



Biofuels Compatibility

Motor Vehicles and Biofuels Compatibility

This page sets out information on vehicles and biofuels compatibility. The information is provided to inform the debate on the use of biofuels as a transport fuel.

Biofuels offer many benefits. By reducing demand for petroleum, biofuels could make energy supply more secure. In some cases they offer a new solution for turning a waste or byproduct into a resource. That said, anyone using biofuels in their vehicle needs to be aware of the differences to using conventional mineral based fuels and if in doubt should check with their vehicle manufacturer before use.

The information provided in these pages also illustrates the first hand experiences of actual users in New Zealand.

A useful report is the TERNZ Research Report commissioned by the New Zealand Ministry of Transport - ["Enabling Biofuels – Risks to vehicles and other engines", 2006](#). It's a good starting point to read about the issues relating to biofuels and suitability in vehicles.

Information is set out under the following headings:

- [Biodiesel and Biodiesel Blends - Suitability](#)
- [Bioethanol Blended Fuels - Suitability](#)
- [New Zealand Focused Information/Research on Motors and Biofuels](#)
- [NZ Experiences - Learning from Others](#)
- [What Did We Learn from NZ Experiences?](#)
- [Other Useful Resources](#)

Biodiesel and Biodiesel Blends - Suitability

Biodiesel is available from producers around New Zealand. A list of producers is on the BANC website. Biodiesel and biodiesel blends that are made to meet, at a minimum, the legally required quality requirements contained in the Engine Fuel Specifications Regulations 2008 and if used correctly carry little or no risks of damaging vehicle fuel systems. Their availability will increase as demand grows. However, vehicle users should check with the engine manufacturer before changing from mineral diesel to biodiesel or a biodiesel blend as to the suitability of the engine to use the new fuel.

A biodiesel blend (B20) is available directly from a pump in [Queenstown](#) for consortium members. The Queenstown Lakes Biodiesel Consortium is part of a tourist focused initiative. For more information on the consortium click [here](#). Other consortia are being formed in other regions, check the EECA website for more details.

Do vehicle manufacturers approve the use of biodiesel or a biodiesel blend in my car? - Many cars will run on biodiesel blends. Typically, B5 (a blend of 5% biodiesel mixed with 95% mineral diesel) is

approved by vehicle manufacturers without risk. Most diesel vehicles on the road are generally fine on biodiesel blends up to 20% blend.

In New Zealand virtually all vehicles can use a 5% biodiesel blend (B5) without any engine or fuel system modifications. Medium blend levels, such as B20 to B30, are able to be used in many diesel cars, large commercial vehicles such as trucks and buses, provided a few simple checks and steps are followed. **Note** – *EECA and the Motor Industry Association of New Zealand (MIA) advice is to contact your vehicle manufacturer before using a blend greater than B5 in your vehicle. The age and manufacturer of your vehicle will influence its compatibility.*

Some engine manufacturers also approve the use of blends up to and including 100% biodiesel. Informed groups including engine manufacturers and fuel suppliers can provide advice on the appropriate blend to use.

VW, Audi, SEAT and Skoda have approved the use of 100% biodiesel in their vehicles in Europe. This applies to cars built between 1996 and 2004 as long as the biodiesel meets the specification DIN41606 (which was later replaced by EN14214). On request, these companies can still provide some new cars that have a warranty that covers the use of 100% biodiesel. **NOTE** - *these vehicles may or may not be the same as NZ models.*

See also - [New Zealand Focus Information/Research on Motors and Biofuels](#).

Things to know about (biodiesel blends):

The following list provides some key issues to look out for when switching to and using biodiesel or a biodiesel blend as well as how they can usually be resolved. If you do experience problems, consult the supplier of your fuel, your engine manufacturer and experts in this field.

