

## ENHANCING THE PERFORMANCE OF PETROL

### How Much Ethanol Does Petrol Contain?

To improve vehicular emissions quality, fuel producers and suppliers now include 'renewable' fuel components in petrol (gasoline). The preferred renewable component of choice is ethanol.

Fuel complying to BS7800:2006 Automotive Fuel; High octane (super) unleaded petrol (i.e. >97 RON) will continue to limit the ethanol content to 5%.



Premium petrol that conforms to BS EN 228:2008 Automotive Fuel Unleaded Petrol (i.e. >95 RON) may now legally contain up to 10% ethanol and although this volume can be variable it should be assumed that the maximum allowable ethanol content is always present.

The UK is now in line with many other countries. In France and Germany E10 petrol (10% ethanol) has been widely available for years and this is also the norm in Australia. The USA currently has a minimum ethanol content in its gasoline of 5.9% vol. and >90% of the country's gasoline is now E10; it recently moved to approve E15 for engines manufactured after 2001 and E85 is also common for those engines on which it is approved (i.e. FFV – flex-fuel vehicles). Brazil, which has the world's most highly developed renewable fuels sector, now mandates 20-25% ethanol in all its gasoline.

### MOWER MATE

- ✓ Cleans up and keeps clean fuel injectors and carburettors
- ✓ Increases fuel economy
- ✓ Improves 'control-ability' and throttle response
- ✓ Reduces unwanted emissions
- ✓ Contains an octane booster to reduce 'pinking' potential
- ✓ Reduces the potential for filter plugging
- ✓ Controls combustion chamber deposit build-up
- ✓ Maintains the fuel's ignition quality
- ✓ Protects against ethanol-based corrosion
- ✓ Delays discolouration, gum/solids formation
- ✓ Contains a high dose of antioxidant (anti-ageing) component
- ✓ Has corrosion inhibition properties
- ✓ Reduces the potential for microbial growth during downtime



### PETROL SUPREME

- ✓ Cleans up and keeps clean fuel injectors
- ✓ Reduces unwanted emissions
- ✓ Improves driveability and throttle response
- ✓ Controls combustion chamber deposit build up
- ✓ Increases fuel economy
- ✓ Contains an octane booster to reduce 'pinking' potential



## Consequences and Side Effects – the Pros and Cons

### Energy Content

The energy content per unit of ethanol compared to petrol is 30% less implying that under identical operating conditions, ethanol-containing fuels will result in a higher fuel consumption than 100% petrol.

### Deposit Formation

The presence of ethanol increases the tendency of fuel to form deposits on inlet valves and fuel injectors. As a result, fuel containing a recognised gasoline detergent additive package should always be used and/or top-treated with a suitable aftermarket additive (e.g. **Exocet Petrol Supreme**).

### Octane Ratings

In simple terms the octane rating of a fuel is a measure of its resistance to 'knock' or pre-ignition. Additives to boost a fuel's octane rating (**Exocet Petrol Supreme**) are available but it should be noted as well that ethanol itself is an exceptional octane enhancer.

### Fuel Volatility

A fuel's volatility is a measure of its tendency to vaporise. A fuel must be volatile enough to provide reliable cold start and warm performance but not so volatile as to cause hot restart, fuel foaming and vapour lock problems as well as poor fuel economy. Ethanol increases a fuel's volatility and whilst blends up to E10 should not be a problem, engines exposed to higher blend ratios may have issues.

### Air:Fuel Ratios

As an oxygenate ethanol contains oxygen. In fact, an E10 blend is about 3.5% oxygen. Clearly this has the effect of increasing the air:fuel ratio and causing the engine to run leaner. On modern, fuel-injected, engine-managed vehicles this has little bearing but on race engines or engines using a carburettor some adjustment will be necessary.

### Water Retention

Ethanol is hygroscopic meaning that it will absorb water directly and readily from the atmosphere. Further, it is highly miscible with water. This has a number of adverse effects:

- i) Water in fuel reduces its calorific value;
- ii) Water promotes the separation of a gasoline-ethanol blend into its constituent parts;
- iii) The transport of ethanol-containing gasoline in existing fuel distribution infrastructure becomes problematic as it exacerbates the problem of water pick-up;
- iv) Picked-up water will most likely contain those contaminants that give rise to corrosion (see below);
- v) The potential to cause physical damage to injectors and carburettors as a result of water 'slugs' is increased.

### Materials Compatibility and Corrosion Issues

Fuel delivery systems fitted prior to 1990 could contain higher proportions of natural and synthetic rubbers than later designs. This will cause problems when used with ethanol containing fuels, which would manifest as softening, cracking or even disintegration/breakdown. Viton and Fluorel are now the materials of choice for fuel lines and related fuel system components.

As regards metallic corrosion, ethanol fuel blends can contain soluble contaminants whose presence results from or is enhanced by the presence of water. They act by breaking down the oxide layers built up on the metal surface and then attacking the metal, resulting in pitting corrosion. The contaminants also serve to increase the fuel's conductivity, which itself promotes corrosion.

The use of a recognised corrosion inhibitor or of a petrol additive package (**Exocet Petrol Supreme**) containing one is usually sufficient to alleviate any corrosion concerns.

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