The key market drivers of bio-lubricants

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Regulations, innovative biotechnological solutions and growing market acceptance will drive the global bio-lubricants market

Bio-lubricants have long suffered from a poor image, with shortcomings in performance and higher prices among the factors limiting them to a few niche applications in forestry and agriculture, to be used only when required by law. However, today, the increased supply of new generation, high-performing, and cost-competitive lubricants based on synthetic bio-based feedstocks is helping to reconcile sustainability, cost, and performance. As a quickly evolving market, the bio-lubricants sector has been identified as one of the fields with the highest growth potential within the wider market for finished lubricants.

The reasons are manifold. The rebirth of bio-lubricants is taking place mainly in the United States and Europe, driven by a mix of regulatory schemes and industry standards. To be labelled as a bio-lubricant, a finished lubricant product needs to conform with strict criteria on bio-degradability, renewability, and low toxicity.

Kline's Definition of Bio-lubricants
Biodegradability: *lubricants that biodegrade to their natural state from 60% onwards in 28 days – "readily biodegradable"*

Toxicity: *lubricants that are non-toxic to the environment, which can be measured by OECD 201-203 tests for acute toxicity, OECD 210-211 for chronic toxicity or equivalent ASTM D-6064*

Renewability: *lubricants with bio-based carbon in excess >25% (in line with CEN 16227), as measured by ASTM D-6866*

One of the most influential pieces of legislation in the area has been the Vessel General Permit (VGP), which mandates the use of bio-degradable substances for marine vessels operating in North American waters. Despite its origin as a U.S. regulation, its impact has been felt across the world, given the global nature of maritime trade and the clout of the U.S. shipping industry. In Europe, the EU Ecolabel can be applied to bio-lubricants fulfilling the required criteria: this scheme aggregates various labelling schemes of individual European countries, such as the Blaue Engel in Germany, the VAMIL Regulation in the Netherlands, and Sweden's Swedish Standard.

However, research conducted by Kline reveals there is more to bio-lubricant demand than mere observance of the rules: in fact, the market for bio-lubricants is evolving at a breath-taking pace. In the past, when the market was almost exclusively regulatory-driven, bio-lubricants were prevalently used for total loss lubrication systems. Products labelled as bio-degradable were shunned by end users due to their much higher average price and sub-standard performance. The emergence of oleochemical derivates, notably synthetic esters, contributed to improving performance issues. Bio-lubricant development, now aimed at accidental loss lubrication applications, became application-driven and more focused on performance.

End-use industries, for their part, became more receptive to the appeal of bio-lubricants, partially in response to regulatory requirements, but also because they were attracted by this new wave of high-quality bio-lubricants with superior performance,

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improved energy efficiency, and prolonged lifetime for lubricants and machines. Lubricant manufacturers started devoting substantial R&D efforts to developing bio-lubricants of a quality which justifies the premium price. OEMs, which wield a great influence over the supply chain of finished lubricants in the automotive field, are also gaining prominence in the bio-lubricant sector. In fact, several OEMs, in both the automotive and industrial fields, are forging partnerships with bio-lubricant blenders, providing the foundations for their organic expansion, as well as becoming involved in the approval process for bio-lubricants. As in engine oils, increasing OEM involvement is partly a consequence of the rising complexity of lubricant specifications.

Synthetic esters form the majority of basestocks for bio-lubricant production worldwide, and their supply is relatively concentrated, with four global players (BASF, Croda, Chemtura/Lanxess, and ExxonMobil) accounting for half of the worldwide supply. PAOs, produced by the likes of Ineos, ExxonMobil, Chevron, and Chemtura, and PAGs, supplied by Dow Chemical BASF, Clariant, and Huntsman, among others, are also included as bio-lubricant feedstocks. Vegetable oils and oils made from palm, canola, and sunflower seeds provide the basestocks for the more commodity products. North American manufacturers like Novvi, Advonex, Elevance, and Biosynthetic Technologies are instead developing innovative biosynthetic basestock solutions, which may represent the future of bio-lubricant technology. Increasing the supply of synthetic bio-basestocks characterised by high performance standards and offering good value for money is bringing the bio-lubricants industry to the next level, with high costs the next obstacle to overcome.

