Working with Biodiesel Blends

A new fuel for New Zealand Drivers and Transport Operators

Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao

A new choice

Sustainable biofuels have many benefits over fossil fuels. Most importantly, they are renewable and result in lower carbon dioxide emissions. Biofuels are already available in parts of the country and more may become available to Kiwi motorists. One of the main types of biofuel is biodiesel.

Climate change is a very relevant issue for the world today. Growing levels of greenhouse gases in the atmosphere are the main cause, and carbon dioxide (CO_2) is a major contributor.

Over 45% of New Zealand's energy-related CO_2 emissions come from the transport sector. Introducing sustainable biofuels to the market is one way to help reduce our CO_2 emissions.

Biofuels have been produced and used overseas for over 20 years in many European countries, the United States, South America, parts of Asia and Australia. Their use is well established and now it is time for New Zealand to introduce sustainable biofuels to Kiwi motorists.

This guide has been developed especially for the motor trade and transport industries and anyone who sells or services diesel powered vehicles to help answer any questions you and your customers may have about biodiesel blends. It complements a brochure that provides information in brief on biodiesel blends for the general public. A booklet (like this one) on bioethanol-blended petrol has also been produced.

If you need more information, visit www.biofuels.govt.nz

Biodiesel blends – a summary

- All biodiesel blends and biodiesel for sale in New Zealand must meet fuel specifications regulated by the government.
- In New Zealand, retail biodiesel blends are allowed up to 5% biodiesel in ordinary diesel. These are often referred to as B5 i.e. 5% biodiesel mixed with ordinary diesel. Some fleet customers buying fuel in bulk may use higher blends of biodiesel, such as B20 (containing 20% biodiesel), but these are not currently permitted for retail sale.
- B5 can be used in most situations with the same confidence as ordinary diesel. In fact, it would be hard to notice any difference in performance when driving on a biodiesel blend compared with ordinary diesel.
- Guidelines for the storage of biodiesel blends are much the same as for ordinary diesel – they should be stored in closed containers somewhere dry, cool and dark for no longer than 3 months.
- B5 must meet the same quality requirements as ordinary diesel including those relating to performance in cold temperatures.
- B5 can be used with the same confidence as ordinary diesel. It can be used in almost any diesel engine, including those found in trucks, earth moving equipment, tractors, generators, and boats.
- Biodiesel blends tend to 'clean' fuel systems, loosening dirt and old fuel deposits and carrying them through to the fuel filter. For a fuel system that has not been regularly maintained, check and if necessary change the fuel filter after first using biodiesel blends.

Contents

Background on biodiesel blends

The facts

Working with biodiesel blends

More information

Background on biodiesel blends

What are biodiesel blends?

Biodiesel blends are similar to ordinary diesel but contain a biofuel, biodiesel, which is commonly made from vegetable oils or animal fats. Biofuels are fuels that can be produced from renewable sources, such as plants, unlike fossil fuels.

Biodiesel (B100) is the base biofuel. Biodiesel blends are blends of a percentage of biodiesel mixed in ordinary diesel. These blends are often referred to as B5 or B20. These names relate to the percentage of biodiesel in the blend. B5 means 5% biodiesel in ordinary diesel, and B20 means 20% biodiesel in ordinary diesel.

Many vegetable oils and animal fats have a composition that makes them useful for combustion. However, they're not suitable for use directly in modern diesel engines. A chemical process is used to convert oils and fats into biodiesel. The process strips the glycerol out to create an excellent fuel with properties quite similar to ordinary diesel.

B5 means 5% biodiesel in ordinary diesel, and B20 means 20% biodiesel in ordinary diesel.

Don’t use raw oils as fuels

Biodiesel is derived from vegetable oils (e.g. cooking oil, rapeseed and soybean) and animal fats (e.g. tallow). Technically it is possible to use these in raw form to power a diesel engine, however, this sort of ‘home brew’ may damage engines and is not recommended.

