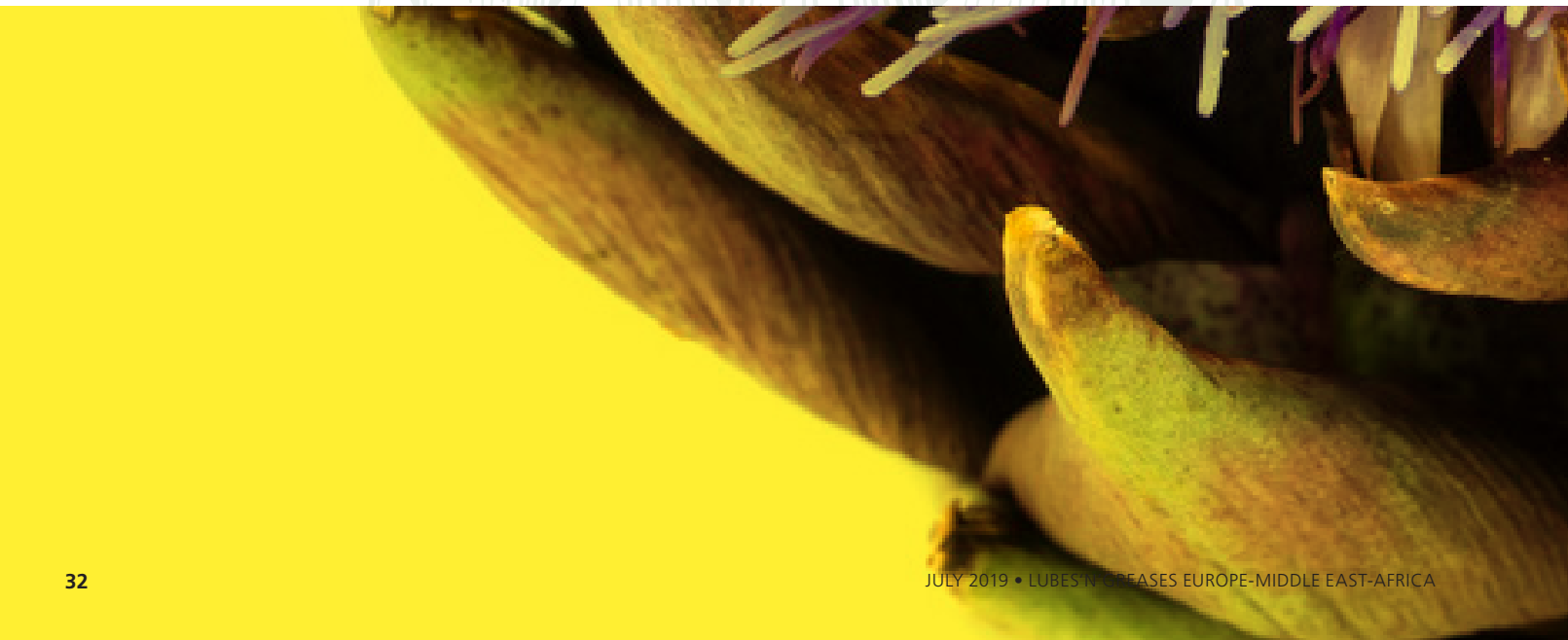
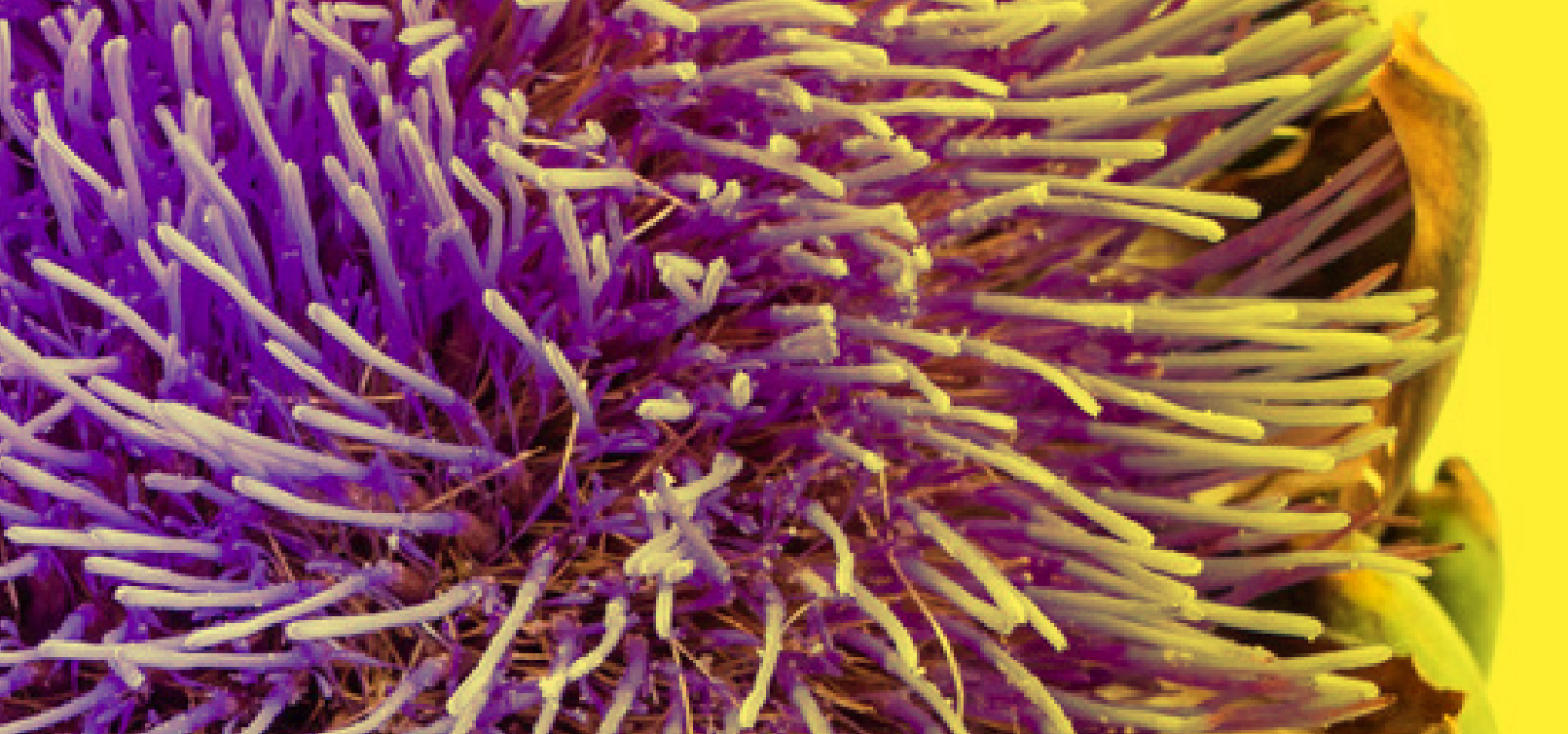


