



Overview of Synthetic Esters and Future Opportunities

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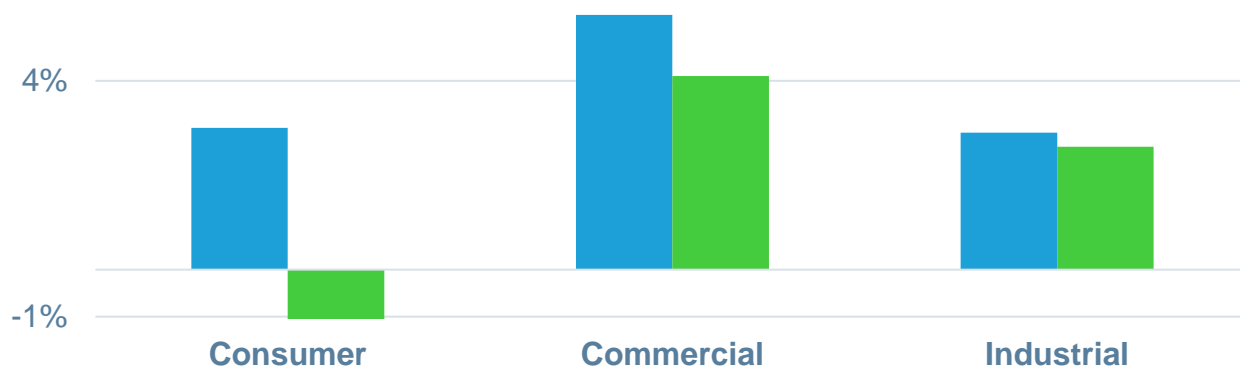


LUBRICANT
EXPO EUROPE

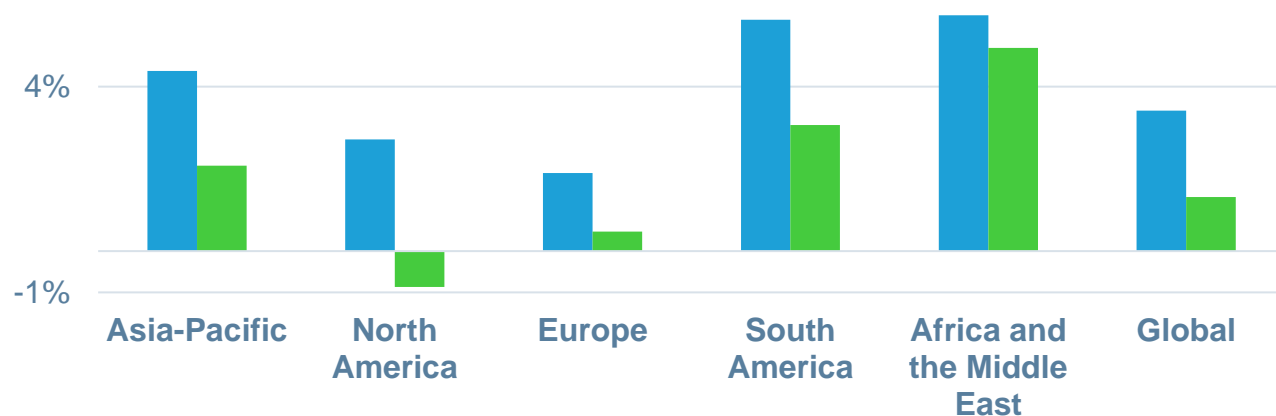
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Synthetic lubricant demand will overperform the market in next 5 & 10 years. Key drivers: OEM recommendations, technical requirements, customer preferences, and availability of synthetic base stocks