- **Cold start** - during the winter months, a vehicle should not be run on 100% biodiesel without checking on the source of the biodiesel. This is because biodiesel made from tallow for instance can gel at low temperatures. Use of lower biodiesel blends can avoid some instances of gelling, especially as pump mineral diesel is winterized appropriate^[1] in the winter months.
- **Solvent qualities** - biodiesel is a good solvent, and it will clean out the fuel system, fuel lines, injectors and fuel tank. Materials that have built up in a vehicle fuel system prior to using biodiesel, may be deposited on the fuel filter which may clog after initial use. Drivers may experience rough running or a performance drop after travelling about 500 - 1,500 km with biodiesel in the engine. This is quite common and can be easily solved by fitting a new fuel filter. Users indicate that it's rare to get subsequent filter blockages after the initial change over to biodiesel.
- **Reaction with rubber** - generally, it's not advisable to use biodiesel in cars which were manufactured before 1992, unless the rubber pipes and fuel components have been replaced with newer ones. The esters contained in biodiesel can degrade rubber products. Engine parts and equipment with rubber seals and piping are usually, therefore, replaced with non-rubber

alternatives. Rubber reacts to biodiesel and can shrink causing fuel leaks, and other problems around pump seals.

- **If in doubt** – seek advice from your motor vehicle manufacturer or from experts in the field.

See also - [New Zealand Experiences - Learning from Others](#)

- **What blends are available in New Zealand?** - BANZ investigations show that many vehicle owners are using a range of biodiesel blends such as B5, B20, B60 and B100 successfully, without reported problems.
- **What do biodiesel and biodiesel blends cost?** The New Zealand Biodiesel Grants Scheme offers assistance to biodiesel producers for biodiesel that is sold for use in internal combustion engines and that meets the Engine Fuel Specifications Regulations 2008. The assistance enables biodiesel to compete with mineral diesel prices. For 'real life' experience of using biodiesel in New Zealand see [New Zealand Experiences - Learning from Others](#).

Availability (Retail and Non-Retail)

Non-Retail - biodiesel can be purchased directly from some biodiesel producers and fuel distributors in New Zealand.

Links to the website of some biodiesel producers are provided below:

- [Biodiesel New Zealand](#) (location Canterbury) (canola and used vegetable oil biodiesel)
- [NZ Ester Fuels](#) (location Tuakau) (vegetable based biodiesel)
- [Environ Fuels](#) (location Te Kuiti) (vegetable based biodiesel)
- [Kiwifuels](#) (location Canterbury) (100% canola biodiesel)

Retail - B5 is now available at three Gull service stations.

What's the rule of thumb for using biodiesel? - Low percentage biodiesel blends (B5) can be used in place of mineral diesel without any engine modification in most diesel engines. Indeed, with the correct fuel specification, many diesel engines run more smoothly on biodiesel, which has good lubricating properties. So, the rule of thumb.....

1. Consider a blend of up to B20 in many vehicles, and potentially higher blends in some vehicles. Always seek the advice of your engine manufacturer and experts in the field before you start using biodiesel blends. Ensure your biodiesel comes from a reputable supplier. In general, and especially for light vehicles, engine manufacturers recommend and will allow blends of up to B5 in order to be able to claim warranty.
2. If you have a vehicle built before 1992, 100% biodiesel may not be suitable because natural rubber pipes were used in the fuel system up until about 1988 and these can be eroded by biodiesel. You may be able to replace them with biodiesel compatible pipes. In most cases, biodiesel is compatible with diesel engines from 1994 onwards, which use 'Viton' (by DuPont) synthetic rubber in their mechanical fuel injection systems.

3. Ensure the biodiesel (B100) meets the New Zealand quality requirements in, Schedule 3 of the Engine Fuel Specifications Regulations 2008. Any fuel supplier selling biodiesel or biodiesel blends that are intended for use in internal combustion engines are required to meet these regulations by law.
4. Check out the experiences of others at - [New Zealand Experiences - Learning from Others](#) - many users in New Zealand are successfully using a variety of blends with no reported problems. Note – experiences reported will be unique to the vehicle – your experience may be different. The New Zealand experience table is updated regularly as new information becomes available.
5. If in doubt – check with the vehicle manufacturer and with experts in the field.

What do the Vehicle Manufacturers say?

Some European manufacturers have specifically modified their diesel engines to allow them to run on higher blends of biodiesel, but many have not. There is a shift towards making engines compatible which generally involves the use of appropriate synthetic rubbers for seals, fuel hoses and gaskets.

Until 2004, the Volkswagen Group approved its diesel engines to run on biodiesel, but it has now changed its policy over concerns about the sensitivity of the latest-generation of fuel injection systems, and the quality of the biodiesel fuels available. It now only warrants its diesel engines for a 5% blend. Owners of older Volkswagen Group diesels may find their cars can run on biodiesel but must call their customer services department and quote an engine code to check.

