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## Racing E85 FAQ's

### 1. Is ethanol a more powerful fuel than gasoline?

Yes. Gasoline actually has more heat content per gallon than ethanol, but ethanol contains oxygen. This more than makes up the difference for the lower heat content of ethanol. An engine burns about 1.6 times as much ethanol by volume as gasoline resulting in a net gain in both horsepower and torque. The engine will run cooler as will the oil. The very high octane rating of ethanol (about 113) also means the engine can run a lot higher compression ratio, further increasing the horsepower-making potential.

### 2. How much higher is the octane with ethanol fuels?

The octane of pure ethanol is so high (about 113 Research Octane Number or RON) that it cannot be measured in the same way as gasoline. Any amount of ethanol in gasoline raises the octane rating of the fuel. E-10 (up to 10% ethanol) has an octane about 2-3 points higher than regular gasoline, typically 89-93 octane (R+M/2 method). E-85 (up to 85% ethanol) is usually rated at 105 octane (R+M/2).

### 3. Will ethanol damage a car's fuel system?

E-10 will not damage any parts of your car so long as it is a late model vehicle that specifies that it is E-10 compatible (refer to the owner's manual to be sure). In fact, E-10 fuels have been shown to promote cleaner fuel injectors and have a higher octane rating (less prone to knocking and run-on). With modern reformulated fuels, especially those containing ethanol, fuel injector clogging that was once a common problem is virtually non-existent today. In order to run E85 (up to 85% ethanol), a car must be specifically designed for it. These are called "Flexible Fuel Vehicles" (FFV's) and are usually identified by a gas cap insignia and in the owner's manual.

### 4. If ethanol is so good, why aren't all gas stations carrying E-10 and E-85 fuels?

At the current rate of gasoline consumption, there simply isn't enough production capacity. However, this is rapidly changing. For example, a year ago, the state of Indiana had only two operating ethanol production facilities. Nine more are now under construction or have already come online. You'll be seeing a lot more ethanol motor fuels as production capacity increases. New cellulosic (plant fiber) technologies are also improving the efficiency of production as well as opening up new raw materials like switchgrass that can easily be grown to produce ethanol.

### 5. I read that ethanol has a negative net energy balance. Won't ethanol production leave us with less energy, not more?

This is a myth and completely incorrect. Actually, gasoline has a negative Net Energy Value (NEV) of -.45 whereas corn-based ethanol has a positive NEV between +1.34 and +1.67. The more ethanol that we produce, the more energy we have. Old studies that contradicted this information mistakenly included the sunlight striking the corn plant leaves as an energy input into the system. Cellulosic ethanol technology has recently demonstrated positive NEV's over +5.00 with the potential to rise as high as a startling +7.00. NEV. And so long as there is land and rain, we'll be able to keep producing ethanol.

### 6. Does ethanol make a car run cleaner?

Yes. As an effective oxygenate, ethanol promotes more complete combustion. Gasoline chemicals contain a lot of carbon resulting in emissions of carbon monoxide and carbon dioxide. Ethanol contains very little carbon and also contains oxygen, so it burns a lot cleaner, with a 2% reduction in greenhouse gases for E-10 and up to a 23% reduction with E-85.

### 7. Years ago, I heard about problems with "gasohol". Is E-10 just a new name for gasohol?

No. Gasohol was introduced in the late 1970's and really was just the existing gasolines of the time with ethanol added. New E-10 fuels are formulated in accordance with federal standards for lower sulfur content, detergency, controlled volatility, and many other factors that make it a much cleaner and better fuel.



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### 8. Why will we be using more gasolines with ethanol in them?

There are a variety of reasons including those of economics, environmental issues, and even national security. Much of the ethanol made today uses corn and other renewable crops raised by our American farmers. This keeps more US dollars in America. Ethanol is environmentally friendly so we can enjoy cleaner air. Decreasing our dependence on foreign oil has also become a critical matter of national security. It is in our best interests to be as energy-independent as possible. Today, every domestic & foreign new car is E10 compatible and there are over two million E-85-compatible "Flexible Fuel Vehicles" (FFV's) already on the road. By the end of this year 2006, there will be an additional 400,000 FFV's produced and sold.

### 9. Will ethanol cause fuel separation and storage problems?

No. It requires a very large amount of water in ethanol mixes to cause "phase separation" in which water and alcohol come out of solution and wind up in the bottom of the fuel tank. E-10 would have to have more than 4 teaspoons of water in it per gallon before phase separation could start to take place. Ethanol and other oxygenates are much more likely to suspend reasonable amounts of water which is why many over the counter fuel additives intended to cure water contamination & icing problems contain these chemicals. The real culprit in ethanol/gasoline blends is the gasoline itself which is prone to oxidation and the formation of gums and varnishes.

### 10. Why use ethanol over methanol?

Methanol is primarily made from natural gas which doesn't alleviate the non-renewable energy issue. Even when made from cellulose, methanol contributes to CO<sub>2</sub> emissions. Methanol has less heat content per gallon than ethanol, so it reduces gas mileage. It is also more corrosive than ethanol. Methanol is harmful or fatal if swallowed and should not be in contact with skin. No domestic or foreign auto manufacturer currently approves methanol for use in motor fuels above 5% concentrations in any of their vehicles. The use of methanol fuels can void new car warranties.

### 11. What hardware/software changes are made to FFV's?

The hardware changes vary somewhat by manufacturer, but include ethanol-compatible fuel system components (corrosion resistant tank, pump, and lines), high flow fuel injectors, a % alcohol detector, changes to the engine computer programming, and sometimes spark plugs with wider electrodes. Older FFV's utilize the % detector, which is located in the pressure side fuel line. Gasoline is an insulator, but ethanol is highly conductive. The % sensor measures changes in electrical conductivity, temperature, and dielectric constant. It sends a duty cycle input to the PCM that allows a calculation of actual ethanol content to be made. The pulse width of the injectors is adjusted accordingly so that the fuel mixture does not become too lean. More recently, manufacturers have eliminated the % detector and use a "deductive refueling logic" to determine what fuel has been added to the vehicle. When the PCM "sees" that there has been a sudden change in fuel tank level, it deduces the amount of oxygenate from O<sub>2</sub> content in the exhaust and makes the appropriate changes to fuel delivery. These include different base injector pulse widths and different ignition timing curves (more fuel, advanced spark timing). E-85 vaporizes well enough for starting down to 10°F. Below that temperature, the engine block heater should be utilized.

### 12. Isn't ethanol really grain alcohol? Can I drink it?

No. While ethanol is the same product that's in alcoholic beverages, ethanol is always "poisoned" when produced and transported as a motor fuel do discourage abuse of the product. For blends like E-10 and E-85, the gasoline content acts as a very effective poison. Like any liquid motor fuel, you should avoid contact with the skin and long exposure to the vapors.