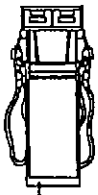

EVALUATION OF THE TANKNOLOGY VACUTECT® LEAK DETECTION SYSTEM

EPA FORMS

PREPARED FOR

TANKNOLOGY CORPORATION INTERNATIONAL

FEBRUARY 20, 1992

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KEN WILCOX ASSOCIATES, INC. - 1312 SW 21ST ST
BLUE SPRINGS, MO 64015 - (816) 229-0860

Discussion for the Evaluation of the Tanknology **VacuTect**® Leak Detection System

Introduction

Tanknology Corporation International has further developed its patented **VacuTect** nonvolumetric tank testing system so that it is capable of testing large tanks when product levels are as low as 5% and as much as 95% of the tank capacity. This represents a convenience to tank owners since, in almost every instance, tanks can be tested without the need to schedule a fuel delivery prior to testing. Attached are the results of a field evaluation of this system.

The Environmental Protection Agency requires that nonvolumetric leak detectors meet certain performance requirements. Tests that are used to conduct annual tightness tests on underground storage tanks must be capable of detecting leaks of 0.1 gal/h, with a Probability of Detection (P_D) of 95% and a Probability of False Alarm (P_{FA}) of 5% or less.

To assist users of these test methods and equipment, the EPA has developed requirements for evaluating the performance of pipeline leak detectors. These are described in detail in "*Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods*", EPA/530/UST-90/OC5, March 1990.

Description of the **VacuTect** Leak Detection System

The **VacuTect** Leak Detection System operates by creating a vacuum of -0.5 psi at the bottom of the tank. A sensitive hydrophone, which detects the sonic signal produced when air is pulled through a leak in the tank, is located below the product level. Leaks that are below the water table are detected by monitoring water level changes inside the tank, which result from drawing water into the tank.

Description of Evaluation Procedures

This evaluation was conducted on a 20,000 gallon tank containing six-inches of Jet A Fuel. The **VacuTect** system was installed in the tank through a three-inch port located in a manway at approximately the center of the tank. An ullage leak constructed from a stainless steel capillary tube was also installed above the manway. The product area leak was located in the liquid directly below the manway using a test valve.

VacuTect is a registered trademark of Tanknology Corporation International

Testing was conducted by opening or closing the leaks in a random manner. The Tanknology equipment was turned off during the adjustments of the leaks. The new leak conditions were established and the equipment was turned back on. Testing continued until the Tanknology test crew reported the results of the test. New test conditions were then established and the test repeated until the entire set of tests was completed.

Test Results

Low Water Table Conditions. Under low water table conditions, air is drawn through any leaks into the tanks. There were no missed detections in either the ullage leaks or liquid leaks. There were also no false alarms under tight conditions. The probability of detection was determined to be 100%, with a 95% confidence interval of 91.3% to 100%. The probability of a false alarm was determined to be 0%, with a 95% confidence interval of zero to 13.9%.

Conclusions

The performance of the **VacuTect** method of tank testing meets the requirements of the federal EPA for the detection of leaks in underground storage tanks. This evaluation was developed specifically to confirm **VacuTect**'s ability to test tanks up to 30,000 gallons when product levels are between 5% and 95% of the tank capacity. Since the test protocol was not otherwise modified, earlier Evaluations performed by Ken Wilcox Associates are still applicable. Specifically, the **VacuTect** system is still certified to test tanks up to 75,000 gallons in capacity, with product fill levels from 60% to 95%.

Results of U.S. EPA Standard Evaluation
Nonvolumetric Tank Tightness Testing Method

This form tells whether the tank tightness testing method described below complies with the performance requirements of the federal underground storage tank regulation. The evaluation was conducted by the equipment manufacturer or a consultant to the manufacturer according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods." The full evaluation report also includes a form describing the method and a form summarizing the test data.

Tank owners using this leak detection system should keep this form on file to prove compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

Method Description

Name VacuTect®

Version

Vendor Tanknology Corporation International

5225 Hollister Street

Houston, Texas 77040 (713) 690-8265

Evaluation Results

This method, which declares a tank to be leaking when air ingress is detected within the product in the tank and/or ullage of the tank system - and/or water ingress. has an estimated probability of false alarms [P(FA)] of 0.0 % based on the test results of 0 false alarms out of 20 tests. A 95% confidence interval for P(FA) is from 0 to 13.9 %.

