

Ethanol

America's Renewable Fuel Source

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Abstract

America is addicted to oil, or at least according to our president. A popular solution proposed by the Bush Administration involves replacing current gasoline consumption with ethanol. Ethanol is a fuel produced by fermenting corn and blending the end product with gasoline. Advocates argue that ethanol is home grown, helps American farmers and provides a clean source of fuel. Critics are suspicious of the Bush Administration's proposals and contend that ethanol is neither a clean fuel nor does it reduce our dependence on foreign oil. The ethanol debate is highly politicized and often focuses on what is the best for big business and politicians rather than consumers. Whether or not the United States Federal Government should continue providing multi-million dollar subsidies to the agriculture industry or invest that money in a different form of energy is the ultimate question. Currently, ethanol enjoys strong support from key business and political leaders and development is likely to continue in the near future.

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Introduction: Ethanol Basics

Brazil has achieved energy independence, a goal the United States has been chasing since the oil shocks of the 1970s (Lynch par 2). Large-scale investments in ethanol, a fuel derived from crops such as sugar-cane and corn, has given the South American country the opportunity to halt all oil imports and export surplus ethanol to surrounding nations. Only recently has the Bush Administration offered strong support for ethanol. Administration officials insist that ethanol is beneficial to our economy and our security. The situation in Brazil makes ethanol very attractive, unfortunately the issue is much more complicated.

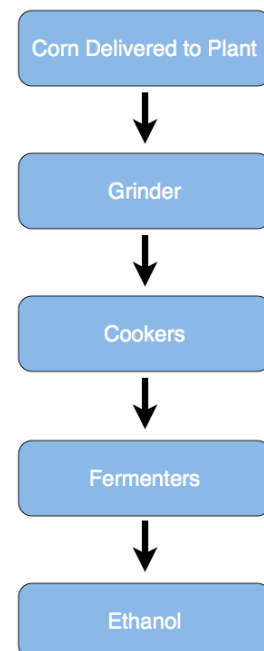
What is Ethanol?

Ethanol is an alcohol-based fuel produced by fermenting starch-based crops, such as corn. For commercial use, ethanol is blended with gasoline to create e85, a combination of 85% ethanol and 15% gasoline (DOE par 2). Ethanol can be blended with gasoline at any ratio, but the standard blend is e85.

How is e85 Produced?

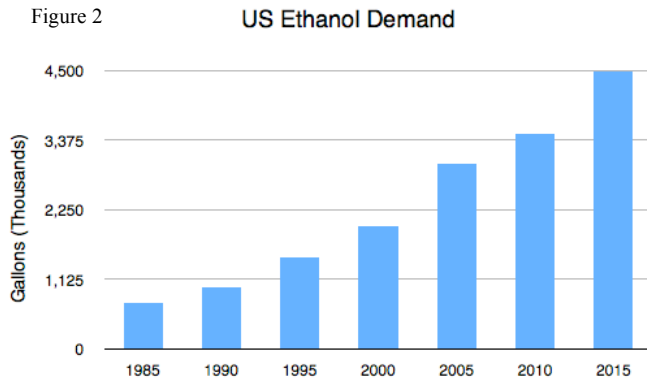
The process used to create ethanol is relatively simple. First, corn is harvested and delivered to a processing plant. Next, the corn is ground up so it can be easily processed. The corn is moved into a cooker where the starch is converted to sugar before moving into the fermenting unit, where ethanol and bi-product carbon dioxide are produced (DOE par 2). Finally, the ethanol is blended with the desired amount of gasoline and then transported to fueling stations.

Figure 1



Section One: Ethanol is a Godsend

The ethanol industry certainly does not lack support. The Bush Administration provides tax breaks and subsidies to corn farmers for ethanol production. American auto companies are producing more flex fuel vehicles that can run on e85 than ever before.



Research shows that US ethanol demand is likely to increase by almost 100,000 gallons over the next ten years. The US will try to meet the increased demand by producing more domestic ethanol.

These companies are also spending millions of dollars pushing ethanol as an alternative fuel. Additionally, the farm lobby is interested in seeing e85 become a common fuel – knowing their corn will be used as the primary feedstock.

Energy Independence

Brazil achieved energy independence thanks to ethanol, and many Americans believe the United States can follow a similar path. Corn is abundant in Minnesota, Iowa, and Indiana, among other Midwestern states. Farm lobbyists argue that purchasing ethanol supports American farmers, whereas buying gasoline supports unstable middle-eastern nations. Advocates for ethanol also contend that ethanol revenue is kept in the United States and spurs economic growth that would have otherwise been lost to foreign oil producers. Finally, since corn is a relatively stable crop, ethanol will not be vulnerable to price fluctuations like gasoline (DOE par 1-5).

