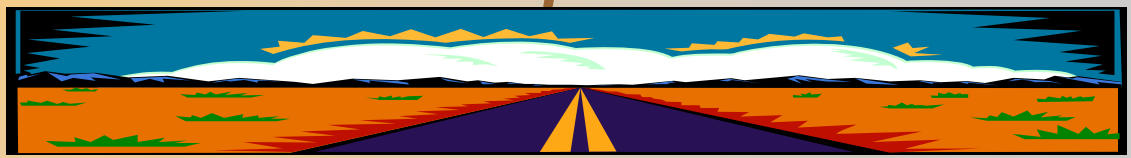
The New World of Alternative Fuels



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Alternative Fuel Overview

- Two main categories
  - Ethanol
    - Most common: E10 and E85
  - Biodiesel
    - Most common: B20

Alternative Fuel Overview

- *Concerns lie with ethanol blends greater than E10 and biodiesel blends greater than B20*
  - *E10 has been pretty common for years*
  - *E85 has become more prevalent due to accelerated phasing out of MTBE*

What is Fuel Ethanol?

- Contains 85% ethanol (E85)
  - 15% gasoline is added to render it undrinkable
- E85 gaining popularity due to recent amendments to the EPAct
  - Designed to encourage the use of alternative fuels

Advantages and Disadvantages of Ethanol Blends

- Improves air emissions
- Can improve octane
- Tax Incentives
- Less Dependence on Foreign Oil
- Compatibility Concerns
- Phase Separation
- Accelerated Corrosion
- Conductivity
- Reduced Fuel Economy

Compatibility Concerns

- Why should we worry about compatibility?
  - State and Federal rules require that " all equipment used for storing and dispensing motor fuels be compatible with the product being stored"

Compatibility Concerns

- Can't you use the same equipment that you use for regular unleaded gasoline?
  - The answer to this is "no." Ethanol blended fuel can cause system parts to degrade and dissolve over time.

Compatibility Concerns

- So what equipment within an alternative fuel system could have potential issues?

Equipment with Potential Compatibility Issues

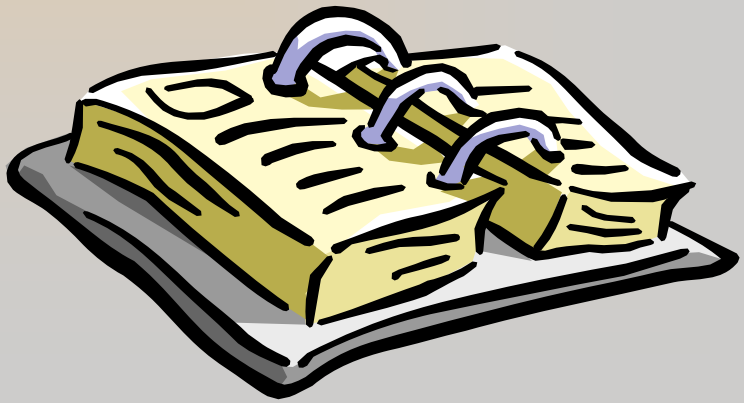
- Fill Pipes
- Spill/Overfill Devices
- Tanks and Piping
- Gaskets, Bushings and Couplings
- Sealants/Adhesives
- Flex Connectors/Boots
- Submersible Pumps
- Leak Detection Equipment
- Filters
- Shear Valves
- Hoses/Nozzles
- Sumps/Dispenser Pans

Equipment Concerns

- Why is all of this equipment affected?
  - Simply put, E85 is not compatible with soft metals such as aluminum, brass and zinc; many plastics, such as polyurethane and PVC; and certain resins used in older, lined tanks.

How can these concerns be addressed?

- Should be addressed at the initial installation stage
- Equipment is considered compatible if it is UL-listed for high blend fuels
- A manufacturer may also provide documentation

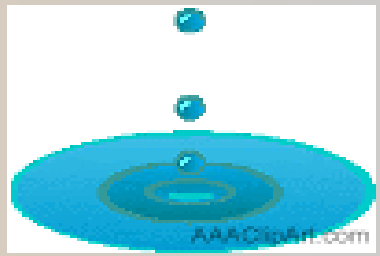


How can these concerns be addressed?

