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# INFOSheet

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Ministry of Agriculture, Food and  
Rural Affairs  
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## Biodiesel Use On-farm?

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Biodiesel is a clean-burning renewable fuel made from agricultural and food-based inputs. Currently farmers use considerable amounts of diesel fuel on-farm. As interest in biodiesel production and use increases farmers have started asking “should I be using biodiesel?” This infosheet outlines some basics on biodiesel, and implications for on-farm use.

### What is Biodiesel?

Biodiesel is a desirable substitute for petroleum diesel because it can be used in standard diesel engines without any engine modification. Biodiesel can be blended with petroleum diesel in any proportion. B100 refers to 100% biodiesel fuel, while B20 refers to a blend of 20% biodiesel and 80% petrodiesel.

### Biodiesel Inputs

Biodiesel is made from a variety of bioproducts such as vegetable oils (soy, canola, etc.), animal fats, and recycled food-based products including restaurant grease. Biodiesel can be blended at any concentration with petroleum diesel and used in any diesel engine with little or no modification to the engine or fuelling infrastructure. Common blends are B2, B5, B10, and B20.

### Biodiesel Performance

Biodiesel is considerably less flammable than petroleum diesel, which burns at 50°C (120°F). Pure biodiesel (B100) does not ignite until 150°C (300°F). The flashpoint (the temperature at which it will ignite when exposed to a spark or flame) of a biodiesel blend falls somewhere between these temperatures, depending on the mixture.



Can farmers fuel their combines from some of the soybeans they are harvesting?



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One of the most common questions on biodiesel use is about its performance in cold weather. Extremely cold weather may affect the performance of high level biodiesel blends (above 5% biodiesel content). Typical cloud points for biodiesel will vary based on the feedstock used in production. Solutions to cold weather problems are the same as those for petroleum diesel. Blends of up to B5 are more typically used in very cold conditions.

### **Vehicle Performance**

Biodiesel-powered engines have been shown to deliver similar torque and horsepower as diesel-powered engines. Biodiesel has a higher cetane rating, which can improve starting ability and reduce smoke emissions. Biodiesel also has better lubricity than petrodiesel, which helps to reduce engine friction and wear, and therefore extend engine durability. Biodiesel has slightly more energy per litre than No. 1 diesel and slightly less energy than No. 2 diesel.

Like petroleum diesel, biodiesel can gel in cold weather. Laboratory tests show that biodiesel blends gel at a higher temperature than petroleum diesel would otherwise. Actual experience with cold weather has varied. B20 blends have been used in some very cold climates, such as in northern Minnesota and Wyoming, where temperatures can fall below  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ) in winter. B20 has been tested in buses in Montréal to determine how well it works in cold weather and Toronto Hydro has used B20 with no adverse affect on its fleet vehicles. However, additives are typically required in higher biodiesel blends (above B5), particularly to address cold flow properties during winter months. Research and testing is underway to reduce production costs and address cold weather issues.

### **Biodiesel and your Engine's Warranty**

Most major engine manufacturers have confirmed that the use of B5 biodiesel will not void their parts warranties. Some manufacturers have confirmed that blends up to B20 are acceptable. As biodiesel is more widely tested and used, manufacturers will be in a better position to support the use of higher blends. John Deere announced in February 2005 that it will use a two percent biodiesel blend, or a B2, as the preferred factory fill in the United States. Some of the products that will be fuelled by the B2 include tractors and combines. Users may want to check with their equipments' engine manufacturer about their specific warranty.

The B100 blendstock (i.e. the pure biodiesel that is blended into petroleum diesel) must meet the American Standard for Testing Material ASTM D6751 or the European standard EN14214. For on-road vehicles a B1 to B5 blend should meet the new Canadian General Standard Board specification CAN/CGSB-3.520 Automotive Low-Sulphur Diesel Fuel Containing Low Levels of Biodiesel Esters (B1 to B5).

### **Case Study: Biodiesel at Kemptville College 2005 to 2007**

Kemptville College (University Guelph) has been operating a tractor on B5 diesel blend since summer 2005. The fuel currently in use is comprised of 5% biodiesel (produced from animal rendering) and 95% diesel fuel. The diesel is supplied by PetroCanada while the biodiesel component is supplied by Natural



Kemptville Biodiesel Tractor

Resources Canada through the Federal Emission Center. The tractor, supplied by John Deere Company, is a 2005 model 5325 with MFD and a front end loader. The unit was initially tested at the Emission Center in Ottawa before being placed into service at the college. Test results indicated that the tractor met all emission requirements, as delivered, for this model. Testing also showed that the emission output improved progressively with the engine operating on B5, B10, B15 and B20 blends. This is a positive finding for future use of higher percentage blends. Operation of the tractor at a B5 blend falls within the tractor manufacturer's warranty requirements and meets fuel test regulations. The B100 blend stock being used meets ASTM D6751-02. Future plans include the use of biodiesel produced from canola oil and soy oil based feedstock.

Operation of this tractor at Kemptville College involves a wide variety of jobs normally handled by a 55 horse power tractor of this type. As of January 2006, the tractor ran in a wide range of temperatures on a B5 blend for 220 hours without any problems. The blended fuel is stored outside in a typical 500 gallon fuel tank and is pumped to the tractor without problem in all conditions.

