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Assessment of Mtech Fuel Saver

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Executive Summary

Moving people and goods by cars and freight vehicles is an important part of our economy and lifestyle in Australia. There are approximately 14 million registered vehicles travelling over 2 billion kilometres per year. This rate of travel is growing, and as it does, the total fuel consumption of the fleet increases. Technological improvements to fuel efficiency are not capable of offsetting the rise in fuel consumption caused by the desire for heavy, powerful passenger vehicles, an aging fleet and increasing distances travelled.

Increasing fuel consumption has health, environmental and economic consequences. Air pollution from unburnt fuel vapours, and the incomplete fuel combustion process consequently costs Australia $2.7 billion per year in loss of life and morbidity. Australian capital cities are subjected to photochemical smog, and road transport accounts for 70.7 million tonnes of greenhouse gases emissions each year. Australia is increasingly dependent on oil imports from other countries and in the future may become vulnerable to possible world decline in oil production.

The Mtech Fuel Saver has been tested in accredited facilities in a number of countries and through various other independent organisations. The Mtech Fuel Saver changes the properties of gasoline and allows it to form smaller droplets, in turn exposing a larger surface area to oxygen in the engine resulting in enhanced combustion. The test results show enhanced combustion leads to a 20% increase in fuel efficiency, a significant and large decline in toxic hydrocarbons, nitrogen oxides and carbon monoxide, and a minimal 20% decrease in greenhouse gases.

Background Information

Australia is a country dependent on motor vehicle transport for the movement of people and the movement of goods (Newman and Kenworthy, 1999). Each year the number of kilometres travelled by freight and personal vehicles increases, as does the total number of registered vehicles and the amount of fuel consumed (ABS, 2005). Australians are travelling further and buying more cars each year, and this has major health, environmental and economic consequences.

Health

The health cost of vehicle pollution is measured by loss of quality of life (morbidity) and cases of premature death. The health effects of vehicle pollution range from mild (dizziness and headaches) to severe (cardiovascular disease, cancer and death) (Bureau of Transport and Regional Economics, 2005).

In 2000, air pollution from motor vehicles accounted for between 900 - 4500 morbidity cases in the form of cardio vascular disease, respiratory illness and bronchitis, and between 900 – 2000 premature deaths. The economic cost of these health effects was estimated to be around $2.7 billion (Bureau of Transport and Regional Economics, 2005).

Air Quality

Pollutants produced by motor vehicles contribute to local and global air quality issues, such as photochemical smog and acid rain and global warming. Motor vehicles are a major source of carbon dioxide, carbon monoxide, particulate matter, hydrocarbons, and nitrogen oxides to air around Australia's capital cities (Bureau of Transport and Regional Economics, 2005).

Reactions between volatile organic compounds and nitrogen oxides form ozone and contribute to photochemical smog. Carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and other hydrocarbons add to the tonnes of greenhouse gases emitted from Australia by transport each year (Department of the Environment, 2006). These gases, when released into the atmosphere create a trapping of infrared radiation which results in warmer temperatures in the lower atmosphere.

While this has been essential for human life in the past, the increased rate of release of these greenhouse gases since the industrial and agricultural revolution has lead to the "enhanced" greenhouse effect, deemed to be a contributing factor in global warming and climate change (Pyper, 2001).

The Australian Greenhouse Office (2005) measured Australia's total greenhouse gas emissions at 559.1 million tonnes of carbon dioxide equivalent (CO_2 –e) in 2005. Transport accounted for 14.4% of total greenhouse gas emissions, and road transport contributed 87.9% (70.7 million tonnes CO_2 –e) of total transport emissions (Australian Greenhouse Office, 2005).

Fuel Consumption and Kilometres Travelled

The fuel consumption of the Australian vehicle fleet varies depending on a number of factors, these include the total number of kilometres travelled, the type, weight and age of the vehicle, the load attached to the vehicle, how and where the vehicle is driven, whether the vehicle is serviced regularly and well maintained, and the condition of the road (Department of the Environment, 2006).

Since 2001 the average rate of fuel consumption of the Australian fleet has increased from 13.6 to 14L/100km (ABS, 2005). The average rate of fuel consumption for a light passenger vehicle is 11.4 L/100km, while for a load bearing truck it is 25L/100km (ABS, 2005).

The total Australian vehicle fleet travelled 206 383 million kilometres in 2005, an increase of 7.8% since 2001. As total kilometres travelled are increasing, so is total fuel consumption. The graphs below show the increase in total kilometres travelled and the increase in fuel consumption in Australia since 2001 (ABS, 2006).

