Results of U.S. EPA Standard Evaluation
Automatic Tank Gauging System (ATGS)

This form tells whether the automatic tank gauging system (ATGS) 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: Automatic Tank Gauging Systems." 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 provide compliance with the federal regulations. Tank owners should check with State and local agencies to make sure this form satisfies their requirements.

ATGS Description

Name <u>TMS 2000 and TMS 3000</u>

Version number <u>Patriot 7100 Probe Model</u>

Vendor <u>Pneumercator Company, Inc.</u>

<u>120 Finn Court</u>
(street address)

<u>Farmingdale, NY</u>   <u>11735</u>   <u>(516) 293-8450</u>
(city)   (state)   (zip)   (phone)

Evaluation Results

This ATGS which declares tank to be leaking when the measured leak rate exceeds the threshold of <u>0.100</u> gallon per hour, has a probability of false alarms [P_{FA}] of <u>2.7</u> %.

The corresponding probability of detection [P_D] of a 0.20 gallon per hour leak is <u>97.3</u> %.

The minimum water level (threshold) in the tank that the ATGS can detect is <u>0.488</u> inch.

The minimum change in water level that can be detected by the ATGS is <u>0.124</u> inches (provided that the water level is above the threshold).

Therefore, this ATGS (**X**) does ( ) does not meet the **federal** performance standards established by the U.S. Environmental Protection Agency (0.20 gallon per hour at P_D of 95% and P_{FA} of 5%), and this ATGS (**X**) does ( ) does not meet the **federal** performance standard of measuring water in the bottom of the tank to the nearest 1/8 inch.

Test Conditions During Evaluation

The evaluation testing was conducted in a <u>50,000</u> gallon (X) steel ( ) fiberglass tank that was <u>154</u> inches in diameter and <u>600</u> inches in length.

The temperature difference between product added to fill the tank and product already in the tank ranged from <u>-5.4</u> deg F to <u>+5.2</u> deg F, with a standard deviation of <u>± 4.6</u> deg F.

The tests were conducted with the tank product levels <u>50</u> to <u>95</u> % full.

The product used in the evaluation was <u>JP-5</u>.

Name of ATGS <u>TMS 2000 and TMS 3000</u>

Version <u>Patriot 7100 Probe Model</u>

Limitations on the Results

The performance estimates above are only valid when:

- The method has not been substantially changed.

- The vendor's instructions for installing and operating the ATGS are followed.

- The tank contains a product identified on the method description form.

- The tank is no larger than <u>75,000</u> gallons.

- The depth of the product in the tank is at least <u>50</u> percent full.

- The waiting time after adding any substantial amount of product to the tank is <u>8</u> hours.

- The temperature of the added product does not differ more than <u>± 6.9</u> degrees Fahrenheit from that already in the tank.

- The total data collection time for the test is at least <u>8</u> hours.

- Other limitations specified by the vendor of determined during testing:

  <u>None</u>

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

Certification of Results

I certify that the ATGS was installed and operated according to the vendor's instructions and that the results presented on this form are those obtained during the evaluation. I also certify that the evaluation was performed according to one of the following:

(X) standard EPA test procedure for ATGS
( ) alternative EPA test procedure for ATGS

<u>H. Kendall Wilcox, President</u>
(printed name)

<u>Ken Wilcox Associates, Inc.</u>
(organization performing evaluation)

H. Kendall Wilcox

<u> </u>
(signature)

<u>Grain Valley, Missouri 64029</u>
(city, state. zip)

<u>January 30, 2001</u>
(date)

<u>(816) 443-2494</u>
(phone number)

* The procedures for determining the minimum product level limitation are specified in a letter from the ATGS and VTTT Committees of the NWGLDE to Gauge Vendors and other interested parties, April 28, 1997.

Automatic Tank Gauging System

This section describes briefly the important aspects of the automatic tank gauging system (ATGS). It is not intended to provide a thorough description of the principles behind the system or how the equipment works.

ATGS Name and Version

TMS 3000 with the Patriot 7100 Probe Model

Product

> Product type

For what products can this ATGS be used? (check all applicable)

       (X) gasoline

       (X) diesel

       (X) aviation fuel

       (X) fuel oil #4

       (X) fuel oil #6

       (X) solvents

       (X) waste oil

       (X) other (list) Liquids with specific gravity greater than 0.6 and a viscosity less than 1500 CPS

> Product level

What product level is required to conduct a test?

       ( ) greater than 90% full

       (X) greater than 50% full

       ( ) other (specify) _____

Does the ATGS measure inflow of water as well as loss of product (gallon per hour)?

       (X) yes

       ( ) no

Does the ATGS detect the presence of water in the bottom of the tank?

       (X) yes

       ( ) no

Level Measurement

What technique is used to measure changes in product volume?

