

BIO-BASED LUBRICANTS



NOVEL TECHNOLOGY IS VERSATILE AND SUSTAINABLE

Battelle's bio-based lubricants can help meet specific market needs and address the environmental concerns in the billion-gallon-a-year industry served primarily by petroleum-based lubricants. These lubricants have been designed to address the technical challenges associated with traditional bio-based lubricants such as poor thermal and hydrolytic stabilities, a limited range of viscosities and relatively high pour point temperatures that have seriously limited their use. These bio-based lubricants also are biodegradable, have a favorable environmental footprint and have the ability to meet the USDA's BioPreferred Product certification.

OUR TECHNOLOGY

Battelle has developed a technology platform for producing bio-based lubricants from vegetable oils such as soybean, corn, palm and algal oils. Through specific chemical modifications of the triglyceride oil, Battelle can improve the thermo-oxidative and hydrolytic stability of the oil, as well as control the performance properties such as viscosity and pour point temperature. Additionally, Battelle has examined the native fatty acid composition of different feedstock oils and is able to leverage those characteristics to further influence performance properties, as well as increase the potential to improve the efficiency of the chemical conversion process.

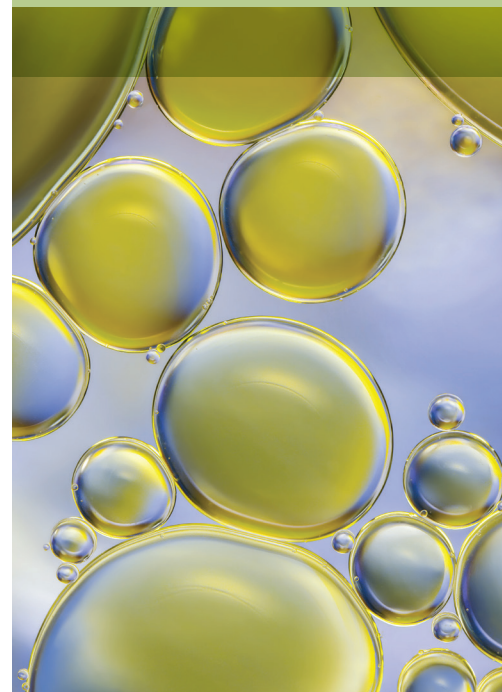
HOW WE DIFFER

Vegetable oils, such as soybean oil, have inherent advantages over petroleum-based feedstocks for lubricant formulations with excellent lubricity due to their polar functionality, high viscosity index and high flash points. Perhaps more importantly, vegetable oils are biodegradable and have a very benign impact on aquatic toxicity and bioaccumulation. However, unmodified vegetable oils have very short use-life as a result of their inherently poor thermo-oxidative and hydrolytic stability. The Battelle technology creates a more stable chemical structure within the vegetable oil while tailoring the viscosity and reducing the pour point temperature of the lubricant.

Patents

Battelle has two granted patents related to this technology:

- US 9,359,572: Modified vegetable oil lubricants
- US 8,357,643: Lubricants derived from plant and animal oils and fats



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CURRENT USE

Base oils form the foundation of an oil lubricant product and are formulated with an assortment of additives to enhance, suppress or impart new properties. A key lubricant base oil parameter and starting point for a lubricant product is its International Organization for Standardization (ISO) viscosity grade, which determines its selection for a specific use.

The versatile technology involved in preparing Battelle's bio-based lubricants allows production of base oils with different useful viscosity ranges:

- ISO 30-60 cSt: high volume hydraulic fluid and engine oil
- ISO 100 cSt: hydraulic fluid and high-speed applications (electric motors)
- ISO 220 cSt: multipurpose extreme pressure grease base oil used in heavy duty automotive and industrial applications
- ISO 460 cSt: grease for low-speed marine applications
- ISO 1500 cSt: grease for rolling element bearings operating at very low speeds and under heavy loads at high temperatures
- A range of low to relatively high ISO values: base oils used in rock drilling operations

OTHER USES

Lubricants are widely used in many applications. The Battelle bio-based lubricants have features of biodegradability and biocompatibility that make them attractive for outdoor use in environmentally sensitive areas where leaks and spills may occur.

Every day, the people of Battelle apply science and technology to solving what matters most. At major technology centers and national laboratories around the world, Battelle conducts research and development, designs and manufactures products, and delivers critical services for government and commercial customers. Headquartered in Columbus, Ohio since its founding in 1929, Battelle serves the national security, health and life sciences, and energy and environmental industries. For more information, visit www.battelle.org.

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