

LPG Future Technology The Exciting Future



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Save your childrens future

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What is driving engine technology?



One of the key reasons for the development of new engine technology is to reduce pollution!

Studies show the affect that pollution is having on the population, especially in high density areas such as cities.

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Emission Legislation



Governments around the world are legislating lower emission targets for car manufacturers to reduce pollution

| Emission Level | Europe | Australia |
|----------------|--------|-----------|
| Euro 2 | 1996 | 2002 |
| Euro 3 | 2000 | 2006 |
| Euro 4 | 2005 | 2008 |
| Euro 5 | 2009 | 2010?? |

Why are these targets difficult?



| | Euro 2 40 sec warm start | Euro 3 -7 deg cold start | Euro 4 -7 deg cold start |
|-----|------------------------------------|------------------------------------|------------------------------------|
| CO | 2.2 g/km | 2.3 g/km | 1.0 g/km |
| Nox | Nox + THC = 0.5 g/km | 0.15 g/km | 0.08 g/km |
| THC | | 0.20 g/km | 0.10 g/km |

Euro 2 vehicles in Australia 2002 - 2005



Cars such as BA Falcon's and VY Commodore's are compliant with Euro 2

They have relatively low OBD capabilities



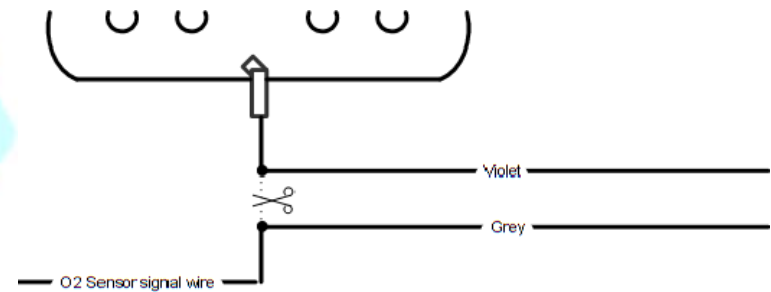
We can install relatively simple LPG systems such as venturi and air valve systems and still satisfy the engine management system

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Euro 2 OBD Australia 2002 - 2005



We could open circuit the O2 sensor on a BA falcon to stop block learning on petrol without bringing on the check engine light



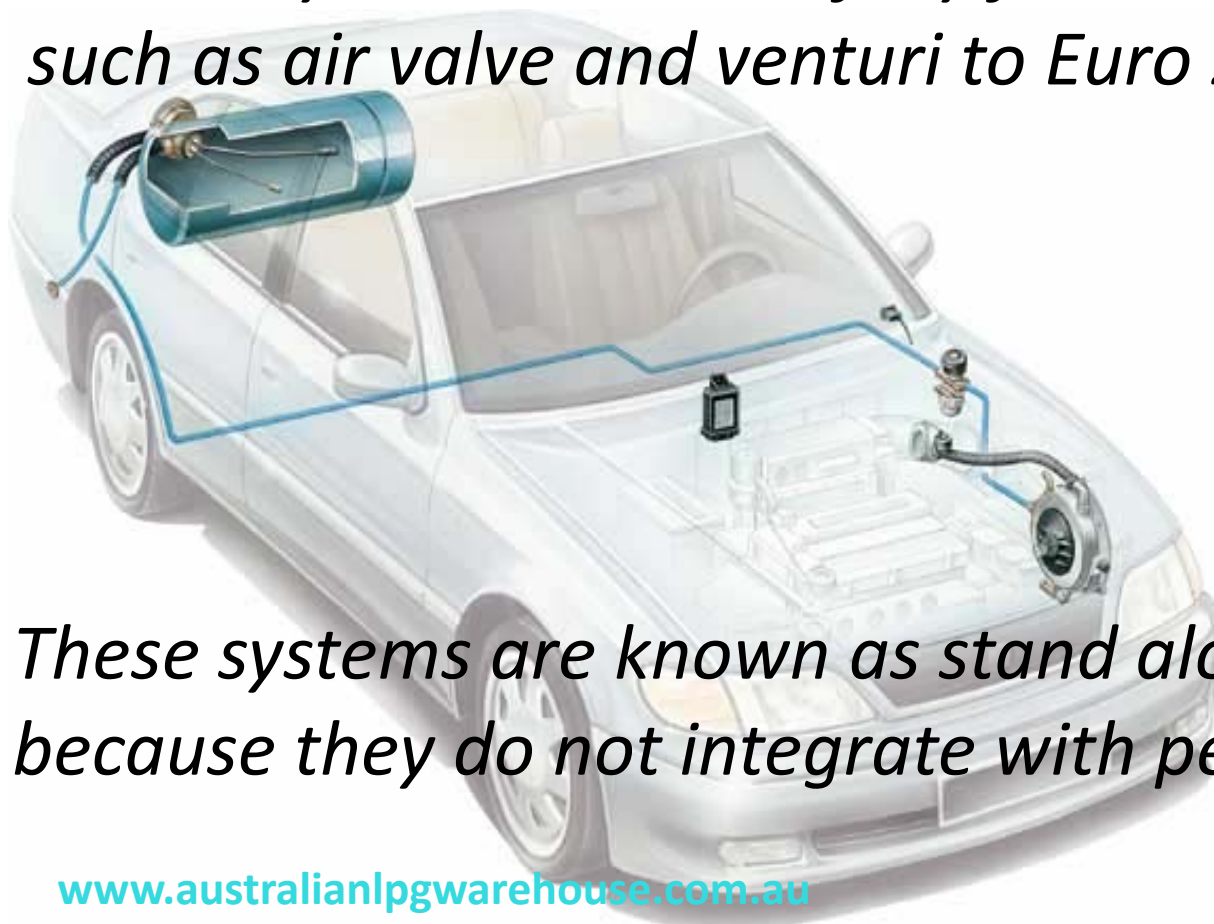
We could send a square wave signal down the O2 sensor wire on a VY Commodore to prevent block learning on petrol ECU



