

Underground Storage Tanks Ethanol Workshop

Presentation by

Lamar Bradley

TN Division of UST

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Biofuel Issues for UST Programs

- As alternative fuel use becomes widespread, most regulated USTs will contain some amount of ethanol. Many of these are **older tanks**.
- Product handling issues- H₂O affinity
- Preventing releases from USTs
 - Federal and state regulations require that UST systems be compatible with fuel stored
 - ❖ Tanks, piping, and dispensers
 - ❖ Leak detection equipment
 - Leak detection equipment must be **functional** with new fuels
 - ❖ Most leak detection equipment in use not tested with alcohols

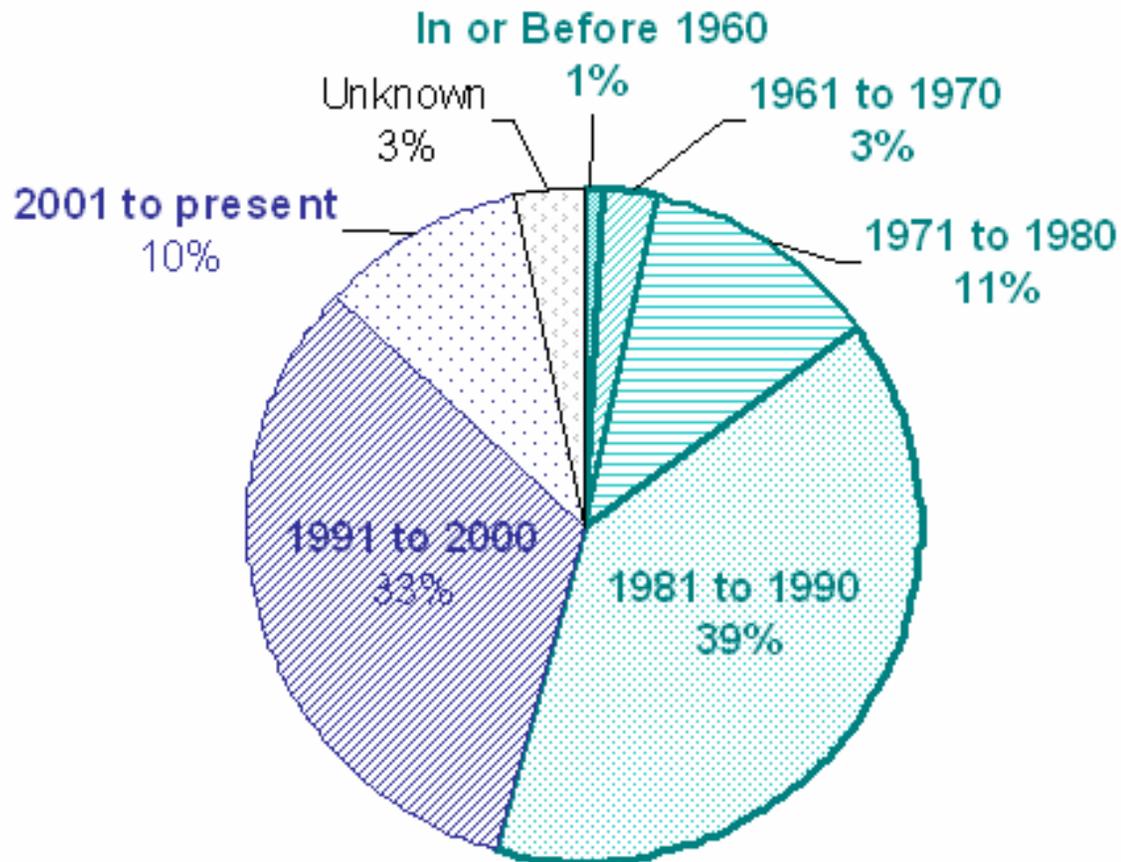
Biofuel Issues for UST Programs

- Preventing releases from USTs (continued)
 - Corrosion Issues
- Cleaning up releases from USTs
 - Need different models to characterize biofuel releases
 - May need different or modified cleanup techniques to remediate biofuel releases

UST System Compatibility

- Owners and operators must use a UST system made of or lined with materials that are compatible with the substance stored in the UST system.
 - TN- Alternative fuel forms needed for tanks with > 10% ethanol
 - TN- lined tanks may not be used to store E85.
- Many older UST system components were designed for petroleum fuels only.
- EPA data from 16 state databases shows that **~50%** of all tanks currently in the ground are **over 20 years old.**

