

Ethanol vehicles and infrastructure guidebook

Kentucky Clean Fuels Coalition





The Kentucky Clean Fuels Coalition was established in 1993 to provide the first alternative fuels resource for Kentucky educators, consumers and providers of alternative fuels/vehicles.

It is now a successful non-profit 501C3 self-supporting organization and a national leader in the clean fuels market.

The mission of the Kentucky Clean Fuels Coalition (KCFC) is to connect providers and consumers of fuels across Kentucky with the best information and education available about clean transportation technologies.

Operating Strategies and Objectives

- Build partnerships between providers and consumers of fuel.
- Raise awareness about the opportunities and benefits of using alternative fuels and advanced transportation technologies.
- Focus on incorporating alternative fuels and advanced transportation technologies
- Provide members and stakeholders with continuing education opportunities and reliable informational resources upon which they can base decisions.
- Commit to air quality and environmental stewardship.
- Provide a balanced source of information for developing partnerships and a realistic market approach to project implementation.
- Focus on incorporating alternative fuels and advanced transportation technologies into technician education.

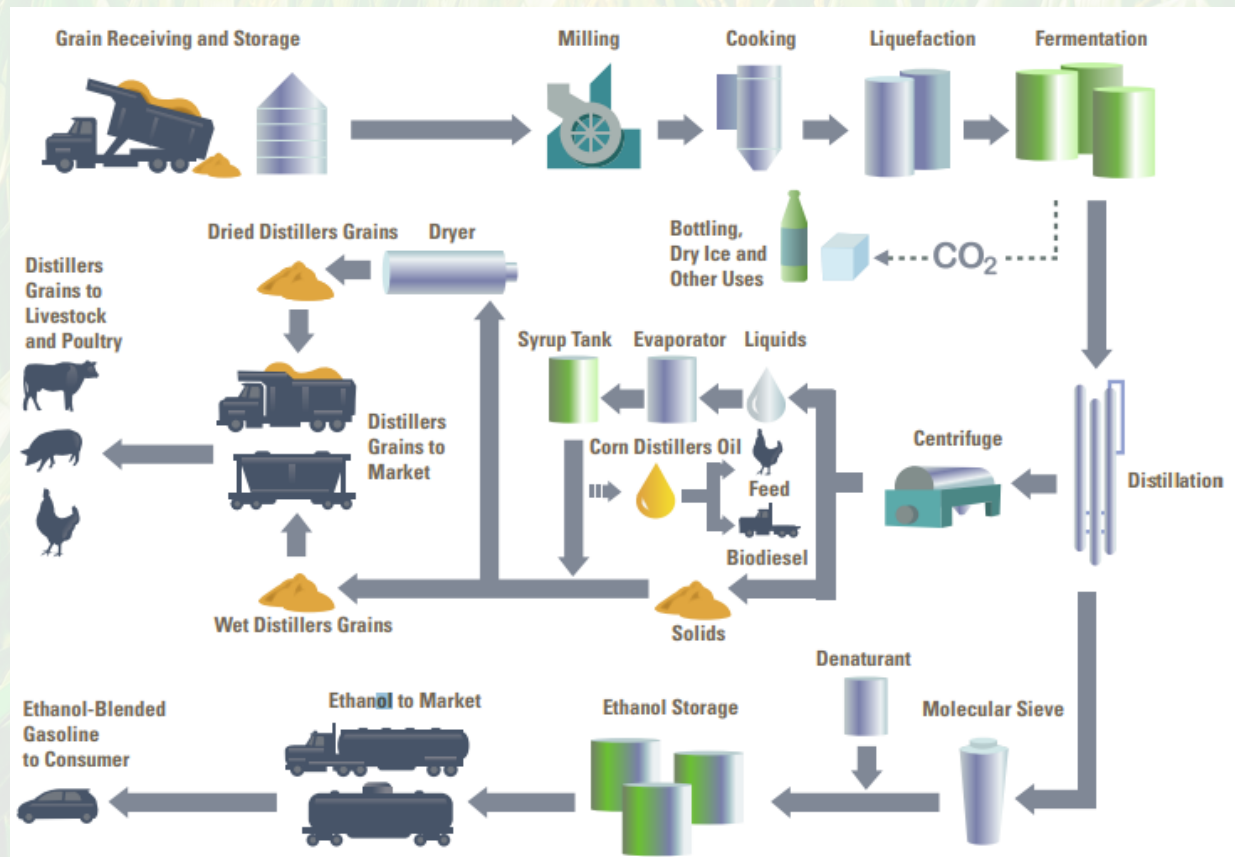
KCFC Vision

Transforming Kentucky into a model area for the development and implementation of public policy that supports and encourages the development and use of alternative fuels and technologies for transportation purposes and to improve air quality, diminish dependence on foreign oil, and enrich the state economy by creating alternative fuel options that make it inviting for commercial carriers to conduct interstate commerce.

Ethanol Basics

Introduction

Ethanol is a renewable, biodegradable, high-octane and low-carbon motor fuel made from corn and other plant materials. Most of the ethanol in the United States is made from corn and processed through dry milling (figure below). Kentucky has two ethanol biorefineries.