Euro 2 OBD Australia 2002 - 2005



Generally we can successfully fit traditional systems such as air valve and venturi to Euro 2 vehicles.



These systems are known as stand alone systems because they do not integrate with petrol system

Euro 2 Vehicles in Australia



Traditionally our market has been the No.2 owner of the vehicle

We should see these vehicles being converted to LPG for about 10 years (up to 2015)

Euro 3 vehicles in Australia 2006 - 2008



Cars such as BF Falcon's, VZ Commodore's and Toyota Prado's are all compliant with Euro 3

They have relatively smart OBD capabilities

Sequential Vapour Injection systems are suitable for this level of OBD. Why?

Because they follow the petrol system to satisfy the engine management system

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Euro 3 OBD Australia 2006 - 2008



Any interruption of O2 sensor signal will cause check engine light illumination

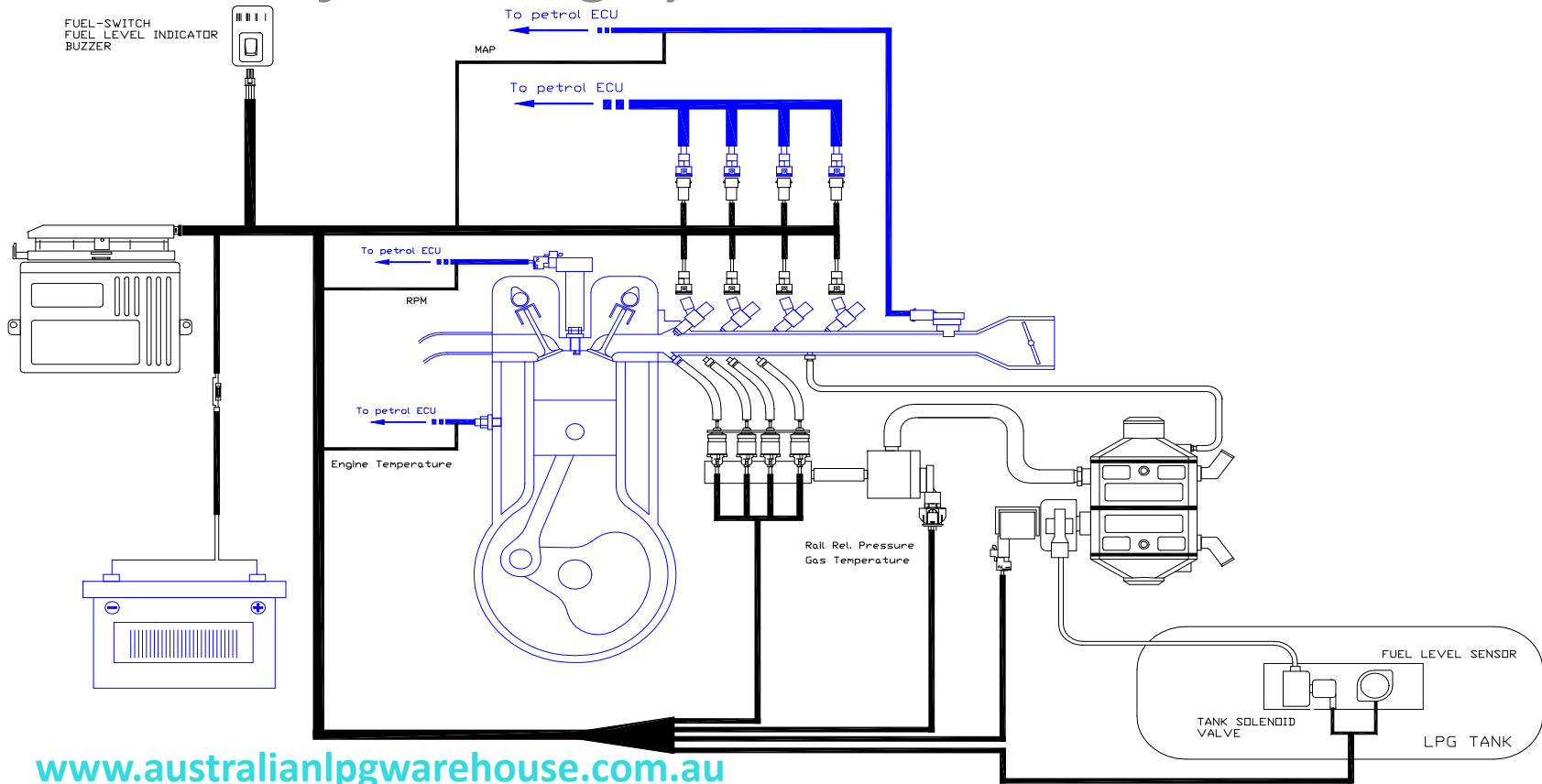
Petrol ECU is looking for varied behaviour of the O2 sensor signal, dependant on driving condition – e.g. W.O.T vs. light cruising

*Increased use of **UEGO** sensor in the exhaust system to determine air fuel ratio especially during cold start condition & wide open throttle driving*

