



NORTH CAROLINA Solar Center

Advancing Clean Energy for a Sustainable Economy

Clean Transportation Program | 919-515-3480 | www.cleantransportation.org | www.ncsc.ncsu.edu

Ethanol Fuel for NC

What is ethanol?

Ethanol is a naturally oxygenated fuel produced by fermenting organic materials like corn, grains, and crop and forestry waste materials. Ethanol is usually blended with gasoline at different levels. E10 is a premium high-octane gasoline for cars and E85 (85% ethanol / 15% gasoline) is an alternative fuel for light-duty vehicles.

What types of vehicles can use ethanol?

E10, a blend of 10% ethanol and 90% gasoline, can be used in any gasoline vehicle without modification. E85, however, offers a higher octane rating and must be used in specified vehicles. All major domestic automakers offer E85 compatible vehicles, or flex-fuel vehicles (FFVs), at the same price as gasoline only models. According to RL Polk, in 2011 there were over 236,000 FFVs on the road in North Carolina. FFVs, which can run on either E85 or gasoline, of any blend in between allow vehicle operators the ability to obtain fuel in areas where E85 is not available. FFV applications include buses, light-duty vehicles and delivery trucks. The number and variety of FFV makes and models available has grown steadily over the years. For a complete up-to-date list of available E85 compatible vehicles look for list under resources at www.cleantransportation.org. To make sure you are purchasing an FFV it is important to check the vehicle identification number (VIN) against this list.

How does ethanol perform?

Vehicles operating on E10 achieve the performance and range expected from a premium fuel. Vehicles running on E85 will have a shorter range than gasoline vehicles because a gallon of ethanol has as much as 29% less energy content than a gallon of gasoline. However, ethanol has a higher octane rating than regular unleaded gasoline, making E85 a premium fuel. Because of the differences between ethanol and gasoline, FFVs have special fuel lines, hoses, gas tanks, valves and gaskets. E85 content may be lowered to 70% in severe cold weather conditions to avoid cold start problems. E10 and E85 burn more completely and at a cooler temperature than gasoline, resulting in fewer combustion deposits and longer spark plug life.

Where can I get ethanol?

North Carolina has 20 public E85 service stations throughout the state with more being planned or installed that will be operational soon. The most current list of stations can be found at http://www.afdc.energy.gov/afdc/progs/ind_state.php/NC/E85. State agencies, local governments, and educational institutions can get E85 at the Motor Fleet Management fueling site on Blue Ridge road in Raleigh,



NC STATE UNIVERSITY

(Continued from page 1)

or DOT stations in Greenville, Hillsborough, Charlotte, Marion and Asheboro. Most all commercial service stations and all 111 DOT sites around the state provide E10, although pumps may not indicate as such. State and local government fleets may also purchase E10 and E85 in all 100 counties from a state purchasing contract (www.doa.state.nc.us/PandC/fuelcost.htm).

What are the benefits of using ethanol?

Vehicles running on ethanol fuels emit less carbon monoxide and other toxic chemicals, such as benzene, than those running on gasoline. They also emit the same or lower levels of hydrocarbon and non-methane hydrocarbons. E85 has fewer highly volatile chemicals than gasoline, resulting in fewer evaporative emissions.

E10 however, may result in greater evaporative emissions. Ethanol blended fuels derived from grain will result in lower life-cycle carbon dioxide emissions because it is derived from plant material which absorb carbon dioxide as it grows. A study by the Argonne National Lab concluded that E85 produced from corn resulted in an 21%-29% reduction in greenhouse gases and cellulosic E85 would be an 86% reduction (Wang, Michael "Energy and GHG Emission Impacts of Fuel Alcohol" Argonne National Lab, 2005

www.transportation.anl.gov/pdfs/TA/347.pdf). E85 is more flammable than gasoline at low temperatures (32° F), but less flammable at normal temperatures. Pure ethanol is non-toxic, water soluble and biodegradable. Producing ethanol from crop, animal, or forestry waste materials can reduce emissions and provide a positive energy balance ratio. Additional benefits of ethanol include diversifying our fuel supply and providing alternative markets for farmers.

Emission	Comparison	Average Change (%)	95% Confidence Range (%)
Hydrocarbons	E85 (FFV) vs. Gasoline (non FFV)	-18	(-28 , -7)
Benzene	E85 vs. Gasoline	-86	(-86 , -86)
NOx	E85 vs. Gasoline	-54	(-60 , -46)
CO	E85 vs. Gasoline (same FFV)	-20	(-39 , 4)
Particulate Matter	E85 vs. Gasoline (same FFV)	-34	N/A

Source: afdc.energy.gov

What is the potential and future prospect for ethanol as a fuel?

The 2007 Energy Independence and Security Act Renewable Fuel Standard (RFS) requires biofuels use to expand from 7.5 billion to 36 billion gallons by 2022. In order to meet the federal RFS, ethanol use will need to expand. Most conventional gasoline in North Carolina and across the country is already E10 so the industry is looking to increase the blend limit in gasoline from 10% to 15%. In late 2010 the U.S. Environmental Protection Agency (EPA) approved selling 15 percent ethanol—known as E15—for cars and light trucks (2007 or newer). Expanding E85 use through increased availability of affordable consumer options for FFVs combined with competitively priced E85 at fueling stations, will support this need and provide a work around of what’s being called the “blend wall”. Further research and development into cellulosic ethanol (using sugars from any plant materials, such as switchgrass) will also increase U.S. capacity for ethanol production and use. In order to reduce the impact of greenhouse gases (GHGs) and land use change pressures associated with ethanol-based fuels, the EPA requires ethanol to meet lifecycle GHG thresholds of 60% for cellulosic biofuel and 20% corn-based ethanol produced in new facilities, and lands brought into production after December 2007 will not be eligible for the RFS2 program.

Resources:

DOE’s Alternative Fuels Data Center www.eere.energy.gov/afdc
 American Coalition for Ethanol www.ethanol.org
 Growth Energy www.e85fuel.com

This document is supported through the Clean Fuel Advanced Technology project with funding from the N.C. Department of Transportation .