According to the Renewable Fuels Association, corn ethanol from a typical dry mill has roughly half of the greenhouse gas (GHG) emissions of gasoline.

Ethanol Blends

Nearly all fuel-grade ethanol is sold as **E10**, a low-level blend of 10% ethanol, which is approved for use in all conventional light-duty vehicles.

E15 (10.5%–15% ethanol) is approved for use in model year (MY) 2001 and newer light-duty conventional vehicles. E15 is offered at nearly 400 stations across 28 states. In addition, E15 offers a higher-octane fuel blend typically at a lower price than E10. **E15 is approved by EPA for use in more than 90% of today's automotive fleet.**

To use **E85**, a high-level blend containing 51%–83% ethanol (depending on geography and season), a vehicle must be a flexible fuel vehicle (FFV). EPA has proposed to also define fuels containing 16-50% ethanol as “flex fuels.”

Benefits of Utilizing Ethanol Blends

- **Requires significantly less maintenance** than conventional vehicles, HEVs, and PHEVs because there is no engine and associated components.
- **Reduces greenhouse gases** because EVs and PHEVs in all-electric mode produce no tailpipe emissions.
- **Improves fuel economy** - HEVs typically achieve better fuel economy than comparable conventional vehicles, and all-electric vehicles have the lowest fuel cost range of all light-duty vehicles (followed by PHEVs and HEVs).
- **Federal tax credits are available** up to \$7,500 depending on the type, make, and model of electric vehicle, and the state you reside in.

Flex Fuel Vehicles

What Are They?

According to the U.S. Department of Energy Alternative Fuels Data Center, there are currently more than 20 million flex fuel vehicles (FFVs) registered in the United States.

FFVs have the flexibility to run on more than one type of fuel. This can be with unleaded gasoline, E85 (flex fuel), or any combination of the two.

Like conventional gasoline vehicles, FFVs have a single tank and fuel system. However, FFVs differ in fuel-system materials and control systems to account for ethanol content (Figure 2).

More than 3,600 stations across the country sell E85 today in over 2,100 cities and towns.



