ACE Ethanol 101:

Frequently Asked Questions

What is ethanol?
Ethanol is "ethyl alcohol," 200-proof grain alcohol. An ethanol plant produces fuel-grade ethanol, and that ethanol is then blended in a percentage with gasoline to make a finished motor fuel.

Terminology is important because the term "ethanol" means different things to different people:

- "Ethanol" is the 100% pure ethanol coming from the production facility.
- Sometimes people say "ethanol" and mean the blend of 10% ethanol / 90% gasoline called E10.
- Sometimes people say "ethanol" and mean the blend of 85% ethanol / 15% gasoline called E85.

Different definitions of "ethanol" can lead to confusion, such as the misunderstandings that "a special vehicle is required to run on ethanol" or that "ethanol is only available at a small portion of the nation's gas stations." In these cases, people say "ethanol" but actually mean the alternative fuel E85.

Will my vehicle run on ethanol-blended fuel?
All vehicles are "ethanol-capable" and can use a blend of up to 10% ethanol. This "E10" is a blend of 10% ethanol / 90% unleaded gasoline and is the most common way ethanol is sold to motorists. Since the 1980s, all automakers have covered the use of up to 10% ethanol under warranty, and no engine modifications are necessary to use E10. E10 is a cleaner burning fuel than straight gasoline.

Can ethanol blends be used in small engines, such as boats, lawnmowers, or chainsaws?
Yes. Manufacturers of small engines realize that up to a 10% blend of ethanol is very common in gasoline, so they make their engines compatible with this fuel.

What is E85? How do I know if my vehicle can use it?
E85 is not gasoline, but rather an alternative fuel comprised of 85% ethanol / 15% unleaded gasoline for use in Flexible Fuel Vehicles (FFVs). These vehicles are truly "flexible" in that their owners have a choice whether to use E85, any blend of ethanol up to that 85% level, or straight unleaded gasoline. On some models this comes as an option, and on some it is a standard feature.

To identify whether a vehicle is flexible fuel, check the owners manual and inside the gas cap. Also, visit www.ethanol.org/e85.html to link to a complete list of FFVs, including the new '06 model year vehicles.

Can my vehicle run on E85 even if it's not an FFV?
If your vehicle is not an FFV, use of any higher ethanol percentage than 10% is not covered by warranty. People have reported that they blend higher percentages of ethanol in regular, unmodified vehicles. A pilot study conducted earlier this year suggests that up to 30% ethanol could be used in a non-flex fuel vehicle, but more research is required on this subject and we as an organization do not endorse this practice until further study is done.

Can I convert my vehicle to use E85?
In theory, it is possible; in reality, it is difficult. A vehicle could be converted to operate on E85, but the challenge would be converting it to be a truly flexible fuel vehicle, one that could operate on any blend of fuel up to the 85% ethanol. There are no companies in the U.S. that sell conversion kits for vehicles to operate on E85. The good news is that automakers are increasing their lineups of FFVs each model year, so whether you're looking for a new or used vehicle, they are available.

Are there any tax incentives to purchase Flexible Fuel Vehicles?
Yes, follow this link to a document that explains the federal alternative fuel motor vehicle tax credit: http://www.ethanol.org/documents/AlternativeFuelVehicleCredit.pdf.

Where can I buy E85 in my area?
A link to a complete list of gas stations offering E85 can be found online at www.ethanol.org/e85.html. This site has a searchable map that gives E85 pump locations by state. The number of stations offering E85 is increasing at a rapid pace.

If gas contains ethanol, is it labeled that way on the pump?
An 85% blend of ethanol is always labeled at the pump because it is an alternative fuel for use only in flexible fuel vehicles.

Because up to a 10% blend of ethanol can be used in any vehicle, in some areas it is labeled and in some it is not. Each state legislates whether labeling is mandatory, voluntary, or not required when gasoline contains ethanol. Many states have moved away from labeling ethanol, so it is not always possible to tell if you're getting ethanol-blended fuel at the pump.

The American Coalition for Ethanol supports the consumer's right to know if gasoline contains ethanol, but we don't favor labels that appear more like a warning label or a poison sticker.

This can be detrimental because people will shy away from purchasing something they are not familiar with or something that looks potentially harmful. If ethanol-blended fuel is labeled at the pump, it should be done in an attractive way that shows consumers all of the benefits that ethanol offers.

