



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 A VEHICLE TANK

Loss of light components – impact on mixture

The evaporation of the lighter components with low density means that the remaining petrol has a higher density. 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. With unleaded petrol carbon deposits in the engine can be electrically conducting and this weakens the spark.

Loss of light components – impact on octane

The light components in petrol are high in octane but when they evaporate the heavier components left are also high octane components so there is no loss in octane but the volatile components provide added octane during cold start and cold acceleration. As a result if the volatile components are missing then engine knock would occur during cold start and cold acceleration.

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 curtails 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 ambient temperatures but can create problems in autumn if the summer fuel is held over to a cooler season. To avoid this fresh fuel should be used in the April May period.

Removal of lead

Lead used to be an octane booster in leaded petrol but it also used to lower the burn off temperature of carbon deposits so that they would burn off at lower temperatures and not foul the spark plugs. Without lead in the fuel the carbon requires a higher temperature to burn away, this can be addressed by using hotter temperature spark plugs in older vehicles.

MAINTAINING FUEL IN VEHICLE 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.
- 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 |
|--|--------|--------|--------|--------|---------|
| 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**