Table 1: total kilometres travelled by Australian vehicle fleet 2001-2005

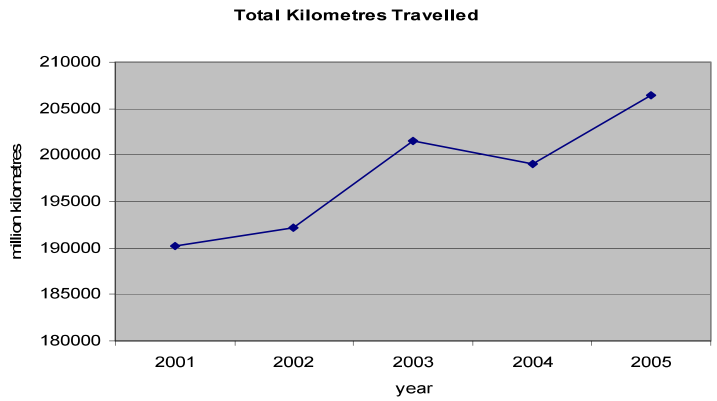
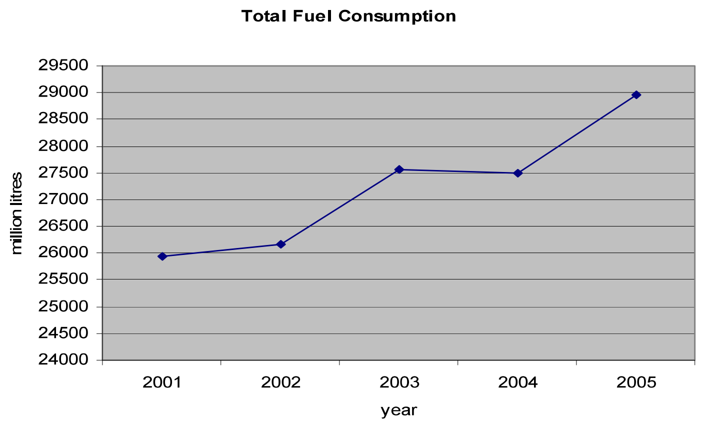


Table 2: total fuel consumption by Australian vehicle fleet 2001-2005



On an individual level technological advances are improving fuel burning efficiency in new motor vehicles; however, despite these advances, the average fuel consumption of the Australian vehicle fleet has increased by 10% since the 1970's. This drop in efficiency is attributed to the age of the fleet (10.1 years) (ABS, 2006), and the consumer demand for more powerful and weighty vehicles. These heavier cars have a higher fuel consumption rate than their smaller, lighter counterparts (Bureau of Transport and Regional Economics, 2002).

Australian Oil Vulnerability

This high consumption rate, coupled with the growing number of cars, and the love affair with weightier more powerful vehicles leads to the problem of future oil supply security. There is a growing body of evidence that indicates world oil production will reach a peak then decline within a decade or two (ASPO, 2007).

OCED countries are consuming 82 million barrels of oil a day for their energy requirements. This is predicted to rise to 96 mb/d in 2010, and reach 115 mb/d in 2020 (IEA, 2001). The transport sector uses 80% of that oil (AIP, 2002). This has risen 53% since 1998 (IEA, 2001).

Australia has been relatively shielded from past oil crisis' due to its domestic oil production from Bass Strait and the Gippsland Basin. As production from these dominant fields' declines, increasing discoveries of smaller fields is needed to keep production steady. The inability to find adequate volumes in ever smaller fields is leading to overall production decline in Australia, and vulnerability to future global shortages (APPEA, 2002).

Australia produces oil at a rate of between 500 000-600 000 barrels per day (58 million litres), yet the domestic demand for petroleum is over 750 000 barrels per day. Each year this demand is predicted to increase around 2% (Rural and Region Affairs and Transport, 2007). This means Australia cannot adequately meet its own oil demand and will be dependent on imports from other oil producing countries to meet these energy needs.

In 2005 the Australian transport sector consumed 28 967 million litres of fuel (ABS, 2005) an equivalent of 246 million barrels per year, or 676 281 barrels per day. The transport fuels are split into petrol (55%), diesel (39%) and LPG (6%) (Robinson, 2002).

Mtech Fuel Saver

Since the 1970's there have been a number of efforts to reduce the amount of pollution and increase the fuel efficiency of Australian vehicles. Vehicles are manufactured according to Australian Design Rules (ADR's) which set desired emission limits, and are fitted with "active" devices like catalytic converters, carbon canisters and on board pollution sensors, designed to reduce and regulate emissions. Unfortunately these devices tend to be of limited value over time, as they become less effective as kilometres travelled increases (Department of the Environment, 2006).

