



FUEL, OCTANE & POWER

INCREASING OCTANE DOES NOT INCREASE POWER

Higher compression and improved engine breathing will increase power. These modifications may lead to detonation or combustion knock which is then eliminated by using fuel with a higher octane.

ALL PETROLEUM BASED FUELS PRODUCE SIMILAR POWER

Petrol refining produces a blend of hundreds of different hydrocarbons that have the required properties to meet the needs of spark ignition engines. It is well recognised that varying the blends has little effect on the power produced in an engine.

BP 100 IS A HIGH OCTANE FUEL THAT HAS GOOD VAPOURISING CHARACTERISTICS

High Octane fuel is required to avoid detonation when compression pressures are increased by either an increased compression ratio or better breathing. The narrow boiling range of BP 100 will ensure good mixture preparation because the heavier hydrocarbons of normal petrol are avoided. Also the lack of very low boiling temperature hydrocarbons will prevent hot fuel handling problems such as vapour lock.

BP METHANOL HAS SPECIAL PROPERTIES THAT INCREASE POWER

Methanol is the only readily available fuel that produces any significant increase in power over petrol. Methanol allows extremely high compression ratios to be used to produce more power. In addition, with methanol the engine can cram more energy into the cylinder for three reasons:

- i. The large amount of fuel being consumed.
- ii. The cooling effect when methanol evaporates raises the density of the mixture, ie. even greater energy content of the mixture.
- iii. Methanol contains oxygen within its chemical structure, which acts like a chemical supercharger.

Methanol requires 3 times the flow rate of petrol so the fuel supply system requires significant modification.

Avoid lean mixtures because methanol has a low resistance to re-ignition; the high exhaust valve temperatures caused by slow burning lean mixtures may induce pre-ignition and hence piston damage.

TOLUENE IS A COMMON OCTANE BOOSTING COMPONENT

Toluene (methyl benzene) gives about 1 octane number boost for each 5% added and the mixture may need to be slightly richer also. The higher octane allows the use of a higher compression ratio for more power. Toluene has a high carbon content that may lead to sooty spark plugs so don't assume that this indicates an overly-rich mixture. Toluene is also a good solvent, and high concentrations affect rubber and plastic components in the fuel system.

RACING FUELS CAN BE TAILOR MADE FOR A PARTICULAR ENGINE

Some hydrocarbons may be particularly suitable as racing fuel components because of their volatility, octane and combustion characteristics, but refineries are not usually capable of separating them from petrol. For example, in the past Formula One teams expended money and resources tailoring a petrol to suit their particular "engine" and application. However, the benefits were relatively small. Note though, that since the regulations have changed, Formula One teams now use commercially available fuel.

The following table summarises some important fuel properties:

Fuel	RON typical	MON typical	Air/fuel ratio by mass stoichiometric	Air/fuel ratio by mass maximum power #	Latent heat of vapourisation MJ/kg	Highest useful compression ratio *
BP Lead Replacement Petrol	96	85	14.4	12.0	0.34	9-9.5
BP Premium Unleaded	96	85	14.4	12.0	0.34	9 - 9.5
BP Regular Unleaded	91	82	14.7	12.5	0.34	8.5 - 9
BP Ultimate	98	87	14.4	12.0	0.34	9.5-10
BP 100 Racing Fuel	110	100	15.0	12.9	0.36	11.5 - 13
BP Methanol Racing Fuel	115	91	6.5	4.5	1.17	15 - 17
Toluene	124	112	11.5	9.8	0.41	13 - 15

* Approximate compression ratios only - depends on engine design and application.

Air/fuel ratios will vary slightly with fuel composition.

Smaller cylinders with shorter flame path allow higher compression to be used. Very high engine speeds also allow higher compression. For example in racing boats where low speed, high load operation is avoided.

**For further information, please call the
BP Lubricants and Fuels Technical Helpline
1800 033 558**

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or visit www.bp.com.au/fuelnews