Currently, the regulatory dimension still exerts the most influence on end users choosing to switch to bio-lubricants, yet this is also pushing the market in new directions. In several European countries, public green procurement policies and local authority regulations mandating the use of biodegradable products are driving demand for bio-lubricants in previously untouched areas such as construction. This has spurred the development of bio-hydraulic fluids, now the largest bio-lubricant product category by consumption volumes, according to Kline's analysis of the global bio-lubricant market.

Bio-lubricants are increasingly used in metalworking, not for environmental reasons, but employee health, and metalworking fluids, used in the primary metals, automotive manufacturing, and general manufacturing sectors, are the second largest bio-lubricant product category. Total loss lubricants used in chainsaws and outboard marine engines in pleasure crafts, greases used for railroads, and transformer oils used in electrical transmission are other examples of specialist lubricant categories that see a high level of bio-lubricant penetration. Worldwide development of "bio" versions of PCMO (for 2T and 4T engines) is still in its infancy.

The size of the global market for bio-lubricants, according to Kline's analysis, is estimated to range between 250 and 300 kilotons in 2016. North America and Europe are the two regions accounting for the highest consumption of bio-lubricants due to stringent environmental protection policies, as well as the high environmental awareness among end users. Together, these two regions represent approximately 80% of the global market. The largest markets for bio-lubricants in Europe are in Northern Europe, especially in Germany and Scandinavia (Sweden, Norway, Denmark, and Finland), with large economies such as France and the United Kingdom slightly behind, but with encouraging signs of forthcoming growth.

Switzerland-based Panolin is an example of a supplier specialised in finished bio-lubricants with a reputation in the industry for high-quality products; Fuchs, the German industrial lubes specialist, also has a wide portfolio of bio-lubricants for construction and other industrial applications. These two companies are the leading suppliers of finished bio-lubricants in Europe and worldwide, driven by their bio-lubricant focus, global reach, and OEM partnerships. Both companies are directly competing with global oil majors, such as BP, Shell, ExxonMobil, and Total, which have also entered the bio-lubricant arena. The combined Houghton and Quaker Chemical Co. will be the largest supplier of metalworking fluids, including their bio-lubricant versions. There are signs of expansion and consolidation in the bio-lubricant supplier scene, with the main industry players busy in acquisitions strengthening their hand. Fuchs acquired Statoil's Fuel and Retail Lubricants business in 2015, while Binol, a leading player in the Nordic bio-lubricants market, was acquired by Quaker Chemical.

The market is still very small in comparative terms: bio-lubricants constitute only around 1% of the global finished lubricants market, roughly estimated at 39.6 million tons in 2016. However, the market potential is there. Kline estimates the bio-lubricants market will grow at a compound average growth rate of 5% during the next five years. North America and Asia-Pacific will still be the regions with the strongest growth. The estimated rate of expansion for bio-lubricants in Europe is set to eclipse the assumed rate of growth for finished lubricants in the continent, and bio-lubricant penetration of the European finished lubricant market is estimated to reach 5% in the next five years.

Several factors influence the growth forecast: both the VGP in the United States and the EU Ecolabel are up for review next year. The main change in the VGP is related to extending the list of compliant vessels to include vessels smaller than 79 feet or 24 metres in length, while the EU Ecolabel scheme might be subjected to major adjustments in an attempt to expand the visibility of EU Ecolabel products in Europe. However, these conclusions are far from certain, and bio-lubricant producers cannot rely on legislative support alone. Regulatory developments can be a prelude to growth, but the onus is on blenders, who will need to keep developing both relevant products and customer interest, especially when mineral lubricants continue to have significant cost advantage over bio-lubricants. Regulation by itself, without the relevant enforcement, will not drive the sector; attractive products with the right combination of price and performance will.

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