As a result of world wide air pollution problems, there have been a number of new technologies added to the car accessory market that aim to reduce greenhouse gases, improve air quality, and save money spent on petrol. Unfortunately controversy surrounds many of these devices, and few have been tested by federally accredited facilities.

Some of these fuel saving devices on the market today only slightly improve fuel consumption, if at all, while others may increase noxious emissions (EPA, 1998). The installation of some devices does not comply with Australian Design Rules or Road Traffic Vehicle Standards, and the consequence of such an installation can result in the vehicle being issued with a Defect Order (RAC, 2007b).

The Mtech Fuel Saver does not modify the original structure of the vehicle, and has been tested in accredited facilities. It is an easy to install ceramic based cylinder that changes the properties of the fuel in any petrol, diesel or gas burning vehicle.

How it Works

A test carried out in the Graduate Institute of Biomedical Materials and Engineering of Taipei Medical University compared the infrared spectrum of gasoline treated with Mtech Fuel Saver with untreated gasoline. The study found the properties of the treated gasoline to have changed in three spectrums. The region of most change (2850 to 3050 cm^{-1}) represented the absorption of saturated and unsaturated hydrocarbons (Chien-Chung, no date).

Saturated hydrocarbons are single bonded hydrocarbon chains with no spare bonding sites. Additional bonds can only be made if part of the hydrocarbon molecule is broken off. Unsaturated hydrocarbons have double of triple bonds between the carbon atoms. These molecules can bond with other atoms without breaking the original hydrocarbon skeleton. The forces that attract different molecules to each other are termed Van der

Waals forces. These attractions cause molecules to group together, and depending on the size and shape of the molecule require different amounts of energy to separate them.

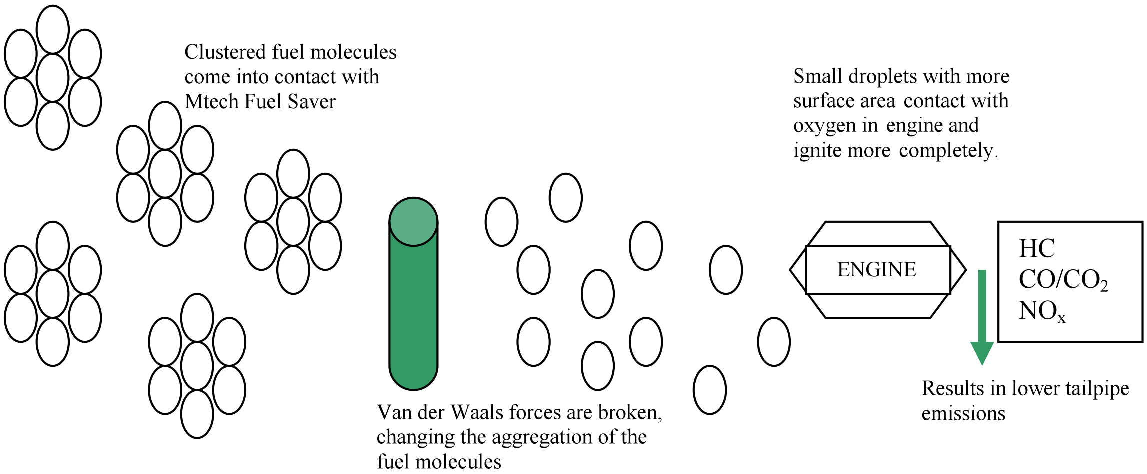
The ceramic powder of the Mtech Fuel Saver absorbs thermal energy and re releases it in a different specific wavelength. This specific energy wavelength (3300 cm^{-1}) is capable of breaking the Van der Waal forces that bind gasoline molecules, and change the clustered molecules to single molecules. This change in aggregation results in a change in property of the gasoline. Surface tension is reduced, and flash point is increased. The decreased surface tension allows the gasoline to form smaller droplets, which expose a larger surface area to contact with the oxygen in the engine and ignite more completely (Chien-Chung, no date).

The Mtech Fuel Saver has been tested in accredited laboratories is USA, China with positive results. The Mtech Fuel was “proof-of-concept” tested by California Environmental Engineering (an EPA and Californian Air Resources Board certified body), and was found to reduce key vehicle tailpipe emissions and improve fuel economy (California Environmental Engineering, 2007).