       ( ) directly measure the volume of product change

       ( ) changes in head pressure

       ( ) changes in buoyancy of a probe

       ( ) mechanical level measure (e.g., ruler, dipstick)

       ( ) changes in capacitance

       ( ) ultrasonic

       (X) change in level of float (specify principle, e.g., capacitance, magnetostrictive, load cell, etc.) <u>magnetostrictive</u>

       ( ) other (describe briefly) _____

Temperature Measurement

If product temperature is measured during a test, how many temperature sensors are used?

       ( ) single sensor, without circulation

       ( ) single sensor, with circulation

       ( ) 2-4 sensors

       (X) 5 or more sensors

       ( ) temperature-averaging probe

If product temperature is measured during a test, what type of temperature sensor is used?

       ( ) resistance temperature detector (RTD)

       ( ) bimetallic strip

       ( ) quartz crystal

       (X) thermistor

       ( ) other (describe briefly) _____

If product temperature is not measured during a test, why not?

       ( ) the factor measured for change in level/volume is independent of temperature (e.g., mass)

       ( ) the factor measured for change in level/volume self-compensates for changes in temperature

       ( ) other (explain briefly) _____

Data Acquisition

How are the test data acquired and recorded?

     ( ) manually

     ( ) by strip chart

     (X) by computer

Procedure information

> Waiting times

What is the minimum waiting period between adding a large volume of product (i.e., a delivery) and the beginning of a test (e.g., filling from 50% to 90-95% capacity)?

     ( ) no waiting period

     ( ) less than 3 hours

     ( ) 3-6 hours

     (X) 7-12 hours

     ( ) more than 12 hours

     ( ) variable, depending on tank size, amount added, operator discretion, etc.

> Test duration

What is the minimum time for collecting data?

     ( ) less than 1 hour

     ( ) 1 hour

     ( ) 2 hours

     ( ) 3 hours

     ( ) 4 hours

     (X) 5-10 hours

     ( ) more than 10 hours

     ( ) variable (explain) _____

> Total time

What is the total time needed to test with this ATGS after a delivery?
(waiting time plus testing time)

_16_ hours ___ minutes

What is the sampling frequency for the level and temperature measurements?

( ) more than once per second

(X) at least once per minute

( ) every 1-15 minutes

( ) every 16-30 minutes

( ) every 31-60 minutes

( ) less than once per hour

( ) variable (explain) _____

> Identifying and correcting for interfering factors

How does the ATGS determine the presence and level of the ground water above the bottom of the tank?

( ) observation well near tank

( ) information from USGS, etc.

( ) information from personnel on-site

(X) presence of water in the tank

( ) other (describe briefly) _____

( ) level of ground water above bottom of the tank not determined

How does the ATGS correct for the interference due to the presence of ground water above the bottom of the tank?

(X) system tests for water incursion

( ) different product levels tested and leak rates compared

( ) other (describe briefly) _____

( ) no action

How does the ATGS determine when tank deformation has stopped following delivery of product?

(X) wait a specified period of time before beginning test

( ) watch the data trends and begin test when decrease in product level has stopped

( ) other (describe briefly) _____

( ) no procedure

Are the temperature and level sensors calibrated before each test?

    ( ) yes

    (X) no

If not, how frequently are the sensors calibrated?

    ( ) weekly

    ( ) monthly

    ( ) yearly or less frequently

    (X) never

> Interpreting test results

How are level changes converted to volume changes (i.e., how is height-to-volume conversion factor determined)?

    ( ) actual level changes observed when known volume is added or removed (e.g., liquid metal bar)

    ( ) theoretical ratio calculated from tank geometry

    (X) interpolation from tank manufacturer's chart

    ( ) other (describe briefly) _____

    ( ) not applicable; volume measured directly

How is the coefficient of thermal expansion (Ce) of the product determined?

    ( ) actual sample taken for each test and Ce determined from specific gravity

    ( ) value supplied by vendor of product

    (X) average value for type of product

    ( ) other (describe briefly) _____

How is the leak rate (gallon per hour) calculated?

    ( ) average of subsets of all data collected

    ( ) difference between first and last data collected

    ( ) from data from last ___ hours of test period

    (X) from data determined to be valid by statistical analysis

    ( ) other (describe) _____

What threshold value for product volume change (gallon per hour) is used to declare that a tank is leaking?

( ) 0.05 gallon per hour

(X) 0.10 gallon per hour

( ) 0.20 gallon per hour

( ) other (list) _____

Under what conditions are test results considered inconclusive?

(X) too much variability in the data (standard deviation beyond a given value)

( ) unexplained product volume increase

( ) other (describe briefly) _____

Exceptions

Are there any conditions under which a test should not be conducted?

