Fuel News

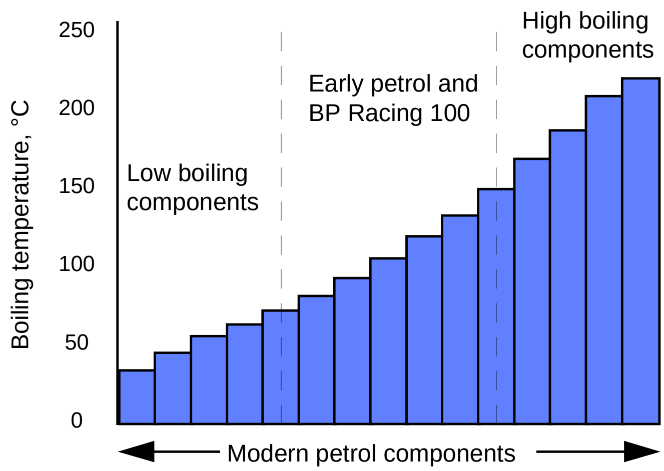
Modern petrol in Vintage Engines

Many enthusiastic owners of classic motorcycles and cars have experienced engine operating problems using modern petrol. The cause is often wrongly attributed to the octane rating of modern petrol. Most users perceive octane as the most important property of petrol but in reality the boiling range or vapour forming properties have the major influence on fuel performance. High octane petrol has no influence on combustion quality or burn rates in these engines. It is the effective ratio of air to vaporized fuel in the combustion chamber that matters.

Over the last 100 years the development of petrol and cars has gone hand in hand. Each engine was designed around the petrol which was available at the time. Petrol has changed, largely because of the pressure to produce greater volumes as the demand has grown. This pressure has resulted in a wider boiling range for petrol with lower boiling point hydrocarbons and higher boiling point hydrocarbons. It is the addition of these light and heavy hydrocarbons that has forced changes in fuel system and carburettor design. Octane has gone up over the same period, but that is only to stop pinging [combustion knock] in high compression engines.

THE NATURE OF PETROL

Petrol is a mixture of many (even hundreds) of different hydrocarbons. Each component has its own boiling point which means that a fuel boils over a range of temperatures.



In the diagram, each bar represents single component. In recent years high and low boiling components have been added to satisfy demand. BP 100 Racing Fuel has a narrower boiling range than normal petrol and it best approximates the fuels produced earlier in the century.

THE EFFECT OF MODERN PETROL IN VINTAGE ENGINES

The effects range from poor vaporization in the carburettor to excessive vapour formation in the fuel system. Each problem engine must be studied with a clear understanding of the likely symptoms. All of the following problems have been reported but vapour lock appears to be the most common.

The possibilities are varied and may include the following cases.

1. Very early engines with wick or surface carburetors may suffer because the low boiling components may vaporize leaving the high boiling components to build up in the carburettor and hence lean off the mixture.
2. Some engines with simple carburetors that do not spray the fuel into small droplets may end up with unburnt high boiling fuel components going out with the exhaust. If the correct amount of fuel is added to the air stream but is not fully vaporized by the time combustion occurs then this is effectively a lean mixture. The air/fuel mixture in these circumstances could be likened to that of a cold engine running with the choke on. A lot of fuel being supplied but not much being burned.
3. In later engines the problem may move to excessive vapour formation in the fuel pump and fuel lines (vapour lock). This is caused by the high fuel system temperatures vapourising the low boiling components in modern petrol. This is the common form of vapour lock which results in lean mixtures.
4. There are several ways in which excess vapour formation in the float bowl can cause a rich mixture or flooding. Pressure build up caused by inadequate venting of the float bowl can force excess fuel from the jets. Secondly, with some fuel system designs, vapour bubbles formed in the float bowl as petrol ejects from the needle valve can cause foaming. The float then sinks in the low density foam which opens the needle valve and floods the engine.
5. Another complex problem is that of ice formation in the butterfly area of the carburettor. In some vehicles the carburetors have inadequate heat input, particularly if exposed to the air stream [motorcycles]. The temperature drop as petrol evaporates can freeze moisture in the air stream. The ice can restrict the flow of air and/or choke the engine causing power loss or stalling. This can occur below about 14°C with humid or foggy atmospheres.

THE EFFECT OF LEAN MIXTURES

To achieve complete and effective combustion, the fuel must be completely vaporized and the air/fuel mixture must be in the correct proportions. A lean mixture (insufficient fuel) burns slowly because of the wide spacing of the fuel molecules. Slow combustion leads to:

1. Overheating of the cooling system caused by the flame being there for a longer period.
2. Overheated exhaust valves, particularly if combustion continues after the valve opens.

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