Other tests were carried out by MGA Research Corporation Wisconsin, USA; the Department of Environmental Protection, Taipei City, China; Industrial Technology Research Institute, Taiwan, China; and independent organisations in Australia.

Figure 1 below shows the effect of the Mtech Fuel Saver on clustered petrol molecules. After contact with the Mtech Fuel Saver, the molecules are separated and have a larger surface area which contacts with oxygen during ignition.

Figure 1: Diagram showing clustered fuel molecules contacting with Mtech Fuel Saver and breaking into single molecules reducing surface tension and increasing flash point.



Recent Tests

A number of different test procedures were used, depending on the country of testing, and all facilities tested before and after installation of Mtech Fuel Saver and measured tailpipe emissions, and/or fuel economy. The increase in fuel economy of the MGA test and the percentage reductions in tailpipe emissions of the other tests are shown in this report.

MGA research corporation, used testing procedures defined by the Society of Automotive Engineers (SAE J1321) for comparing fuel economy of vehicles installed with “easy to change components” (SAE, 2007). MGA Research Corporation compared the fuel economy of three cars before and after installation of Mtech Fuel Saver.

The Taipei City Government (2006) used undefined emission idle tests on its test vehicles. Results were taken after 15 minutes (Honda 1996) and after 1 week (Toyota 1996).

The Industrial Technology Research Institute (ITRI) used FTP75 to test two vehicles, and an undefined emission idle test for its third vehicle. The FTP75 uses simulated highway and city driving modes to represent “on road” conditions (EPA 1998). FTP 75 is the testing procedure referenced in the early ADR standard for light Australian vehicles (ADR37/01) (Department of Transport and Regional Services, 2001).

The Mtech Fuel Saver has been tested in Australia with positive results. A private taxi company tested Mtech using on one of its vehicles and found the installation of the Mtech increased horsepower and torque, and reduced tail pipe emissions of the tested vehicle.[1]

The results of the recent tests are simplified in tables below. The tables show the increase in fuel efficiency (MGA test) and the reduction in tailpipe emissions by percentage. Original test results are included in the Appendix.

Fuel Consumption

Table 1 shows the results from MGA Research Corporation. The table shows the difference in fuel consumption after installation of the Mtech Fuel Saver on three different sized vehicles. The average percentage difference in fuel consumption after installation of Mtech Fuel Saver is 22.7%.

Table 1: MGA research corporation fuel economy test results.

Test Vehicle	Weight Lbs (kg)	MPG (L/100km) Before Mtech Fuel Saver	MPG (L/100km) After Mtech Fuel Saver	% difference
2007 8 cylinder, 5.3 litre	5292lb (2400kg)	18 (13)	21.64 (10.8)	20.20
2007 6 cylinder, 3.5 litre	3441lbs (1560kg)	24 (9.8)	29.5 (7.97)	22.92
2007 4 cylinder, 1.8 litre	2564lbs (1163kg)	34 (6.9)	42.5 (5.5)	25
Average reduction in fuel consumption				**22.7%**

[1] The testing procedure was undefined for this test.

Emissions Reductions

Table 2 shows the results from the Taipei Government tests. There is an overall reduction in tailpipe emissions after installation of the Mtech Fuel Saver. Hydrocarbons are consistently reduced in both tests and carbon monoxide is significantly reduced in one test.

Table 2: Taipei Government. Reduction in emissions.

Test Vehicle	Test type	CO % reduction	HC % reduction
Toyota 1996	Emission Idle Test	90 (after 1 week)	89 (after 1 week)
Honda 1996	Emission Idle Test	-	86.48 (after 15 mins)

Theresults from the Industrial Technology Research Institute in Table 3 show a constant reduction in total hydrocarbons and a reduction in carbon monoxide and nitrous oxides in the FTP 75 tests. The general emission test showed the greatest reduction in hydrocarbons (96.85%).

Table 3: ITRI. Reductions in emissions.

Test Vehicle	Test Type	CO % reduction	HC % reduction	NOx % reduction
Ford	FTP 75	7	22.7	30
Toyota 2003	FTP 75	17	14	19
Toyota 2003	Emission Idle Test	-	96.85	-

The results from the private test on an Australian taxi (Ford model), showed a reduction in carbon dioxide, hydrocarbons and oxides of nitrogen in the two tests on the same vehicle subjected to different resistance .

Table 4: Australian Ford taxi. Reductions in emissions.