A good analogy is the labeling of cigarettes. Labeling gasoline that it contains ethanol is like labeling cigarettes that they contain paper – ethanol is the only part of gasoline that would not hurt you.

Is there any funding available to add E85 to my gas station or convenience store?
Yes, sometimes there is. The National Ethanol Vehicle Coalition is a non-profit association that promotes the development of E85 vehicles and infrastructure. Contact them through www.e85fuel.com or by phone at (877) 485-8595.

The Energy Policy Act of 2005 contains a new federal tax credit to assist with the installation of equipment and infrastructure to dispense E85 at retail outlets. This new incentive provides a 30 percent federal income tax credit, up to a maximum of $30,000, to assist with the establishment of alternative fuel infrastructure, including equipment necessary to dispense E85. This tax credit became effective in 2006 and is scheduled to expire December 31, 2008. Contact the Internal Revenue Service for more information about this tax credit.

What storage and dispensing conversion procedures should I consider before offering E85 at my gas station?
The technology for storing and dispensing gasoline can be applied to alcohol fuels such as E85 because alcohols and alcohol blends, like gasoline, are liquid fuels 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. Although material research and testing is expected to continue, the parts and

materials discussed in this guidebook have performed well with E85. They can be obtained from your usual supplier.

What is the ethanol "subsidy"?
Many are misinformed that ethanol producers receive a huge government subsidy. That is a myth. In fact, ethanol's "subsidy" is really a federal tax credit that goes to oil companies as an incentive to blend ethanol with gasoline. This blender's tax credit totals 51 cents per gallon of ethanol or 5.1 cents per gallon on E10 blends.

This benefit is a lower tax which not only serves as an incentive for oil companies to blend ethanol with gasoline, but it also enables ethanol to compete with gasoline, even if it is higher priced. The benefit to petroleum marketers is that they can offer a higher-quality, higher-octane fuel containing ethanol at a competitive price. The benefit to taxpayers is that this tax credit is usually passed all the way back to the consumer in the form of lower pump prices for higher octane ethanol enriched fuel.

What impact does ethanol have on gasoline prices?
Ethanol adds to the overall supply of motor fuel in the U.S. and helps keep pump prices competitive and affordable. The blender's tax credit is usually passed down to consumers in the form of more competitive prices at the pump. According to the Consumer Federation of America, consumers who purchase gasoline blended with 10 percent ethanol could be saving as much as 8 cents per gallon compared to straight gasoline.

Does ethanol help reduce air pollution?
Yes. There is a significant reduction in both carbon monoxide and hydrocarbon tailpipe emissions when ethanol is blended and used with gasoline in automobiles. Many cities and states across the nation take advantage of the environmental benefits of ethanol, including Chicago, Denver, Milwaukee, Minneapolis, New York, and Los Angeles.

According to the Department of Energy's Argonne National Laboratory, ethanol-blended fuels reduced CO2-equilvalent greenhouse gas emissions by 7.8 million tons in 2005, which has the effect of removing the annual greenhouse gas emissions of over 1 million automobiles from the road.

What about ethanol's impact on fuel economy?
Critics of ethanol often allege that because ethanol contains fewer British Thermal Units (BTUs) of energy, ethanol-blended fuel has a negative impact on gas mileage. In reality, variables such as speed, stop-and-go driving, tire pressure, and the weather's effect on driving conditions have a much greater impact on fuel economy than what fuel you use in your engine.

In 2005, ACE conducted a study comparing gas mileage between unleaded and E10, E20, and E30. On average, the difference between straight unleaded and E10 was only 1.5% - a negligible amount. Some believe that lower BTU value has a one-to-one impact on fuel economy – this research proves that is not the case. In light of this finding, more research is underway to examine the fuel economy of E85.

What is ethanol made from?
The majority of ethanol is made from corn, but it can also be made from many other crops including wheat, barley, milo/sorghum, potatoes, etc. New technology will allow ethanol to be made from "cellulosic" feedstocks, including corn stalks, grain straw, paper pulp, municipal solid waste, switchgrass, and other sources.

How is ethanol made?
Ethanol is produced by taking the starch or sugar portion of the corn and fermenting it. The fermented starch is then distilled into alcohol. The excess water is removed so the resulting ethyl alcohol (ethanol) is very pure – 200 proof.