- Many components currently made are compatible
- Information regarding some components is not readily available
- An acceptable practice to make equipment compatible is nickel plating

Phase Separation

- What is “Phase Separation”?
  - When the ethanol in ethanol blends separates from the petroleum.



- When does this occur?
  - When even a small percentage of water enters the tank.

Phase Separation

- Why does it occur?
  - Ethanol is attracted to petroleum, but it has an even greater attraction to water because of similar chemical groupings.
- What happens when it occurs?
  - Customers may get a lower-octane fuel or a blend of ethanol and water.

Accelerated Corrosion

- Why does it occur?
  - Since ethanol acts as a scouring agent, it can loosen internal deposits and sludge.
  - Ethanol can accelerate an existing corrosion cell or plug in steel tanks.
  - Not cleaning the tank properly before introducing ethanol-blended fuels can lead to corrosion.

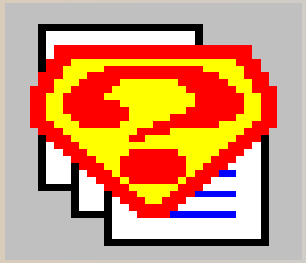
Conductivity and Fuel Economy

- Ethanol has a greater electrical conductivity than petroleum
  - Will impair the operation of capacitance ATG probes
  - Magnetostrictive probes will work but must be compatible
- Fuel Economy
  - Decreases by about 10 %

What should an inspector look for?

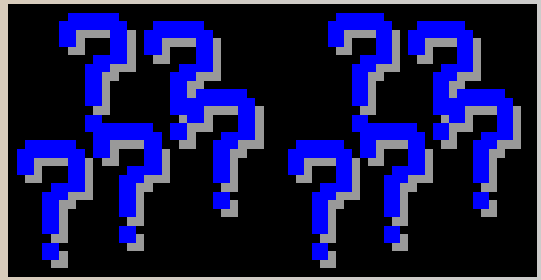
- Many components of an alternative fuel system can be checked when conducting inspections.
  - Fill Pipes, Drop Tube Shut Off Valves, Dispenser nozzles: No Aluminum!
  - Hoses: No Rubber!

What should an inspector look for?



- Fittings and caps are tight to keep water out
- Verify that the spill bucket does not contain water
- Ensure that the tank owner is checking sumps and spill buckets for water regularly

What should an inspector look for?



- Make sure that they are sticking the tank regularly to check for water
- Make sure that they are using the correct water-finding paste for use with ethanol
- Check for regular filter changes

What should an inspector look for?

- Automatic tank gauge is calibrated for use with E85 and is producing accurate results
- Check for signs of breakdown of visible equipment in use that may not be compatible
- Check for appropriate labeling indicating E85

What is Biodiesel?

- Produced from vegetable oils and recycled greases

- Can be used as a diesel fuel replacement
- Commonly added for lubrication
  - Blends from 1 % to 20%

Advantages and Disadvantages of Biodiesel

- Tax Incentives
- Less Dependence on foreign fuels
- Increased lubrication of engine parts
- Reduced air emissions
- Compatibility concerns (>B20)
- Cold flow
- Fuel Economy
- Solvency

Compatibility Concerns

- Potential equipment problems
  - Only evident for blends greater than B20
    - Hoses and Gaskets
    - Inappropriate filters may clog
    - Copper, brass, bronze, lead, tin and zinc
    - Some plastics

Other Biodiesel Concerns

- Cold Flow
  - May freeze or gel and clog filters
- Fuel Economy
  - B20 shows 1-2% decrease
  - Economy decreases with higher blends
- Solvency
  - May loosen/dissolve sediments in tank

What should an inspector look for?