Using raw oils can lead to engine deposits, filter ‘plugging’, poor fuel atomisation and combustion, dilution of and reaction with the lubricating oil and undue strain on injection components. The cleanliness of raw oils sold for use in engines may also be suspect, causing injector fouling and plugging.

Biodiesel blends at the pump

Retail biodiesel blends in New Zealand are allowed up to 5% biodiesel (i.e B5).

Some fleet customers buying fuel in bulk may use higher blends of biodiesel, such as B20, but these are not currently permitted for retail sale.

Government specifications

All biodiesel blends for sale in New Zealand must meet fuel specifications regulated by the government so that you and your customers can be confident about their quality. B5 must meet the same quality requirements as ordinary diesel, including those relating to performance in cold temperatures.

Why up to 5%?

Biodiesel blends at a 5% blend level are very diluted blends of biodiesel. B5 is approved by the vast majority of vehicle manufacturers, including the Engine Manufacturers Association (EMA) and the Fuel Injection Equipment (FIE) manufacturers.

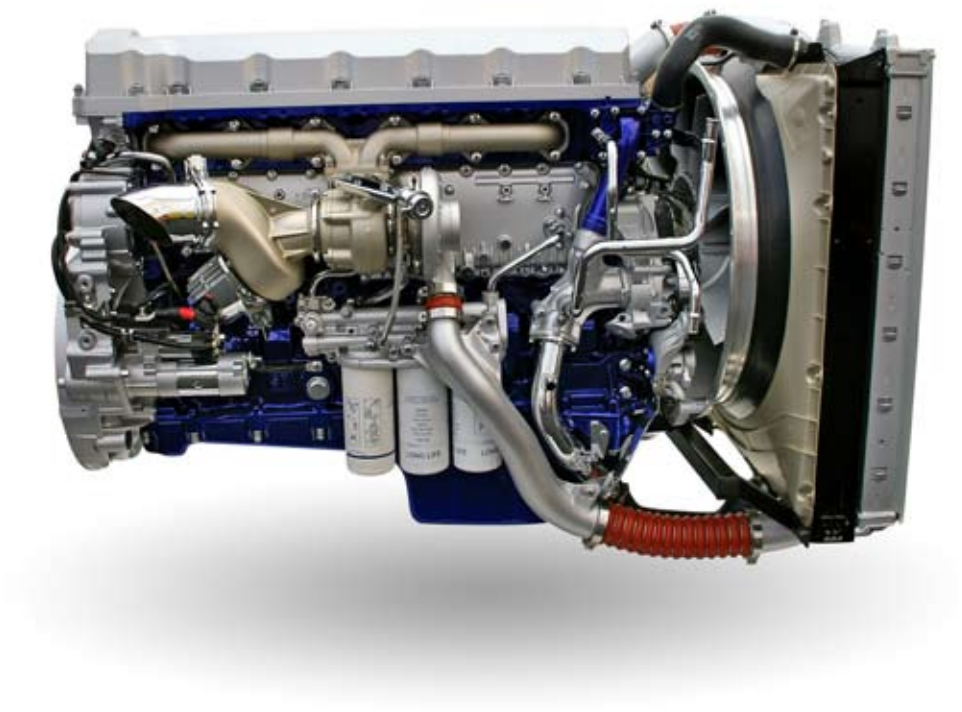
Limiting blends to 5% ensures cold properties are the same as for ordinary diesel.

Make the switch to biodiesel blends!

- Biodiesel blends will increase the use of renewable energy in the transport sector and help New Zealand reduce its emissions of carbon dioxide (CO_2) and in turn reduce our reliance on fossil fuels.
- Biodiesel blends are a cleaner burning fuel and can help improve air quality. They can also help reduce New Zealand’s overall emissions of CO_2.
- Biodiesel is more biodegradable than ordinary diesel.

Biodiesel blends must meet the same quality requirements as ordinary diesel, including those relating to performance in cold temperatures.

