

# Lead Replacement Petrol and Lead Substitute Additives

What do we require from fuels? Priority is POWER! The higher the octane level of fuel, the more performance that can be gained from the fuel. Secondary is that fuel acts as a lubricant in an engine. In the case of Super, lead is the lubricating agent. With the arbitrary requirement for fuel to contain NO LEAD, in the market place, fuel suppliers have created a product designed as a replacement for leaded fuels and they appropriately named it Lead Replacement Petrol (LRP). Some companies refer to it as Lead Free Super.

## **WHAT ARE OUR OPTIONS?**

In summary of the following arguments, we are left with two alternatives -

- 1) Take LRP as it comes, and forget about the chance of engine damage, or;
- 2) Take the initiative to guarantee fuel quality by administering a lead replacement ourselves. Easily done when we fuel up by adding to regular unleaded (or premium unleaded for a higher octane count). We recommend this option.

## **WHAT REPLACES LEAD?**

Three of the internationally used replacements for lead are: Phosphorous, Sodium and Potassium.

### **Phosphorous**

- In Western Australia phosphorous was first used in LRP to replace previously used lead.
- Is the least expensive of the available chemical compounds sold by Octel (*Octel previously made the lead used by fuel companies for the last est. 80 years.*)
- Has the lowest vapor point
- Stays on the valve for the shortest period following wide open throttle
- Senior chemists from both Shell and BP have verbally stated that the valve protection will be evident for seconds only following wide open throttle and then the car will need time to recover (cool) before more protection is added to the valve and seat.
- Has been accused in NZ, since changeover, of causing valve sticking and sooty engines from the day it was released.
- Some self dose lead substitute additive products in the marketplace may use this for lead replacement.
- May poison catalytic converters from just one application.

### **Sodium**

- Stays on the valve longer when you go to wide open throttle with no valve sticking.
- Used by Red Line Oils (#1 100% Synthetic Oil company in the world) in their product **Red Line Lead Substitute**, which:-
  - Is being endorsed by **The Federation of British Historic Vehicle Clubs**, after 'demanding test' results (by Motor Industry Research Association) found Red Line

Lead Substitute to be one of four products that passed, out of 32 products available for testing. See <http://www.morrisminoroc.co.uk/mmoc/fbhvelead.ht>

- Red Line Lead Substitute has high temperature stability.
  - Provides the protection of high leaded fuels.
  - Will not damage catalytic converters.
  - At the time of writing, benefits for using Red Line Lead Substitute were significant and costs were similar to buying LRP One bottle of Red Line Lead Substitute treats 450 litres of unleaded fuel (minimum recommended dosing).
  - May be used in turbos.
- Creates the lowest amount of soot.

### **Potassium**

- Used by the UK in their LRP. WA has since changed from Phosphorous based to Potassium. East coast has been introduced straight onto Potassium based LRP.
- Has a higher temperature stability than phosphorous -as first used in WA LRP.
- Does not protect the valve seats, at highway speeds, or under load.
- Protection with potassium on the valve seat is totally dependent on the temperature of the exhaust gases. Double dosing does not null the issue of heat over the exhaust seat, and in simple terms two pieces of paper are no more heat stable than one.
- Motorists still complain of vehicles' downside effects since using new formula Potassium based LRP.
- It should be noted that mixed use of Phosphorus based self dose additives along with new formula Potassium based fuel is believed to cause adverse chemical reactions and therefore not recommended.

As a test case for LRP in Australia, our geographic position in WA isolates us from other major motoring densities allowing WA to be monitored for damage. While under trial, the need is here to ensure every mechanic in WA is on the lookout for changes in the service pattern of older cars, and of special note are increases in the rate of damage, like valve recession. Unfortunately, we can almost guarantee our results will be exactly the same as experienced in the UK. (Remember their Potassium based LRP has higher temperature stability than Phosphorous used in WA LRP.) Drivers in the UK who have made damage complaints appeared to go unheeded and are reported as being told by the fuel industry-

... 'that the car must have been run on straight unleaded fuel', or;

... 'the vehicle was old and was going to fail anyway'.

Isolating evidence to prove that fuel caused specific damage above any number of other possible contributing factors would be difficult, therefore ensuring little or no claims are made.

### **VALVE SEAT DAMAGE**

Phosphorous and Potassium are not adequate to reach the valve faces and seats which need protection. (This is where the lead in leaded fuels use to sit and cushion the valve). Phosphorous will not withstand the heat in this area, which will then lead to heavy valve seat recession within 60 hours.

Double dosing and hard driving, when using Potassium or Phosphorous based Lead Replacement Additives, again leaves the valve seat inadequately protected, especially as chemical vapor temperature is reached, deposits form twice as fast on the valve stem & other areas in the exhaust where the temperatures are lower. This leads to sticking valves and all the associated valve train damage, sootiness and other combustion area problems.

Use a high quality hydrocarbon detergent like Red Line Oil SI 1 Injector Cleaner to clean the combustion chamber, valves and fuel system. Regular use of this product on lower dosage will maintain the cleanliness of your fuel system. Refer to manufacturer's recommendations.

### **LACK OF REGULATORY STANDARDS**

A debatable concern is that Australian fuel industries have been allowed to choose the formula of Lead Replacement Petrol, with no Australian or International recognized standard to reach. We will be using the LRP formulae that fuel companies decide is the most commercially acceptable.

### **DIESEL FUEL INDUSTRY CHANGE**

The next big change in the industry is the reduction of sulfur in diesel fuels. Already under trial in parts of Queensland is No Sulphur Diesel Fuel. In effect in parts of Western Australia is Low Sulphur Fuel. The future may see it regulated into the transport industry.

Because sulfur helps to lubricate fuel pumps and injectors, the diesel industry can expect a rapid increase in wear damage, meaning increase in parts failure.

Already under trial in Australia is the use of Red Line Oils RL2 Diesel Additive & RL3 Diesel Additive (with added Cetane booster).

Disclaimer: The information stated in this document is the basis of research that is expressed as opinion only. Consumers are advised to verify facts for themselves.

**Technical information on Red Line Lead Substitute is available from  
[www.redlineoil.com.au](http://www.redlineoil.com.au)**