

Rolls-Royce Owners' Club of Australia Library

Converting to LPG (Liquefied Petroleum Gas)

By Tony Ward (NSW), September 1999

In answer to a member's request for the "pros and cons" of changing to LP gas, here is the bulk of an article published by the Australian Liquefied Petroleum Gas Association and supplied by the NRMA Technical Library.

What is LP Gas?

Liquefied Petroleum Gas (LP Gas), like petrol, is a hydrocarbon fuel. It is mainly composed of propane and butane with a minor amount of propylene. LP Gas in its normal state is a vapour, but when moderately compressed, it becomes a liquid. This enables a vehicle with a full LP Gas cylinder to travel a similar distance as the same vehicle would travel on an equal amount of petrol. The technical specification of LP Gas for automotive use is controlled to ensure consistent vehicle performance with clean, smooth combustion under all driving conditions. LP Gas is nontoxic, non-corrosive, free of lead and heavier than air. LP Gas in its basic state is both colourless and odourless. To alert people when there is a gas leak, an odourant with a distinctive smell is added at the time of production.

Where does LP Gas come from?

There are two sources of supply:

1. Naturally occurring LP Gas which is gas that has been extracted from oil and/or gas fields in various areas of Australia. There are four main areas:
 - Bass Strait in Victoria
 - Cooper Basin in South Australia
 - The Northwest Shelf in Western Australia
 - The Surat Basin in Queensland
2. Refinery Production. In Australia there is refinery production of LP Gas in all mainland States - one refinery in Western Australia, one in South Australia, two in Victoria, two in New South Wales and two in Queensland. In 1992 approximately 16% of total

production came from the refineries. In 1996 22% of total production came from refineries.

Is Autogas available in remote country areas?

Autogas marketers have made a major commitment in recent years to the establishment of nationwide retail network of Autogas outlets. It is now possible to travel very comfortably to all locations in Australia utilising autogas.

Several publications are available from LP Gas merchants or book shops which detail available outlets in each State and their opening and closing times.

Is LP Gas safe?

All use of LP Gas in vehicles is controlled by State Government Regulations and National Codes. The components associated with the LP Gas fuel system are manufactured and then fitted to extremely strict standards. There is substantial practical evidence to confirm that LP Gas fuelled vehicles are as safe, if not safer than petrol fuelled vehicles. Ask yourself the question: Do I prefer to have a vehicle that has a plastic tank full of petrol or a vehicle that has a 3mm thick steel cylinder full of LP Gas parked in my garage?

In all States and Territories motor mechanics must hold an additional licence (involving further training) to allow them to install and/or repair LP Gas components.

Is LP Gas environmentally friendly?

The use of LP Gas has a positive impact on both the urban and global environmental problems Australia faces.

Combustion of Autogas results in less, and in some cases none, of the following harmful emissions:

- carbon monoxide
- methane
- sulphur dioxide
- low level ozone
- unburned hydrocarbons
- oxides of nitrogen
- particulates

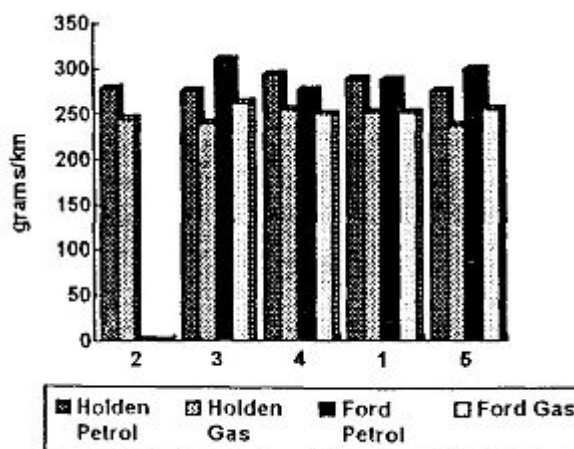
LP Gas also reduces greenhouse gas emissions. Tests conducted on a number of Holden Commodores and Ford Falcons by ALPGA to Australian Standard 2077 and ADR 37/00 requirements produced results which had very low exhaust emissions when the vehicles were fuelled with LP Gas compared with when they were fuelled with unleaded petrol (ULP).

