

Storing and Dispensing E85

Guidelines for storing and dispensing an alternative fuel.

The increasing interest in alternative fuels tends to focus on the vehicles and the various fuels used to power them. E85—a blend of gasoline and up to 85 percent ethanol by volume—is in the forefront of discussions on alternative fuels, and if it becomes as widely used as predicted, numerous local governments will be required to both store and dispense the fuel to their municipal fleets. Although all local governments are familiar with handling diesel and gasoline fuels, E85 requires at least some special considerations.

The same technologies used to store and dispense gasoline and diesel fuels are used for alcohol-based fuels because, like gasoline, they are liquid at ambient pressures and temperatures. However, only E85 compatible materials should be used in the storage and dispensing systems.

Most operating problems with ethanol-fueled vehicles have been traced to contaminated fuel. Consequently,

choosing the right materials for fuel storage and dispensing systems and following proper fuel-handling procedures are crucial for successfully operating ethanol-fueled vehicles.

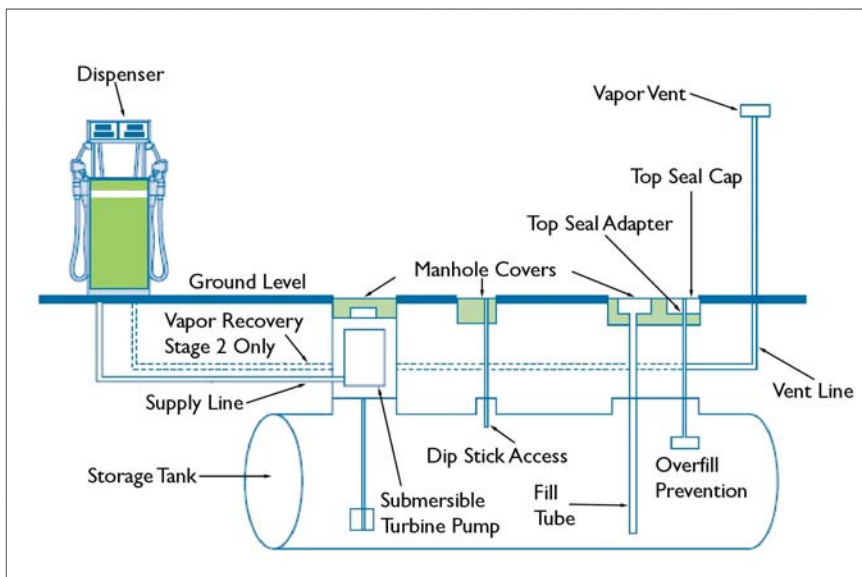
In many cases, existing gasoline and diesel fuel systems may also be used to store and dispense E85. Most metal underground storage tanks that meet EPA codes can be used to store E85. Many underground fiberglass tanks that meet the EPA standards may also be used to store E85. However, fiberglass storage tanks manufactured before 1992 should not be used with E85. If you are considering the use of an existing fiberglass underground storage tank (UST) that was manufactured before 1992, contact the National Ethanol Vehicle Coalition at www.e85fuel.com for additional information.

If an existing UST will be used to store E85 and if the tank is either metal or fiberglass that is certified for

E85, the following steps should be taken.

CLEANING TANKS. If another type of fuel was stored in the tank you are planning to use for E85, the tank must be cleaned. During storage, particles and moisture can build up over time to form sludge or what is called “water bottoms.” Since ethanol is miscible with water, when introducing E85 or another ethanol blend into a dirty storage tank, ethanol’s “cleaning action” will mix with the water bottoms and remove the sludge and result in contaminated fuel. A simple tank cleaning will prevent any problems. There are several methods for cleaning sludge from storage tanks. A certified and bonded company that is familiar with cleaning petroleum storage tanks must complete each of the cleaning methods listed here.