- Signs of wear on hoses, gaskets and seals
- Regular filter changes
- Ensure that automatic tank gauge is properly calibrated for use with biodiesel and is producing accurate results
- Check for proper labeling

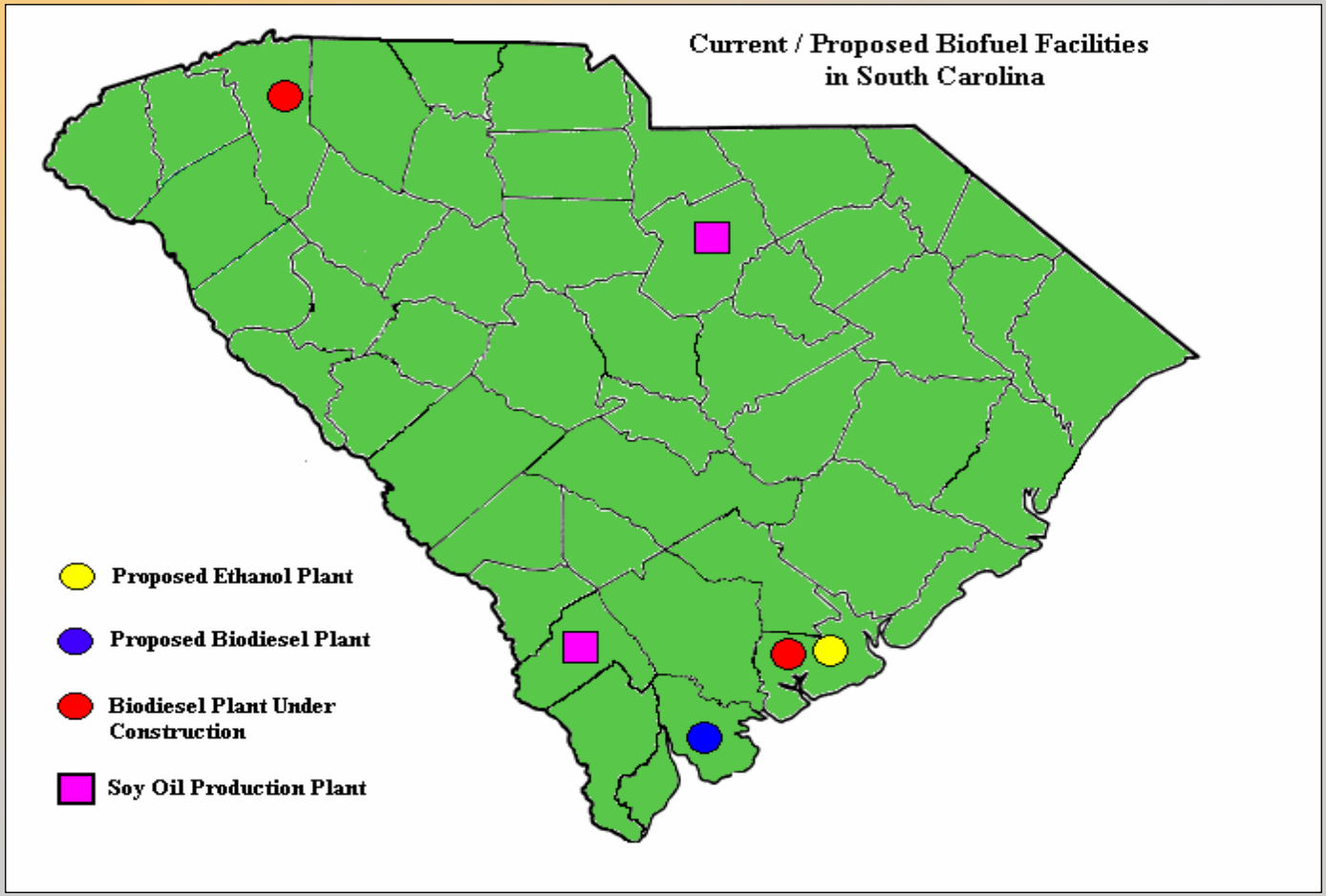
SC UST Program Alternative Fuel Initiatives

- Created Alternative Fuel Checklist and information sheet
- Established relationship with Palmetto Clean Air Coalition
- Created a reference notebook containing compatibility documents and research

