

Bio-based Innovations – Are the Gaps on Cost and Performance Closing?

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The Bio-economy



- The European Commission defines the bioeconomy as “**the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy***”



- Carbon from a bio-based source (e.g. vegetable oils, fats and biomass) is considered **renewable carbon**
 - Can be identified by C14 analysis
 - Only found in bio-based raw materials and not in crude oils and natural gases
 - Carbon associated with fossil fuels (e.g. coal, natural gas, crude oil) is not considered to be renewable carbon



- Carbon is part of the natural carbon cycle, so whilst plants and soil release CO₂ to the atmosphere they also **absorb CO₂**
 - Burning of fossil fuels only results in the release of CO₂ into the environment, hence have contributed to a net increase in CO₂ over time

*https://ec.europa.eu/research/bioeconomy/policy/bioeconomy_en.htm

How should we consider 'sustainable' in the context of fuels and lubricants ?

- UEIL defines sustainable Lubricants as:

*Lubricants created by innovative businesses enable the use of safe, resource saving technologies and processes which reduce the burden on the planet, local environments and benefit people and society.**

*<https://www.ueil.org/sustainability/faq/>

Are the Gaps on Cost and Performance Closing?



- Does this question pre-suppose that petrochemical derived base oils and additives are the 'ultimate' in performance ?



- As biobased innovators, are we being asked to compromise our biobased innovations to lower performance to that of crude oil derived raw materials?

- Two approaches to increasing the biogenic carbon content:



- **Production of common chemical building blocks from bio-based / renewable raw materials** will enable the production of 'industry standard' base oils and additives
 - Performance same, higher cost



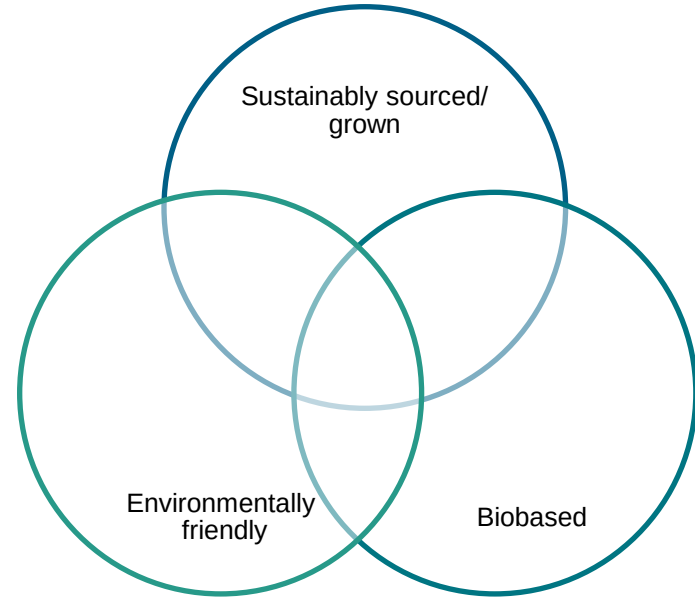
- **New high-performance products designed to be safe and sustainable**
 - Higher performance, higher cost **BUT VALUE ADDING**

Cargill Approach to Designing Innovative New Products

Safety, sustainability, performance



Sustainability elements



Value Adding

Human Hazards
Environmental Hazards
Biodegradability
Bioaccumulation
Product Carbon Footprint

Improved Energy Efficiency
Reduced CO₂ Emissions
Minimise Raw Material Use
Extend durability of oil and equipment
Enable Increasing:
- recyclability
- re-use
- regeneration



Design to meet the needs of the customer



Helping the world *thrive*