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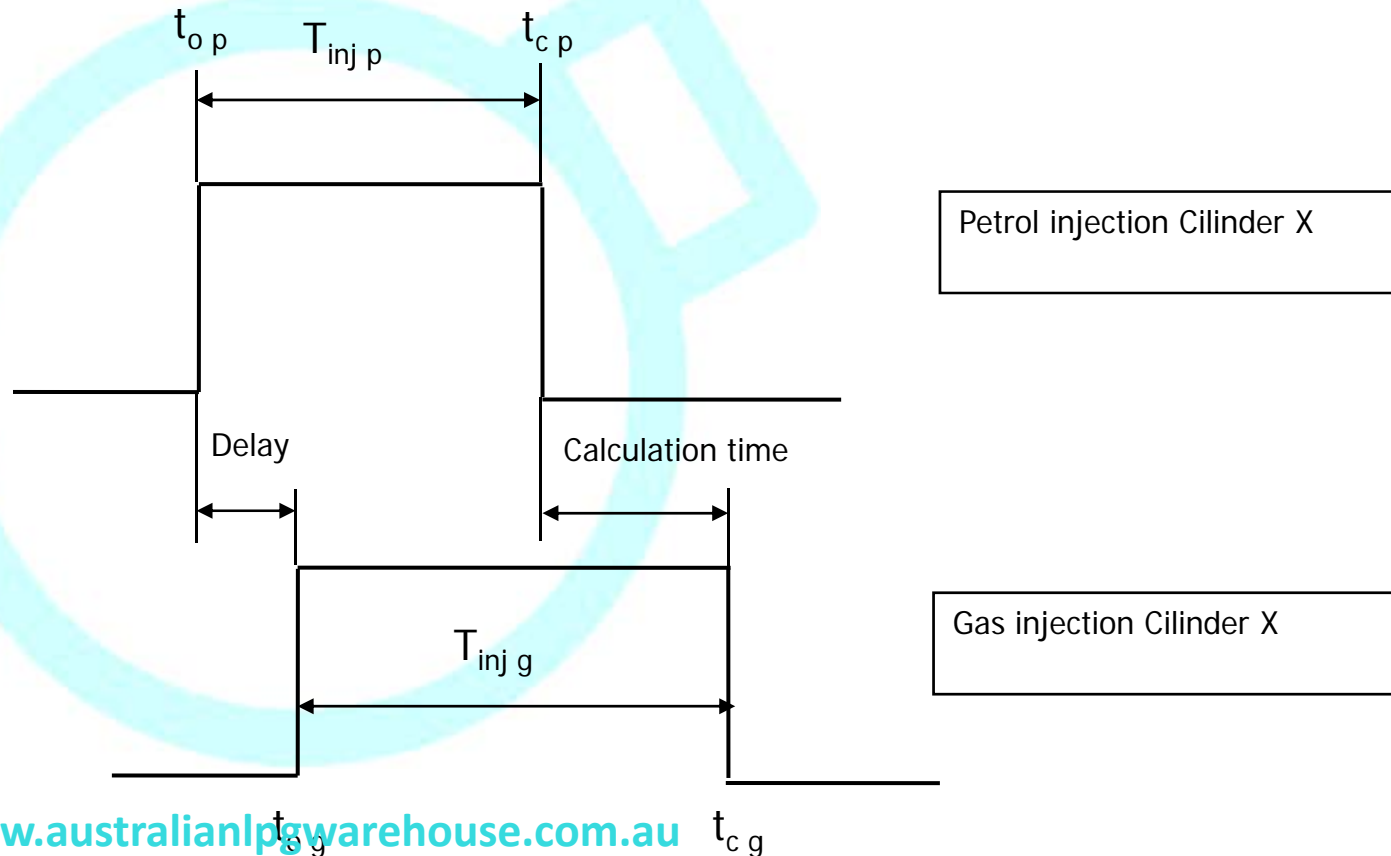
Euro 3 LPG Sequential Vapour Injection

What is a following system?



Euro 3 LPG Sequential Vapour Injection

The theory is:



Euro 3 Vehicles in Australia

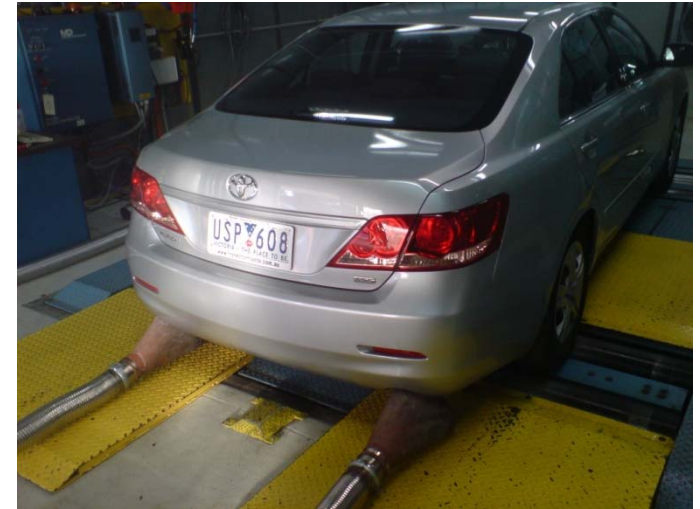


We should see these vehicles being converted to LPG for about 10 years (up to 2018)

Euro 4 vehicles in Australia 2008 - 2010



The next generation of vehicles in Australia will dramatically reduce exhaust gas pollution!



They have very smart OBD capabilities

We will still be able to fit Sequential Vapour Injection systems that follow the petrol system on most models.