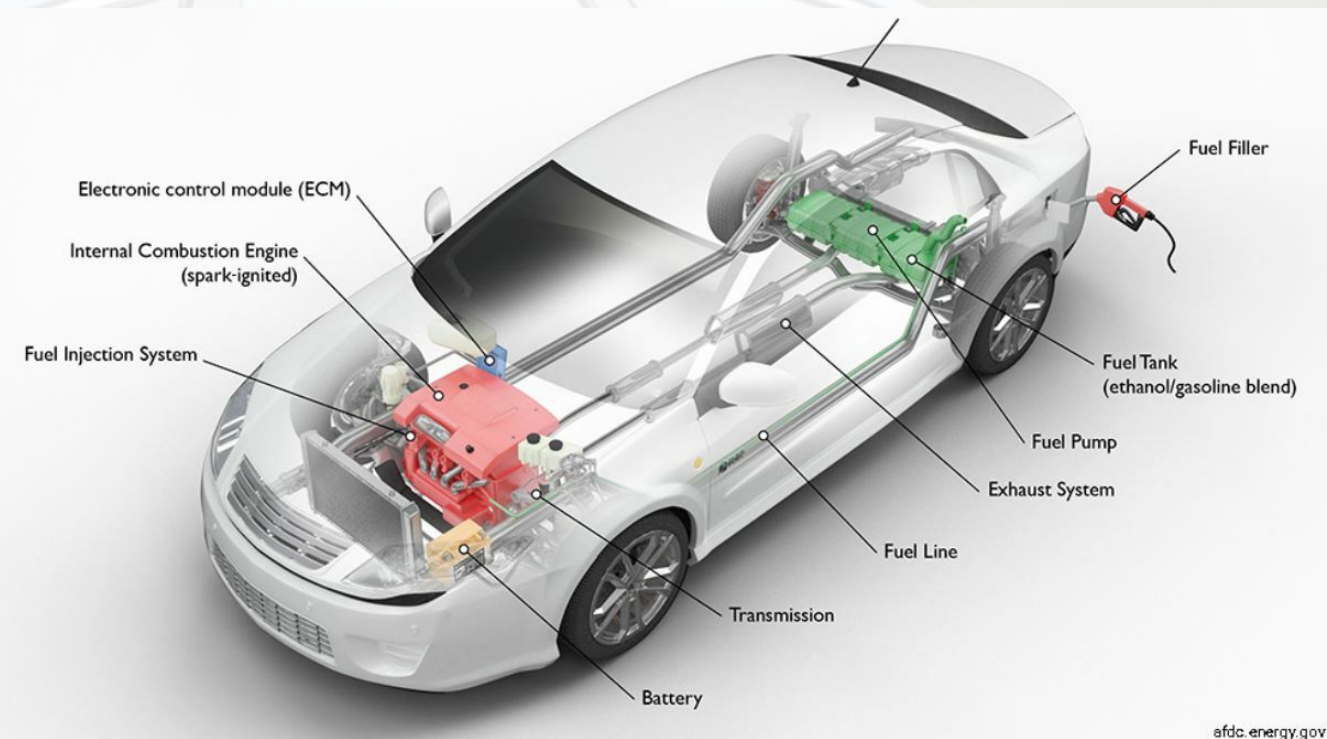
This is an example of a Flex Fuel Station that has E85.

DID YOU KNOW?

NASCAR uses E15! This is a blend of gasoline with 15% ethanol.

Flex Fuel Vehicle Components

Please see below for an illustration on components on a flex fuel vehicle. FFV components are the electronic control module (ECM), Internal Combustion Engine (spark ignited), Fuel Injection System, Fuel Filler, Fuel Tank for ethanol and gasoline, Fuel pump, Exhaust system, Fuel Line, Transmission, and Battery.



afdc.energy.gov

Do YOU Have A Flex Fuel Vehicle?

- **May help bolster market acceptance** of flex fuel vehicles.
- **Displays commitment to sustainability**, helping the community to achieve climate goals and attracting eco-conscious customers to businesses.

Ethanol Benefits

Ethanol's Octane Advantage

A fuel's octane rating is the measure of its ability to resist “knocking” in the engine, which is caused when the air/fuel mixture detonates prematurely during combustion. Ethanol has an octane rating of 114.

Ethanol offers more engine knock resistance at a lower cost than any other gasoline additive on the planet. Using a lower octane fuel than required can cause the engine to run poorly and can damage the engine and emissions control system over time. Ethanol is the cleanest and safest octane option available. Octane sources such as MTBE and aromatics (like benzene) are highly toxic and pose great risk to our air and water.

AVAILABILITY

INCREASES ENERGY SECURITY

Ethanol is produced domestically from corn grain, sugar cane, and other plant materials - and its production creates jobs in rural areas.

APPLICATION

IMPROVES ENGINE EFFICIENCY

Ethanol blends provide increased power and performance to engines, and certain blends can improve engine efficiency.

ENVIRONMENT

REDUCES GREENHOUSE GASES

The feedstock crops grown to produce ethanol offset carbon dioxide released in ethanol-fueled vehicles.