Test	CO_2 % reduction	HC % reduction	NOx % reduction
Ford	7	96	29
Ford	3	97	62

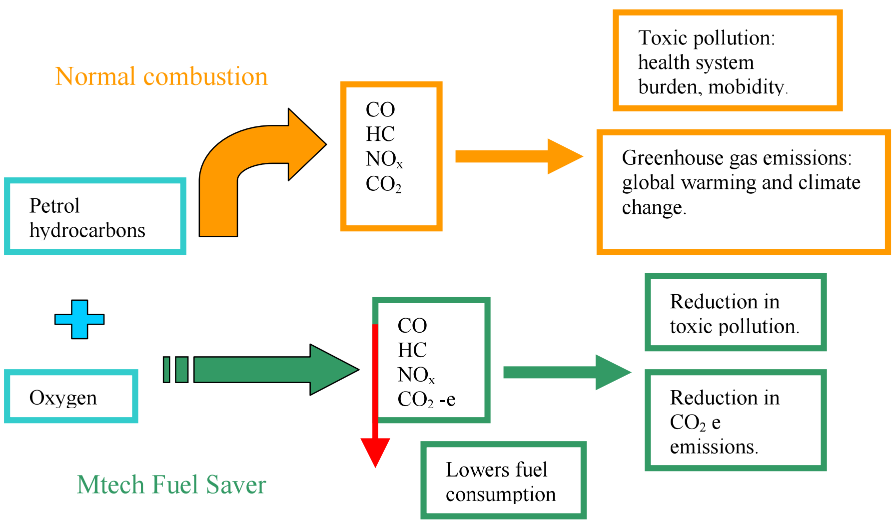
Summary of Results

Carbon monoxide was reduced in three of the above tests, from 8.7 to 90%. The average reduction for carbon monoxide was 38%. Hydrocarbons were reduced in seven of the above tests. The average reduction of hydrocarbons was 71%. Nitrogen oxides were reduced in four of the above tests. The average reduction was 35%. Carbon dioxide was reduced in two of the above tests. The average reduction was 5%. [2]

Discussion

Installation of the Mtech Fuel Saver has reduced the fuel consumption and vehicle emission of the cars in the above tests. Inferences can be made from the results of the given tests as to the advantages of fitting the Mtech Fuel Saver to the Australian vehicle fleet. Benefits can be seen in areas of public health, ambient air quality, greenhouse gas emissions and total fuel consumption. The diagram below outlines these benefits.

Figure 2: Benefits of installing Mtech Fuel Saver



[2].This report uses averages from the different tests to provide a discussion tool. From the given results it is clear that significant reductions have been achieved by the installation of this device.

Reducing Vehicle Emissions-Health Benefits

Reducing vehicle exhaust emissions provides a positive benefit in areas of health. The toxic components of vehicle exhaust are present in high levels in urban areas, especially where vehicles idle for long periods. The Mtech Fuel Saver can reduce tailpipe emissions, and therefore improve air quality by reducing the most toxic components of fuel, carbon monoxide, hydrocarbons and oxides of nitrogen, and converting them to less toxic carbon dioxide.

Carbon monoxide competes with oxygen molecules for binding sites on the haemoglobin and myoglobin molecules, reducing the ability of the blood to transport oxygen around the body (Kleinman et al, 1990). Long term effects of carbon monoxide exposure at low levels can lead to heart disease and damage the nervous system. Pregnant women who are exposed to CO may give birth to low weight offspring (Department of Environment and Water Resources, 2007).

Oxides of nitrogen (NO_x) at low levels cause eye, throat, lung and nose irritation leading to coughing and shortness of breath, tiredness and nausea. High level exposure can result in burning and swelling of tissue in the upper respiratory tract, reduced oxygenation in the tissues, a build up of fluid in the lungs and death.

Over 300 hydrocarbons are found naturally in crude oil or formed during the refining process. Benzene is one such compound. Benzene along with other aromatic hydrocarbons, toluene and xylene, is needed in petrol to increase the octane rating of fuel and provide acceptable fuel economy of the engine.

Benzene is classified as a toxic health hazard. Exposure can result in skin and eye irritations, drowsiness dizziness, headaches, and vomiting. Benzene is carcinogenic and long term exposure at various levels can affect the immune system. It can cause Leukaemia and has been linked with birth defects (Department of the Environment and Water Resources, 2005b).

The benefits of installing the Mtech Fuel Saver to the entire Australian fleet could mean a significant reduction in toxic air pollution which would result in saved lives and alleviated suffering caused by poor air quality.

Reducing Vehicle Emissions- Greenhouse Gases

Green house gas emissions are attracting world wide attention due to their part in global warming and climate change. Worldwide actions in the form of global agreements have been established in order to meet the challenge of climate change. Australia has committed to meeting reductions that aim for 2012 levels of CO_2, to increase no more than 8% of 1990 levels, however we are far from achieving that target.

