

WHAT IS CANOLA?

Canola seed oil is an environmentally friendly alternative to using diesel fuel in pile driving hammers. There has been an increasing demand for this type of fuel since it is ecologically safe for application in sensitive areas such as waterways, forestry or agriculture. This type of product is biodegradable, ie., it can be broken down naturally.

To obtain the oil from the seed, the shell must be broken and the oil extruded under pressure. This removes approximately 80% of the seeds' oil. Commercial crushing plants use a solvent extraction process to obtain almost 100% of the oil. This process is somewhat complex and dangerous, making it unattractive for farm use. Commercially available farm-scale presses generally have low throughputs and require about 0.16 kWh of electricity for every litre of oil extracted.

The canola seed is 40% oil by weight. Potentially harmful gums and waxes, present in all oils seeds, are low in canola. Higher levels may require removal, which adds to the expense and complexity of obtaining a diesel fuel extender. (MacDonald, pg. 2)

Canola is also low in erucic acid and glucosinolates. These both cause digestive problems when consumed by animals. (MacDonald, pg. 2)

Some characteristics of the canola oil are:

Physical State	Liquid
Odour	Distinctive
Appearance	Dark Brown
Specific Gravity	0.92
Boiling Point	>300°C
Freezing Point	-18°C
PH	7-7.3
Flashpoint	200°C
Chemical Stability	Stable
Hazardous Decomposition Products	Oxides of Sulfur and Carbon

This product is not hazardous, nor is it a controlled product. It is flammable upon open flame above the flash point and can be extinguished using foam, CO₂, dry chemical or water spray. Toxic fumes may evolve upon burning. (M.S.D.S.)

Although the product is environmentally safe, spills should be contained and picked up. Disposal shall be in compliance with Federal, Provincial and Local laws. (M.S.D.S.)

- how long does it take for the oil to break down? any precautions regarding contamination during service?
- into what components? Compare to diesel time and components in chart.

CANOLA AS A DIESEL-HAMMER FUEL

Canola oil is approximately 8% heavier than diesel fuel. As well, it has between 11 and 17 times higher viscosity or 'thickness'. (MacDonald, pg. 1) As temperature increases, the viscosity of diesel fuel decreases marginally. In the same case, the viscosity of canola fuel decreases drastically. However, at any given temperature, the viscosity of canola is at least 10 centistokes greater than that of diesel, and is as much as 90 centistokes greater at approximately 10°C. (Strayer, Appendix)

-does it lose viscosity in service? And or temperature?

Canola oils have a polar nature, that is, they have an affinity to metal surfaces. Therefore, the lubrication properties of canola are excellent.

-any anti-wear agent?

-shelf life?

-is it compatible with the seal materials such as nitrile viton and polymethane?

-corrosion problems?

HOW DOES CANOLA RUN IN A DIESEL HAMMER?

Brass and copper react with most vegetable oils and diesel fuel. It is recommended that pipes, valves, fittings, etc., be made of steel or plastic. (MacDonald, pg. 8)

-any pointers to ensure maximum life from oil and equipment?

-fluid quality

-oil change intervals

-preferred level of moisture

ENERGY CHARACTERISTICS OF CANOLA VS. DIESEL

Canola provides 85-90% as much energy as diesel on a liter to liter basis. This comparison is from gross calorific values. (MacDonald, pg. 1)

-why does our hammer run better with canola?

One litre of canola oil has only 13% less energy than one litre of diesel fuel. (MacDonald, pg. 2)

-chart

-study for U.S. Department of Energy: the engine produced slightly more power when burning canola oil. (Strayer, pg. 2)

EMISSIONS COMPOSITION OF CANOLA VS. DIESEL

- sulfur and carbon oxides
- chart

Diesel fuel is a petroleum based oil product. Generally, in open-ended or non-circulating systems, lubricant is discharged directly on or into the ground. This presents the opportunity for contamination of the surface or ground waters. (Matex)

WHERE CAN CANOLA BE USED? WHERE HAS CANOLA BEEN USED?

- example of jobs where used

BENEFITS/DRAWBACKS

- more wear on engine
- byproduct can be used as fertilizer (Design Around the World, William Morse, P. Eng. , Design Engineering May 1989, pg. 14)

There have been reports indicating that prolonged use of vegetable oil as a fuel can cause engine deterioration. Piston ring seizure, piston failure, injector nozzle fouling, crank case oil contamination, and build-up of deposits on pistons and valves are some of the associated problems. (MacDonald, pg. 6)

Due to the high viscosity of canola oil, cool weather use may be more difficult. This can however, be overcome by preheating the oil at the fuel tank or engine, depositing an additive that would reduce the viscosity to an acceptable level, esterify the vegetable oil, or use a combination of vegetable oil and diesel fuel. (MacDonald, pg. 6)

PRICING

Canola would become competitive if diesel fuel prices were to rise to \$0.64 /L.

CONCLUSIONS

To improve engine performance, scientists are examining precombustion chambers, improved lubricating oils, the use of various methyl and ethyl esters (alcohols), and mixtures of diesel and vegetable oils. (MacDonald, pg. 6)

	CANOLA	DIESEL
Energy Content	39 MJ/kg	44.7 MJ/kg
Price	\$17.00 per billion J	\$9.70 per billion J
Specific Gravity(@15.5°C)	0.92	0.82

CANOLA AS A DIESEL-HAMMER FUEL

<i>Viscosity (cSt)</i>	34	2.4
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(MacDonald, pg. 9)

REFERENCES

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MacDonald, R. D., Vegetable Oils as a Diesel Fuel Substitute.

Craig, W. K., Strayer, R. C., Vegetable Oils as Diesel Fuel, Energy, Mines and Resources Canada, U. S. Department of Energy, June, 1983.

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Shell Naturelle® HF, Shell's Biodegradable Hydraulic Oil, Lube Report, Technical Information from Shell Canada.

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