Fuel News

Fuel, Octane & Power

HIGHER OCTANE FUEL INCREASES POWER

Higher compression and improved engine breathing will increase power. These modifications may lead to detonation or combustion knock due to higher temperatures. This can be eliminated by using fuel with a higher octane or cooling the mixture. Modern vehicles have sophisticated engine management systems that can detect engine knock and will adapt the engine to run on the fuel without knocking by changing the time at which the spark fires to simulate a lower compression. 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 and increase in emissions. An alternative is to inject the fuel directly into the cylinder which cools the mixture and enable a higher compression with a lower octane fuel so that there is no power loss.

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

BP 100 is a high octane fuel, typically around 106, that achieves high octane by using lead additives. 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. Because BP 100 contains lead it cannot be used on the open road. It is restricted to special vintage car and powerboat racing applications.

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 pre 1986 vehicles designed for leaded fuel may need to add an additive to prevent valve seat recession if they do not have hardened valve seats. 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 to produce the same power output so the fuel supply system requires significant modification to enable the higher flow rate.

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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 has similar combustion properties to methanol but does not have the same cooling effect. 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. 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.

The following table summarises some important fuel properties for carburretted and port fuel injection engines.

Fuel	RON typical	MON typical	Air/fuel ratio by mass stoichio-metric	Air/fuel ratio by mass maximum power #	Latent heat of vapourisation MJ/kg	Highest useful compression ratio *
BP Regular Unleaded	91	82	14.7	12.5	0.34	8.5 - 9
BP Regular Unleaded with 10% ethanol (e10)	93	82	14.7	12.5	0.34	9
BP Premium Unleaded	95	85	14.4	12.0	0.34	9 - 9.5
BP Ultimate	99	88	14.4	12.0	0.34	9.5-10
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.

Spark ignition direct injection engines (SIDI) use the cooling affect of the fuel to enable operation at a higher compression ratio and for these engines with a 91 octane fuel a compression ration of 11:1 is possible.

For further information, please call the BP Lubricants and Fuel Technical Helpline 1300 139 700 local call or visit www.bp.com.au/fuelnews