



HIGHER OCTANE FUEL INCREASES 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. Modern vehicles have sophisticated engine management systems that can detect engine knock and will adapt the engine to run on the fuel without knocking. Modern vehicles are tuned to use Premium Unleaded Fuel with an octane of 95 to gain best emissions performance per kilometer. When they use a lower octane fuel the engine will adapt to use that fuel without knocking but this will mean a loss in power.

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. Unfortunately BP 100 contains lead and therefore cannot be used on the open road. It is restricted to special vintage car and powerboat racing applications. Special provisions and purchase arrangements controlled by CAMS apply to leaded racing fuels such as BP 100 and a log book and permit from CAMS is required to be able to buy Racing 100.

BP ULTIMATE

BP Ultimate is the highest octane retail fuel that BP has on the market. It has an octane rating between 98 and 100 and does not contain ethanol. It is suitable for all cars but older pre 1986 vehicles designed for leaded fuel may need to add an additive to prevent valve seat recession. BP Ultimate also contains a high dose of additive to protect the fuel system and to remove deposits that foul intake valves and the combustion chamber causing poor combustion and knock.

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:

- The large amount of fuel being consumed.
- The cooling effect when methanol evaporates raises the density of the mixture, ie. even greater energy content of the mixture.
- 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. Ethanol is similar to methanol but does not have the same cooling effect however it is increasingly being used at 10% in petrol to offset greenhouse gas emissions.

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 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 Premium Unleaded	95	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	99	88	14.4	12.0	0.34	9.5-10
BP Regular Unleaded with 10% ethanol (e10)	93	82	14.7	12.5	0.34	9.5
Opal	93	88	14.4	12.0	0.34	9.5
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 Fuel
Technical Helpline 1300 139 700 local call
or visit www.bp.com.au/fuelnews**