Only the starch portion of the corn, which is about 70% of the kernel, is made into ethanol. The remaining portion is left over in the form of a co-product called distillers grain. This is a highly nutritious animal feed that contains all the remaining fats, oils, and proteins after the starch is taken out and converted to ethanol.

How many gallons of ethanol can be made from a bushel of corn?
With today's technology, one bushel of corn yields 2.8 gallons of ethanol. And that number is constantly increasing. Just a few years ago, that number was closer to 2.5 gallons per bushel of corn.

How many bushels of corn are needed for a typical ethanol plant? How many acres of corn would be needed to satisfy that demand?
An "average" ethanol plant today might be able to produce 50 million gallons of ethanol annually. A plant this size would require approximately 18 million bushels of corn. At the 2004 national corn crop average yield of 140 bushels per acre, approximately 128,500 acres of corn would be needed to supply the ethanol plant.

How much of the nation's corn crop is used for ethanol production?
In 2004, 1.26 billion bushels of corn went to ethanol production – about 12% of the nation's total crop. That figure rose to 14% for the '05 corn crop – about 1.6 billion bushels of an 11.1 billion bushel crop. As the nation's ethanol production climbs, some bushels from the export category will likely shift over into ethanol production.

Also, about 11% of the nation's sorghum crop was used as a feedstock for ethanol production in '04. Grain sorghum is used as a feedstock for ethanol production, mainly in areas on the periphery of the Corn Belt such as Kansas and western Nebraska.

Why should we use grain such as corn for fuel when people are hungry throughout the world?
Corn used for ethanol production would otherwise be fed to livestock or used for export markets, yet some suggest that it is immoral to use corn for fuel instead of food. Clearly there is a world hunger problem, but it is not appropriate to fix blame for world hunger on farmers and U.S. ethanol producers. The world produces ample crops containing the proteins and nutrients needed to feed the world's population. However, there are distribution bottlenecks that hamper these supplies of food from reaching those in need. Additionally, corrupt governments and wars cause havoc and disrupt the otherwise safe, efficient, and peaceful provision of food to hungry people.

What is cellulosic ethanol?
Cellulosic biomass, dubbed the most abundant material on earth, holds tremendous promise as a feedstock for ethanol production due to its widespread availability and potential for high fuel yields.

Examples of sources for cellulosic ethanol include corn stover (the stalks and husks left over after harvest), wheat and barley straw, sugarcane or rice bagasse, sawdust, paper pulp, small diameter trees, and dedicated energy crops such as switchgrass and other fast-growing grasses.

How is cellulosic ethanol made?
As with producing ethanol from grain, processing cellulosic sources extracts the fermentable sugars from the feedstock for distillation into alcohol. Unlike in grain, the sugars in cellulose are locked in complex carbohydrates called polysaccharides, or long chains of simple sugars. Separating these complex structures into fermentable sugars is essential to the efficient and economical production of cellulosic ethanol.

Is the ethanol from corn and cellulose the same?
Yes, the ethanol produced from corn or milo and the ethanol produced from cellulose are chemically identical.

What is switchgrass? Why is it a good potential source for ethanol?

Switchgrass is one source likely to be tapped for ethanol production because of its potential for high fuel yields, hardiness, and ability to be grown in diverse areas. Switchgrass' long root system – actually a fifty-fifty split above ground and below – helps keep carbon in the ground, improving soil quality. It is drought-tolerant, grows well even on marginal land, and doesn't require heavy fertilizing.

How close is cellulosic ethanol to being commercialized?
The technology to create cellulosic ethanol is available today, and is in the early stages of commercialization. Though most of the pieces are in place, the key is to continue to make it more cost-effective and economically competitive. Some estimate the technology is within 5 to 10 years of being fully commercialized.

What does a typical ethanol plant offer in terms of economic benefits?
An ethanol plant will have a large positive impact on the area's economy. A study conducted in 2002 found that an average sized ethanol plant (a 40 million gallon per year plant) would:

- Cost of approximately $60 million to build with construction taking about a year; the construction generates a one-time boost of $142 million as spending circulates throughout the economy.
- Spend more than $56 million annually on goods and services, ranging from corn to labor to utilities.
- Expand the economic base of the local economy by $110.2 million.
- Generate an additional $19.6 million in household income.
- Support the creation of as many as 694 new permanent jobs.
- Generate at least $1.2 million in new tax revenue for state and local governments.
- Generate additional revenue for local farmers by increasing demand, which in most cases results in increasing the average local basis by at least 5-10 cents per bushel.