The study showed that if a modern ULP fuel injected engine fitted with a 'closed loop' engine management system was converted to LP Gas operation and fitted with an LP Gas 'closed loop' management system, it would reduce exhaust gas emissions by:

- An average 62% reduction in emissions of Carbon Monoxide compared to the limits set by ADR 37/00 for production vehicles.
- An average 83% reduction in emission of hydrocarbons compared to the limits set by ADR 37/00 for production vehicles.
- An average 65% reduction in emissions of oxides of nitrogen compared to the limits set by ADR 37/00 for production vehicles.

When the LP Gas emissions results are compared to unleaded petrol (ULP) the average values of HC and NOX are lower for LP Gas with a 34% reduction in oxides of nitrogen and a 13.33% reduction in carbon dioxide.

The use of LP Gas reduces evaporative emissions of HC virtually to zero (due to being a sealed system) not only from the vehicle's cylinder but also during refuelling, transport and handling of the fuel.



Carbon Dioxide (CO₂) is one of the main contributors to greenhouse gas emissions. The table (right) displays the results obtained from all the tested vehicles.

What makes up an LP Gas system?

LP GAS FILL POINT: Connection for the LP Gas fuel dispensing bowser. It takes no more time to fill an LP Gas container than a tank for other vehicle fuels.



LP GAS CONTAINER: A pressure vessel made of high-quality steel and constructed to comply with AS 3509. Incorporates various safety devices including:

- Automatic fill limiters restrict filling to 80% of cylinder capacity to allow for liquid expansion.
- The safety valve limits any pressure increase to well within safety specifications.

- Manually operated cylinder shut off valve used to shut off fuel from container to under bonnet components.
- Excess flow valves designed to stop flow of liquid from the container in the event of a cylinder valve shear off.
- Electric solenoid operated shut off valve designed to completely shut off LP Gas liquid flow from the cylinder in the event of a broken fuel line and/or engine shut down.

FUEL LOCK: Allows fuel to flow to the engine only when the engine is functioning.

CONVERTOR/REGULATOR: Reduces LP Gas pressure allowing liquid LP Gas to change into a vapour, then regulates how much LP Gas vapour the engine requires as engine load increases.

GAS AND AIR MIXER: Mixes LP Gas fuel vapour with incoming air for combustion.

LP GAS FUEL CONTROL PROCESSOR: Operates in conjunction with vehicle manufacturer's on-board computer to accurately meter fuel. Complies with emission standards set by Governments. Increases fuel economy and engine flexibility.

Is much of the vehicle's manufacturer's equipment altered?

Vehicle manufacturers are compelled to construct vehicles and engine management systems that meet strict Federal Government and State Environmental Protection Authorities requirements. Consequently, when a vehicle is converted to operate on LP Gas these guidelines and requirements must be maintained. This is achieved by the fitment of LP Gas components that complement the original equipment fitted to the vehicle.

