How To Inspect Underground Storage Tanks

Petroleum Storage Tank Maintenance
WEBINAR: 12/18/2013
10:00 -11:15 am CST
Outline

• PEI RP-900 and RP-1200 inspections
• Fiberglass Tank Deflection Testing
• Tank Cleaning & Water Removal Methods
• Internal Video Inspections
• Daily, Monthly, & Annual Inspection Checklists
PEI RP-900: Daily Checklist

- **Leak Detection**
  - ATG functional & no alarms
  - Daily Inventory
  - No Complaints (Slow-Flow)

- **Tank Area**
  - Fill cover
  - **Spill bucket (clean & dry)**
  - Fill pipe

Don’t forget dispensing equipment.
PEI RP-900: Monthly Checklist

- Leak Detection Method
  - ATG – passing tests
  - SIR – passing tests
  - Other methods - passing

- Tank Equipment
  - Manholes
  - Spill containers
  - Drop tubes
  - Tank stick
  - Check for water
  - Vents

- Vapor Recovery

- Wells

- Corrosion Protection

Figure 7.5.3.1 Test reports printed out by automatic tank gauges must be kept on hand to document compliance with leak detection requirements.

Figure 6.5.4.1 Water paste applied to a gauge stick will change color if water is present. Minimizing the amount of water in a tank is important to maintain fuel quality for all fuels, and is critically important for fuels containing alcohol. Numbers on gauge sticks should be clear and easy to read.
PEI RP-900: Annual Checklist

- **STP Inspection**
  - Test Line Leak Detection
  - Check for leaks
- **Sump Inspection**
  - Condition
  - Product or Water
  - Test Sensors

Inspection normally conducted by certified technician
Methods for checking
- Spill & Overfill Systems
- Leak Detection Equipment
- Secondary Containment
EPA Guidance

- EPA Checklists
- Release Detection
- Spill Protection
- Overfill Protection
- Corrosion Protection

Operating And Maintaining Underground Storage Tank Systems
Practical Help And Checklists
Deflection Testing Fiberglass Tanks

- Fiberglass tanks became popular in 1970’s
- Some 30 – 40 year old tanks are still in service
- Tanks may deflect or deform over time
- Many potential causes of structural deformation and/or deflection
  - Poor installation practices
    - Poor compaction; substandard backfill; migration of backfill
    - Voids or air pockets; lack of support in critical areas
  - Softening of fiberglass resin due to fuel additives
    - Many “new” additives that tanks may not be designed to handle
    - Alcohol/Ethanol/Other blends may impact older tanks
  - Other Heavy Load Factors
    - Excessive traffic loads (tanker trucks)
    - High water table
    - Damaged tank pad or construction activity
Example of Fiberglass Tank Deflection

Example of structural deformation and bottom flatness:

Cross-section view of underground storage tanks.

- Tank shell has round cross-section and normal stress loads.
- Measures the “sector” which is the distance from a 24” chord to the bottom of the tank.
- Tank shell suffers from excessive stress due to deformation.

Original 92” Diameter

"NORMAL" Tank

1.6" Distance

24" CHORD

DEFLECTED TANK

90” Diameter

Original 92” Diameter

1.1" Distance
Methods To Detect Deformation

• Vertical Deflection Measurement (tank diameter)
  • Normally measured during installation – part of checklist
  • **Should compare diameter before and after backfilling**
  • Not a reliable indicator for existing tanks
  • **Original diameter usually not available for comparison**

• **Bottom Flatness Test** (Tanknology “Level I” inspection)
  • Better indicator of tank deflection than diameter measurement alone
  • Most cost--effective and accurate method for multiple tanks
  • Requires proprietary tool and expertise

• **Internal Video Inspection** (Tanknology “Level II” inspection)
  • Provides visual observation of possible deformation and bottom flatness
  • May also show blistering, deterioration, stress cracks, buckling, etc.
  • Tank must be empty