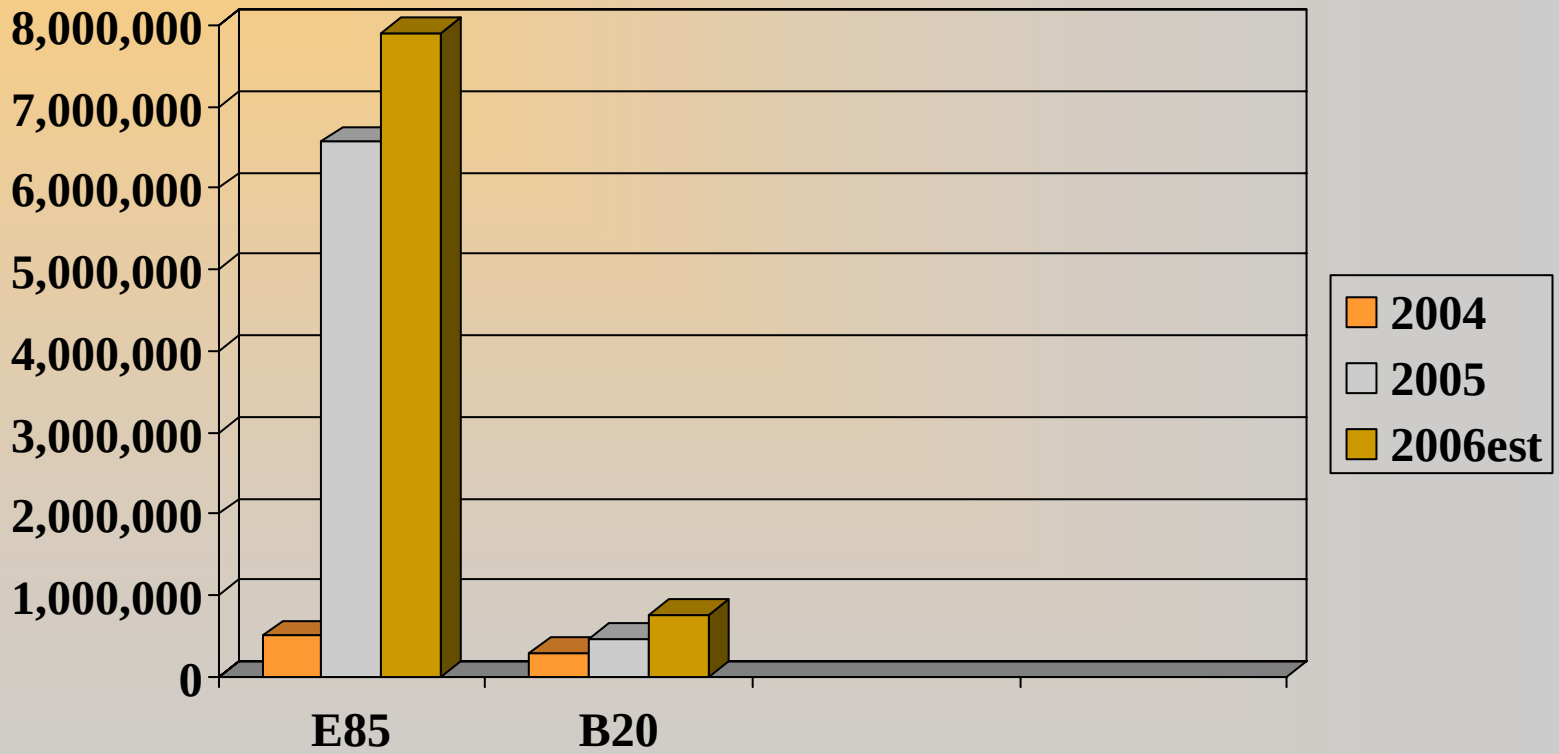
SC UST Program Alternative Fuel Initiatives

- Contacted tank owners who converted prior to checklist
- Established a program to track all facilities who use alternative fuels
  - Current SC E85 locations: 36
  - Current SC B20 locations: 37

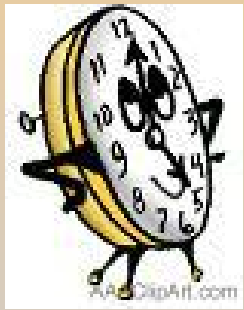
Current/Proposed Alternative Fuel Production Sites



SC E85/Biodiesel Consumption (Gallons)



Questions?



Thank you for your time!

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