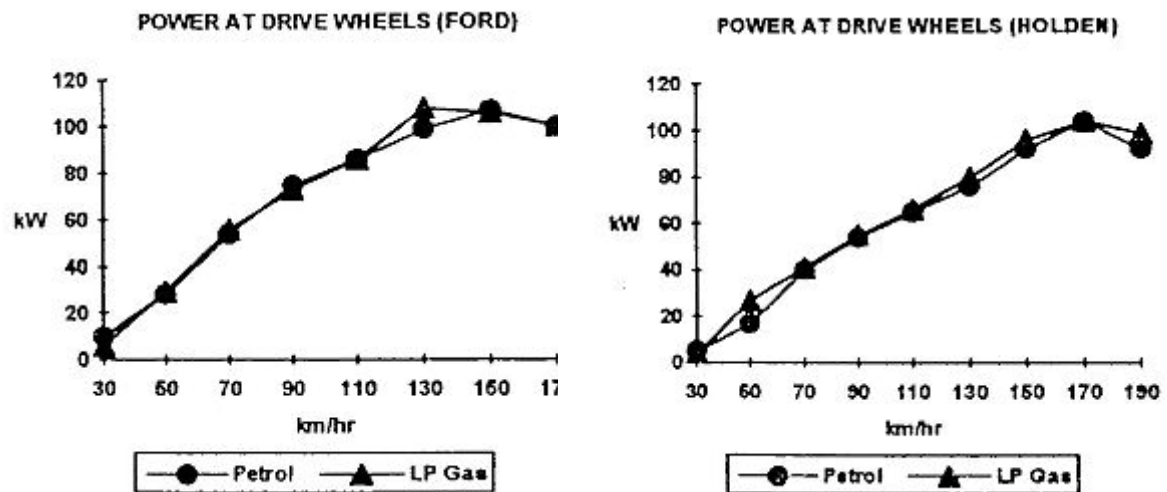
Should conversions be dual-fuel or gas only?

Modern day fuel injected engines limit for Unleaded Petrol (ULP) and comprising the latest engine management systems lend themselves to be converted to dual-fuel operation, giving excellent results in both fuel modes. The LP Gas equipment has been developed to tap into the vehicle's engine management system so as to give similar engine performance whether driven in LP Gas mode or petrol mode.

There has always been a belief that when an engine is converted to LP Gas usage it will suffer a reduction in power and torque. This may have been the case in pre ULP fuel injected engines which had cylinder heads, combustion chambers, induction ports and inlet tracts designed for petrol carburettor fed engines.

However, the advent of ULP fuel injected engines has allowed a complete rethink and redesign of components which were part of the cause of loss in engine power when fuelled with LP Gas (eg larger valves, tuned inlet tract tubes, large plenum chambers etc).

The following graphs display and compare engine performance results obtained from a Holden Commodore V6 and a Ford Falcon 6 cylinder when using LP Gas and then ULP.



As can be seen in the above graphs, engine performance was not compromised on either fuel.

Does LP Gas have an effect on engine wear?

An appreciable reduction in overall engine wear is normal. This is particularly applicable during cold starting because LP Gas does not wash lubricating oil from the cylinder walls. Modern unleaded petrol engines are especially suitable for conversion to LP Gas.

Can a reconditioned engine be converted satisfactorily?

A new or reconditioned engine should be run-in on petrol for approximately 3000 km and then switched over to LP Gas operation. A new vehicle can be converted at time of purchase to dual-fuel operation, but the engine should be run-in on petrol then switched to LP Gas operation.

Does conversion alter insurance or registration costs?

In all States the major insurance companies do not impose an extra premium or penalty for LP Gas fuelled vehicles. This further confirms the inherent safety of conversions. Your insurance company and relevant Government Transport departments should be notified immediately after LP Gas installation to ensure that records are updated.

Are local garages competent to tune converted vehicles?

No, because in all states only authorised or licensed LP Gas installers may work on LP Gas vehicle systems. Motorists are advised to take any problems involving operation on LP Gas to any ALPGA accredited LP Gas conversion workshop. If the matter appears to involve only the petrol mode on a Dual Fuel conversion, it is still advisable to check first with an LP Gas conversion workshop. Automotive LP Gas installers are also qualified motor mechanics.

On what basis do you choose the installer?

LP Gas conversion work should be undertaken only by experienced companies with authorised staff, possessing the equipment to properly fit and tune the vehicle. Cheap conversions may initially seem attractive, but any savings are certain to be taken up in increased running costs and poor overall performance. Correctly installed LP Gas components, which are installed by specialists and tuned correctly, will provide trouble free performance with assured after sales support.

ALPGA Accredited Automotive LP Gas Installers are attentive to customers' interests and provide quality workmanship and service. Look for this sign before authorising any LP Gas work on your car.