



# NC CLEAN ENERGY TECHNOLOGY CENTER

Advancing Clean Energy for a Sustainable Economy

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## Becoming an E85 Fuel Provider:

### Why sell E85 (85% ethanol/15% gasoline)?

- There are approximately 14 million E85 compatible flex-fuel vehicles (FFVs) on US roads, which can operate on either gasoline or ethanol blends up to 85%. All major US automakers sell FFVs, most often with no additional cost to the purchaser.
- Consumers interested in energy independence and the environment want cleaner burning fuels that reduce our dependence on fossil fuels and support agricultural interests.
- Tests have shown that E85 reduces carbon monoxide as well as harmful hydrocarbon and benzene emissions. On a life cycle basis, corn-based E85 can reduce greenhouse gas emissions up to 52% (DOE AFDC).

### What are the differences between gasoline and ethanol fuels?

- E85 vapor is less flammable than gasoline (above 35°F).
- E85 contains 27% less energy per gallon, but increases power 3-5%. It also has a higher octane number (ranging from 100 – 110) compared with 87 for gasoline.
- Ethanol readily absorbs water, which requires certain precautions to ensure the fuel quality is not compromised with moisture and makes it incompatible with certain materials.
- For more detailed information about the differences, distributors should review the DOE's Handbook for Handling, Storing, and Dispensing E85. (<http://www.afdc.energy.gov/pdfs/48162.pdf>)



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# Developing an E85 fuel dispensing facility in North Carolina:

## Underground Storage Tank Systems

Permit forms for Underground Storage Tanks (USTs) are available under the Permits section at:

<http://portal.ncdenr.org/web/wm/ust/forms#PIB>. The UST- 20 “[Alternative Fuel Compatibility Checklist](#)” form insures E85 compatibility by requiring applicants to provide Underwriters Lab (UL) numbers, manufacturer approval, or approval by a Professional Engineer (PE) on all components (not including the dispenser) of an underground storage tank system.

The following “rules of thumb” can help determine the potential for an existing site to be converted to E85

Materials NOT to be used with Ethanol	
<b>Non-metals</b>	<b>Metals</b>
Natural Rubber	Zinc
Polyvinyl Chloride (PVC)	Brass
Cork gasket material	Lead
Leather	Lead-based solder
Polyurethane	Aluminum
Polyamides	Terne-plated steel
Methyl-methacrylate plastics	
Certain thermo and thermoset plastics	

- Most fiberglass (FG) tanks, pipes and adhesives used to seal/connect pipes are compatible. Single-or double-wall fiberglass tanks are non-corrosive and may be used for storing fuel ethanol if approved by UL. Xerxes and Owens Corning (now Containment Solutions) are the primary manufacturers of FG tanks. FG tanks manufactured prior to 1992 MAY NOT be able to handle E85. Smith and Ameron are primary piping manufacturers of FG piping. Anything made by Smith after 1984 is E85 compatible including adhesives.
- Flex pipe systems are generally compatible. APT (Franklin Fueling Systems) and OPW are primary manufacturers. No sealant is required in these installations. Steel piping is likely NOT compatible because sealant used on steel pipes is not compatible.
- Ends of pipes can be a concern (pump, flexible steel connector) but costs are in the \$100's not \$1000's.
- Most metal underground storage tanks that meet EPA December 1998 codes can be used to store E85. Underground tank systems can use double-walled, low-carbon, cold-finished steel tanks, but welded tanks are preferred and must be corrosion protected to meet EPA requirements. Do not use plated-metal tanks.

## Above Ground Tank Systems

An above-ground system can be typically installed at a lower cost if all regulations and fire-codes are met. As with the underground systems, stainless steel, cold-finished steel, or fiberglass tanks are recommended and must meet the requirements for storing ethanol. The aboveground tank sizes are typically smaller than the underground tanks with capacities of 1,000 to 2,000 gallons, but can be 5,000 or 10,000 gallons if regulations and spacing allow. It is important to consider your ethanol supplier when deciding upon a size of tank because the cost per gallon may increase significantly for orders less than a full tanker (typically 7,000-7,500 gallons).

