

BIODIESEL

FACT SHEET 4



Results of Biodiesel Use

Emissions

There are a large number of biodiesel emissions studies. Analysis, and therefore conclusions, in these studies vary in relation to type of biodiesel used (i.e. feedstocks, process technology, etc), blends of biodiesel used, types of engine used, fuel injection methodology, engine load, sampling methodology, experimental designs and test methods used. A recent CSIRO study compared the results between conventional diesel and biodiesel (B100). In addition, the US National Biodiesel Board has published data on the air toxic emissions of biodiesel compared to diesel. The summarised results of these two studies are detailed in Table 1 below.

In another study Environment Australia incorporated a desk top study and literature review of existing Australian and overseas data concerning the emissions characteristics of alternative and conventional fuels that are or may be suitable for use in road vehicles weighing 4.5 tonnes gross vehicle mass (GVM) or more. The study found that compared to low sulfur diesel (LSD – <500ppm), on a full fuel cycle basis, 100% biodiesel generally resulted in slightly lower emissions of particulate matter, higher emissions of NOx, significantly lower greenhouse gas emissions and air toxics emissions ranging from ‘much the same’ to ‘significantly lower’ depending on the feedstock used.

Table 1:

Emissions Reduction for B100 (Truck Data) Compared to Conventional Diesel Fuel (LSD)		
Emission Type (CSIRO Study)	B100	Reduction
Greenhouse		up to 92%
Total Hydrocarbon		60%
NOx		-5%*
CO		47%
PM10		37%
Emission Type (National Biodiesel Board)	B100	
Sulfates		100%
PAH (Polycyclic Aromatic Hydrocarbons)**		80%
nPAH (nitrated PAHs)**		90% ***
Ozone potential of speciated HC		50%
* Increase ** Average reduction across all compounds measured *** 2-nitrofluorine results were within test method variability		

Source: Beer, et al. "Final Report (EV45A/2/F3C) to the Australian Greenhouse Office on the Stage 2 Study of Life-cycle Emissions Analysis of Alternative Fuels for Heavy Vehicle", 2002.

Toxicity

Compared to diesel exhaust biodiesel use reduced the potential cancer causing compounds polycyclic aromatic hydrocarbon emissions (PAH) and nitrated (nPAH). These reductions are principally due to the fact that biodiesel fuel contains no aromatic compounds. CSIRO report that there appear to be no health risks of air toxic emissions from biodiesel with respect to mortality, toxicity, fertility or teratology (the branch of embryology and pathology that deals with abnormal fetal development and congenital malformations). All air toxic emissions from biodiesel are lower than equivalent diesel emissions except for acrolein. Though highly toxic, the slight increase in acrolein is offset by the decrease in the equally toxic aldehydes. The CSIRO report also found a real reduction in acrolein emissions with increasing biodiesel concentration.

Biodiesel has similar toxicity to soapy water, therefore does not cause dermatitis like regular diesel.

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Lubricity

Any addition of biodiesel to diesel will improve the lubricity of the resulting biodiesel blend. Fuel lubricates some moving parts of diesel pumps and injectors. To avoid excessive wear, the fuel must have some minimum amount of lubricity. In the absence of sufficient lubricity in fuel, vehicles can suffer excessive pump wear and, in some cases, engine failure. In addition, certain modes of deterioration in the injection system could also affect the combustion process and hence emissions. Accordingly, to prevent problems arising from the introduction of low sulfur grades of diesel, lubricity additives have been developed to compensate for the deterioration in natural lubricity of low sulfur diesel.

In cooperation with the US National Biodiesel Board, lubricity tests were completed conventional diesel fuel (US Grade No. 2-D) was tested and the results indicated that the inclusion of 2% biodiesel into any diesel fuel will be sufficient to address the lubricity concerns that diesel engine companies and diesel fuel injection equipment companies have with these existing diesel fuels.