SOWING THE SEEDS OF CHANGE

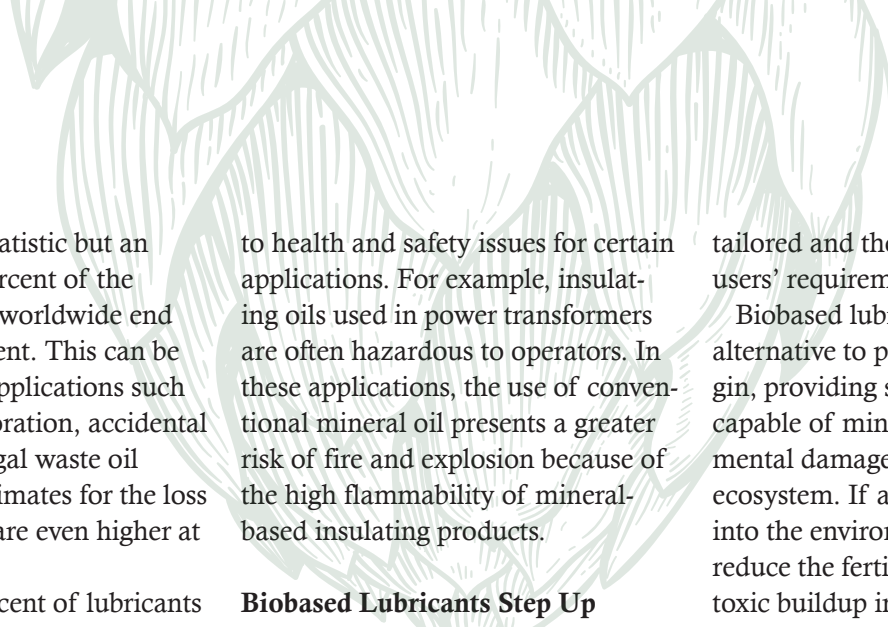
Sustainable Biobased Lubricants on the Horizon





While meeting only a small part of overall lubricant demand, biobased lubricants can play a big role in mitigating use of fossil-based products and the industry's environmental impact. **Mike Peters** from specialty oils and fluids company SIP highlights an innovation project that could offer commercial scale biobased lubricants from sustainable crops.





It is a startling statistic but an estimated 50 percent of the lubricants used worldwide end up in the environment. This can be through total-loss applications such as rail grease, evaporation, accidental spillage or even illegal waste oil dumping. Some estimates for the loss of hydraulic fluids are even higher at 70 to 80 percent.

More than 95 percent of lubricants are based on a mineral oil or synthetic fluid that is non-biodegradable and can have a severe environmental impact if dispersed. This pollution is a serious threat to aquatic and terrestrial life, especially when originating from agricultural or marine applications where dispersal has a direct effect on the food chain.