- **OpticSweep™** (Optic Fuel Clean, Inc, www.cleanfuelguys.com). This patented system uses a fiber optic camera and controllable probe with an extraction device that can visually inspect and clean fuel storage tank bottoms at any fuel level and with no tank downtime. The OpticSweep can locate and remove water, sludge, bacteria, rust particles, and sediment while pumping continues.
- **Steam Cleaning.** This involves physically entering the tank, steam cleaning it, and removing sludge. Care must be taken to properly dry the tank.
- **Filter Agitator.** The agitating device is lowered into the tank. The fuel and any debris are agitated and circulated. A filtration system removes the suspended debris.
- **Chemical Solvents.** Chemical solvents are used to remove scale and debris. Liquid and debris are then pumped from the tank and disposed.



Typical E85 underground storage system.

Choosing the appropriate cleaning techniques will depend on your particular situation, the type of fuel that has been stored in the tank, availability of the service, and state and local environmental regulations.

UNDERGROUND TANKS. You can use double-walled, low-carbon, cold-finished steel tanks, but welded tanks are preferable and must be corrosion protected to meet EPA requirements. Do not use plated-metal tanks. Pre-1992 single- and double-wall fiberglass tanks may be used when listed by Underwriters Laboratories, Inc. (www.ul.com)

ABOVEGROUND TANKS. Several companies manufacture aboveground storage tanks that may be used for E85. Generally, above-ground storage tanks are smaller than USTs and are typically installed in capacities of 1,000 to 2,000 gal. Tanks may be constructed of stainless steel, cold-finished steel, or fiberglass. The use of plated metal tanks is generally not recommended.

Dispensers

Companies that produce E85 compatible pump dispensers can be found at www.pei.org/e85/. The E85 dispenser must use iron, unplated steel, or stainless steel in the fuel path. In the case of vane-type pumps, avoid impellers made from soft metals (zinc, brass, lead, aluminum). Steel or an engineering polymer with a high chemical resistance will give excellent results. Use of non-compatible dispenser materials may lead to premature meter inaccuracies and introduction of contaminants into the fuel.

Dispenser hoses, nozzles, and fitting connectors are the same for above-ground and underground fuel-storage systems. Avoid any components made from zinc, brass, lead, aluminum, or other soft metals; the ethanol fuel may cause leaching from such soft metals, which may contaminate the vehicle's fuel system and could potentially result in poor vehicle performance.

FILL PIPES. Fuel enters the fueling site dispensing system at the point the fuel is "dropped" from the truck through the storage tank fill pipe. Over the last several years, major component manufacturers, such as OPW ([\[fc.com\]\(http://www.opw-fc.com\)\), have converted many of their gaskets, tubes, adapters, piping, and shear valves to be compatible with ethanol blended gasoline and E85. Anodized coatings or components made of cast-iron or stainless steel are available to use with E85.](http://www.opw-</p></div><div data-bbox=)

PUMPS AND LEAK DETECTION EQUIPMENT. Pressurized and suction fueling systems require different types of leak detection equipment. Suction systems have a pump within the fuel dispenser, while pressurized pumps pump the fuel out of the tank to the dispenser. Typically, pressurized systems will require both continuous and periodic leak detection as well as other line tightness testing and other precautions. If a suction system has a check valve solely at the dispenser, leak detection testing may not be required, and there may be fewer line testing requirements.

PIPING. The best choice for underground piping is non-metallic, corrosion-proof pipe. New fiberglass pipe should pose no problems when used with E85 systems; however, ask for a product that has been tested for alcohol compatibility (ethanol and methanol) according to UL971. Schedule 40 black iron pipe and galvanized pipe may be used, but will require corrosion protection. Pipe thread sealant, when needed, must be a Teflon tape or Teflon-based pipe-thread compound. If secondary piping is needed, thermoset reinforced fiberglass or thermoplastic double-wall piping should be used.

FUEL FILTERS. The dispenser filter is the last line of defense before the fuel reaches a vehicle's tank. Typically, a 30-micron filter is used with diesel fuel and a 10-micron filter is used with gasoline. E85 dispensers should use a 1- or 2-micron filter. The smaller pores will prevent contaminated fuel from causing fuel pump and engine problems. This is especially important with tanks that have been converted to E85.

