the induced leak rate was 0.05 gal/hr. The 0.05 gal/hr leak was induced by inserting a calibrated orifice into the pipeline system. This procedure was implemented a total of 30 times. In addition to the 10 tests that were conducted on a level pipeline, the pipeline was also tested 10 times with a low spot present in the center of the pipeline system and 10 times with a high spot present in the center of the pipeline system.

Results of the Evaluation

The results of the evaluation can be seen in Tables 1, 2, and 3. A total of 30 tests were conducted in this evaluation. A 0.05 gal/hr leak was present in 15 of the tests. The VacuTect Testing Procedure correctly identified the leak in 15 tests and reported the line as tight in the remaining 15 tests. Therefore, the probability of detecting a leak in a European/Safer Suction Pipeline System (P_D) is 100%. The corresponding probability of false alarm in a European/Safer Suction Pipeline System (P_{FA}) is 0%.

Evaluation Results for the Tanknology VacuTect Testing for European/Safer Suction Pipeline Systems

Table 1. European/Safer Suction Pipeline with Low Center

Test No.	Date	Start Time	End Time	Actual Test Conditions	Tanknology Results	Results Correct (Yes/No)
1	12/17/94	1500	1507	Tight	Tight	Yes
2	12/17/94	1508	1517	Leak	Leak	Yes
3	12/17/94	1510	1518	Tight	Tight	Yes
4	12/17/94	1518	1520	Leak	Leak	Yes
5	12/17/94	1520	1523	Tight	Tight	Yes
6	12/17/94	1523	1524	Leak	Leak	Yes
7	12/17/94	1525	1535	Leak	Leak	Yes
8	12/17/94	1536	1542	Leak	Leak	Yes
9	12/17/94	1542	1546	Tight	Tight	Yes
10	12/17/94	1546	1547	Tight	Tight	Yes

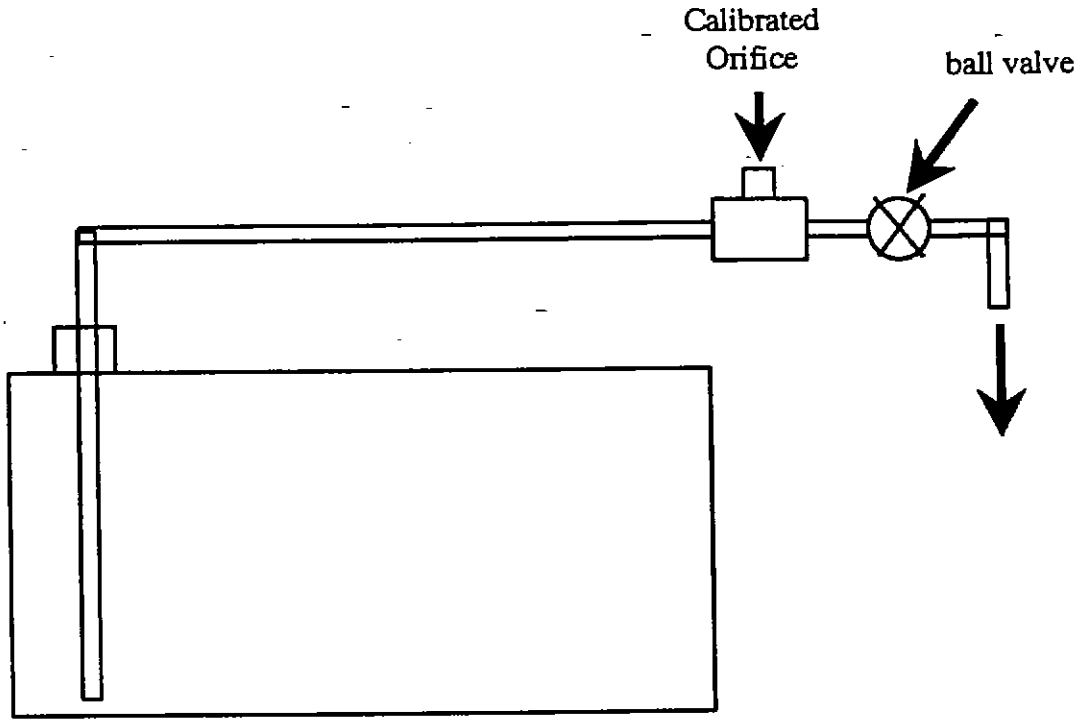
Table 2. European/Safer Suction Pipeline with High Center

Test No.	Date	Start Time	End Time	Actual Test Conditions	Tanknology Results	Results Correct (Yes/No)
1	12/17/94	1607	1610	Leak	Leak	Yes
2	12/17/94	1610	1615	Tight	Tight	Yes
3	12/17/94	1622	1623	Tight	Tight	Yes
4	12/17/94	1635	1638	Leak	Leak	Yes
5	12/17/94	1647	1648	Tight	Tight	Yes
6	12/17/94	1650	1651	Leak	Leak	Yes
7	12/17/94	1651	1652	Tight	Tight	Yes
8	12/17/94	1654	1655	Leak	Leak	Yes
9	12/17/94	1656	1657	Leak	Leak	Yes
10	12/17/94	1657	1658	Tight	Tight	Yes