From 1990 to 2004, total greenhouse gas emissions rose by 2.3% to 564.7 million tonnes (Australian State of the Environment, 2006). Road transport is a large contributor to greenhouse gas emissions and in 2005; 70.7 million tonnes was released by Australian transportation alone (Australian Greenhouse Office, 2005).

Measurement of greenhouse gas emissions is calculated in equivalency factors of carbon dioxide (CO_2-e). This enables all emissions that affect air quality to be weighed and combined into a single measure of air quality. This is based on international agreement that different greenhouse gases are weighed according to their Global Warming Potential (GWP) (Beer et al, no date).

The results from the given tests show the Mtech Fuel Saver can reduce total greenhouse gas emissions by around 20%. This could equate to a possible saving of around 25 million tonnes CO-e per year if applied to the Australian fleet.

Reducing Vehicle Emissions- Fuel Saving

The results from the MGA fuel consumption test show an average improvement of 22.7% in fuel efficiency.

Australia currently uses 28 967 million litres of fuel in the transport sector per year, a reduction of 22.7% would bring this figure down to 22 391 million litres, saving 6575 million litres per year (56 million barrels). This works out to a saving of 153 424 barrels per day bringing Australia daily demand down from 750 000 to 596 576 barrels per day. By bringing the daily demand down by 22.7%, means Australia is capable of meeting its own demand from domestic production.

Passenger and light commercial vehicles travel an average of 188 832 million kilometres per year. There are approximately 14 million registered passenger cars and light commercial vehicles. Each vehicle does an average of 13 488 km/year. The average consumption (L/km) for petrol, diesel, and LPG vehicles is 12.5, 12.9 and 15.1 respectively. The 2007 Australian average fuel prices were $1.27 per litre for unleaded, $1.30 for diesel, $ 0.54 for LPG (RAC, 2007a).

Using the example of passenger and light commercial vehicles, Table 6 uses the average fuel consumption of these vehicles and current average fuel prices to work out potential savings per year over different distances if installing Mtech Fuel Saver.

Table 6: Possible savings for petrol, diesel and LPG passenger cars and light commercial vehicles after installation of Mtech Fuel Saver (rounded to the nearest dollar).

Petrol $1.27 per litre	kms	L/100km	litres/year	Cost $	MTECH cost $	Saving $
	14 000	12.5	1750	2,222	1718	504
	20 000	12.5	2500	3,175	2454	720
	40 000	12.5	5000	6,350	4908	1440
	80 000	12.5	10000	12,700	9817	2880

Diesel $1.30 per litre	kms	L100km	litres/year	Cost $	MTECH cost $	Saving $
	14 000	12.9	1806	2,347	1815	533
	20 000	12.9	2580	3,354	2592	761
	40 000	12.9	5160	6,708	5185	1523
	80 000	12.9	10320	13,416	10371	3045

LPG $0.54 per litre	kms	L/100km	litres/year	Cost $	MTECH cost $	Saving $
	14 000	15.1	2114	1,141	882	259
	20 000	15.1	3020	1,630	1261	370
	40 000	15.1	6040	3,261	2521	740
	80 000	15.1	12080	6,523	5042	1481

The Mtech Fuel Saver demonstrates benefits for all car users. The benefits are increased as vehicle kilometres travelled increases. Petrol and diesel vehicles get larger monetary savings due to the current higher cost of these fuels in today’s market.

Widespread installation of the Mtech Fuel Saver would benefit Australians health, environment and economy. Mtech Fuel Saver reduces toxic emissions, reduces total greenhouse gas contribution and fuel consumption, possibly saving Australians hundreds of dollars worth of petrol.

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Appendix 1

Equation for determining annual emissions of hydrocarbons, carbon monoxide and nitrogen oxides: Annual emission for CO_2 (2004) was taken directly from Department of Transport and Regional Services (2007).

Emission factor (g/km) x kilometres travelled (year) = annual emissions

Kilometres travelled (2001) 190 152 million		Emissions per year-based on 2000/2001 figures (kg)
Emission factor HC	2.25 g/km	427 842
Emission factor NO_x	1.78 g/km	338 470
Emission factor CO	16.84 g/km	3 202 159
Annual emissions CO_2	-	66 291 000

Appendix 2: Estimation of GWP of Hydrocarbons

Measurement of greenhouse gas emissions is calculated in equivalency factors of carbon dioxide (CO_2-e). Each compound is given a global warming potential factor that rates each compound with carbon dioxide which has a global warming potential factor of 1.

