BIOFUEL – ETHANOL BASE FUELS

What is Biofuel

Biofuel is a term for fuel from plant sources. A biofuel is a fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, rather than a fuel produced by geological processes such as those involved in the formation of fossil fuels, such as coal and petroleum, from prehistoric biological matter. Biofuels can be derived directly from plants, or indirectly from agricultural, commercial, domestic, and/or industrial wastes.

Biofuel is used for the same purposes as fossil fuels such as oil. It can not only power cars and lorries but can also be used to heat homes and fuel industry. Biofuels can be used to generate electricity. The biofuel version of gasoline is called **Bioethanol**.

Ethanol fuel is ethyl **alcohol**, the same type of **alcohol** found in alcoholic beverages. It is most often used as a motor **fuel**, mainly as a biofuel additive for **gasoline.**

A system known as the "E" factor to define the amount of biofuel in any biofuel blend:

- **E10** = 10% ethanol + 95% gasoline
- **E85** = 85% ethanol + 15% gasoline
- **E"X"** = X% ethanol + X% gasoline (dependent on geography and season)

Advantages

There are several advantages for using biofuel:

- Low cost alternative: Biofuel can be cheaper than regular fuel
- Pollution: Overall, ethanol is considered to be better for the environment than gasoline. Ethanol-fueled vehicles produce lower carbon monoxide and carbon dioxide emissions, and the same or lower levels of hydrocarbon and oxides of nitrogen emissions. E85, a blend of 85 percent ethanol and 15 percent gasoline, also has fewer volatile components than gasoline, which means fewer emissions from evaporation. Adding ethanol to gasoline in lower percentages, such as 10 percent ethanol and 90 percent gasoline (E10), reduces carbon monoxide emissions from the gasoline and improves fuel octane
- Availability and flexibility: E85 is also widely available at a growing number of stations throughout the United States. Flexible fuel vehicles have the advantage of being able to use E85, gasoline, or a combination of the two, giving drivers the flexibility to choose the fuel that is most readily available and best suited to their needs.

Disadvantages or Problems

There are several disadvantages for using biofuel:

- Fuel economy and performance: A gallon of ethanol contains less energy than a gallon of gasoline. The result is lower fuel economy than a gallon of gasoline. The amount of

energy difference varies depending on the blend. For example, E85, with 83% ethanol content, has about 27% less energy per gallon than gasoline (the impact to fuel economy lessens as ethanol content decreases)

- Phase Separation: Phase Separation describes what happens to gasoline containing Ethanol when water is present. When gasoline containing even small amounts of Ethanol comes in contact with water, either liquid or in the form of humidity; the Ethanol will pick-up and absorb some or all of that water. When it reaches a saturation point the Ethanol and water will Phase Separate, actually coming out of solution and forming two or three distinct layers in the tank. Phase separation is also temperature dependent.

  When this Phase Separation occurs you will have an upper layer of gasoline with a milky layer of Ethanol and Water below it, and then in many cases a third layer of just water at the bottom. If this happens and you try to start the engine you can have one or more of the following problems:
  - If your fuel tank pick-up tube is in the water layer, most likely the engine will fail to start.
  - If the engine is running and suddenly draws water you can have damage from thermal shock or hydro-lock.
  - If the pick-up tube draws the Ethanol-Water mixture or just Ethanol you can have problems where the engine will operate in an extreme lean condition, which can cause significant damage or even catastrophic failure.
  - If the pick-up tube draws the gasoline, it will operate very poorly due to lower octane that is the result of no longer having the Ethanol in the fuel. (*Note: Ethanol itself is not the octane booster, it is the formulation/combination of ethanol and the other elements that provides the octane.*)
- Deforestation: Perhaps the most shocking thing is that virgin rainforest is being torn up to grow palm oil for the biofuel industry. Ancient forests are natural "carbon sinks". When these valuable habitats are wantonly destroyed to make way for biofuel crops many other species suffer and irreplaceable bio-diversity is lost - probably forever.
- Food Scarcity: Biofuels also create a new use for traditional food stuffs such as grains and soya. This has affected both prices and world reserves. According to the International Grain Council, grain stocks are now lower than they have been since the 1970s.
- Water Scarcity in the World: It has been asserted that 1 gallon of (corn) ethanol takes 1,000 gallons of water to produce. In a world where water security is becoming a growing issue, this certainly gives pause for thought! The data refers to irrigated crops - i.e. ones where extra water needs to be added to aid growth. According to Noel Gollehon, a senior economist with the USDA's Natural Resources Conservation Service, about 15% of the corn for bioethanol is produced using irrigation. This is clearly not so sustainable as water tables continue to fall and drought is becoming more prevalent.