( ) water in the excavation zone

( ) large difference between ground temperature and delivered product temperature

( ) extremely high or low ambient temperature

( ) invalid for some products (specify) _____

(X) other (describe briefly) <u>None</u> _____

What are acceptable deviations from the standard testing protocol?

(X) none

( ) lengthen the duration of test

( ) other (describe briefly) _____

What elements of the test procedure are determined by personnel on-site?

( ) product level when test is conducted

(X) when to conduct test

( ) waiting period between filling tank and beginning test

(X) length of test

( ) determination that tank deformation has subsided

( ) determination of "outlier" data that may be discarded

( ) other (describe briefly) _____

( ) none

Reporting Form for Leak Rate Data
Automatic Tank Gauging System (ATGS)

ATGS Name and Version: Pneumercator TMS 2000 and TMS 3000 with the Patriot 7100 Probe

Evaluation Period: From 11-Jan-00 to 09-Feb-00

Test No.	Date at Completion of Last Fill (d-m-y)	Time at Completion of Last Fill (military)	Date Test Began (d-m-y)	Time Test Began (military)	Time Test Ended (military)	Product Temperature Differential (deg F)	Nominal Leak Rate (gal/h)	Induced Leak Rate (gal/h)	Measured Leak Rate (gal/h)	Meas.-Ind. Leak Rate (gal/h)
1	11-Jan-00	1445	11-Jan-00	2245	0644	-5.4	0.1	0.068	0.044	-0.024
2	11-Jan-00	1445	14-Jan-00	0212	1012	-5.4	0.3	0.309	0.300	-0.009
3	11-Jan-00	1445	14-Jan-00	2200	0604	N/A	0.0	0.000	0.000	0.000
4	11-Jan-00	1445	16-Jan-00	0400	1200	N/A	0.2	0.269	0.264	-0.005
5	17-Jan-00	1617	18-Jan-00	0017	0822	5.2	0.0	0.000	0.000	0.000
6	17-Jan-00	1617	19-Jan-00	0400	1205	5.2	0.1	0.157	0.174	0.017
7	17-Jan-00	1617	24-Jan-00	1200	2005	N/A	0.3	0.351	0.249	-0.102
8	17-Jan-00	1617	24-Jan-00	2100	0505	N/A	0.2	0.168	0.104	-0.064
9	25-Jan-00	1330	25-Jan-00	2130	0535	-0.6	0.0	0.000	0.000	0.000
10	25-Jan-00	1330	26-Jan-00	0800	1605	-0.6	0.1	0.095	0.106	0.011
11	25-Jan-00	1330	27-Jan-00	0805	1610	N/A	0.3	0.286	0.211	-0.075
12	25-Jan-00	1330	27-Jan-00	1630	0034	N/A	0.2	0.168	0.192	0.024
13	Aborted - System lost programming - followed a fill so will have to redo series, see Test 27.									
14	28-Jan-00	1915	29-Jan-00	1200	2005	-0.5	0.0	0.000	0.000	0.000
15	Aborted - Power went out while test was running.									
16	28-Jan-00	1915	31-Jan-00	1950	0355	N/A	0.3	0.263	0.260	-0.003
17	28-Jan-00	1915	01-Feb-00	0455	1300	N/A	0.0	0.000	0.000	0.000
18	01-Feb-00	1840	02-Feb-00	0240	1045	5.0	0.1	0.140	0.165	0.025
19	Aborted - Console reset itself and ran 4 hour test instead of 8 hour test.									
20	01-Feb-00	1840	02-Feb-00	2117	0522	5.0	0.3	0.328	0.421	0.093
21	01-Feb-00	1840	03-Feb-00	1800	0159	N/A	0.2	0.220	0.163	-0.057
22	01-Feb-00	1840	04-Feb-00	0208	1007	N/A	0.1	0.109	0.041	-0.068
23	04-Feb-00	1630	05-Feb-00	0020	0819	-5.1	0.2	0.225	0.158	-0.067
24	04-Feb-00	1630	05-Feb-00	0920	1719	-5.1	0.3	0.335	0.340	0.005
25	04-Feb-00	1630	06-Feb-00	0520	1319	N/A	0.1	0.110	0.000	-0.110
26	04-Feb-00	1630	06-Feb-00	1340	2139	N/A	0.0	0.000	0.066	0.066
27	07-Feb-00	1330	07-Feb-00	2130	0529	0.2	0.2	0.232	0.252	0.020
28	07-Feb-00	1330	08-Feb-00	0710	1509	0.2	0.0	0.000	0.000	0.000
29	07-Feb-00	1330	09-Feb-00	0410	1209	N/A	0.3	0.320	0.243	-0.077
30	07-Feb-00	1330	09-Feb-00	1225	2024	N/A	0.0	0.000	0.045	0.045