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Triangle Manufacturing, Inc.

TEI System 5000, Version 1.0, Version 1.0W

NON-VOLUMETRIC TANK TIGHTNESS TEST METHOD (VACUUM)

Certification
Leak rate of 0.1 gph with PD = 100% and PFA = 0%.

Leak Threshold
A tank system should not be declared tight when the acoustic noise level of the tank under vacuum is greater than the calibrated background acoustic noise level (prior to evacuation).
A tank system should not be declared tight if any water ingress is detected.

Applicability
Gasoline, diesel, aviation fuel, fuel oil #4, waste oil.

Tank Capacity
Maximum of 20,000 gallons.
Tank must be minimum 14% full.
Microphone should be located within 24 feet of all points within the tank.

Waiting Time
None between delivery and testing.

Test Period
Minimum of 1 minute when groundwater is below bottom of tank.
When groundwater is above bottom of tank, Version 1.0W (includes either Triangle TEI System 5000 Water Sensor, Triangle Manufacturing Conductivity Water Sensor Version 1, or Estabrook EZ-3 Conductivity Water Sensor) must be used and test period extended to ensure water ingress detection during test.
For Triangle TEI System 5000 Water Sensor:
Minimum of 10 minutes when using (time begins after sensor is set up and calibrated).
For Triangle Manufacturing Conductivity Water Sensor Version 1:
Minimum test time must be calculated using Triangle Manufacturing operations manual. Calculation is based on tank size, groundwater elevation, and product elevation.
For Estabrook EZ-3 Conductivity Water Sensor:
Minimum test time must be calculated using Estabrook EZ-3 operations manual, but cannot be less than 1 hour. Calculation is based on tank size, groundwater elevation, and product elevation.
There must be no dispensing or delivery during test.

Test Pressure
Vacuum as directed in operating instructions.
If vacuum cannot be maintained, see manufacturer's instructions.

Temperature
Acoustic signal is independent of product temperature.

Water Sensors
Version 1.0W (includes either Triangle TEI System 5000 Water Sensor, Triangle Manufacturing Conductivity Water Sensor Version 1 or Estabrook EZ-3 Conductivity Water Sensor) must be used to detect water ingress.
For Triangle TEI System 5000 Water Sensor:
Minimum detectable water level is 0.0532 inch.
Minimum detectable change in water level is 0.00013 inch.
Minimum water level in tank must be adjusted to at least 0.0532 inch at the sensor before starting the test.
For Triangle Manufacturing Conductivity Water Sensor Version 1:
Minimum detectable water level is 0.0258 inch.
Minimum detectable change in water level is 0.0043 inch.
Minimum water level in tank must be adjusted to at least 0.0258 inch at the sensor before starting the test. For testing tanks without water the placement of the water sensor must be at the low end of the tank and tank bottom water samples should be collected both before and after testing is completed for visual indication of phase separated fuel if the tank is storing ethanol blended gasoline.
For Estabrook EZ-3 Conductivity Water Sensor:

Minimum detectable water level is 0.014 inch.
Minimum detectable change in water level is 0.0095 inch.
Minimum water level in tank must be adjusted to at least 0.014 inch at the sensor before starting the test.

Groundwater Depth to groundwater in tank excavation backfill must be determined.
Version 1.0 can only be used when groundwater is below bottom of tank.
Version 1.0W must be used when groundwater is above bottom of tank.

Calibration Acoustic sensor must be calibrated before each test in accordance with manufacturer's instructions.
When using Version 1.0W, Triangle TEI System 5000 Water Sensor, Triangle Manufacturing Conductivity Water Sensor Version 1, or Estabrook EZ-3 Conductivity Water Sensor must be calibrated before each test in accordance with manufacturer's instructions.

Comments Manifolded tank systems must be isolated prior to test.
Evaluated using unleaded gasoline.
Microphone was 24 feet away from the leak source during evaluation.
Headphones are used during test to listen for air ingress signal. Noise signals are tape recorded rather that recording the noise levels in decibels.
Vacuum test method may not be effective in some tank excavation backfill (such as clay) because it may plug holes in tank.
If soil is saturated with product, air or water ingress may not be detected by vacuum test.
A well point in tank excavation backfill may help identify presence of this condition.

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Date of Evaluation: 01/20/98; 01/16/2025