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Bio Fuel and its use in Historic Motorsport (and Classics)

Bio Fuel is a term used for fuel consisting, in part, of product from a sustainable source. This is usually from a crop of some type, and can be converted into fuel for petrol and diesel engined vehicles.

Bio Diesel is gaining popularity for cars and commercial vehicles and terms such as B5, B10, B20 and B100 are now commonplace. The number refers to the vegetable extract content of the fuel.

For the purpose of this article we will deal with the fuels for petrol engined vehicles i.e. Bio Ethanol.

Bio Ethanol is sourced from a variety of starchy vegetable crops such a sugar beet, sugar cane or sweetcorn. The ethanol is derived by distillation to produce a pure alcohol. To obtain the correct combustion characteristics it has been determined that a 15% incorporation of conventional petrol helps to produce an acceptable finished product, hence the E85 Bio Ethanol (85% ethanol in 15% petrol).

Bio Ethanol is very pure and non-polluting in its combustion, however detergents and corrosion inhibitors are still necessary for the 15% petrol component, but are present in smaller quantities compared to standard petrol.

In some respects Bio Ethanol has many advantages over conventional petrol, such as its octane rating being approx. 105 and having a 3-5% power advantage. Regarding emissions, when compared to engines run on standard petrol, Bio Ethanol fuelled vehicles generally provide lower levels of carbon monoxide (CO) and carbon dioxide (CO2) and either the same or lower levels of hydrocarbons (HC). Nitrogen oxides (NOx) are usually similar in both cases.

Bio Ethanol also provides additional oxygen to the combustion process, which is particularly useful where a forced induction system is used (turbocharged & supercharged), as it helps take advantage of a larger fuel charge into the cylinders and optimises fuel combustion and power generation.

However, this can be a disadvantage in carburettor engines as the additional oxygen will weaken the mixture downstream of the carburettor and the risk of detonation will be dramatically increased. (Modern engines are protected by knock sensors and sophisticated electronics).

The main down side is that its energy value is lower than standard petrol so that more fuel is consumed. The ideal air/fuel ratio for petrol is 14.7:1 whilst with Bio Ethanol it is 10:1 (both by weight), meaning that a Bio Ethanol fuelled vehicle would need an extra 40% of fuel to travel the same distance as an equivalent petrol vehicle.

Bio Ethanol is also corrosive. Non-metallic materials that show signs of degradation are natural rubber, polyurethane, cork gasket, leather, PVC, polyamides, methyl methacrylate plastics, thermoplastic and thermoset polymers. Therefore fuel hoses, seals, washers gaskets etc must be compatible for use with Bio Ethanol.

Suitable elastomers that can withstand its use are Buna N, Neoprene, Polypropylene, nitrile, Viton and PTFE

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Motorsport

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Bio Ethanol's relative lack of lubricity also means that valves and seats need to be hardened to the correct specification.

Zinc, brass, lead and aluminium are all sensitive and degrade over time. Lead tin alloy plated steel is common in the manufacture of fuel tanks, as is lead based solder, so all are vulnerable.

Unplated steel, stainless steel, cast iron and bronze all show acceptable resistance to ethanol corrosion.

Conclusion

The issue of fuel system compatibility is vital.

A modern vehicle will be designed to run on this new fuel, whereas older vehicles will have components that are not compatible with Bio Ethanol and it may not be possible to replace them with parts manufactured from suitably compatible materials. Indeed it may not even be possible to ascertain whether or not a component is manufactured from a compatible material.

Whilst the environmental benefits and PR spin will look attractive, the technical repercussions of using these fuels may well outweigh the advantages. In older vehicles, the deterioration, over time, of the valve gear, fuel lines, seals in carburettors, fuel tanks and fuel injection may result in a far more serious risk to health than the reduction in emissions.

Millers Oils recommend that, whilst there are many advantages to be had in modern vehicles, the historic racing and classic car world should approach the use of Bio Fuels with caution.

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