

Storing and Dispensing E85 and E95

Experiences from Sweden and the US.

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Target groups: Organisations and companies that want to set up a fuel station for E85 or E95 fuel.

Storing and Dispensing E85 and E95

Fuel Storage and Dispensing

These guidelines for storing and dispensing E85/95 are based on the experiences from Sweden and the US. The technology for storing and dispensing petrol can be applied to alcohol fuels such as E85/95 because alcohols and alcohol blends, like petrol, are liquid fuels at ambient pressures and temperatures. However, only E85/95-compatible materials should be used in the storage and dispensing systems. Most operating problems with ethanol-fuelled 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-fuelled vehicles. Although material research and testing is expected to continue, the parts and materials discussed in these guidelines have performed well with E85/95. They can be obtained from your usual supplier.

Materials Recommendations

As with all liquid fuels, it is vitally important that proper fuel handling techniques is being practiced to prevent fuel contamination. Materials commonly used with petrol are totally incompatible with alcohols. When these materials (such as aluminium) come in contact with ethanol, they may dissolve in the fuel, which may damage engine-parts and may result in poor vehicle driveability. Even if parts do not fail, running an ethanol-fuelled vehicle with contaminated fuel may cause deposits that could eventually harm the engine.

It is vitally important to take in consideration the fact that E85/95 is corrosive. The suppliers' concerned have show a certificate or other kind of documentation that the material is compatible to fuel ethanol.

The following sections describe parts and equipment that are compatible and noncompatible with fuel ethanol. The compatible materials should be available from your usual petroleum equipment supplier.

Materials COMPATIBLE with fuel ethanol

Metallic:

Unplated steel, stainless steel, black iron, and bronze.

Nonmetallic materials:

Nonmetallic thermoset reinforced fiberglass, thermo plastic piping and thermoset reinforced fibreglass tanks as listed by Underwriters Laboratories, Inc. Buna-N, Neoprene rubber, polypropylene, nitrile, Viton, and Teflon materials.

Materials NONCOMPATIBLE with fuel ethanol

Metallic:

Zinc, brass, lead, and aluminium Ternary (lead-tin-alloy)-plated and steel lead-based solder.

Nonmetallic materials:

Natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics, and certain thermo and thermoset plastics.

IMPORTANT!

Before planning any fuel storage system, check your local building and fire codes.

The method you use will depend on your particular situation, national and local environmental regulations.

Storing Fuel Ethanol:

Using Existing Fuelling Systems

In many cases, existing petrol, diesel, or other hydrocarbon fuelling systems may also be used to store and dispense fuel ethanol. An existing underground storage tank can be used to store E85/95 if the tank is either metal or fibreglass that is certified for E85/95. If another type of fuel was stored in the tank that will be used for the E85/95, it must be cleaned because storing petrol underground causes some particulates to settle out and form sludge. Introducing alcohol into these tanks will place this sludge into suspension and will lead to serious problems.

Materials to use for underground tanks

Welded tanks are preferable and should be corrosion protected. You can also use double-walled, low-carbon, cold-finished steel tanks.

Materials to use for aboveground tanks

Aboveground tanks may be constructed of stainless steel, cold-finished steel, or fibreglass. The use of plated metal tanks is generally not recommended. Several companies manufacture aboveground storage tanks that may be used for E85/95. Generally, aboveground storage tanks are smaller than underground storage tanks and are typically installed in capacities of 1000 to 5000 litre.

Dispensers

The E85 dispenser must use iron, unplated steel, or stainless steel in the fuel path. Steel or an engineering polymer with a high chemical resistance will give excellent results. In the case of vane-type pumps, avoid impellers made from soft metals (zinc, brass, lead, aluminium). Companies that produce E85/95-compatible pump dispensers include Tokheim Corporation, Dresser Wayne, Autotank and Bennett Pump Company.

General Dispensing Equipment

In-Line Filters.

A 1-micron, in-line filter is recommended for fuel ethanol dispensing equipment. This size filter will trap most of the debris and impurities that might be present in the storage tank and prevent them from being transferred to the vehicle during refuelling. Number of companies produce 1-micron E85/95-compatible fueling filters.

Dispenser Hoses.

The type of hose used for dispensing E85/95 depends on the type of *Nozzles*. A nickel-plated nozzle is the best choice. Aluminium nozzles should not be used with E85/95, and nozzles made from any aluminium alloy must be used with caution.

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 aluminium or brass fittings are used, they must be nickel plated to avoid any contact between the bare metal and the fuel ethanol.

Piping.

The best choice for underground piping is non-metallic corrosion free pipe. Do not use conventional zinc-plated steel piping for fuel ethanol. Pipe thread sealant, when needed, must be Teflon tape or Teflon based pipe-thread compound. If secondary piping is needed, thermoset reinforced fiberglass or thermoplastic double-wall piping should be used.

Fire Safety Considerations

Fuel ethanol fires generally release less heat than petrol fires, but any fires should be taken seriously. Use a dry chemical extinguisher. An alcohol-type or alcoholresistant (ARF) foam may be used to effectively combat fuel ethanol fires. Avoid detergent foam.

Costs

The costs will of course vary depending on the circumstances that apply to the establishment of an ethanol fuelling station. To establish a new complete station for ethanol refuelling, including a 50 m³ tank, cost around 42 000 Euro¹. In the case of a 20 m³ tank the cost would be about 32 000 Euro. Treating the inside of an existing tank so that it can be used for ethanol costs about 7400 Euro for a 50 m³ tank and about 4800 Euro for a 20 m³ tank. Exchanging the connection between tank and pump costs about 26 Euro per meter, excluding the necessary digging. A new dispenser costs about 5 000 Euro.

¹ All prices based on costs in Sweden 2005.

More information:

Handbook for Handling, Storing, and Dispensing E85. National Renewable Energy Laboratory (NREL) www.e85fuel.com

Tokheim Corporation, www.tokheim.com

Dresser Wayne, www.wayne.com

Autotank, www.autotank.com/english/company

Bennett Pump Company, www.bennettpump.com

Petroleum Equipment Institute, Ethanol Compatible Equipment Guide, www.pei.org/e85/

BioAlcohol Fuel Foundation, Charlie Rydén, charlie.ryden@baff.info , www.baff.info,

City of Stockholm, Environmental and Health Administration, Eva Sunnerstedt, eva.sunnerstedt@miljo.stockholm.se , www.miljobilar.stockholm.se