Vauxhall does not recommend using pure biodiesel without modifications to the standard engine, and using such fuels will invalidate a warranty. A few mainly German and French manufacturers have designed a range of vehicle engines that can operate on high quality B100 - one example is the VW Golf TDi Mk4.

Research suggests that many 'conventional' diesel vehicles may tolerate biodiesel blends of up to B20 without reporting significant problems. To check whether a particular car can use high percentage biodiesel blends, read your vehicle manual, ask your dealer and (for new cars) check the wording on the vehicle warranty. However, it is likely that you may have to take responsibility for any damage to your engine while it is under warranty.

NOTE - *It's important to check what the manufacturer says about the model of car that you have. Are there any differences in European/NZ models. Check out this table ([NZ based research](#)) for manufacturer comments; and [the experiences of NZ users](#).*

Tabulated Reports from a select number of international cars are presented here <http://www.biodiesel.org/>. Many vehicle brands shown on the website are 'known' in New Zealand but its focus is the US market. Generally information is limited and its best to seek assurance/approval directly from your motor vehicle manufacturer.

NEWS - Who's using Biodiesel in their vehicles?

- **Volvo Bus Australia approved 30% biodiesel** - In keeping with its commitment to environmental care [Volvo Bus Australia has approved the use of up to 30 percent bio-](#)

[diesel blends](#) in its nine- and 12-litre engine buses without engine modification.

The great thing about the bio-diesel blended fuel is that it can be used in current Volvo nine- and 12-litre diesel engines without any modifications, which is excellent for bus operators.

If operators manage their service programs to cater for the use of bio-diesel then the impact on bus operation is very minimal," says David Mead, General Manager Volvo Bus.

- Nelson goes Gold with a Biodiesel NZ biodiesel distribution hub - GO Nelson!** - Biodiesel New Zealand is establishing a bulk distribution facility in Nelson to supply upper South Island customers with both its Biogold™ NZ20 renewable fuel blend and Biogold™ NZ100 pure biodiesel. Demand from customers in the region is growing strongly and the new fuel storage and dispensing facility is being established at Fulton Hogan's Port Nelson property. The hub will allow the Biodiesel NZ's distribution partners, Allied Petroleum and Mini-Tankers, to service the commercial "delivered-to-tank" market. More than 80 commercial customers in the region have expressed an interest in using the fuel and feedback from a recent EECA-organised information seminar indicates Nelson has a large motivated group promoting positive environmental change. See [Press Statement from Biodiesel NZ](#) and [Media Release from BANZ](#) supporting the news.
- KEA Campers pass 100,000km milestone on biodiesel - walking the talk on clean green!** - KEA Campers believes in being a sustainable and [environmentally-responsible](#) company. Our goal is to be leading the industry in this area. As part of this mission, KEA has now been using 100% bio diesel in our transfer van since November 2009. In December 2008 KEA joined forces with New Zealand bio fuel producer, New Zealand Ester Fuels, to develop a bio diesel suitable for our Auckland transfer van – a 2008 Ford Transit, the same vehicle as the rental fleet's [2 berth campervan](#). We ensured that the fuel was made using waste products, 100% bio diesel and met the New Zealand standard. The result was a bio diesel derived from used vegetable oils collected from restaurants and chicken cooking/processing operations. [KEA environmental credentials](#) and how they present themselves and NZ Inc to the world

Bioethanol Blended Fuels - Suitability

Petrol blended with bioethanol is available at all Gull and some Mobil service stations in New Zealand.

Do vehicle manufacturers approve the use of bioethanol in my car? - To assist vehicle owners identify whether their particular vehicle is suitable for bioethanol blended fuel the Motor Industry Association has collated information, by make, about the use of bioethanol blends of 3% (E3), 5% (E5) and 10% (E10) for New Zealand new vehicles. Bioethanol suitability depends on what market the model is sold in. At present many filling stations in the UK have 5-10% ethanol in their petrol. Almost all contemporary cars can be run on E10 fuel without any modification. The Motor Industry Association's information note cautions that for the vast majority of Japanese used imports vehicle manufacturers state

that they can safely use bioethanol blend fuel up to a 3% maximum (E3). Some later models (2006 onwards) may be suitable for bioethanol blend fuel of up to 10%.

