

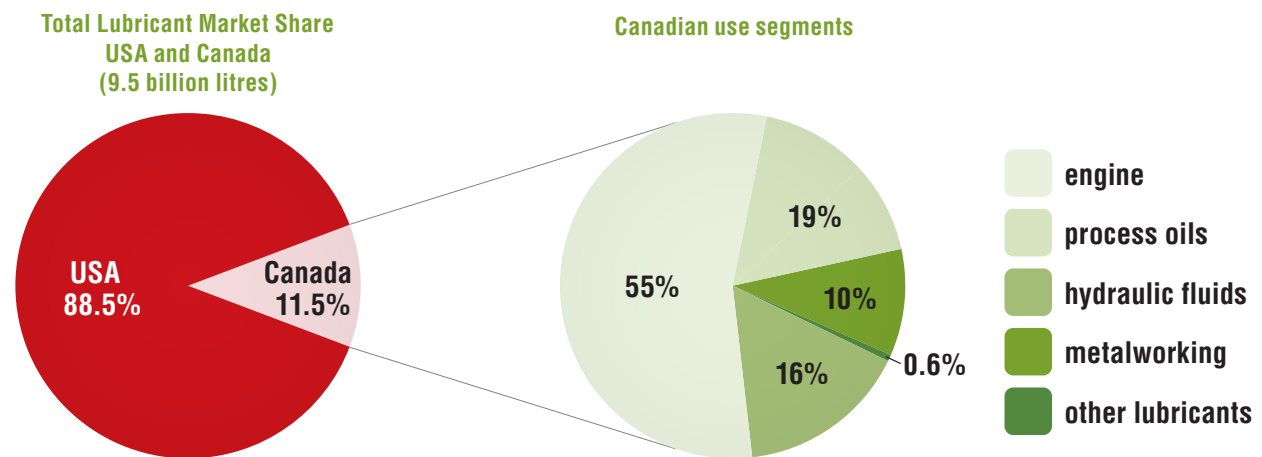
Factsheet: soybean oil-based lubricants

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Soybean oil can be used to manufacture many different products that traditionally use a petroleum base. These include foams, films, lubricants, plastic moulded parts, composites and packaging.

Although many technologies and processes for soybean oil are still in their infancy, there is definite potential to replace petroleum-based ingredients with those from soy. A rapidly growing market for soybean oil is bio-based lubricants and industrial fluids. This includes everything from hydraulic and transmission fluids to greases, motor and penetrating oils and fuel additives.

Below is a diagram that represents the Canadian lubricant market. The left illustrates the Canadian share of the total lubricant market in Canada and the United States, and the right details the various market segments within the Canadian market.



Source: Freedonia, United Soybean Board and Soy 20/20

What's driving the market?

The market for vegetable oil-based lubricants is being driven by various factors, including environmental concerns, green marketing opportunities, cost reduction, solving supply problems, and improving product performance.

Growing regulatory pressures, combined with an increasing need by companies to demonstrate environmental responsibility, are helping move these technologies forward. For example, approximately 9.46 billion litres of lubricants are sold annually in North America. Studies have shown that in some segments, as much as 60 per cent of these products can end up directly in ground water, rivers, lakes and in soil. Much of this can be avoided by using vegetable oil-based products, which are biodegradable.

Soybean oil-based lubricants versus alternatives

Soybean oil-based lubricants have low toxicity levels and are readily biodegradable.

When compared to petroleum-based lubricant ingredients, vegetable oils, including soy, have a higher viscosity index, lower evaporation loss and the potential to enhance lubricity, which could improve energy efficiency.

Viscosity index is a measure of a fluid's change in viscosity with temperature and the higher the index, the smaller the relative change in viscosity due to temperature. Lubricity refers to oil's capacity to lubricate; studies show that the lubricity of vegetable oils is superior to that of mineral oil.

Many vegetable oil-based products cost less than synthetic, non-petroleum-based alternatives, making them a good economic choice as well as an environmentally friendly one.

Engine oils

This includes engine oil, diesel engine oil, motor oil and fuel additives. Engine oils are by far the largest segment of the global lubricants market, representing a demand in excess of 3.78 billion litres per year in the U.S. alone.

In Canada, many of these bio-based products are now available. Successful market tests of a number of engine oil products have been conducted, including trials with a 5W20 motor oil, a 15W40 diesel engine oil, and a diesel fuel additive.

Hydraulic fluids

These are fluids used in hydraulic equipment systems that have various mechanical parts, such as cylinders, pumps, valves, pistons, and gears found in every commercial sector, including basic industries and manufacturing settings, construction, agriculture and transportation.

