

Ethanol Storage in Underground and Aboveground Storage Systems...What Owners Should Know

General Information

The use of Ethanol was promoted and legislated by the Energy Policy Act of 1992. It reduces our reliance on foreign oil, is good for the environment, improves air emissions, and can improve octane levels. It is sold in two main forms – E10 and E85. It can be used in any vehicle or small engine that uses conventional gasoline fuels, and is used as a fuel extender and octane improver with blends that are usually 10% ethanol and 90% unleaded gasoline. There is a growing shift to E85, which is usually in concentrations of 75-85% ethanol and 25-15% unleaded gasoline. While ethanol promotes more complete combustion, it has a lower energy ratio than gas, and it decreases fuel economy by 1 - 3%. It acts as a solvent, and is very soluble in water. However, E85 can only be used in “flex-vehicles” that are designed and manufactured to use E85.

Specific Issues Associated With E10

E10 can have a potential adverse effect on storage tank systems because of phase separation (mixing with water), corrosion, permeability, compatibility, and solvent action. Also, aged seals or gaskets may need to be replaced. Phase separation with E10 causes two liquid layers to form in the tank. The lower layer contains water and ethanol. The upper layer is the petroleum fuel with a small amount of ethanol. When phase separation occurs, customers will get a blend of ethanol and water that will adversely affect vehicle performance potentially stranding motorists at the pump. Also, **marina owners take note** - there has been a high incidence of problems reported by boat owners using E10, particularly with older fiberglass fuel storage tanks.

Tank owners will have a greater potential for corrosion problems, particularly as water and contaminants enter the fuel system. Soft metals such as zinc are most vulnerable, followed by elastomers, polymers, rubber, polyurethane, and dissolved alcohol based glues and pipe sealants. Owners considering converting existing petroleum fuel tanks to E10 use should thoroughly clean, de-water, and inspect tanks before conversion. A housekeeping and surveillance program should still be implemented to monitor for the presence and effects of water, sludges, and other contaminants.

Specific Issues Associated With E85

The storage and distribution of E85 has a much more significant potential adverse effect on storage tank system components that are in continuous contact with E85, and can potentially contaminate vehicle fuel tanks. E85 can corrode soft metals such as aluminum and zinc and the more cathodic metals such as brass, copper, and lead. It can act as a scouring agent that can loosen internal deposits and sludge. E85 can accelerate an existing corrosion in steel tanks. Not cleaning the tank properly before introducing E85 can lead to loss of product.

E85 is not compatible with many plastics, and certain resins used in older, lined tanks. E85 can impair the operation of Automatic Tank Gauges and probe floats, and destroy the sealing ability of some materials such as cork, rubber, and leather. Phase separation can occur, and filter maintenance is an important issue because improperly sized or efficiency rated fuel filters may allow contaminants and corrosive element from the tank to enter the vehicle fuel system during fuel transfer.

Equipment Recommendations for E85 Systems

Tanks should be double-walled and must be either steel, fiberglass-jacketed steel, or UL-listed fiberglass. Existing submersible turbine pumps cannot be used, but newer alternative fuel pumps are available. Existing mechanical line leak detectors are compatible, however, existing inventory probes are not. Owners must purchase approved alternative fuels probes that are available from major ATG manufacturers. Existing spill buckets are acceptable in most cases and are typically stainless steel, cast iron, nylon, and polyethylene. Most existing overfill drop tubes are not compatible since they are aluminum. Nickel plated metals are recommended.

For piping, steel and UL971-listed polyethylene flexpipe and semi-rigid pipe are compatible with ethanol. The glue utilized for joints is a problem with fiberglass piping. Fiberglass piping installed prior to 1991 needs to be verified with the manufacturer to assure compatibility with E85. All fittings and connectors in contact with E85 fuel should be made of materials like stainless steel, black iron, or bronze. If aluminum or brass fittings are used, they must be nickel plated. Dispensers are the most significant problem area. Many traditional materials utilized in the past (aluminum, brass, copper, leather, cork, rubber) may be of a certain alloy or chemical composition to not be compatible with E85. Most existing dispenser hoses are compatible, but the nozzles, swivels, breakaways, and filters are not. Electrode-less nickel plated aluminum nozzles are recommended, and bare aluminum nozzles should not be used with E85.

Recommendations for Owners for E85 Systems

Tank owners converting existing gasoline/diesel fuel storage tank systems to E85 should verify with the manufacturer that the system components are compatible with E85 and use only E85 compatible equipment from tank to dispenser nozzle. Owners should inspect their systems and make sure the tank and lines are thoroughly cleaned of water and sediment. They should check their tanks carefully for loose rust, sediment, and rust plugs because E85 may dissolve the rust plugs and cause tank leaks. They should install "one (1) micron dispenser filters" with an appropriate and verifiable filter efficiency rating of at least 95%, ensure that the hose is E85 compatible, and use nickel plated aluminum nozzles. Owners with converted E85 storage tanks systems should look for aluminum fill pipes, drop tube shut-off valves, and dispenser nozzles, and verify that dispenser hoses are not made of rubber.

Florida owners considering the storage of E85 in underground or aboveground storage systems should install new equipment that is designed and constructed to be ethanol compatible. They should talk to the manufacturer/installer about material compatibility and warranty issues before they purchase the equipment and confirm that everything in the system is compatible with E85 and will work as designed. All dispensers should be UL listed for ethanol. After installation, owners should keep a vigilant watch for water or condensate in the storage tank system. They should check to see if fittings and caps are tight to keep water out, verify that the spill buckets do not contain water, and regularly check sumps and spill buckets for water. Owners should also install filters with the proper pore size and efficiency to protect against transferring contaminants to customer vehicles. Special care should be taken to document operations, maintenance, and repairs. They should see if the automatic tank gauge is calibrated for use with E85 and is producing accurate results. Finally, owners should check for signs of breakdown of visible equipment in use that may not be compatible, for signs of wear on hoses, gaskets and seals, and for appropriate labeling indicating E85.