See '[Other Useful Resources](#)' for research, tests and other useful information on biofuel use in cars.

Download the information note from the Motor Industry Association – [List of New Zealand new cars that can use E3 and E10 biofuel \(source – MIA\)](#).

See also - [New Zealand Focused Information/Research on Motors and Biofuels](#).

Things to know (bioethanol blends):

- **Engine lubrication** – Generally the use of blends between E3 and E10 is fine in most vehicles. Inappropriate use of ethanol blends can cause damage to vehicle fuel systems through the corrosion of metal parts and the perishing of rubber materials which may result in fuel leakage.
- **Some vehicles are made to use higher blends** such as E85 and E100. These blend levels are drier and alkaline, and while they can often improve power, they can reduce the lubrication of the engine parts due to the elimination of all impurities left by petroleum, therefore, inappropriate use of these fuels can result in premature wear of some parts in the fuel system.
- **Corrosion - rubber and aluminum** - Low level ethanol blends such as E3 and E10, purchased from a reputable supplier are unlikely to cause any corrosion problems if your vehicle is compatible with bioethanol blends. Higher levels – E85 will reduce lubrication of parts and so additional petrol can be added. It is recommended to carry out an inspection to check the vehicle parts and general maintenance condition of the vehicle. Items such as: fuel pump, injection nozzles, oil, filters, MAP sensors and Lambda probe, etc. should be inspected. Corrosion problems can arise with rubber and aluminum components if there is inadequate preventive maintenance and adulterated fuel (fuel that contains impurities of water, chlorine and solvent).

NOTE - In July 2009, The Ministry of Transport announced the results of corrosion testing on bioethanol blended fuel on aluminium engine components.

The tests simulated the use of bioethanol blended petrol in vehicles previously used in Japan and found that this fuel caused no adverse effects with blends up to 10 percent. See the Ministry [media statement](#) and the [full test results](#) for more details.

The use of corrosion inhibitors is mandatory. See Section 8 - [Engine Fuel Specification Regulations 2008 \(SR2008/138\)](#).

- **Cold starts** – In cold climates, Bioethanol has a disadvantage for cold start properties. To ignite properly, it is either necessary to add a small proportion of petrol or find other technical solutions like an engine block heater. Some petrol present in the fuel tank aids smoother running and helps to prevent issues with cold starts.
- **Higher than E10** – Using fuel in vehicles that are not capable of handling bioethanol ratios above 10% can damage parts from the fuel pump to the engine. Depending on the age of the vehicle and the vehicle manufacturer, 'flex-fuel' specific parts can include the fuel tank, fuel pump, fuel sending unit, non-metallic fuel lines and hoses, fuel filter, fuel injectors, and parts of

the exhaust system. Regardless of the vehicle maker, the use of bioethanol-blended fuels can cause operability issues from using bioethanol blends where the bioethanol concentration is usually above 10% in vehicles from a condition called "phase separation". Phase separation occurs when water saturation happens in bioethanol-blended fuel.

What blends are available in New Zealand?

Petrol blended with bioethanol is available for retail sale in New Zealand. Ethanol blended fuel can be sold in retail settings at levels of up to 10% in New Zealand as long as the fuel pump is appropriately labelled.

- **Gull New Zealand** - Gull New Zealand announced in April 2010 that their sales of bioethanol had reached 5 million litres. Gull sells E10 blends – [‘Gull Force 10’ and ‘Gull Regular Plus’](#). Gull launched its first biofuel, Gull Force 10 in August 2007 and followed this with the launch of Gull Regular Plus in 2008. Gull advises that drivers should consult their vehicle engine manufacturer before converting to a new type of fuel.
- **Mobil** - Mobil sells bioethanol blended fuel at a number of stations and has been conducting trials in a number of locations around the lower North Island. Mobil sells 98 octane fuel containing up to 10% ethanol (E10), and a 91 octane fuel containing up to 3% ethanol. For further information please read the [Mobil ethanol-blended petrol brochure](#).
- **Anchor Ethanol** – Anchor Ethanol is New Zealand’s main ethanol producer. They sell ethanol wholesale to the public depending on the quantities sought. Contact [Anchor Ethanol](#) for more details.

