

Ethanol Notes (4/8/05)

Production

The process of making ethanol for vehicles is **similar to that of brewing beer**. You start with **grain or corn**, add **heat, yeast, enzymes** and after a couple of days – you end up with a highly distilled **180-200 proof alcohol**.

Since ethanol is made from live plants, there is a **net zero GHG** effect upon the environment because the plants absorb as much carbon as they release while being burned as fuel.

Currently, 90% of the ethanol used in the US is produced from **corn in the Midwest** and likely involves GMOs somewhere along the line.

A number of federal studies have concluded that corn to **ethanol production creates 34-67% more energy than it uses**.

Obviously, there are many ways of **improving the production process** from its' current state. Examples for improving current production include:

- Involving **biodiesel with the farm equipment** and transportation trucks
- Using more **sustainable farming** practices
- Producing the fuel **closer to the end user**
- Utilizing the byproduct of ethanol production as **dried distiller's grain** for animal feed
- Utilizing the byproduct of ethanol production as **fertilizer** and even **weed inhibitors**
- Using **alternative crops**: **sugar cane, sugar beets, cattails**.
- Using **cellulose-based crops**: **rice straw, switch grass, lawn clippings**. (*This is a new technology made possible by a specially developed enzyme*).
- Using **waste from other industries**: **sewage, compost, sugar/sucrose, wood pulp, cheese whey, potatoes, brewery, food and beverage**.

Ethanol is normally blended with gasoline for a number of reasons. 1) In order to “**denature**” the fuel to keep people from trying to drink it and to avoid being taxed as an alcoholic beverage. 2) To minimize problems in **cold weather**. 3) And to comply with auto manufacturers' **warranties**.

E10 is 10% ethanol / 90% gasoline and is warranted by all major auto manufacturers.

E85 is 85% ethanol / 15% gasoline and is warranted for any flexible fueled vehicle (FFV).

Refineries in California were recently forced to replace **MTBE** with ethanol, which means all gas in California now contains **5.7% ethanol**.

Storage/Distribution

Current legislature in California makes it difficult and very expensive to serve ethanol from a standard gas station. The California Air Resource Board (CARB) has yet to recognize a single manufacturer to become certified in our State for storing and dispensing ethanol. One fueling station in San Diego went ahead and applied for an experimental permit and after a large investment (primarily by Ford) they are able to finally provide E10 and E85.

The rest of the Country does not seem to have the same problem with ethanol. **The Midwest is littered with stations providing E85.** Many of those states have E10 (gasohol) in place of gasoline.

Brazil has been using 22% ethanol in their gas since the 70's and recently pushed that up to 24%. Their cars are very similar to ours and they've had no problems as a result of using higher blends of ethanol.

Although current laws in California impede the ability to distribute or sell ethanol from a pump. **They do not prohibit the transportation of fuel ethanol** in a safe and legal manner with certain restrictions of course. This is how and why we arrived at a home delivery service to get ethanol into our tanks – and gasoline out.

Straight alcohol does have different properties than gasoline. It is **nontoxic**. It **burns at a lower temperature** and therefore helps **extends the lifetime of an engine**. It **disperses more readily** than and evaporates more completely than gasoline if spilled. It even acts as a solvent and **keeps you engine clean**. Because of its' corrosive nature, however, it also reacts differently with other materials than gasoline does.

Here are some materials that may become degraded as a result to be exposed to ethanol over a period of time: **zinc, brass, lead, aluminum, terne (lead-tin alloy)-plated steel, lead-based solder, natural rubber, polyurethane, cork, leather, polyester-bonded fiberglass, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics.**

Here are some materials that tend to perform well during exposure to ethanol: **unplated steel, stainless steel, black iron, bronze, Buna-N, neoprene rubber, polyethylene, nylon, polypropylene, nitrile, Viton, and Teflon.**

Application

Now here's where the rubber meets the road as far as moving towards a local ethanol program.

Any car that runs on gasoline can run with a certain amount of ethanol. As I already said, E10 is covered under any warranty. And Brazil is not the only folks playing with blends in standard vehicles. A 2002 publication by the National Renewable Energy Laboratory (NREL) covers the very topic of 17-24% mixes. Here are their key points:

- **Any gasoline vehicle will run on E10 without any modifications.**
- **Most cars built after 1985 should run well with high blends of ethanol (no mods).**
- **All cars built after 1995 will run well on high blends of ethanol (no mods).**
- **Adding ethanol improves efficiency of the catalytic converter to 77-99%.**
- **Eight out of ten cars tested on E15 showed equal or less wear than cars on gasoline.**

The way I figure it. After sifting through various research papers and documents, my best estimate as far as GHG reduced as a result of running E24 - **the average person will save over 1.5 tons of CO2** being released into the atmosphere in a one year period. I arrived at this number by using averaged data. But there are many factors which would effect this rule of thumb. It depends on the age of your car, how fuel efficient it already is, how well suited it is towards ethanol mixes in terms of emissions, how often you drive, how the ethanol is actually made and transported to you. And so on.

Another useful figure is that **by using E24, you are emitting about 20-30% less GHG.**

If you happen to have a flexible fuel vehicle you can obviously use higher blends – but be sure to use the correct lubricants for your engine because ethanol can dry out therefore warp the heads when used in high mixes. It is very doable to use 95 or even 100% ethanol in a vehicle provided you know what you're doing. You can go to the resource section in our website to look at a list of FFVs.

Assuming you have a supply of E85 or E95, and you have a car that is not an FFV, I suggest you proceed in the following manner. 1) Every time you go to the gas station, put 10 gallons of gas in the tank. Then mix-in a number of gallons depending upon the age of you car (you can always up the mixture after some experimentation).

- If your car is 70s or older – start with 1 gallon of ethanol per 10 of gasoline.
- If it's from the 80s use 2 gallons per 10
- And for 90s or newer, 2.5 gallons would be a good start.

If you are interested in literally converting your vehicle to run on E85 or higher, there is a chip which you can install. It costs less than \$300 and is made in Canada or Brazil. We are only experimenting with them at this point, so don't get too excited. The Brazilian chips claim to work on any vehicle with any mixture of fuel. The Canadian chips work with most American made cars. Essentially, the chips override your OBC and control the amount of fuel delivered by the injectors and the timing.

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