The facts



Biodiesel blends have a number of benefits over ordinary diesel

- Good lubrication properties. Biodiesel can improve the lubricity of diesel fuel.
- 100% biodiesel is not a hazardous substance so has no HSNO classification. However, biodiesel blends should be stored and handled the same as ordinary diesel.
- Biodiesel is more biodegradable than ordinary diesel.
- Biodiesel typically has a higher cetane number than ordinary diesel. However, there is no guarantee that biodiesel blends will have a higher cetane number than ordinary diesel. The minimum cetane number or index is the same for biodiesel blends as for ordinary diesel (51), which means they will perform at least the same as ordinary diesel. Cetane is a measure of how well a fuel ignites in a diesel engine. Higher cetane is better for engines.

Biodiesel blends should be stored and handled the same as ordinary diesel.

Good for almost all situations

Biodiesel blends are an excellent fuel, with properties similar to ordinary diesel. B5 can be used in most situations with the same confidence as ordinary diesel. In fact, it would be hard to notice any difference in performance when driving on a B5 blend compared with ordinary diesel. Biodiesel blends have good combustion and lubrication properties, making them good for your engine.

Mixing and matching is OK

You can switch between using biodiesel blends and ordinary diesel at any time. Drivers can fill up with biodiesel blends or ordinary diesel, whatever is most convenient, and have a mix of both in the tank at the same time.

Higher viscosity

Biodiesel is less fluid than normal diesel. Higher viscosity fuels can increase fuel injection equipment pressures and put more strain on associated components. Fuel injection into the engine's combustion chamber may also be affected. The 5% blend level with ordinary diesel is a significant dilution which will avoid these problems.

Biodiesel blends purchased from service stations must meet the government's specifications for ordinary diesel, which stipulate the same allowable viscosity for biodiesel blends as ordinary diesel.

Lower energy content

The energy content of a litre of biodiesel is around 92% of that of ordinary diesel so in a 5% blend, this energy reduction is around 0.4%; too small to be noticed. There is often a variation in energy content of up to 2-3% between different batches of ordinary diesel.

Higher blends

Some engines are approved for use with B20 (blends with up to 20% biodiesel in ordinary diesel) and a few are approved for 100% biodiesel, i.e no ordinary diesel.

Some wholesale diesel customers in New Zealand, such as bus fleets, may use higher blends but these blends will not be available for retail sale.

B5 can be used in most situations with the same confidence as ordinary diesel.

Working with biodiesel blends

Vehicle support

Virtually all diesel engine vehicles can use biodiesel blends (B5) without any engine or fuel system modifications.

Biodiesel blends are used widely overseas and many engine manufacturers approve their use. To find out if a vehicle has been confirmed by the manufacturer as supporting a biodiesel blend look in the owner's handbook or contact the official representative of the vehicle manufacturer in New Zealand. Any reference in the handbook may be in relation to 100% biodiesel, rather than a B5 blend, as some countries retail 100% biodiesel. This can be confirmed with the manufacturer. Contact details for the representatives can be found in the owner's handbook or online at the vehicle manufacturer's New Zealand website.

Store biodiesel blends correctly

Biodiesel biodegrades much faster than ordinary diesel. This is an environmental benefit if there is a spill but it does mean that biodiesel blends may begin to biodegrade if stored incorrectly.

The guidelines for storage of biodiesel blends are much the same as for ordinary diesel – they should be stored in closed containers somewhere dry, cool and dark for no longer than 3 months.

If the fuel tank is not likely to be used for an extended period of time, it is recommended that you fill the tank. This will help reduce the surface air exposed to the atmosphere thereby reducing any absorption of water.

Additives

No after market additives are needed for biodiesel blends. The Engine Fuel Specifications Regulations ensure that the quality of biodiesel blends for retail sale, including cold temperature properties, must meet the same specifications as ordinary diesel

Fuel additives mixed with fuel after it is sold may put any fuel out of specification and should only be used if approved by your vehicle manufacturer.

Diesel bug

Don't introduce biodiesel blends into a tank of ordinary diesel where you suspect the presence of water or microbial growth (diesel bug) without flushing out the tank first. Biodiesel blends can take up water more easily and water allows growth to occur and spread. If you do suspect diesel bug seek specialist advice.