What’s the rule of thumb for bioethanol?

Low percentage bioethanol blends (up to E10) can be used without any engine modification in many petrol engines. So, the rule of thumb.....

1. Ensure the bioethanol meets Schedule 4 of the Engine Fuel Specifications Regulations 2008 ([see Schedule 4 - requirements for denatured ethanol for blending](#)). Any fuel supplier selling bioethanol blends that are intended for use in an engine are required to meet these regulations by law.
2. Most vehicles can use blends of up to E10 but check with your vehicle manufacturer (also see the [List of New Zealand new cars that can use E3 and E10 biofuel](#) from MIA). For blends above E10 use with caution and check with your vehicle manufacturer. In some cases, vehicles are made specifically to use upto E85 or E100.
3. Check out the experiences of others at – [New Zealand Experiences - Learning from Others](#) – many users in New Zealand are successfully using a variety of blends problem free. Note – experiences reported will be unique to the vehicle – your experience may be different. This table showing the experiences of biofuel users in New Zealand is updated regularly as new information comes available.
4. If in doubt – check with the vehicle manufacturer and with experts in the field.

5. See also [New Zealand Focused Information / Research on Motors and Biofuels](#).

New Zealand Information / Research on Motors and Biofuels

BANZ has assembled the following resources to demonstrate the compatibility of current motor vehicles on the roads in New Zealand with biofuels. .

- [Engine Manufacturer Acceptance of the Use of Biodiesel Fuels in New Zealand, May 2010 – EECA Commissioned Report](#)
- *Fuel requirements for Diesel Fuel Injection Systems Diesel Fuel Injection Equipment Manufacturers Common Position Statement (2009)*
- [Enabling Biofuels – risks to vehicles and other engines, 2006](#)
- [Encouraging the uptake of transport biofuels, Ministry of Transport](#), Cabinet Paper, 2002.
- Engine Manufacturer Indicated Compatibility of Light Vehicles - at a glance (Source: [Engine Manufacturer Acceptance of the Use of Biodiesel Fuels in New Zealand, May 2010 – EECA Commissioned Report](#)).

NZ Experiences - Learning from Others

The Table below shows some experiences of biofuel users in New Zealand. This information has been assembled by BANZ. The information presented has been given to BANZ voluntarily and is not checked or verified. The table is regularly updated.

Vehicle Use	Vehicle Make	Location	Blend	Fuel Feedstock/ Origin	When Operating	Further details
Click here to view the most recent users experiences table (updated October 2010)						

The biofuel users who responded to this survey indicate that the overwhelming majority had no reported problems using biofuels and were happy with their biofuel experiences.

The table above shows that biofuels are being used in a wide range of activities, engine types, locations and blends. The majority of responses so far have been for biodiesel blends.

What Did We Learn from NZ Experiences?

Biodiesel has a number of advantages over diesel and bioethanol over petrol:

- **Fuel use situations and models** - From the information collected its clear that there are few limits to when, where and how biofuels can be used in New Zealand. The use of biodiesel blends ranged from motorsport to road haulage, taxi and tourist services, regular bus routes and construction/digging/on-site work (4WDs) and boats! The vehicles reported in use ranged from a 1962 tractor to a variety of regular cars, mini vans and various truck sizes. Brands noted include

the following: Skoda, Toyota, Nissan, Mazda, Mitsubishi, Isuzu, Daihatsu, Mercedes, Hyundai, Scania, Caterpillar.

- **Blends and Feedstocks used** - Biodiesel blends used ranged from B5 to B100. Many commented that there was a smooth transition to the use of biodiesel and some reported plans for B100 use in the future. Feedstocks mentioned most are used vegetable oils and canola with some animal fat feedstocks reported.
- **Issues to Manage** – There were few issues noted that were of concern other than the blocking of filters with biodiesel use. This is a common issue and after the first change of the fuel filter the majority of users reported no other problems. In colder situations some reported the formation of ‘gels’ and to remedy problems experienced, blend ratios were altered. For some it’s just been a case of trial and error. No significant power or performance issues have been reported. Many vehicles have been running over 100,000 km’s without reported problems. Those who experience problems have generally been able to address them successfully and cooperatively with the help of the biodiesel producer/supplier.
- **Availability**- Some users reported frustration at not being able to easily locate suppliers. **To buy bioethanol** – see [here](#) for more details and **to buy biodiesel** – see [here](#) for more details.
- **Positive Experiences** – All respondents were positive about their experience of biofuels. There was a wide range of benefits reported. Some reported the benefit of being ‘true’ to their environmental conscience and that there had been positive customer feedback. For many, being able to live up to New Zealand’s ‘clean green’ or ‘100% pure’ image was important. For others, their ability to save money and to contribute to activities which reduce waste and reuse resources was key.