Biodegradability

Biodegradability refers to the ease with which compounds break down into simple molecules found in the environment, such as carbon dioxide and water. Biodegradability is desirable in the event of a spill or leak of fuel to the environment.

Biodiesel degrades approximately four times faster than diesel and the National Biodiesel Board reports that, within 28 days, pure biodiesel (B100) degrades 85% to 88% in water (compared to 26% for diesel).

Blending biodiesel with diesel also accelerates the biodegradability of the diesel component and it has been reported that blends of 20% biodiesel with 80% diesel fuel degrade twice as fast as neat diesel.

Competitive Advantage of Using Biodiesel

Experience in other countries where biodiesel has reached commercial production indicates that biodiesel sales are concentrated in niche markets where environmental benefits or competitive advantage are the basis for purchasing decisions.

Federal, state and local authorities are putting a higher weighting in tendering processes on the sustainable business practices of bidders in the urban bus fleet and waste management sector. Social and environmental factors are becoming standard selection criteria. Biodiesel has strong social and environmental credentials that should be favored by selection committees.

The biodegradability of biodiesel has opened up a niche market in the marine sector. As biodiesel biodegrades faster than diesel in aquatic environments and is non-toxic (diesel is toxic) there is a significant potential environmental benefit from using biodiesel in both fresh and salt water environments.

Fuel Economy, Power and Torque

Biodiesel can be used in existing diesel engines and fuel injection equipment with little impact on operating performance, supplying similar power, torque, fuel consumption and haulage rates.

Engine Life

Early test results for work undertaken by ARFuels are indicating that the increased lubricity and other positive impacts of biodiesel may result in increased engine service life. Importantly at this stage, it appears unlikely that the use of biodiesel will reduce engine service life.

Service Intervals

Arfuels recommends that service intervals recommended by the vehicle manufacturer be maintained when using biodiesel. However, early test results by Arfuels are suggesting that the increased lubricity and other positive impacts of biodiesel may result in increased service intervals without adverse impact. Arfuels maintains its recommendation to conform to manufacturers' recommendations, but advises users of biodiesel to make any changes based on engine oil testing and technical advice.

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Storage, Handling and Distribution

Biodiesel is significantly safer than diesel. The storage and handling procedures for petroleum diesel can be used for biodiesel also. The fuel is best stored in a dark, dry and clean environment, in storage tanks, preferably steel, aluminium, teflon, fluorinated polyethylene or polypropylene. Materials which should be avoided include lead, copper, brass, tin and zinc. Biodiesel has a flash point higher than diesel. Many diesel fuel suppliers recommend storing diesel for no more than three to six months unless using a stabilizing additive. The current industry recommendation is that biodiesel or biodiesel blends also be used within six months.

A longer shelf life is possible and storage enhancing additives can provide additional benefits. Acid numbers in biodiesel and biodiesel blends will become elevated if the fuel ages, or if it was not properly manufactured. Raised acid numbers have been associated with fuel system deposits and reduce the life of fuel pumps and filters.

Pure biodiesel and biodiesel blends should be stored at temperatures higher than the pour point of the fuel. Biodiesel blends will not separate in the presence of water however it is recommended that good 'housekeeping' be maintained. This is in respect to tank and fuel maintenance, to ensure water in storage systems is monitored and minimised.

Additives

Additives are being investigated to control operability properties of biodiesel, such as cold flow and NOx emissions, as well as storage properties. Existing diesel additives used to eliminate bacterial or algal growth in diesel are effective for biodiesel. Arfuels biodiesel has a suitable bactericide/fungicide added during manufacture. In suitable quantities, Arfuels biodiesel may be supplied without this additive upon request.

Source of information for Fact Sheet

Arfuels has used a number of sources including its own internal data. However a number of references are from the document "Setting National Fuel Quality Standards, Paper 6, National Standard for Biodiesel – Discussion Paper, prepared by Environment Australia, March 2003".