Table 3. European/Safer Suction Pipeline with a Level Grade

Test No.	Date	Start Time	End Time	Actual Test Conditions	Tanknology Results	Results Correct (Yes/No)
1	12/17/94	1701	1702	Tight	Tight	Yes
2	12/17/94	1703	1704	Tight	Tight	Yes
3	12/17/94	1705	1706	Leak	Leak	Yes
4	12/17/94	1707	1708	Tight	Tight	Yes
5	12/17/94	1709	1711	Leak	Leak	Yes
6	12/17/94	1711	1712	Leak	Leak	Yes
7	12/17/94	1713	1714	Tight	Tight	Yes
8	12/17/94	1714	1715	Leak	Leak	Yes
9	12/17/94	1716	1717	Tight	Tight	Yes
10	12/17/94	1717	1718	Leak	Leak	Yes

Figure 1. Diagram of the Evaluation Setup for the Tanknology VacuTect Testing Procedure



Evlauation Procedure:

1. Fill pipeline with product.
2. Evacuate Tank.
3. Open ball valve, verify vacuum on line.
4. Close ball valve, conduct tests.
5. Open and close orifice 10 times for each configuration (ie. low center, high center, level grade).

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

European/Safer Suction 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 is capable of detecting leaks in a European/Safer Suction Pipeline System. The United States Environmental Protection Agency (EPA) does not have regulations requiring leak detection of European/Safer Suction Pipeline Systems and therefore there is not a Standard EPA protocol for evaluating European/Safer Suction Pipeline Leak Detection Systems. The evaluation procedure is therefore a modification of an EPA protocol that is based on the EPA's evaluation procedure, specified in *Standard Test Procedures for Evaluating Leak Detection Methods: Pipeline Leak Detection Systems.*

Tank system owners who use this pipeline leak detection system should keep this form on file to show to regulatory agencies. 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: Tanknology VacuTect Testing Procedure

Version of System: _____

Manufacturer Name: Tanknology Corporation International
(street address)
5225 Hollister
(city, state, zip code)
Houston, TX 77040
(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.*

   *There are not EPA regulations requiring leak detection of European/Safer Suction Pipeline Systems. However, 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 is 100 %.

Criterion for Declaring a Leak

3. This system
( ) uses a preset threshold
( ) measures and reports the output quantity and compares it to a predetermined threshold to determine whether the pipeline is leaking.
(X) Other (please describe) Air ingress is detected withing the product in the tank and/or ullage of the tank and/or European/Safer suction piping connected to the tank.

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 See below (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.
Air ingress is detected withing the product in the tank and/or ullage of the tank and/or European/Safer suction piping connected to the tank.

Evaluation Approach

6. A total of 30 tests were conducted on nonleaking line(s) between 12/17/94 (date) and 12/17/94 (date).

7. The pipeline used in the evaluation was 2 in. in diameter, 50 ft long and constructed of fiberglass (fiberglass, steel, or other).

8. A mechanical line leak detector
( ) was
(X) was not
present in the pipeline system.

9. Other information concerning the pipeline:

Three separate sets of tests were conducted on the pipeline system. Ten tests were conducted with a low spot in the center of the line. Ten tests were conducted with a high center in the line, and ten tests were conducted with the line sloped back to the tank. No check valve was present in the line during these tests.

Data Used to Make Performance Estimates

10. Were any test runs removed from the data set?
(X) no
( ) yes

If yes, please specify the reason and attach to the evaluation. (If more than one test was removed, specify each reason separately.)

11. The induced leak rate used in the evaluation was 0.050 gal/hr and was induced with (please specify how the leak was induced) calibrated orifice inserted into pipeline.

Application of the System

12. This leak detection system is intended to test European/Safer Suction Pipeline Systems that are associated with underground storage tank facilities, that contain petroleum or other chemical products, that are typically constructed of fiberglass or steel, and that typically measure 2 or 3 in. in diameter and 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)
    - 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 a single field test is 2 hr.
    - please give any other limitations specified by the vendor or determined during the evaluation: tester must verify that the suction line is open to the tank (i.e., there is no check valve present at the tank top).

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.

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 a modified EPA procedure and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox
(name of person performing evaluation)

H. Kendall Wilcox
(signature)

February 8, 1995
(date)

(816) 795-7997
(telephone number)

Ken Wilcox Associates, Inc.
(organization performing evaluation)

19401 E. 40 Hwy, Suite 100
(street address)

Independence, MO 64055
(city, state, zip)