

# A brief history of ethanol

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When Henry Ford rolled out his landmark Model T in 1908, it put power to the ground with a 2900cc inline-four engine. That engine generated 20 horsepower and could propel the car to a top speed of just over 40 miles per hour and still get 15-20 miles per gallon. The fuel of choice for that first Model T was ethanol, which America's legions of farmers could make at home in great quantities, with plenty to fill the T's 10 gallon fuel tank and still have plenty left over for making moonshine.

Ethyl alcohol, the substance we know as ethanol, quickly fell out of favor as fuel for internal combustion engines simply due to the increasing use of and rapidly declining price of gasoline. Ethanol, also referred to as grain alcohol, is relatively easy

committed to the war effort, ethanol was again popular as a fuel. Following the end of the war, however, ethanol disappeared from the gas supply in the US as the nation enjoyed unprecedented economic success.

The oil crisis of the 1970s brought ethanol back into vogue, and Congress created the wave, starting with the Solar Energy Research, Development and Demonstration Act of 1974, which created incentives and subsidies for companies researching the conversion of organic material into energy. The Environmental Protection Agency (EPA) got into the act in 1973 by starting the long phase-out of lead in gasoline, a process complete by 1986. Ethanol found its way into nearly every gallon of gas sold in the US during that time as an anti-knock additive; suddenly important due to the missing benefits of having lead in the mixture.

In 1978, the Energy Tax Act reintroduced the term gasohol, defining it as gasoline blended with at least 10% ethanol. This law effectively created a \$0.40 per gallon subsidy for ethanol producers, spurring production of the volatile liquid in 10 distillation facilities that eventually produced upwards of 50 million gallons of ethanol every year. In just under a year, Amoco, Chevron (formerly Standard Oil), Texaco and other major refiners were pumping millions of gallons of ethanol-blended gasoline into American fuel tanks.

Congress boosted its support of ethanol production throughout the 1980s, starting with the Energy Security Act in 1980 that guaranteed a million dollars in loans for any firm willing to put up 90% of the construction costs for an ethanol plant. That same year saw barriers go up against importing foreign ethanol. By 1984, there were over 160 ethanol plants in the US and the government was covering \$0.60 of every gallon of ethanol produced in the country. Even this massive subsidy wasn't enough, though, and by the end of the following year, nearly 50% of the

ethanol plants had gone bust. Ethanol subsidies didn't drop below \$0.50/gallon until the last few years. In 2011, Congress acted to remove completely the \$0.45/gallon ethanol subsidy effective 1 January 2012. That had the effect of popping gas prices up a little over four cents a gallon almost immediately.

The idea of using gas blended with 8-10% ethanol in winter to control carbon monoxide emissions got its official start in Colorado in 1988; in 1992, amendments to the Clean Air Act mandated the wintertime use of ethanol in gas in 39 urban regions in the US—regions where the EPA said the emissions danger to the ozone layer was the highest. A dozen states boosted the subsidies in the mid-1990s due to poor corn harvests forcing corn prices higher, which caused ethanol producers' material costs to skyrocket, despite many—if not all—of them switching from coal to natural gas for their power source. The federal subsidy on ethanol remained above \$0.50 a gallon throughout the 1990s and into the 21<sup>st</sup> century.

In the 1980s and 1990s, the refining industry started using an additive in gasoline called methyl tertiary butyl ether, or MTBE. MTBE is made by fusing together natural gas and petroleum. Unfortunately, by the end of the 20th century, scientists and environmentalists found enough MTBE in America's water supply for the states, and eventually the federal government, to start banning its use, a process completed in 2003. MTBE was replaced by ethyl tertiary butyl ether, ETBE—a substance made by fusing together ethanol and petroleum, further increasing the percentage of ethanol pushed into every gallon of gas. However, the amount of ETBE in a gallon of gas isn't included in the measurement of how much ethanol is in a gallon of gas, because ETBE is considered an additive instead of one of the base ingredients.

The Energy Independence and Security Act of 2007 basically ensured the perpetual presence of ethanol in America's gasoline supply, legislating the use of 36 billion gallons of ethanol and other substances be blended into the fuel supply by 2022.



to make in about a week and only requires corn, water, yeast, sugar, heat and time.

Despite losing favor as a single-substance fuel source, ethanol got into the gas tank again in the 1920s, when Standard Oil started adding it to their gas to boost octane in an attempt to reduce knocking in engines. With the Depression in full swing in the 1930s, Americans could buy a substance called "gasohol," which had 5-10% ethanol mixed in with the gas. During World War Two, with so much US manufacturing and production

Currently, ethanol production is well over seven billion gallons a year, possibly as high as 10 billion gallons or more.

Ethanol is considered a green fuel because it comes from a renewable resource—corn. However, every ear of corn that gets mashed to make ethanol is an ear of corn that doesn't get processed into cattle feed, corn meal, high fructose corn syrup or tortillas. It's touted by the ethanol production industry as "clean burning," "high octane" and a "job creator." Speaking out against its use is therefore tantamount to political suicide for any public office holder willing to take on this issue.

