Fuel News

Petrol Life in Vehicle Tanks

INTRODUCTION

Petrol is a mixture of many components with different properties that contribute to the performance of the fuel. When petrol is left out in an open container exposed to the air it will in time completely evaporate. As it evaporates the composition and properties will change because different components evaporate at different rates. This is a normal feature of petrol and the same process takes place in equipment fuel tanks. Where petrol is kept for more than a week in equipment tanks then it can become stale and it is better to add fresh fuel before using. Examples are classic, veteran and vintage cars and bikes, racing cars and bikes, drag cars, boats, dual fuel vehicles, lawn mowers etc.
Generally petrol will last in equipment fuel tanks for about 3 weeks at a temperature of around 20 deg C, after that it will perform better when fresh petrol is added.
Petrol will last in sealed containers for more than 6 months, while some breathing will take place this is not enough to significantly affect product quality.
In underground storage tanks the rate of replenishment prevents the fuel from becoming stale

HOW PETROL CHANGES IN EQUIPMENT TANKS

Loss of light components – impact on mixture

The light components in petrol are lost first as the petrol sits in the fuel tanks. These components provide valuable octane benefits during cold start. Because they are volatile they compose most of the air fuel mixture during cold start, if they are absent then the mixture becomes lean resulting in higher temperatures, pre ignition, detonation and piston damage. This is generally the cause of piston damage in high revving engines used in boats and small engines such as chain saws etc.
The portion of the petrol that remains has a higher density and higher octane but this is not available during cold start resulting in hard starting. Because the fuel carburetors and injectors operate on a volume metering system the higher density means that more fuel is introduced for a given volume of air and so the air fuel ratio is fuel rich. If all the fuel cannot be burnt then it forms carbon deposits that will foul the spark plug and cause the engine to stop and not start. This is generally the cause of problems in classic cars where the engine stumbles and hesitates or cuts out.

Loss of light components – impact on octane

The light components in petrol are lost first as the petrol sits in the fuel tanks. These components provide valuable octane benefits under high revving conditions such as cold start acceleration and the loss of these components can result in detonation and pre ignition at high speed resulting in piston damage.
The remaining components that have not evaporated are high octane and octane can actually increase with time but this octane is not available for high revving conditions.

Gum and Peroxide formation

With long storage periods, especially in the presence of hot weather or engine heat the petrol can oxidize to form peroxides. These compounds can attack rubber and metal, stripping away the liner on fuel lines or copper from fuel pumps and attacking rubber hoses. These normally take a few months to form in sufficient quantity to cause a problem. This process is faster if Ultra Violet light can get to the petrol.

IMPACT OF ENVIRONMENTAL LEGISLATION ON PETROL PROPERTIES

Volatility restrictions

Current State EPA legislation restricts petrol volatility in the summer period, generally November to March. In that period petrol will have less volatile components than at other times, generally the summer volatility of petrol is 30% lower than the winter volatility which means that the loss of lighter components in summer can be quicker. However this is not usually an issue due to higher temperatures but can create problems in autumn if the summer fuel is held over. To avoid this fresh fuel should always be used in the April May period.

MAINTAINING FUEL IN EQUIPMENT TANKS

It is not possible to provide a foolproof strategy for engines that are used only intermittently, however the following principles help.

1) Always add some fresh fuel when the equipment is to be used if it has not been used for more than a week. This will provide additional volatile components and protect from cold start high revving detonation and piston damage.
2) Always keep the tank half full to stop water vapour from being sucked in and condensing.
3) Use a fuel that contains anti oxidants, metal deactivators and corrosion inhibitors to protect metal surfaces such as BP Ultimate
4) Using a hotter spark plug will help to reduce carbon deposits

EXAMPLE OF HOW PETROL CHANGES WHEN STORED IN FUEL TANK

Property	Week 1	Week 2	Week 3	Week 4	Week 5
% volume lost	3	5	8	10	15
Octane RON	98.1	98.4	98.6	99	99.5
Density kg/l 15 deg C	0.75	0.76	0.765	0.78	0.79
Equivalent air fuel ratio at constant volume	13:1	12.8:1	12.7:1	12.5:1	12.3 :1

At the end of 5 weeks the fuel is 5% heavier and the fuel air mix will contain more fuel.

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