Fuel contains over 300 hydrocarbons in its composition (AIP, 2002) the most damaging of these in terms of its GWP is methane (CH_4), which has a GWP of 25. The other hydrocarbons in fuel vary in their GWP's. Table 7shows the GWP of methane and 7 other hydrocarbons described in IPCC Working Group 1 Report (2007). The GWP of nitrogen oxides in not included in the IPCC report due to the variable nature of the compounds. The GWP of nitrous oxide (N_2O) is 298. This report assumes that around 50% of NO_x could be changed into N_2O and calculated accordingly.

Table 7: IPCC 100 year GWP of hydrocarbons

Compound	Formula	GWP 100 year
Methane	CH_4	25
Ethane	C_2H_6	5.5
Propane	C_3H_8	3.3
Butane	C_4H_{10}	4.0
Ethylene	C_2H_4	3.7
Propylene	C_3H_6	1.8
Toluene	C_7H_8	2.7
Isoprene	C_5H_8	2.7
Average GWP		6.1

Table 8: IPCC 100 year GWP of CO and NO_x

Compound	Formula	GWP 100 year
Carbon monoxide	CO	1.9
Nitrous oxide	N_2O	298

Appendix 3: Calculations estimating greenhouse gas emissions per annum before and after installation of Mtech Fuel Saver

Hydrocarbons (GWP 6.1)	emissions (million tonnes)	CO_2-e (million tonnes)	Possible emissions after reduction of 71% (million tonnes)	Estimated CO_2-e after Mtech (million tonnes)	Reduction in CO_2-e (million tonnes)
1 year	0.46	2.83	0.13	0.79	2.04
10 years	4.60	28.30	1.30	7.90	20.40
50 years					

Nitrogen Oxides (GWP = emissions/2x298)	emissions (million tonnes)	CO_2-e (million tonnes)	Possible emissions after reduction of 35% (million tonnes)	Estimated CO_2-e after Mtech (million tonnes)	Reduction in CO_2-e (million tonnes)
1 year	0.37	54.68	0.24	36.20	18.48
10 years	3.70	546.80	2.40	362.00	184.80
50 years					

Carbon monoxide (GWP 1.9)	emissions (million tonnes)	CO_2-e (million tonnes)	Possible emissions after reduction of 38% (million tonnes)	Estimated CO_2-e after Mtech (million tonnes)	Reduction in CO_2-e (million tonnes)
1 year	3.47	6.59	2.17	4.10	2.49
10 years	34.75	65.93	21.70	41.00	24.90
50 years					

Carbon dioxide (GWP 1)	emissions (million tonnes)	CO_2-e (million tonnes)	Possible emissions after reduction of 5% (million tonnes)	Estimated CO_2-e after Mtech (million tonnes)	Reduction in CO_2-e (million tonnes)
1 year	66.29	66.29	62.97	62.976	3.315
10 years	662.91	662.91	629.76	629.765	33.145
50 years	3 314.55	3314.55	3 148.82	3 148.822	165.728

Transport emissions	Total before Mtech (million tonnes)	Possible total after Mtech (million tonnes)	% reduction
CO_2-e	130.40	104.00	20.25

Using emission factors (g/km) of hydrocarbons, carbon monoxide and nitrogen oxides (Department of Environment and Water Resources, 2005a), and multiplying the given factor for each compound, by the total kilometres travelled in 2001 (ABS, 2005) the CO2-e per annum of each compound for the Australian fleet is calculated

The result of each calculation is multiplied by the corresponding GWP factor to give an estimate of the total fleet contribution to greenhouse gas emissions (CO_2-e) for each compound. This is totalled for an estimate of CO_2 -e without Mtech.

The reduction in emissions for each compound after installation on the Mtech Fuel Saver is calculated using the above test results. A CO_2 -e is determined for each compound, and the total CO_2 e is estimated from those results. The contribution to greenhouse gas after installation of Mtech is deducted from the original greenhouse gas contribution and the reduction is measured as a percentage.

Appendix 4 Table of motor vehicle pollutants: National Pollution inventory 2002

POLLUTANT	ESTIMATED KG 2001-2002
Sulfur dioxide	99 000 000
Lead and compounds	490 000
Particulate matter 10 microns or less	14 000 000
Carbon monoxide	2 100 000 000
Oxides of nitrogen	320 000 000
Volatile Organic Compounds	260 000 000
Benzene	8 700 000
Formaldehyde	1 900 000
Polycyclic Aromatic Hydrocarbons	160 000
Toluene	30 000 000
Xylene’s	23 000 000
Arsenic and compounds	8

Frequently Asked Questions

Q: How does Mtech work?

