

Biofuel compatibility with underground storage tank systems

Concern and issue

Minnesota leads the nation with the most facilities dispensing biofuels. The biofuel industry is expected to grow even further with increasing blends of ethanol and biodiesel entering the marketplace. National studies have shown certain metallic and non-metallic materials, which comprise a traditional underground storage tank (UST) system, may not be compatible with higher blends of ethanol and biodiesel.

The Minnesota Pollution Control Agency's (MPCA) mission is to protect and improve the environment and enhance human health. State agencies, including the Department of Agriculture, Department of Commerce, and the MPCA, support the Minnesota biofuels industry as a means to achieve cleaner air, promote energy independence, and stimulate economic development.

The MPCA is also responsible for ensuring compliance with applicable state and federal environmental regulations. For UST systems, this means keeping fuel products contained within the UST system and preventing releases to groundwater.

Phase separation

Ethanol blends well with gasoline but is very miscible (mixable) in water. When water intrudes a UST, the ethanol in the ethanol-gasoline blend will absorb the water. If enough water is present, it will overwhelm the ethanol's ability to remain blended with the gasoline.

Because ethanol mixes easier with water than gasoline, the ethanol will be drawn from the gasoline into the water at the bottom of the tank, separating from the gasoline. The product in the tank is no longer a blend of ethanol and gasoline, but two layers – a layer of gasoline on top, and an ethanol-water layer on the bottom. Phase separation can be a problem for vehicles and the storage tank systems.

Compatibility

All UST systems must be compatible with the substance stored. Biofuels can corrode soft metals such as aluminum, zinc, and the more cathodic metals such as brass, copper, and lead. It can act as a scouring agent on steel tanks and piping, which can loosen internal deposits and sludge. If internal corrosion exists, the biofuel can accelerate the corrosion and cause a failure of the metal tank or piping.

Biofuels may also degrade many non-metallic materials such as natural rubber, polyurethane, older adhesives, certain elastomers and polymers used in flexible piping, bushings, gaskets, meters, filters, and cork materials.

Tank leak detection equipment composed of certain materials may not be compatible with higher blends of biofuels. Because ethanol has a higher conductivity than gasoline, certain probes will not work in ethanol-blend fuels. Tank owners and operators should verify that the floats used are alcohol compatible and that the ATG system is properly calibrated for the ethanol blend.

All underground storage tank (UST) systems must be compatible with the substance stored and dispensed regardless of the blend level. Tank owners/operators who wish to store ethanol blends greater than 10% or biodiesel blends greater than 20% must demonstrate compatibility of equipment, that is either: 1) listed by a nationally recognized, independent testing laboratory for use with the fuel stored, or 2) approved by the manufacturer to be compatible with the fuel stored.

Converting or installing UST's to store higher biofuel blends

The conversion to ethanol blends greater than 10% and biodiesel blends greater than 20% will require time and effort to evaluate existing equipment and verify compatibility. 30 days prior to introducing a biofuel blend greater than E10 or B20, you must complete and submit the MPCA UST change in status form which can be found at <https://www.pca.state.mn.us/sites/default/files/t-u5-04b.pdf>. Within 30 days of introducing an ethanolblend greater than 10%, or biodiesel blend greater than 20%, you must complete and submit the MPCA Alternative Fuel Compatibility form which can be found at <https://www.pca.state.mn.us/sites/default/files/t-u5-09.pdf>

Please consult with your tank contractor when the conversion takes place and for assistance in filling out the form.

The process involved in converting an existing UST system to store higher blends of biofuels is critical. Many resources are available to help guide you through this process including the American Lung Association checklist and the NREL E85 handbook.

The following equipment/components/materials must be compatible with the biofuel blend you intend to store and dispense:

- Tank
- Piping
- Drop tube
- Spill bucket
- Overfill equipment
- Submersible pump
- Suction pump
- Leak detection, probe, float & sensors
- Line leak detector
- Interstitial sensors
- Sump sensors
- Sumps
- Grommets/boots
- Flex connectors
- Gaskets
- Bushings
- Couplings
- Pipe sealant
- Dispensers and hanging hardware

Additional information

You can find additional information concerning biofuel compatibility and converting to higher blends of biofuels at the following websites:

U.S. Environmental Protection Agency, Emerging Fuels and USTs– <https://www.epa.gov/ust/emerging-fuels-and-underground-storage-tanks-usts>

U.S. Environmental Protection Agency, Biofuels Compatibility Resources – <https://www.epa.gov/ust/biofuels-compatibility-resources>

American Lung Association of the Upper Midwest -<http://www.cleanairchoice.org/fuels/e85.cfm>

Association of State and Territorial Solid Waste Management Officials -
http://www.astswmo.org/files/policies/Tanks/2016-05-ASTSWMO%20Compatibility%20Considerations%20for%20UST%20Systems_FinalReport-v2.pdf

National Renewable Energy Laboratory, E85 Handbook -
https://afdc.energy.gov/files/u/publication/ethanol_handbook.pdf

Renewable Fuels Association, E15 Retailer Handbook - <https://ethanolrfa.org/wp-content/uploads/2015/09/RFA-E15-Retailer-Handbook-Update-Jan-20131.pdf>