Not for very cold areas

In winter, if the biodiesel blend has not been purchased locally, drivers should not park in the mountains or overnight in very cold areas (i.e. where the temperature might fall below minus 6°C). This is similar for ordinary diesel – locally purchased fuel will be formulated to suit the region's colder temperatures. Simply driving through cold areas with a biodiesel blend in the tank is not a problem. This only affects vehicles or equipment that is left standing for extended periods, e.g. overnight.

Fuel systems and filters

Biodiesel blends tend to 'clean' fuel systems; loosening dirt and old fuel deposits and carrying them through to the fuel filter. Although blending with ordinary diesel reduces this phenomenon, this still happens slowly over time, particularly in older vehicles or where the fuel system may be in poor condition.

Replace the fuel filters in older vehicles after a few tanks of a biodiesel blend, when they will have had a chance to catch any loosened material. Remember, power loss can be a sign that an engine's fuel filters are blocked, and is not as a result of the change in fuel. Full power will be restored once the fuel filters are replaced.

Check for fuel leaks

Biodiesel blends may affect the materials of certain fuel system components such as seals, hoses, gaskets and wire coatings.

The non-metallic materials and components most at risk include fuel injection pump seals. As biodiesel blends contain only 5% biodiesel it is unlikely that using them will result in any problems with these components.

However, there is still a small risk of components degrading. You and your customers should keep an eye out for wet patches under the vehicle after it has been parked, moisture at the bottom of the engine, unusual diesel smells when operating the vehicle, or a reduction in the fuel economy, any of which may indicate a fuel leak.

Follow ordinary diesel safety rules

Although biodiesel is considered as being non-toxic to humans, biodiesel blends are in fact about as toxic as ordinary diesel.

When handing biodiesel blends take normal safety precautions – avoid skin contact, splashes in the eyes and inhaling the fumes.

Suitability for new technologies

Diesel engine technology continues to evolve. Among recent developments are particulate traps – exhaust systems designed to reduce fine particles emitted from engines. These new technologies are fitted onto new diesel vehicles entering New Zealand that are designed for use with B5 blends.

Other developments will include advanced emissions-related technologies such as selective catalyst reduction systems (SCR). Advice regarding the compatibility of biodiesel blends will be available from manufacturers when these technologies reach New Zealand.

Oil change frequency

Oil change frequency for B5 blends is no different to ordinary diesel. For higher biodiesel blends, some engine manufacturers recommend increased oil change frequency. This is because in some countries the oxidation stability of biodiesel was not tightly regulated, as it is in New Zealand, which could degrade lubricating oil.

What else can use biodiesel blends?

Biodiesel blends (B5) can be used with the same confidence as ordinary diesel. They can be used in almost any diesel engine, including those found in trucks, earth moving equipment, tractors, generators and boats.

Biodiesel blends should be stored in closed containers somewhere dry, cool and dark for no longer than three months as they may absorb moisture from the air. Don't let biodiesel blends sit in equipment that isn't used regularly. Looking after the fuel in this way is the same as you should do with ordinary diesel.

If the fuel tank is not likely to be used for an extended period of time (but not longer than 3 months), it is recommended that you fill the tank. This will help reduce the surface air exposed to the atmosphere thereby reducing any absorption of water.

If you have any doubts check the owner's handbook or with the equipment supplier.

More information

Biodiesel blends diagnostic sheet for workshops

All biodiesel blends and biodiesel for sale in New Zealand must meet fuel specifications regulated by the government, but as biodiesel blends are new to New Zealand this worksheet has been developed to help you with any issues you may encounter for vehicles using biodiesel blends.

Virtually all diesel engined vehicles can use biodiesel blends of up to 5% without any engine or fuel modifications and can be used in most situations with the same confidence as ordinary diesel. Biodiesel blends are very unlikely to cause problems for vehicle operators. The information below is to help workshops recognise problems that might be caused by biodiesel blends and distinguish them from other faults that commonly affect diesel vehicles – regardless of the fuel they use.

