Why is there Ethanol in Petrol?

By Neil Kidby

If you spent countless years working for one of the country's foremost roadside rescue organisations then you might very well have a gut feel for most of the ills that afflict the internal combustion engine in its multiple guises. Neil is also a classic bike and car buff so he sees things from more than one perspective. With the topic of ethanol in petrol being so contentious here's a slant from the industry's perspective; a no holds barred, warts and all summary.

I am frequently asked about what petrol to use in older vehicles and the effect that ethanol in fuel has, hopefully this article will answer these questions. It may at times appear grim reading for older vehicles but it isn't really, we just need to think a little and in some cases shop around for fuel. The addition of an additive will be of benefit as well as you will see later.

The addition of ethanol in fuels has been controversial within the classic vehicle movement to say the least; it is seen as a "green" alternative to fossil fuels and to make us less reliant on them too. Sadly it is not without its drawbacks when used in vehicles that were not designed to use this type of fuel. Namely older vehicles. In 2009 all EU member states signed up to the Renewable Energy Directive, which requires 10% of road transport energy to be from renewable sources by 2020. The current UK minimum required by the Renewable Transport Fuels Obligation is 4.75%. There are no current plans to mandate the 10% level. Ethanol is a form of alcohol that has been modified so it can be used as a fuel, it can be made from starch or sugar crops such as sugar cane, sugar beet, wheat or other grains, pretty . much any fruit or vegetable matter can be distilled into ethanol. It generally has a lower energy level which means less mpg. Ethanol is not a modern fuel; the original Ford Model T Ford was actually designed to run on it until 1908. Henry Ford said it was the "Fuel of the future." Was he ahead of his time?

The original idea of adding Tetra-Ethyl Lead to petrol significantly improved its octane rating which meant it could be used in higher compression engines without detonation. (Pinking) This addition saw ethanol being almost ignored as a possible fuel source for cars for many years. Pure Ethanol has an octane rating of 113 which means it has a far higher resistance to pinking than conventional fossil fuels. This is why methanol (another alcohol fuel) has been used in dragsters and some racing cars. Pinking (or detonation) is caused when the whole fuel charge burns too quickly, lead makes it burn in a much slower and more controlled way. The EEC announced that from 2013 fuel companies are obliged to include 3.5% of bio fuel in all their petrol and diesel sales, there are financial rewards given to them for doing so. The idea was that this would increase to around 15% by 2015; this has proved unworkable due to various problems. There is no specific mandate as to the percentage for each individual type of fuel though. The fuel companies mainly concentrated on diesel fuel as a way of meeting their quota. Due to bio diesel being quite easy to manufacture and having few (if any) detrimental effects on the vehicles using it. By contrast this is certainly the case for older vehicles but more modern diesel engines are not very well suited to bio diesel. This is because the engine management system monitors the exhaust gases, bio fuel by its nature can have a higher nitrogen content, when bio diesel is burnt this can create higher Nitrous Oxide levels in the exhaust gases than conventional fossil fuels. One of the main reasons for exhaust gas recirculation systems (EGR) on modern diesel engines is to reduce the nitrous oxide levels. The amount of bio fuel that has to be included in fuel sales increases by a small percentage each year so the fuel companies now have to have a renewable element to their petrol to meet their targets. Note; pure ethanol has no nitrogen; its chemical make-up is C2+H5+OH (1).

Ethanol is a renewable energy source and is a good source of fuel in an engine that is designed to run on it, but unfortunately it does have a corrosive nature. This is partly due to its acidic nature and also the high oxygen content within the fuel. Metals corrode and rubber components can also be attacked. Natural rubber is particularly vulnerable to the effects of ethanol. Steel fuel tanks can corrode due to ethanol being hydroscopic. (Absorbs moisture from the atmosphere) Fuel pipes and rubber parts can also suffer as can rubber petrol pipes. Carburettors and the jets inside them and even cork gaskets can also be corroded by ethanol. It has been reported that only older vehicles are likely to suffer reactions to ethanol in fuel, other research has discovered that some engines produced as late as 2007 have materials in their fuel systems that could be damaged by ethanol. Fuel pumps are particularly vulnerable. Another corrosive reaction to be taken into consideration is electrolysis. This is found where two electronically dissimilar metals react with each other. Ethanol magnifies this effect, adding corrosion inhibitors to the fuel will help this situation.

Ethanol is only added when the fuel is in the delivery tanker, ready to be delivered. This is because if it was added sooner than this, the ethanol would attack the storage tanks in the fuel depot! Ethanol can't be transferred along pipelines either with the rest of the fuel, it will attack them too. Because ethanol contains 35% Oxygen, it needs less air to burn, those with knowledge of fuel/air ratios will know an ideal air/fuel mixture for conventional petrol is 14.5 to 1. Pure ethanol only needs a 9 to 1 ratio. This means the cars mixture needs to be adjusted accordingly because even low levels of ethanol added will effectively make for a weaker

This article was spotted by Club member Dave Shead. It was originally published in the Vintage Japanese Motorcycle Club's magazine, Tansha, and Dave thought that it would be of interest to our members. The article was written by Neil Kidby, the Editor of Tansha and we are reproducing the article here with their permission.

Our Club Technical Consultant, Robbie Marsh says that Mazda state that the NC and ND MX-5 are compatible with E10 petrol (EN228) and that the NA and NB MX-5 require petrol that has 5% ethanol or less.