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Euro 4 OBD Australia 2008 →



Monitors the deflection of the crank angle sensor to determine correct combustion

Petrol ECU is looking for varied behaviour of the O2 sensor signal, following self induced testing

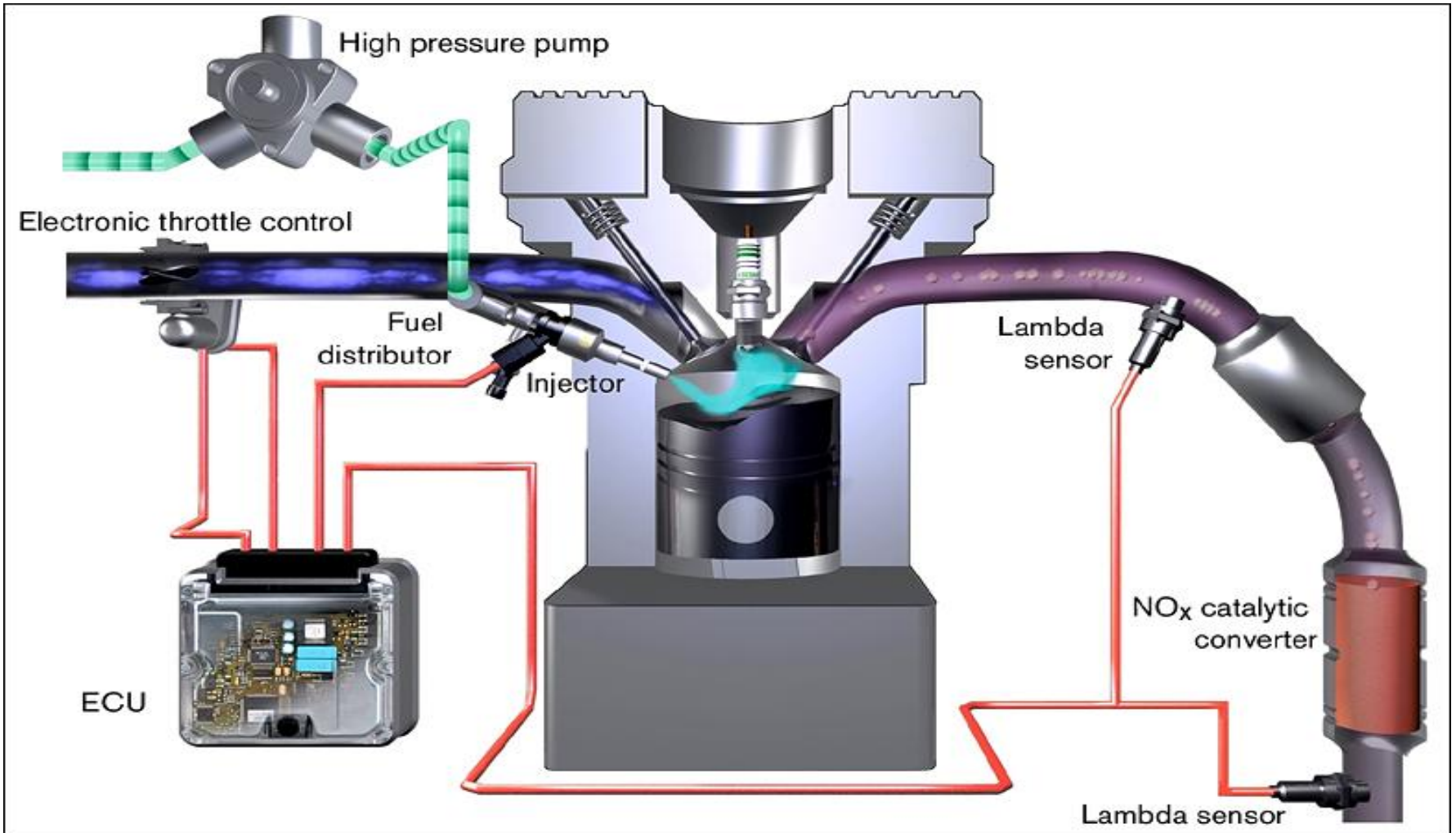
Deactivation of cylinders to lower fuel consumption and emissions during light cruise

Euro 4 Vehicles in Australia



We should see these vehicles being converted to LPG for about 10 years (up to 2020)

What's on the Horizon



What's the Solution – Split Fuel



Icom already have Direct Injected Petrol engines running on Liquid LPG injection.

The LPG system adds LPG in the high pressure side of the petrol pump

- This keeps the petrol injector operating temp under control*

Conclusion



Sequential Vapour Injection technology will carry our industry into the future!

We are already using these systems on vehicles now!

The future is already here!

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