Moreover, there are additional risks with conventional oils related

to health and safety issues for certain applications. For example, insulating oils used in power transformers are often hazardous to operators. In these applications, the use of conventional mineral oil presents a greater risk of fire and explosion because of the high flammability of mineral-based insulating products.

Biobased Lubricants Step Up

This is where biobased lubricating oils can play a much larger role than they currently do. But there are some production and performance challenges that must be overcome. On the technical side, biobased lubricants must ensure the functionality and integrity of all equipment. Specifications come from the industry and original equipment manufacturers, and products need to be carefully

tailored and then tested to meet end users' requirements.

Biobased lubricants are a valid alternative to products of fossil origin, providing sustainable solutions capable of minimizing the environmental damage if dispersed in the ecosystem. If accidentally discharged into the environment, they do not reduce the fertility of soils or lead to toxic buildup in groundwater, instead biodegrading in a number of days without leaving any trace. Moreover, biobased lubricants are the optimal solution for machinery operating in ecologically sensitive agricultural, forest, marine or urban areas, for use in agricultural machinery, boats and waste compactors, for example.

In the past, many biobased lubricants have suffered from problems with oxidation stability, which can cause sludge buildup in equipment. They are also susceptible to the presence of water, namely their hydrolytic stability, which again can cause deposits and corrosion of metal parts. However, with the careful selection of raw materials and improved efficiency of manufacturing processes, a number of esters have been produced that can overcome these deficiencies.

Keep on Running

Substantial funding is being offered by the European Union to support this kind of product development in the form of Horizon 2020, the largest research and innovation program ever launched by the bloc. The program makes available almost €80 billion over the seven years between 2014 and 2020 for projects that "drive economic growth and create jobs" across the EU, reduce member states' dependency on fossil-based products, such as fuel and petrochemicals, and contribute to meeting

energy and climate change targets for 2020 set out in the Paris Agreement.

Funded by the Bio-Based Industries Joint Undertaking under Horizon 2020 is the First2Run project. It aims to demonstrate the effectiveness of a sustainable agro-industrial business model based on the valorization of low-input and underutilized oil crops (such as cardoon, also known as artichoke thistle) grown in arid or marginal land and not in competition with food or feed oil crops. The project involves five companies – Novamont, SoliQz, Matrica, SIP, Roelmi HPC – and the University of Bologna.

These crops are exploited for the extraction of vegetable oils to be further converted into bio-monomers and intermediates. They are the starting point for a new range of low-

impact bio-products such as biobased lubricants, cosmetics and bio-plastics.

Byproducts from this manufacturing process have also been

enhanced to produce animal feed and other value-added chemicals and to increase the sustainability of the value chain to maximize raw material use and resource efficiency.

Starting from the integration of a bio-refinery with the agricultural value chain, First2Run aims to give life to a project that creates virtuous synergies with the local agricultural sector. This is done respecting the characteristics of the land and ecosystems, meanwhile creating important opportunities for growth and income integration for farmers and local community.

The project has synthesized a number of esters from biobased

carboxylic acids blends obtained from first-of-its-kind bio-processes.

Different formulations have been created and successfully validated as biobased lubricants especially for applications such as hydraulic and dielectric oils.

The use of such biobased lubricants not only offers advantages from an environmental perspective, but also in technical, safety and performance terms, as their higher flash point lowers the risk of fire compared to a mineral oil-based lubricant. Moreover, it guarantees protection of equipment from corrosion and wear, with excellent demulsibility, air release and foaming properties.

Additional advantages are due to their chemical nature: very high viscosity index (the viscosity does not change too much with tem-

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perature thus allowing less consumption of energy by hydraulic pumps); low evaporation loss, so less need for topping-up and a healthier work environment; naturally good tribological properties; high oxidative stability; and high detergency power.

Looking Ahead

Standardization and certification at the European and international level is a requirement for establishing biodegradability, biobased content, ecotoxicity and product performance. Research activities supporting product and process standardization, including harmonization of international standards, and regulatory activities are considered essential to support the creation of new markets and to create trade opportunities for such innovative and promising biobased lubricants, combining environmental sustainability with high technical performance.

The European Ecolabel process for certifying environmentally acceptable lubricants, which has been in operation for more than 25 years, has addressed this requirement to some degree but it is only a voluntary system. Companies can use this certification to help promote environmentally acceptable lubricants in the market, but unless there are some mandatory requirements for using them, the market will not accept the higher cost and therefore not increase their

market share as much as it should.

However, biobased products should be an essential part of the European market, if government legislators want to mitigate the damage done to the environment by the fossil-fuel industry and decrease dependence on fossil-based products.

The First2Run project demonstrated a number of successful processes to obtain renewable and biodegradable esters for a range of applications, including biobased lubricants. What is needed to increase the use of environmentally acceptable lubricants in the market is some form of government legislation and OEM support. □

Mike Peters has more than 45 years of experience in the oil and petroleum additives industries, during which time he's travelled extensively and done business with a wide range of global lubricant producers and national oil companies. Peters had technical, marketing and sales management roles with Afton Chemical and joined SIP Ltd in 2001.