Synthetic and Semi-synthetic Demand Growth by Customer Segment, 2023 - 2033



Synthetic and Semi-synthetic Demand Growth by Region, 2023 - 2033

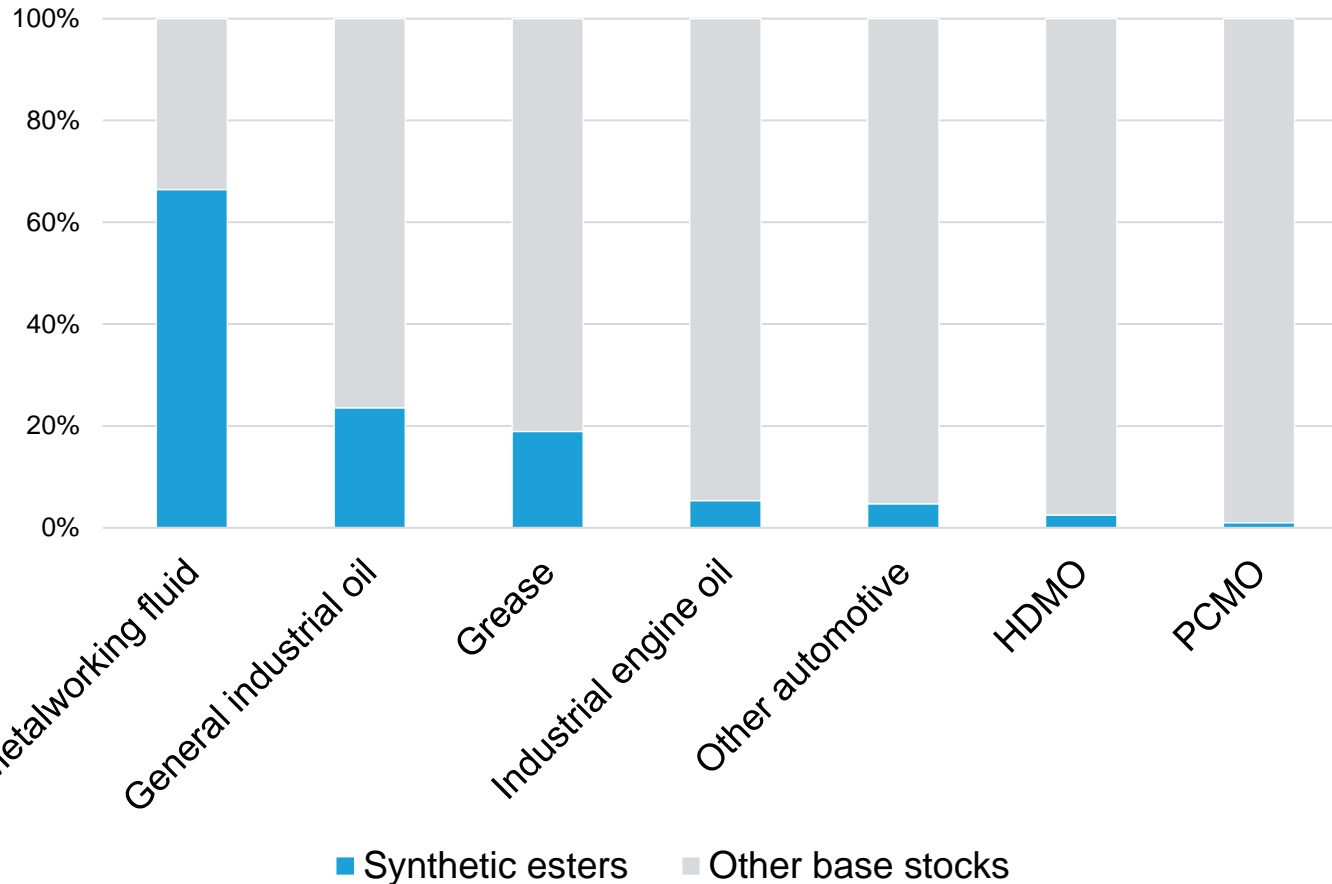


■ Synthetic ■ Semi-synthetic

- Key growth drivers for synthetic lubricants
 - OEM recommendations to use lighter viscosity oils for fuel economy, compliance to environmental regulations, preference for extended drain intervals and increasing technical demands in specialized applications
 - OWs is the fastest growing category within PCMO in many countries including Asia
 - High demand growth in South America, Asia Pacific and Middle East Africa with increase in penetration rate of synthetics over the next 10 years
 - On **supply side**, growing availability of synthetic base stocks

Synthetic esters are used in variety of applications from automotive to industrial lubricants

Global Synthetic Lubricant Basestock Demand Share by Application, 2023



- High-temperature stability, lubricity, additive solubility, seal compatibility, low-temperature flow, and biodegradability are key product attributes of synthetic esters making them attractive for a range of applications
- **General Industrial Oil:** Synthetic esters are integral in formulations for fire-resistant hydraulic fluids, in compressor oils for energy efficiency, extended drain intervals and fire resistance.
- **Metalworking fluids:** Used as an additive as opposed to a base stock with polyol esters preferred due to their hydraulic stability, good lubricity and thermal stability. Key benefits include ease of handling and improved performance
- **Automotive lubricants:** Functions as solubility enhancers, provides seal compatibility, reduce volatility and enhance efficiency through higher lubricity.

Unveiling the Major Forces Propelling Ester Demand Across Diverse Applications (1/2)

All product categories	<ul style="list-style-type: none">• Sustainability• Regulations• Increase in the demand for bio-lubricants across many sectors: construction, rail, marine, agriculture, forestry etc.
PCMO	<ul style="list-style-type: none">• Fuel economy, emission reduction targets influencing OEMs specifications• Introduction/growth of ultra low viscosity 0W8/12/16/20• Transition from PAOs to Group III/III+ in mainstream formulations• Top Tier formulations from OEMs should support growth of PAOs
HDMO	<ul style="list-style-type: none">• Emission reduction targets; fuel economy; higher fuel standards => higher share of “premium products”• 0Ws remains low while there is an ongoing shift from 15W to 5W30/10W30• Penetration of PAOs will remain low
Food Food grade lubricants Refrigeration oil	<ul style="list-style-type: none">• Population growth and economic growth are key drivers for Food sector• Increase is the processed & ready-made food => higher requirements for industrial and cold chain and refrigeration oils• MOSH/MOAH regulations; compliance costs => Higher demand for food grade lubricants

Unveiling the Major Forces Propelling Ester Demand Across Diverse Applications (2/2)

Transformer Oil

- Ester based lubricants account for ca. 5% of the demand
- Higher demand for power generation from AI, datacenters, increase in middle class & economic growth
- Energy transition => higher share of renewable energy; infrastructure for electric vehicles

Grease

- The demand for synthetic esters in grease formulations is fueled by their inherent technical advantages, including biodegradability, low toxicity, and exceptional performance across a broad temperature spectrum. Key applications in industries such as wind energy and off-highway vehicles, particularly in mining, are identified as significant drivers that will propel demand growth.



Q&A

Panel Discussion

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