We'd like to construct an ethanol plant. Where do we begin?
Ethanol plants need to be built where they make sense, so there are many necessary pieces that need to come together to make a plant successful. Rules of thumb:

Grain availability: How many bushels of grain are available within 50 miles, 100, miles, 150 miles?

Grain pricing: What is the local grain price for corn? What is the historic basis (difference between local price and Chicago price)?

Natural gas or coal availability: What is the most economical fuel? A nearby pipeline is needed to use natural gas and coal requires expensive handling facilities. Figure about 35,000 BTUs per gallon of ethanol produced. Estimate delivered cost of each.

Power: Calculate about 1 kWh of electricity per gallon of ethanol produced.

Site issues: Site needs rail access, road access, and availability of 3.5 gallons of water for each gallon of ethanol produced.

Distillers grain: Dried distillers grain can be sold by rail, but wet distillers grain should be used within 100 miles of the plant. DDG can be used for hogs, poultry, and cattle; WDG can be used for cattle. How many livestock are within 100 miles of the plant? Check historic prices for distillers grain in the area.

Financing: There are many possible ownership and financing structures, but most require between 30%-50% equity. Ethanol plant costs decrease on a per gallon basis as plants get larger.

Feasibility studies: There are many reputable firms and consultants that can help you conduct a feasibility study. It is crucial to determine whether you have all the necessary pieces in place before you begin.

Design-build firms: Always use a reputable design-build firm that has experience in the ethanol industry. Check the "Parts & Service Providers" section on the ACE website to see a list of companies providing these services.

How can I invest in ethanol?
At this time, very few ethanol production companies are listed on a public stock exchange. Archer Daniels Midland is a large agribusiness that has several ethanol plants in addition to a wide range of other ag processing businesses. They are listed under "ADM" on the New York Stock Exchange. Pacific Ethanol is a California-based company that recently obtained listing on the NASDAQ – their ticker symbol is "PEIX."

Much of the growth in the ethanol industry to date has been through farmer-owned cooperatives. These ethanol plants are owned by groups of farmers and other local investors, and their stock is not listed publicly. However, sometimes these ethanol producers do have stock available. If they do, it may be listed on www.agstocktrade.com. Alerus Securities also lists available stock on www.alerusagcoopstock.com.

How can I get a job in the ethanol industry?
One place to look for ethanol industry job listings is www.ethanoljobs.com.

What is MTBE?
MTBE is methyl tertiary butyl ether. It is a gasoline additive that, like ethanol, is an oxygenate. The extra oxygen content helps fuel to burn more completely and more cleanly. MTBE, *unlike* ethanol, has been found to pollute groundwater supplies and has been banned from use in 25 states. Ethanol is just as effective at increasing octane and making a cleaner burning fuel, but it is not harmful to the environment.

How many gallons are in a barrel of oil / ethanol?
One barrel equals 42 U.S. gallons, whether you're talking oil or ethanol.

What does "net energy balance" mean? What is ethanol's energy balance?
Net energy balance is a term used to describe how much energy is needed to produce a product versus how much energy that product provides. Two professors that are long-time critics of ethanol claim that ethanol has a negative energy balance, meaning more energy is required to produce ethanol than ethanol offers as a motor fuel.

This is not true. Scientific study after study has proven ethanol's energy balance to clearly be positive. The latest USDA figures show that ethanol made from the drymill process provides at least 77% more energy as a fuel than the process it takes to make it.

The bottom line is that it takes about 35,000 BTUs (British Thermal Units) of energy to create a gallon of ethanol, and that gallon of ethanol contains at least 77,000 BTUs of energy.

How much oil can ethanol really displace?
Research has determined that 1 barrel of ethanol (1 barrel = 42 gallons) can displace 1.2 barrels of petroleum at the refinery.

In 2005 the U.S. produced 4 billion gallons of ethanol, which equates to about 3% of the country's total gasoline consumption (140 billion gallons per year). This is a small percentage, but a critically important one. Every gallon of ethanol we can make and use means we are less dependent upon oil and more dependent upon clean, renewable, homegrown energy sources.