Environmental Friendliness

Ethanol is produced from corn, a renewable resource, whereas gasoline is produced from petroleum, a non-renewable resource. According to the American Lung Association, e85 burns much more cleanly than gasoline since it contains the highest oxygen content of any fuel available today. The American Lung Association further cites that e85 reduces greenhouse gas emissions by up to 30% and the United States Environmental Protection Agency reports that e85 reduces harmful smog causing pollutants (ALA par 4). Reducing greenhouse gas emissions is especially important in large cities like Los Angeles and Atlanta where pollution and smog are widespread problems.

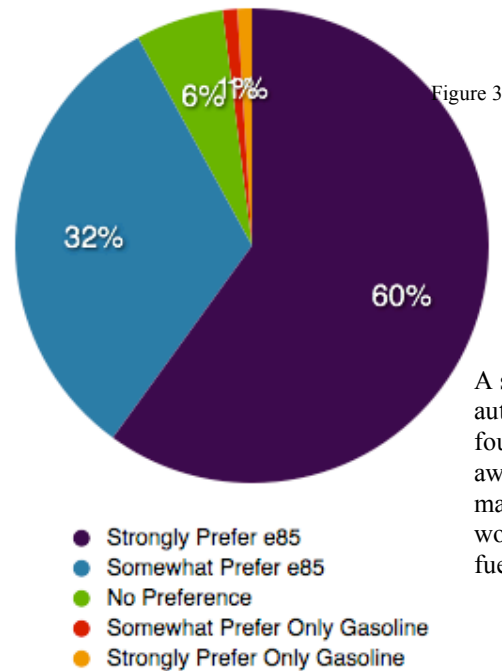
Flex-Fuel Vehicles Hit the Market

In the United States, the “big three” are perhaps the biggest supporters of e85.

Ford, General Motors (GM) and DaimlerChrysler already have millions of flex-fuel vehicles on the market. Unlike other alternative fuel vehicles, like hybrid-electric vehicles, which cater mostly to drivers who prefer small cars, American auto companies have made e85 compatible

vehicles for all types of drivers. For Instance, GM manufactures the Chevrolet Impala, GMC Sierra and Saturn Relay as flex-fuel vehicles; regardless of personal tastes, almost any driver can find a flex-fuel vehicle that fits their preferences. GM is committed to

What Type of Car Would You Prefer to Own?



A survey conducted on automobile consumers found that they are already aware of e85's benefits. A majority of consumers would prefer to own a flex-fuel vehicle.

promoting ethanol consumption as an alternative to gasoline, and launched its “Live Green Go Yellow” campaign with a 2.4 million dollar commercial advertisement during Super Bowl XL (Mello par 8). "We recognize it's more than just putting the vehicles out there," said GM spokesman Dave Barthmuss. "That's why we are helping to get people to work together to fuel the vehicles" (Mello par 10).

Consumer Considerations

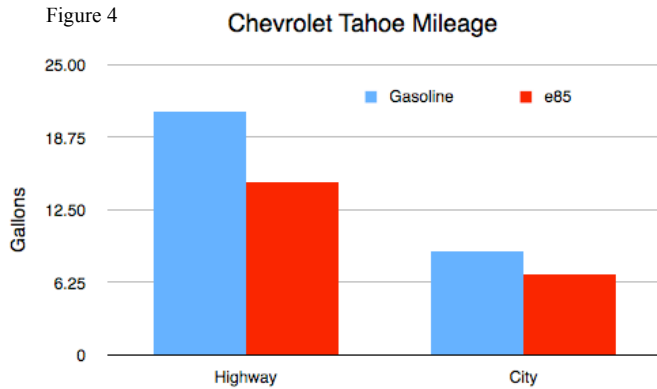
Filling fuel tank with ethanol will not only provide the consumer with the warm feeling of protecting the environment and economy, using e85 will increase the performance of the vehicle. According to Edmond’s magazine, ethanol has a higher octane rating than gasoline, which provides more torque and horsepower to the vehicle (Mello par 17). An average GM or Ford vehicle can expect to experience a 5% increase in horsepower when running on e85. Moreover, ethanol and gasoline can be blended at virtually any ratio in the tank, so a driver in a pinch can still fuel his/her car or truck on gasoline if e85 is not immediately available. Finally, Edmond’s concludes that early research shows e85 causes reduces wear and tear on a vehicle’s engine and will reduce maintenance costs in the long term (Mello par 18).

Section Two: The Dark Side of e85

Consumers always become suspicious when government, Detroit automakers, and the farm lobby work together on a new technology like ethanol since the Bush Administration, Big Auto, and American farmers all have agendas. Politicians want to help whoever will donate to campaigns; auto companies want to maximum profit (regardless of social responsibility claims); and farmers want to sell as much of their corn as possible. Consumer satisfaction and environmental responsibility may still be a

consideration for these groups, but not the driving force of their actions. Consumer Reports, a monthly American magazine published by the Consumers Union, did extensive tests on e85 vehicles and found the new fuel might not live up to the hype.