Tank Installation Dates

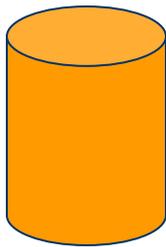


Water Affinity Issues

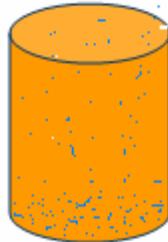
- Ethanol 100% soluble in H₂O and in petroleum fuels
- Ethanol molecule has greater affinity for H₂O than hydrocarbon
- As H₂O is introduced, ethanol molecule gravitates toward H₂O molecule and bonds form
- When ethanol reaches H₂O saturation point, phase separation occurs

Phase Separation

Ethanol
gasoline blend



Water added to
Ethanol gasoline
blend



Phase separation
occurs



Leak Detection Issues

- Leak detection equipment must function properly when used with alcohol-blended fuels
 - Current leak detection equipment is tested using old protocols (no ethanol)
 - Physical and chemical characteristics of ethanol may prevent some equipment from detecting releases, **or sensing water ingress.**
 - Ideally, any water intrusion would be detected before phase separation occurs.

Leak Detection Issues

- There does not appear to be a lot of research on water intrusion into ethanol blended fuels
 - Currently some leak detection product manufacturers are conducting their own research.
 - EPA doing some limited studies (ETV), although vendor participation has been slow.

Corrosion Issues

- Ethanol is more corrosive to metals than hydrocarbons- corrosive in liquid and vapor states.
- Accelerated corrosion noted in sumps.
- Good news – atmospheric corrosion - not likely to cause leaks in short term.

E-10 location in service 2 years



Regular Unleaded
sump

Corrosion on riser
pipe and pump (steel)

E-10 location in service 2 years



Corrosion on copper and brass components

Corrosion on riser pipe and pump (steel)

E-10 location in service 2 years



Diesel sump - no obvious corrosion

E-10 location in service ?



Corrosion on product piping

E-85 sump



Ethanol corrosion concerns

The introduction of alcohol blends may aggravate pre-existing conditions and introduce other corrosion challenges.



EPA Biofuel Activities

- RFS 2- final rule February 2010
 - 36 billion gallons of renewable fuel by 2022 (E10 & E85)
- E15 Waiver application
 - E15 would be stored in older UST systems if waiver granted
- Biofuel Research Efforts

Federal Mandates

The Energy Independence and Security Act of 2007 (EISA) established volumetric mandates for the use of renewable fuels sold in the U.S. EPA is required to develop and implement this program, known as “RFS2”

- The two most common “renewable fuels” in the U.S. today are **E10**, and **E85** (Flexible-fuel vehicles only).
- Two ethanol-related barriers face the RFS2 program:
 - 1) Limited E85 vehicle and refueling infrastructure prevents greater use of E85.
 - 2) Near saturation of the nation’s fuel at 10% ethanol means nation will not be able to meet the mandates unless higher blends (greater than 10%) are allowed.

E15 Waiver Application

- CAA, Section 211 provides statutory authority to register new fuels and fuel additives provided they meet two requirements:
 1. Does not increase emissions or cause damage to vehicle components over life of vehicle
 2. Does not have a negative health effect
- March 6, 2009—Growth Energy submitted a waiver petition **to increase the amount of ethanol to up to 15%**
- EPA is considering full vs. partial waiver.
- EPA deadline: Dec. 1, 2009, but deferred pending current research test results.

EPA Biofuel Research Efforts

1. DOE Material Compatibility testing
 - Materials Testing on coupons in stir tank
 - Immersion tests in different ethanol blends: E10 – E25
 - 4 weeks for metals and elastomers
 - 16 weeks for plastics (E25 only)

EPA Biofuel Research Efforts

2. Environmental Technology Verification (ETV) testing of leak detection equipment
 - Battelle Institute developing a Test Plan for ATGs
 - Test Plan may become new the test protocol for future ATG evaluations
 - Once ATG work is completed, project will focus on another leak detection category, most likely sensors.

Remediation Issues

- Ethanol makes BTEX more soluble in water
- Biodegradation of ethanol consumes oxygen, sulfate, and nitrate
- These factors lead to a lack of biodegradation of BTEX, and may lead to **longer BTEX plumes**
- Over long-term, ethanol degrades into **methane gas**, which may lead to safety issues





Thank You



Lamar Bradley
Tennessee Division of UST
(615) 532-0952
Lamar.Bradley@tn.gov