A: Mtech works by changing the properties of the fuel. It releases thermal energy at a wavelength capable of separating fuel molecules. Once fuel molecules are separated, they can form smaller droplets. The smaller droplets have a larger surface area and ignite better and burn more completely.

Q: Will it work on my car?

A: Yes. The Mtech Fuel Saver works on all petrol, diesel and gas vehicles.

Q: Can I install Mtech myself?

A: Yes. On most vehicles the Mtech is easy to install. Unless your car has an anti-syphoning device it is introduced to the fuel tank via the filler neck, and components are fitted under the air filter and attached to the radiator hose. Motorcycles, scooters, the majority of cars and diesel vehicles over 6 litres fit this category. Some vehicles are fitted with anti syphoning device, and on these cars the Mtech needs to be introduced via side access to the tank by a mechanic.

Q: How quickly after installation does Mtech begin to work?

A: The Mtech fuel saver is designed to begin changing the properties of the fuel as soon as it contacts it. Changes in fuel efficiency and emissions should begin after around 30 minutes of contact with Mtech Fuel Saver.

Q: How long will Mtech last?

A: Mtech is manufactured to last over ten years.

Q: Does Mtech lower the toxicity of air pollution?

A: Yes. Air pollution is divided into two groups, criteria pollutants- those widespread pollutants which are regulated and used as indicators of air quality and air toxics or hazardous air pollutants which are present in low concentrations, but by their characteristics are hazardous to human, animal or plant life.

Criteria Pollutants	Motor vehicle contribution?	Reduced by Mtech
Carbon monoxide	✓	✓
Lead	✓ in petrol (until 2002)	
Nitrogen dioxide	✓ (80%)	✓
Ozone	✓ (NO_x react in sunlight with reactive organic substances)	✓
Particles	✓	Not tested in this report
Sulfur dioxide	✓	✓
Air Toxics		
Benzene	✓	✓
Formaldehyde	✓	✓
Poly aromatic hydrocarbons (PAH's)	✓	✓
Toluene	✓	✓
Xylene's	✓	✓

Mtech lowers the criteria pollutant carbon monoxide. It also lowers nitrogen oxides- thereby reducing ozone and nitrogen dioxide. Finally it reduces hydrocarbons- lowering vehicle contribution of toxic pollutants benzene, formaldehyde, PAH's, toluene and xylene.

Q: Does Mtech reduce greenhouse gases?
A: Yes. Compounds which enhance the greenhouse effect are allocated a number according to how much they contribute to global warming when compared to carbon dioxide. This is called a global warming potential (GWP). For example: the hydrocarbon methane (CH_4) has a GWP of 25. This means each weight of methane has 25 times the global warming potential as the same weight of carbon dioxide. The Mtech Fuel Saver has been shown to reduce carbon monoxide, oxides of nitrogen, and hydrocarbons. Each of these compounds contributes more per weight to global warming than carbon dioxide (see Appendix 2); therefore a reduction in these compounds and their combinations can effectively reduce the total greenhouse gas emissions from vehicles.

Q: Does the Mtech Fuel Saver reduce other pollutants from vehicle exhaust?
A: The Mtech Fuel Saver could possibly reduce other pollutants from vehicle exhaust such as sulfur dioxide and particulate matter. The Mtech Fuel Saver changes the properties of gasoline and helps it burn cleaner in the engine. A cleaner burn leads to less pollution. The tests in this report do not measure other pollutants from the tailpipe as carbon monoxide, oxides of nitrogen and hydrocarbons are the ones identified in each countries emission standards and therefore the compounds focused on by the testing facilities.

Q: Why are there different testing procedures in this report?
A: Each country, Australia, China, and the United States of America have different tests procedures from which to determine emissions of new cars. These testing procedures ensure that all new vehicles meet minimum pollution control requirements. In an accredited testing facility, these are the procedures used to measure emissions of the tested vehicle. Many of these procedures are references in other countries. Australia's older design standards (ADR37/01) referenced the American FTP75 procedures. Today Australian standard (ADR79/01) reference European standard, EC Directive 98/69/EC (Euro 3). China's emission standards reference the European standard Euro 3.

Q: Why has the Mtech Fuel Saver produced different results using the same test?
A: There are many variables which influence the functioning of the tested vehicle. Engine size and condition, driver variation- acceleration and deceleration and warm up time all contribute to different results.