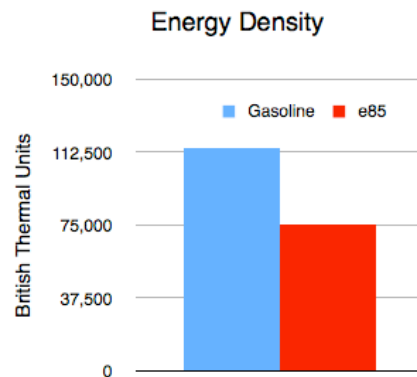
Putting Flex-Fuel Vehicles to the Test



Tests by the Consumers Union found the Chevy Tahoe burns significantly more e85 per gallon than gasoline.

However, mileage dropped significantly when running on e85. On the highway, the Tahoe averaged 15 miles per gallon (mpg), down from 21 mpg on gasoline. In the city, the Tahoe averaged an embarrassing 7 mpg, compared to 9 mpg on gasoline (Consumer Reports par 4). The cause of the decreased mileage is contributed to lower energy content in the fuel. According to the National Highway Traffic Safety Administration, e85 contains about 76,000 British thermal units (BTU) per gallon compared to 115,000 BTU in gasoline (NHTSA par 6). The result is that engines must burn more e85 to generate the same amount of energy as gasoline.

In Fall 2006, members of the Consumers Union performed a series of tests on a 2007 Chevrolet Tahoe, a popular sport utility vehicle. Contrary to the claim that e85 produces more torque and horsepower, tests showed no significant change in these metrics.



The energy density in e85 is significantly lower than gasoline. As a result, more e85 must be burned to produce the same amount of energy as gasoline. Figure 5

Buying Incentives

Currently, e85 is not price competitive with gasoline and flex-fuel capability of vehicles is rarely the deciding factor in a purchase. Despite polls which show consumers prefer to purchase a flex fuel vehicle, statistical data does not back up the hypothesis. Consumers commonly believe that the price of e85 is stable and the price of gasoline is susceptible to price shocks. However, Craig Pirrong, director of the University of Houston's Global Energy Management Institute claims, "if the price of oil goes up, you would expect the price of ethanol to go up as well" (Consumer Reports par 14). Another pricing problem with flex-fuel vehicles is that they rate much lower than their competitors in reliability tests. For example, if a consumer were to compare a Toyota Prius with a Chevrolet Impala, both popular midsize vehicles, he/she would find that the Prius gets much higher mileage and scores much higher in terms of reliability.

Big Business Conspiracy

A strong motivation for automakers to manufacture flex-fuel vehicles is the fuel-economy credits they receive. The federal government established the Corporate Average Fuel Economy (CAFÉ) standard in 1988 to regulate the efficiency of auto engines. Under the regulation, the entire fleet of an automaker's vehicles must meet minimum miles per gallon: 27.5 for cars and 21.6 for light trucks (pickups and SUVs). The Union of Concerned Scientists (UCS), a nonprofit organization focused on environmental protection contends that offering CAFÉ credits for manufacturers who produce flex-fuel vehicles has actually increased gasoline consumption by 1%.(UCS par 4).

Here is how it happens: the federal government assumes that a flex-fuel vehicle will run on gasoline 50% of the time and e85 the other 50% of the time (a terrible

assumption since on average flex-fuel vehicles run on e85 less than 1% of the time). The end result is that the government rates every flex-fuel vehicle at about 1 2/3 the fuel economy they actually achieve with gasoline (Consumer Reports par 19). For example, the Chevy Tahoe tested by the Consumers Union registered 21 mpg, below the 21.6 legal requirement; however, since the Tahoe is an FFV the government rates it as 33 mpg. The Union of Concerned Scientists estimates that FFVs have saved Detroit \$1.6 billion in CAFÉ fines (UCS par 1). Conspiracy theorists claim that greed ultimately hinders environmental protection and consumer satisfaction.