The corresponding probability of detection [P(D)] of a 0.10 gallon per hour leak is 100.0 % based on the test results of 33 detections out of 33 simulated leak tests. A 95% confidence interval for P(D) is from 91.3 to 100 %.

Does this method use additional modes of leak detection? (X) Yes ( ) No. If Yes, complete additional evaluation results on page 3 of this form.

Based on the results above, and on page 3 if applicable, this method (X) does ( ) does not meet the federal performance standards established by the U.S. Environmental Protection Agency (0.10 gallon per hour at P(D) of 95% and P(FA) of 5%).

Test Conditions During Evaluation

The evaluation testing was conducted in a 20,000 - gallon (X) steel ( ) fiberglass tank that was 126 inches in diameter and 370 inches long, installed in unknown backfill.

The ground-water level was 147 inches above the bottom of the tank.

Nonvolumetric TTT Method **VacuTect**

Version

Test Conditions During Evaluation (continued)

The tests were conducted with the tank <5 percent full. (6 inch product)

The temperature difference between product added to fill the tank and product already in the tank ranged from N/A degrees F to N/A degrees F, with a standard deviation of N/A degrees F.

The product used in the evaluation was Jet A.

This method may be affected by other sources of interference. List these interferences below and give the ranges of conditions under which the evaluation was done. (Check None if not applicable.)

(X) None

Interferences	Range of Test Conditions

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.
- The vendor's instructions for using the method are followed.
- The tank contains a product identified on the method description form.
- The tank capacity is 30,000 gallons or smaller.
- The difference between added and in-tank product temperatures is no greater than + or - N/A degrees Fahrenheit.

(X) Check if applicable:
Temperature is not a factor because Physical principles of the method do not depend on temperature

- The waiting time between the end of filling the test tank and the start of the test data collection is at least N/A hours.
- The waiting time between the end of "topping off" to final testing level and the start of the test data collection is at least N/A hours.
- The total data collection time for the test is at least varies* hours.
- The product volume in the tank during testing is 0 % full.**
- This method (X) can ( ) cannot be used if the ground-water level is above the bottom of the tank.

Other limitations specified by the vendor or determined during testing:
The pressure is reduced to a minimum of -0.5 psig at the bottom of the tank
* A leak is declared as soon as air or water ingress is detected.
**Can be 5% full with water.

Nonvolumetric TTT Method VacuTect

Version

> Safety disclaimer: This test procedure only addresses the issue of the method's ability to detect leaks. It does not test the equipment for safety hazards.

Additional Evaluation Results (If applicable)

This method, which declares a tank to be leaking when _____ has an estimated probability of false alarms [P(FA)] of ___% based on the test results of ___ false alarms out of ___ tests. Note: A perfect score during testing does not mean that the method is perfect. Based on the observed results, a 95% confidence interval for P(FA) is from 0 to ___%.

The corresponding probability of detection [P(D)] of a ___ gallon per hour leak is ___% based on the test results of ___ detections out of ___ simulated leak tests. Note: A perfect score during testing does not mean that the method is perfect. Based on the observed results, a 95% confidence interval for P(D) is from ___ to ___%.

> Water detection mode (If applicable) * Tanknology Magnetostrictive Water Sensor

Using a false alarm rate of 5%, the minimum water level that the water sensor can detect with a 95% probability of detection is 0.017 inches.

Using a false alarm rate of 5%, the minimum change in water level that the water sensor can detect with a 95% probability of detection is <0.001 inches.

Based on the minimum water level and change in water level that the water sensor can detect with a false alarm rate of 5% and a 95% probability of detection, the minimum time for the system to detect an increase in water level at an incursion rate of 0.10 gallon per hour is 48 minutes in a 20,000 - gallon tank.

Certification of Results

I certify that the nonvolumetric tank tightness testing method was isolated and operated according to the vendor's instruction. I also certify that the evaluation was performed according to the standard EPA test procedure for nonvolumetric tank tightness testing methods and that the results presented above are those obtained during the evaluation.

H. Kendall Wilcox, Ph.D.
(printed name)

H. Kendall Wilcox
(signature)

February 20, 1992
(date)

Ken Wilcox Associates
(Organization performing evaluation)

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

(816) 229-0860
(phone number)