It's well known the damage that alcohol can do to the body. We consume ethyl alcohol (ethanol) in massive quantities as a society. When it's consumed, it gets front-of-the-line service inside our bodies, getting processed ahead of nearly everything else we might consume at the same time. Alcohol's processing starts in the stomach, where the dehydrogenase enzyme starts to break it down; most of it gets absorbed in the small intestine, but about a tenth of it goes out through exhalation, perspiration and urination. From the small intestine, alcohol gets carried to the liver in the bloodstream, where that organ attacks it as a poison, trying desperately to clean it out of the blood and return the body to equilibrium. In addition to the damage this substance does to our society through the scourges of alcoholism and drunk driving, it can also contribute to a myriad of health problems such as cancer, heart disease, obesity, hyper- and hypoglycemia, kidney disease, liver disease and other syndromes.

The current blend of about 10% ethanol in each gallon of gas, while perhaps not totally ideal, is easily processed by modern internal combustion engines, from the two-stroke thumpers in weed eaters and lawn mowers to the massive V-12 behemoths in supercars. This mixture, referred to as E10, has been in more or less continuous use for two generations. As long as it's not stored for long periods of time, it doesn't attract much water, gum up too many fuel systems or damage any vehicle

components. For most car drivers, this isn't too much of a problem; as Americans, we're a car culture, and we drive a lot, burning up about 400 million gallons of gas every single day.

As motorcyclists, it's this cycle of storage we need to be carefully attuned to. While pure gas—or E0 as it's referred to by refiners—can go "stale," lose its volatility and gum up the works in our carburetors or fuel injection systems, the introduction of ethanol into the gasoline both accelerates and exacerbates this process, causing more problems and damage and doing it more quickly, even with "just" E10, compared to E0. This is the main reason it's important to add a fuel stabilizer, such as Sta-Bil, to the fuel system of a motorcycle being stored with a gas in the tank for any extended period of time. The stabilizer prevents the staleness and keeps especially the ethanol in the solution from absorbing water.

It's 2012 and the world is changing. July was the hottest month in the United States since 1936, continuing an upward temperature trend that's been going on since at least 1900 and accelerating since 2000. One of the results of that ongoing trend has manifested this year in a terrible drought torturing literally more than half the nation. In 2000, corn cost about \$110 per metric ton (2205 lbs.), or about \$2.82 per bushel (56 lbs.). In 2008, corn prices spiked to \$293/mt (\$7.50/bushel), dropping to about \$150/mt (\$3.84/bushel) in 2009; due to the drought now, however, corn is going for just over \$338/mt (\$8.66/bushel). The drought is not predicted to get better this year and may, in fact, extend over the next two to three years, driving corn and other food prices up for possibly the next five years.

One bushel of corn, processed properly, only results in two and a half gallons of ethanol. That's enough to manufacture 25 gallons of E10. Unfortunately, only the more difficult—and thus more costly—wet-milling method of processing corn yields ethanol; the good news, however, is that wet-milling for ethanol production creates byproducts such as 12 pounds of cattle feed, three pounds of corn meal, a pound and a half of corn

oil and 17 pounds of carbon dioxide, generally captured to use as an industrial refrigerant or to fizz up carbonated beverages. (Processing and output data from North Dakota State University.)

Even before factoring in the transportation, processing and storage costs for diluting gasoline with ethanol, we could see an immediate drop in the cost of gasoline, not to mention an immediate improvement in the quality of gas. Such disparate groups as the US Department of Agriculture and the International Food Policy Research Group agree, both issuing reports in August 2012 that point to a causal relationship between the ongoing drought and high (and rising) corn prices. Even 182 members of Congress agree simply removing, even temporarily, the ethanol requirements for gasoline could bring down corn prices—not to mention gas prices. Holding fast to its position that ethanol reduces the amount of pollutants spewed by internal combustion engines, the EPA has so far refused to agree to even a temporary waiver of the ethanol requirements.

There may never be a day when our gasoline is free from ethanol, but perhaps we can see an end to the calls to increase the percentage of each gallon of gas that is given over to ethanol. Maybe the popularity of the HBO television series "Boardwalk Empire" will help in that arena, as it's boosted the demand for moonshine—or at least the legal versions of corn whiskey. Corn, after all, belongs in our bellies, not in our gas tanks.

Data and statistics gathered from the following websites:  
[www.fuel-testers.com](http://www.fuel-testers.com) [www.gpreinc.com](http://www.gpreinc.com)  
[www.ifpri.org](http://www.ifpri.org) [www.upi.com](http://www.upi.com)



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K bikes and Oilheads Anton Largiadèr  
Repairs and maintenance (434) 295-0496 (h)  
Tire installation (434) 409-3767 (m)  
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