Actual Fuel Economy v. Fuel Economy Credits

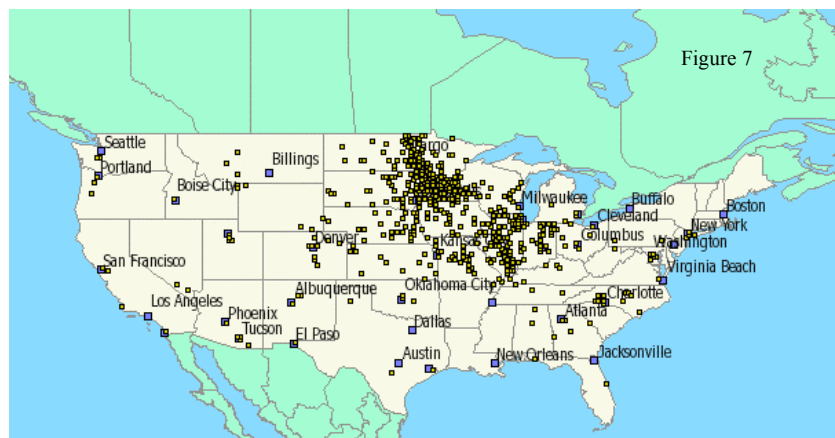
Model	CAFÉ Test Result (mpg)	Credited Fuel Economy (mpg)
Chevrolet Impala	29	48
Chevrolet Tahoe	20	33
Ford Taurus	26	43
Ford F-150	19	31
Chrysler Sebring	28	46
Dodge Durango	15	26
Nissan Titan	19	31

The US government credits auto makers with extra CAFÉ points if a vehicle runs on gasoline and e85. Scientists argue that gasoline consumption has actually increased since e85 vehicles were introduced. Conspiracy theorists believe the automotive companies owe billions of dollars in fines and should face stiffer regulations in the future.

Figure 6

e85 Scarcity

The United States has approximately 176,000 gasoline and diesel fueling stations across the country, and only 800 of them offer e85 at the pump. Making matters worse, most e85 pumps are located in the Midwest near Minnesota and Iowa where most of the country's corn is grown. Many states don't sell e85 at all. The only option for transporting e85 to other states is using ground transportation like trucks or trains. There are no dedicated ethanol pipelines in the US and e85 can't be shipped through traditional gasoline pipelines (Consumer Reports par 21). Adding to the problem, fueling stations have a difficult time justifying the cost of installing an e85 pump. According to the American Petroleum Institute, installing e85 pumps costs fueling stations up to \$200,000 each. Finally, ethanol is already blended in small quantities with traditional gasoline, and there is very little left over to produce a significant quantity of e85 (Consumer Reports par 23).



Most e85 fueling stations are located in the upper-midwest. Drivers in other parts of the country have a very difficult time finding a fueling station that sells e85.

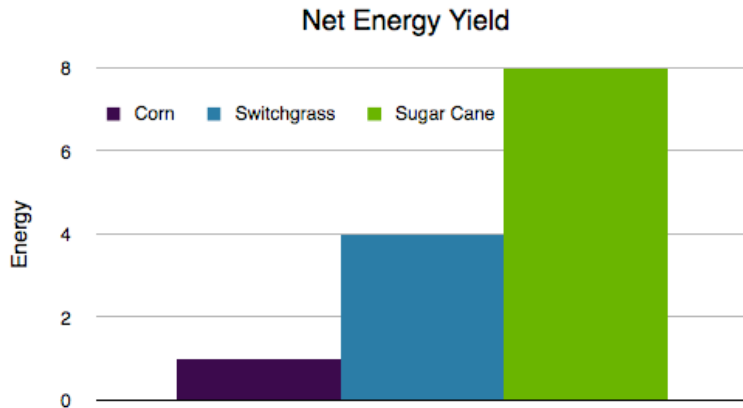
“Energy Independence” is Just a Political Soundbite

Americans would like to believe that we can follow Brazil's footsteps and free ourselves for foreign oil; but they neglect many fundamental differences between the two countries. The primary difference is in the feedstock used to produce the ethanol. According to the Institute for Energy Research, sugar cane grown in Brazil is about 7 times more energy efficient than corn grown in the United States. Additionally, the

amount of energy needed to produce ethanol from corn is often ignored. Oil is needed to run farming equipment to harvest corn crops. Petroleum is a common ingredient in fertilizers that farmer's use in their fields. Energy from coal is often used to power the ethanol production facility;

and finally, diesel is needed to power trucks that deliver e85 to fueling stations.

Some studies find that e85 uses up to 30 times more energy to produce than the fuel yields.



Corn has a much lower net energy yield than sugar cane. The implication is that almost 7 times as much corn must be used to produce a gallon of ethanol than sugar cane. In the future the US may consider using switchgrass as a feedstock, which has a higher energy yield than corn.

Figure 8

Conclusion: The Debate Continues

There is no shortage of disagreement about the costs and benefits of producing ethanol. Some scientists claim that ethanol produces more energy than is used to make the fuel, while others argue the exact opposite. The environmental debate is just as fierce; environmentalists claim that the production process puts just as much co2 into the environment as burning e85 takes out. In terms of the vehicles themselves, the verdict is in and they get a big thumb down. Consumer activist groups conclude that FFVs are not worth purchasing as a substitute to other vehicles in the same class. Ethanol research and development is likely to continue in the future. Once the fact is well known that corn is not a feasible feedstock for ethanol, research will likely switch to feedstocks such as

cellulose and switch grass. Ethanol may not be realistic in the status quo, but circumstances are likely to change in the future.

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