COST EFFICIENCY

IMPROVES FUEL ECONOMY

Vehicles with engines optimized to run on ethanol blends would see an increased fuel economy due to improved engine efficiency.

Ethanol As A Pollution Solution

We don't have to wait and hope for major technological or economic breakthroughs to drive the decarbonization of our liquid fuels — ethanol is available now at a low cost.

The ethanol molecule is 35% oxygen; therefore, it burns more cleanly and completely than petroleum-based hydrocarbons in gasoline.

Additionally, the feedstocks grown to produce ethanol **offset the carbon dioxide** released in ethanol-fueled vehicles.

Adding ethanol to gasoline reduces tailpipe emissions of the following pollutants:

- **Carbon monoxide**, which can cause harmful health effects by reducing oxygen delivery to the body's organs
- **Exhaust hydrocarbons**, which contribute to ozone pollution, irritate the eyes, damage the lungs, and aggravate respiratory problems
- **Air toxins** like benzene, which can cause cancer and reproductive or birth defects
- **Fine particulate matter**, which can pass through the nose and throat and enter the lungs, causing asthma and other serious health effects

Online Resources

Resource List

To learn more about alternative fuels like ethanol and where to refuel, please check out the following online resources:

- **Kentucky Corn Growers Association:** This is an association dedicated to growing opportunities for Kentucky corn farmers in a changing industry. This grassroots organization founded in 1982, represents the interests of more than 6,000 corn farmers in the Commonwealth by: Improving markets and demand, strengthening consumer trust for products and practices, investing in research for economically and environmentally sustainable production and by advancing leadership and membership to provide a voice for Kentucky Corn Growers. For more information, please visit kycorn.org.
- **Alternative Fueling Station Locator:** Find alternative fueling stations and electric vehicle charging locations in your area by visiting the website (afdc.energy.gov/stations) or downloading the iPhone or Android app.
- **Ethanol Handling and Use Guide:** Use this handbook to learn basic information regarding fuel properties, standards, codes, and the proper and safe use of E85 and other ethanol blends, with supporting technical and policy references included (afdc.energy.gov/uploads/publication/ethanol_handbook.pdf).
- **Kentucky Business Investment (KBI) Program:** Companies engaged in energy-efficient alternative fuel production, alternative fuel production, and gasification may be eligible for the KBI Program. The KBI Program provides income tax credits

and wage assessment incentives to eligible companies that locate or expand operations in Kentucky.

- **Kentucky Enterprise Initiative Act (KEIA):** Companies engaged in energy-efficient alternative fuel production, alternative fuel production, and gasification may be eligible for an incentive through KEIA. KEIA provides a refund of Kentucky sales and use tax paid by approved companies for building and construction materials for the acquisition, construction, or expansion of a new or existing facility or eligible equipment used in research and development.
- **Ethanol Production Tax Credit:** Qualified ethanol producers are eligible for an income tax credit of \$1.00 per gallon of corn- or cellulosic-based ethanol that meets ASTM specification D4806. The total credit amount available for producers is \$5 million for each fuel type in each taxable year. Unused ethanol credits from one ethanol-based cap, such as corn, may be applied to another ethanol-based cap, such as cellulosic, in the same taxable year.
- **On-Farm Biofuel Production Grants:** The Governor's Office of Agricultural Policy provides grants through the County Agricultural Investment Program for on-farm energy efficiency and renewable energy production projects, including funding for equipment, structures, or other supplies necessary to convert biomass crops into useable energy or to convert grains and oilseeds into ethanol or biodiesel for use in on-farm equipment.
- **Commonwealth Agri Energy:** Commonwealth Agri-Energy, LLC is proudly owned by the 3500 members of the Hopkinsville Elevator CO-OP and they are 100% Farmer Owned. They are a fuel ethanol plant made from corn in Kentucky and are the information resource for fuel ethanol and distillers grains in Kentucky and Tennessee. For more information, please visit <http://www.commonwealthagrienergy.com/>



For More Information:

 www.kentuckycleanfuels.org/

 facebook.com/kycleanfuels/

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