Hydraulic fluids account for 16 per cent of the lubricants market in Canada. Environmental regulations and consumer pressures in Europe are already forcing the conversion to more environmentally acceptable hydraulic fluids, particularly in sensitive areas such as waterways, forests and farmland.

Process oils

Process oils are used in industries to aid manufacturing or production processes, modify properties, impart desired properties or reduce costs. They often become part of the finished product. Examples of product applications are rubber products, PVC, and plastics. Soybean oil may be used in the form of epoxidized soybean oil (ESO), modified or highly refined oil. The amount of soybean oil used is typically minor compared to the other components and therefore development and adoption of new applications can be slow and very specific to the needs of a particular industry.

Metalworking fluids

These are fluids used to provide cooling, lubrication, corrosion prevention, and reduced wear on the contact parts of machinery used for metalworking operations.

Many metalworking fluids now being introduced are based on soybean oil and methyl soyate. This includes vegetable oil-based products like rust preventatives, cleaners, cutting and grinding fluids and industrial lubricants.

Research is now underway to formulate soybean oil or methyl soyate for more technically challenging applications, such as extreme pressure metalworking.

Other lubricants

There is a wide array of products and applications in the lubricants category. These cover a range of industrial and commercial products such as grease, bar/chain, drip oil, rail and flange, wire rope and consumer products such as two-cycle oil and penetrating oils. These applications generally represent smaller volumes than the previously discussed categories and vary greatly in terms of potential acceptance and market share.

Market potential

Although petroleum-based products will continue to serve a large segment of the market, soybean and other vegetable oils are proving that they are viable alternatives for certain applications.



Market research studies that examine the potential acceptance and estimate potential market share in North America suggest use will differ greatly from segment to segment due to their unique demands and characteristics. Furthermore, the absolute volumes vary greatly between the major and minor applications (i.e. hydraulic fluids vs. bar chain oils).

Below is a chart that illustrates the differences in terms of volume and estimated potential market shares and how that translates into a farm-based feedstock unit such as bushels of soybeans.

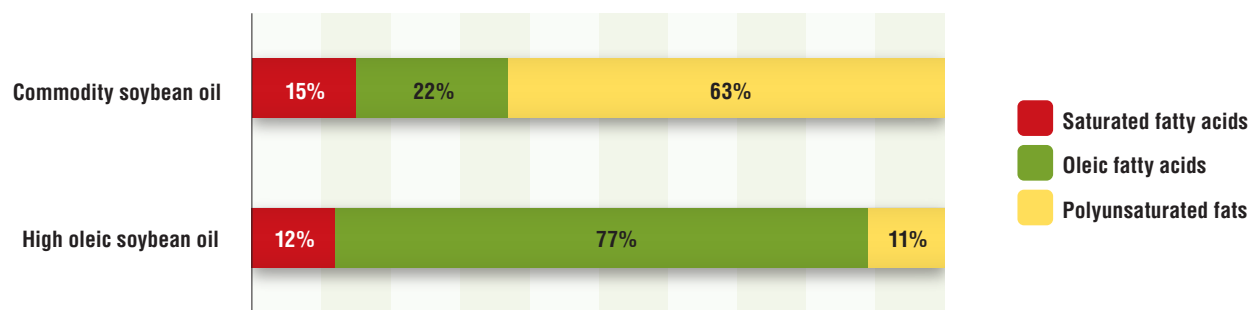
Lubricant applications	Potential market share soybean oil based products	mt Soybean oil required	Bushels required
Hydraulic fluids	2%	2,900	532,730
Crankcase/engine	8%	41,154	7,559,916
Metalworking	3%	2,700	495,990
Process oils	2%	3,500	642,950
All others	37%	2,048	376,192
Total		52,301	9,607,778

Source: Soy 20/20

Impact of new high oleic soybean varieties

New high oleic soybean varieties will significantly improve performance of soybean oil and will play an important role in realizing its potential and opening new market applications. The current utilization of soybean oil as a lubricant has been limited in part by its performance with respect to heat and oxidative stability. New soybean varieties with high oleic fatty acid content will greatly improve performance characteristics required by applications such as engine oils and hydraulic fluids.

Comparison of fatty acid profiles percentages for soybean oils



Note: Values may vary slightly

About Soy 20/20

Soy 20/20 brings together government, academic and industry partners to stimulate and seize new global bioscience opportunities for Canadian soybeans. Funding for Soy 20/20 is provided under Growing Forward, a federal-provincial-territorial initiative, and by Grain Farmers of Ontario.

For more information

www.soy2020.ca or 519-826-6559

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