• Manned Tank Entry
  • Measurements of deflection, bottom flatness, and hardness
  • Costly and potentially dangerous
Bottom Flatness Testing - Setup

Digital Caliper

Insert through standard 4” riser.
Tank Cleaning Methods (1 of 2)

- **Bottom Sweep**
  - Removal of water and/or debris from bottom of tank using guided hoses.
  - Cim-Tek Cim-Cart, Gorman-Rupp Tankleenor, Tanknology, others

- **Fuel Filtration or Fuel Polishing**
  - Cyclones, Coalescer/Separators, Filtration, Conditioning, etc. Establish return flow of liquid to carry debris toward inlet.
  - Algae-X, Tanknology FuelPure®, others
Tank Cleaning Methods (2 of 2)

- **Rotational Pressure Washing or Impingement Cleaning**
  - Tank is empty. Spray Balls or Rotating Spray Nozzles wash and rinse the entire tank. Waste water and debris is pumped and/or vacuumed from tank.
  - Butterworth, GamaJet, Spraying Systems

- **Video-Guided Pressure Washing**
  - Spray nozzle cleans specific areas of tank. Video camera monitors and directs cleaning process. Vacuum out waste water and debris.
  - Tanknology TankClean®

- **Internal Entry**
  - Shovels, Scrapers, Brooms, Mops, etc
Video Inspections - Reasons

• Verify and locate holes & cracks
• Verify and locate water ingress
• Fuel Contamination
• Water bottoms
• Cleaning operations
• Corrosion inspections
• Lining inspections
• Condition of fiberglass tanks
• Condition/presence of overfill protection
• Operation of STP’s and other equipment
• Retrieval of dropped equipment
• Identify available bungs for ATG installation
Water Ingress

- Water ingress at STP Riser
Small Water Ingress

- Random inspection identified small water ingress
Water Ingress

- Small water ingress through crack in tank
Water Ingress

- Large water ingress through hole in tank bottom
Water Ingress

- Large water ingress through hole in tank bottom
Water Ingress

- Large water ingress through STP Riser under Containment Sump
Small Water Ingress

- A tank failed the VacuTect® test due to water ingress
- The tank was taken out of service and sat idle for 6 mos.
- Several inches of water and sludge accumulated
- The tank was then pressure washed with TankClean™
Small Water Ingress

- After thorough cleaning the entire tank was visible
- A small ingress was identified at bottom with TankCam®
- The hole had been clogged by sludge in tank
- The water trickled in again after pressure cleaning
Water Bottoms

• ULSD Tank with clear fuel but sediment on tank surface
• No water at Fill Pipe or ATG Riser
• “Clean” sample collected
• No history of water pump-outs
• But a “pool” of water exists on tank bottom between fill & ATG
• Dark color indicates microbial growth (confirmed by lab sample)
Fuel Contamination

- Sediment and debris in bottom of tank
- Looking down through 20” of gasoline
Fuel Contamination

- Heavy sludge on tank bottom
Fuel Contamination

- Heavy sludge on tank bottom
Fuel Contamination

- Heavy sludge on tank bottom
Tank Cleaning – Video Guided Wash

- High-pressure TankClean™ water jet is directed toward surfaces that need cleaning
- Process is monitored with TankCam®
- Debris is pumped out with vacuum truck
Tank Cleaning – Video Guided Wash

- TankClean™ Process
Corrosion Inspection

- STI-P3 tank.
- Interior still shiny with no signs of corrosion
Corrosion Inspection

Heavy corrosion in steel tank. Small water drip at ATG and hole in end cap. History of water ingress and sludge.
Corrosion Inspection

- ULSD systems have experienced corrosion inside tanks

Ball Float close-up
Corrosion Inspection

- ULSD systems have experienced corrosion inside tanks

View down fill riser  STP shaft
Lining Inspection

- Internal linings – Good?
Internal lining. Sludge covers bottom of tank.