Note: When looking for causes of fuel related problems, it is important to ensure that the vehicle's engine management, air intake and fuelling systems are in a good state of repair.

General advice you could give motorists and fleet managers using biodiesel blends:

- B5 meets the NZ specification for ordinary diesel. If your vehicle runs on diesel now you should have no problems using B5. If you have any concerns contact your vehicle manufacturer.
- Avoid storage for periods of more than 3 months.
- Have your fuel filters checked, especially after your first few fills.

See chart on following page.

Issue	What to check for	Possible cause	What to do
Scale and plaque	Scale and plaque can cause fuel filter blocking which can lead to fuel starvation, smoking and loss of power. Look for solids on the membrane of the primary fuel filter. Check when the fuel filter was last changed. If it has been some time the vehicle may simply be due for new filters.	Solvency of biodiesel may release scale and plaque from the inside surfaces of the fuel tank and lines which then gets caught by the fuel filters.	Try to assess the likely condition of the filter before the use of biodiesel blend, for example how old is it? Change primary fuel filter, inspect secondary fuel filter if symptoms persist and monitor vehicle performance. (This problem won't recur once the fuel system is clean.)
Water in fuel	Free water in any diesel can cause fuel pump and injector failure. Look for corrosion of fuel pump components and water trapped in fuelling system, including the pump, primary filter, water trap and fuel tank.	Water can occasionally find its way into fuel tanks during prolonged wet weather. This is no more likely when using biodiesel blends than ordinary diesel. Biodiesel and biodiesel blends react the same to water as ordinary diesel.	Remove fuel, dry fuel system and tank, clean the water trap (if fitted), change fuel filters and fill with fresh dry fuel. Check the fuel pump and injectors for signs of corrosion.
Waxing	Waxing causes fuel filter blocking which can lead to fuel starvation and loss of power. Look for whitish waxy material on the membrane of the primary fuel filter.	Biodiesel is prone to waxing in very cold conditions. At a 5% biodiesel blend waxing is unlikely to be a problem.	Replace primary fuel filter. If necessary, inspect secondary filter.
Diesel bug	Diesel bug causes fuel filter blocking which can lead to fuel starvation and loss of power. Fuel is often hazy and greyish in appearance. Filter membranes are often charcoal grey.	Water in storage or vehicle tank combined with slow product turnover can encourage diesel bug growth. Free water is required to be present for diesel bug to develop into problem.	Drain fuel and check for free water in vehicle and storage tanks. Replace fuel and filters, and clean the water trap (if fitted).
Fuel leak	Check gaskets and seals. Inspect vehicle fuel system for corrosion. Ensure fittings are of suitable materials. 'Yellow' metals such as brass may cause an issue. Seal failures are more common in older type VE rotary fuel pumps. Metals to avoid: brass, bronze, copper, lead, tin, zinc.	The solvency and acidity of biodiesel blends can be higher than ordinary diesel. This can affect unsuitable fittings or seals that have aged.	Replace perished seals or corroded parts. Check condition and age of seals – they may have been at the end of their natural life anyway.
Damaged fuel pump or injectors	If water does not appear to be the cause of the problem, check for sticking of moving parts, varnish and deposits on critical components and coking on the injectors.	Damage to fuel pumps or injectors is most likely as a result of free water. If water is not the cause, it is possible that the biodiesel has aged or that the cause is unrelated to the fuel.	Take a fuel sample. Check/replace both primary and secondary fuel filters. Replace damaged parts.
Damaged diesel particulate filter	Poor running, smoking. Vehicle fails emissions test.	Regenerative diesel particulate filters (DPF's) can suffer blockage or catalyst deactivation caused by metal soaps. If fuel filters are working correctly, this type of damage is unlikely.	If the DPF appears to be malfunctioning, please consult with the vehicle manufacturer. The cause may be unrelated to the biodiesel blend.

Ministry of Economic Development
Manatū Ōhanga

Ministry of Transport
TE MANATŪ WAKA

EECA
Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao

New Zealand Government