Follow-up emission testing will be carried out in summer 2006. The agreed test period for this tractor is 2 years or 1000 hours of operation. All regular maintenance will be carried out by the college, along with periodic sampling of the oil by Wear Chek. A continuous log book is being maintained, recording any unusual conditions. At the end of the 2 year period, the tractor will return to the Emission Center for final testing, and then to Kemptville for horsepower testing. Finally, the engine will be taken apart and all components inspected for wear comparatively to John Deere's specifications. All data collected throughout this test will be documented.

### **Case Study: Toronto Hydro**

In September 2001, Toronto Hydro began a large-scale pilot project using biodiesel in about 80 fleet vehicles. By July 2002, Toronto Hydro had extended this project to include the entire diesel fleet of 400. As a result Toronto Hydro-Electric System received the 'Award of Excellence' during National Transportation Week 2002. The award is presented to an individual or corporation that has made an outstanding contribution to the betterment of the transportation industry in areas such as safety, environment, education, technology, policy or corporate development.



Photo Credit – Toronto Hydro

### **Case Study: Montreal BioBus**

Biodiesel blends of B5 to B20 were tested on 155 buses in downtown Montreal as part of a BioBus demonstration project funded in part by the Government of Canada and the Quebec provincial government. The study showed how biodiesel operated in routine conditions, particularly in cold weather. The study demonstrated that biodiesel is a viable fuel in a region like Montreal where temperatures can get very cold.

Biodiesel projects in other countries have been carried out in warmer climates, whereas the BioBus project provided a baseline for biodiesel use in a cold climate. The vast majority of biodiesel used in other countries is produced from vegetable oil grown as a cash crop, whereas

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some of the biodiesel in this project came from agro-industry waste (24% vegetable oil, 28% animal fat, and 48% recycled cooking oil).

### **Societal and Economic Benefits**

Biodiesel is produced from local, renewable resources – either agricultural products or agro-industry residues such as slaughterhouse waste, recycled cooking oil, non-food-grade virgin oil. This can provide new value for products that were once destined for a land-fill site, creating new markets for local industries and reducing government's and industry's disposal costs.

### **Environmental Benefits**

Biodiesel is non-toxic and is totally biodegradable, making it better for handling and for the environment. Spills will degrade faster than diesel fuel. None-the-less, care should be taken in handling all fuels.

Over the life cycle – from growing oilseeds or rendering animal waste to biodiesel's manufacture and use – pure biodiesel produces approximately 64 to 92 percent fewer greenhouse gas emissions compared with petroleum diesel, depending on the oil or fat used in its production. A 20 percent blend of biodiesel with petroleum diesel (B20) produces approximately 12 to 18 percent fewer emissions, and a 2 percent blend (B2) produces 1 to 2 percent fewer emissions. This makes biodiesel useful in addressing climate change concerns. As well, when using and changing waste products into biodiesel, they are diverted from landfill sites where they may have produced methane gas, which contributes to climate change.



Biodiesel also offers air quality benefits including lowered hydrocarbon, carbon monoxide, particulate matter emissions. There are conflicting research results regarding the impact of NOx emissions.

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Some content provide by:

Natural Resources Canada - <http://oee.rncan.gc.ca/transportation/fuels/biodiesel/biodiesel.cfm>

The Biodiesel Association of Canada

Rothsay Ltd – BioBus project - [http://www3.sympatico.ca/rothsay/images/e\\_biobus.pdf](http://www3.sympatico.ca/rothsay/images/e_biobus.pdf)

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## **Resources:**

### **Biodiesel Fuel Testing**

Website: [www.biofuels.arc.ab.ca](http://www.biofuels.arc.ab.ca)

Deni Sarnelli, Alberta Research Council, Fuels & Lubricants Group  
250 Karl Clark Road, Edmonton, Alberta, Canada T6N 1E4

A typical biodiesel (B100) ASTM D6751 test costs \$1400 (for certification). Assistance is available to cover some of testing costs. For the first application the test cost is reduced by 70% to \$420. The second application test cost is reduced by 50%. Additional applications are reduced by 30%.

### **Suppliers of Biodiesel:**

#### **Canadian Renewable Fuels Association**

Website: [www.greenfuels.org/biodiesel/suppliers.htm](http://www.greenfuels.org/biodiesel/suppliers.htm)

They maintain a list of companies that produce fuel to ASTM quality standards by providing independent third party verification of their high standards of biodiesel.

### **Fleet Challenge**

Fleet Challenge Canada is a national program dedicated to promoting and supporting continuous improvement in energy efficiency and emission reduction among commercial vehicle fleets of all kinds.

Contact information:

Telephone: 416-972-9502

Fax: 416-972-1238

Toll Free: 1-866-299-0313

Website: [www.fleetchallenge.ca](http://www.fleetchallenge.ca)

### **The National Biodiesel Accreditation Program: BQ-9000**

The National Biodiesel Accreditation Program is a cooperative and voluntary program for the accreditation of producers and marketers of biodiesel fuel called BQ-9000. The program is a unique combination of the ASTM standard for biodiesel, ASTM D 6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices

Website: [www.bq-9000.org](http://www.bq-9000.org)