Many users reported an improvement in vehicle performance and many – as the use in motorsport would confirm – have not seen a significant drop in performance. Many owners reported an increase in mid-range responsiveness. The majority indicated that their vehicles performed as well on biodiesel as they had on mineral diesel and many reported a significant reduction in exhaust emissions. Many commented on a ‘smoother’ ride .

Your experience?

Do you run a vehicle on biofuels? We'd like to hear about your experiences. See [here](#) for a form to provide us with your details. If you have been using biofuels or biofuel blends from a reputable supplier we will include your experiences on the form. Your personal details will be kept confidential.

Other Useful Resources

- [Energy Efficiency and Conservation Authority](#)
- Ministry of Transport
[Encouraging the uptake of Transport Biofuels](#), Cabinet Paper, 2002
[Enabling Biofuels - risks to vehicles and other engines](#), 2006

- [The Motor Industry Association of New Zealand \(MIA\)](#)
- [Greenfleet](#) (Sustainable Business Network)
- [Saab Bio Power](#) – a UK based website designed by Saab to support driving solutions based on bioethanol
- What Green Car Web-site (UK and US versions)
 Biofuels - <http://www.whatgreencar.com/biofuels.php>
 Biodiesel - <http://www.whatgreencar.com/biodiesel.php>
 Bioethanol - <http://www.whatgreencar.com/bioethanol.php>
- <http://www.biodieselfillingstations.co.uk/approvals.htm>
- The Society of Motor Manufacturers and Traders UK - presentation entitled '[Biofuels and Road Vehicles](#)'
- What Car website (UK)
 Can I use biodiesel? <http://www.whatcar.com/car-news/what-car-q-and-a/can-i-use-biodiesel/216860>
 Where can I buy Bioethanol ? - <http://www.whatcar.com/car-news/what-car-q-and-a/where-can-i-buy-bioethanol/235746>
- The UK Automobile Association (The AA)- Advice on bioethanol and biodiesel - http://www.theaa.com/motoring_advice/news/biofuels.html
- New Zealand Automobile Association (The AA) - <http://www.aa.co.nz/motoring/tips/practical-motoring-tips/Pages/Information-about-biofuel.aspx>
- The RAA - advice on bioethanol in petrol - - <http://www.raa.com.au/page.aspx?TerID=146>
- Use of Ethanol Blending Fuels (source: [Autospeed.com](#))
- The Japanese Automobile Manufacturers Association (JAMA) - [Industry position on Biodiesel](#), October 2009

MIA Members websites

- [Citroen](#)
- [Fiat](#)
- [Alfa Romeo](#)
- [Ford](#)
- [Kia](#)
- [Mitsubishi](#)
- [BMW](#)
- [Mercedes](#)
- [Toyota](#)
- [Mazda](#)
- [Hyundai](#)

Issues of Interest

Integration of Biofuels, Combustion Engines Vital for Biofuel Success

Transportation experts are proposing that the research and development of next-generation biofuels must be done in conjunction with the development of advanced combustion engines if those biofuels are to become a reality and long-term success in the U.S. transportation sector, according to a new report issued by Sandia National Laboratories (article in Bio Fuels November 2010).

- Click [here](#) to link to Article
- Click [here](#) to link to Report

[1] A diesel fuel is winterized by (1) refining it to remove many of the waxy hydrocarbons so the *Cloud Point* or *Wax Appearance Point* are sufficiently low, (2) blending a diesel fuel with kerosene to lower the amount of waxy hydrocarbons present, (3) blending the diesel fuel with special additives called flow improvers or anti gelling agents that prevent the separated wax particles from collecting together, or (4) a combination of the above.