HOSES. Dispenser hosing for E85, as with gasoline, will vary with the type of vapor recovery system that is required in your area. Stage II vapor recovery systems require different fueling hose systems than do areas with Stage I-only systems. For E85, always use the hose with the highest resistance to alcohol, as some

E85 will always be in contact with the inside of the hose. Goodyear Tire & Rubber Company (www.goodyear.com) is one well-known producer of alcohol-resistant hoses. Any hose material deemed to be "100 percent methanol compatible" will be safe to use with E85, as methanol can be considerably more corrosive.

NOZZLES. Do not use aluminum nozzles with E85 fueling systems. Several companies manufacture stainless steel or nickel-plated nozzles that are compatible with E85. These may be slightly more expensive than the more common aluminum variety.

FITTINGS AND CONNECTORS. All fittings, connectors, and adapters that will be in contact with the fuel blend should be made of materials like stainless steel (best choice), black iron, or bronze to avoid degradation. If aluminum or brass fittings are used, they must be nickel-plated to avoid any contact between the bare metal and the fuel ethanol.

Signs. Tanks containing ethanol fuel must be labeled. A bronze pentagon with "E85" in black must label the fill box and fill box cover.

The E85 labels should be placed on the fill boxes and fill box cover in one of the following ways:

- Paint the decal on the top of the cover or on the rim of the fill box.
- Attach a tag to the fill pipe adapter.
- Screw a tag into the fill box rim.
- Fit a plastic or fiberglass insert into the rim of the fill box.

Each state, along with the U. S. Department of Transportation, has developed signage to place at refueling stations. You should contact your state department of transportation to obtain the correct signage for your area.

The Federal Trade Commission requires a small sticker to be placed on the face of the fuel-dispenser as close as possible to the price per unit of fuel. The sticker should have a black background with orange text. You may receive one of these stickers by contacting the National Ethanol Vehicle Coalition at nevcc@e85fuel.com or calling 877-485-8595.

E85 Quality Assurance

Once your E85 refueling station has been installed, taking simple operational precautions can assure fuel quality. Periodically checking the fuel properties will avoid costly damage to vehicles operating on E85. Some of these checks may be performed in the field, but others may require the services of a specialized laboratory. A list of some of these laboratories may be obtained by visiting the Alternative Fuels Data Center E85 Fleet Toolkit at www.eere.energy.gov/afdc/e85toolkit/.

After the refueling station has reached normal operation, test the fuel periodically. At a minimum, the following items should be checked every one to two months, depending on how frequently the station is used:

- Electrical conductivity.
- Particulate content.

- Hydrocarbon content.
- Reid vapor pressure.

Shipping Procedures

To ensure the high quality of your fuel, it may be wise to occasionally send a sample to a laboratory for analysis. Your fuel provider may be able to recommend a laboratory in your area that can perform this type of test. To safely ship a sample of the fuel, follow all of your shipper's requirements for hazardous materials. Be sure that the following information appears on the outside of the package:

- DOT Shipping Name: Alcohol n.o.s. (ethanol, gasoline).
- Identification Number: UN 1987.
- Diamond Labels: Flammability 3.
- Label: "Flammable Liquid."

- Arrow Label: "This End Up."

Using a one-gal container compatible with ethanol is recommended. The SturdeeSeal UN 4G (American Labelmark Company, www.labelmaster.com) gasoline combination package is one product on the market that has been successfully used for this purpose. The combination package contains an unmarked one-gal metal can with an epoxy phenolic lining, fiberboard, polyethylene bag, and closing tape.

The preceding was excerpted from *Handbook for Handling, Storing, and Dispensing E85*, prepared by the National Renewable Energy Laboratory, a Department of Energy national laboratory, with the assistance of the National Ethanol Vehicle Coalition. The full handbook is available at www.e85fuel.com/pdf/storing-handling-e85.pdf. 