## **E85 dispensers**

As of the date of this factsheet, UL has certified the following dispensers as E85 compliant equipment:

- Gilbarco: Encore Series 300, 500, and 550
- Dresser Wayne : G520, G610, G620, Ovation E, EB12, EB23

North Carolina's State Fire Marshal (who, along with local inspectors, has authority over dispensing equipment) requires that, in lieu of any 3<sup>rd</sup> party verification (UL), entities wishing to install or retrofit a pump to dispense E85 must get a NC Professional Engineer (PE) to attest to the compatibility of the new and/or retrofitted dispenser pump.

In addition to assuring compatibility of meters, electronic board, seals, gaskets, and internal piping a dispenser that is E85 compatible must:

- Switch out the necessary dispenser components (non-aluminum nozzle, ethanol compatible breakaways with a Teflon-lined hose with stainless steel ends and fittings)
- Add the 1-micro (instead of 10-micron gasoline) in-line filter, ~\$400.

Contact the following for more information:

Protec Fuel Management - Steve Walk,  
(651) 442-7240, [steve@protecfuel.com](mailto:steve@protecfuel.com)

Jones & Frank Fluid Handling Equipment  
- Steve Bernstein, (704) 393-8542 x3913

**Senate Bill 567** ratified by the NC General Assembly on 6/5/07 allows E-blends, including E85, to be dispensed from any equipment certified for gasoline or E10 provided manufacturer has initiated the process of third party verification of E85 compatibility or has compatibility statement from manufacturer.

## **Converting an existing gasoline or diesel fuel dispensing facility to E85:**

A suitable tank must be cleaned completely before switching fuels. When preparing a tank for E85, follow these steps:

- Pump all remaining fuel out of the bottom and any moisture that may have accumulated
- Clean the tank walls by: using a filter agitator device, physically entering the tank and steam cleaning the sludge, using a robotic cannon to liquefy the sludge, or using a chemical cleaner
- Pump out the sludge that was cleaned from the tank walls, and dispose of properly
- Add 100 gallons of E10 (10% ethanol 90% gasoline) and then pump out all E10 and any remaining residue. Add and sell out 500 gallons of E10. E10 is fully compatible with any gasoline engine.

This last step is recommended, but not always necessary. This cleaning process to prepare the tank for E85 storage should cost \$500 - \$800.

## Financial Incentives & Considerations :

The federal Renewable Fuel Standard (RFS) requires an increasing amount of renewable fuel to be incorporated into the U.S. fuel mix. By 2022 a total of 36 billion gallons will be required. To meet the RFS, biofuels such as ethanol and biodiesel are tracked through a Renewable Identification Number (RIN) system. RINs are purchased by obligated parties such as petroleum refiners. As an E85 marketer there is an opportunity to sell RINs by becoming the “blender of record”. Marketers who wish to resale RINs must first register with the EPA at :

<http://epa.gov/otaq/fuels/reporting/programsregistration.htm>

## Signage

All parts of the E85 fueling system must be properly labeled to identify the percentage of ethanol in the fuel for federal requirements and vehicle owners. These include a bronze pentagon decal with “E85” in black on the tank fill box and fill box cover, E85 logo pump decals, cautionary statement, orange/black Federal Trade Sticker, an E85 nozzle cover, and a pump toppler. It is also recommended that point of sale brochures are made available to inform and train customer behavior.



## Maintenance

E85's increased solubility, water absorption capacity, and conductivity create additional maintenance requirements. Operators should monitor daily for the presence of water in storage tanks (which generally collects at the bottom) and require prompt removal when more than 1 inch of water is detected. Owners and operators should also continuously ensure proper sealing of all tank openings and fittings to prevent ingress of water.

## Resources:

Handbook for Handling, Storing, & Dispensing E85 [www.afdc.energy.gov/pdfs/48162.pdf](http://www.afdc.energy.gov/pdfs/48162.pdf)

American Coalition for Ethanol [www.ethanol.org](http://www.ethanol.org)

Blend Your Own Ethanol [www.byoethanol.com](http://www.byoethanol.com)

Growth Energy [www.e85fuel.com](http://www.e85fuel.com)

NC Solar Center/NCSU [www.cleantransportation.org](http://www.cleantransportation.org)

Protec Fuel Management [www.protecfuel.com](http://www.protecfuel.com)

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