



How can bio-based building blocks help to reduce Scope 3 emissions in the lubricant industry?

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Lubricant industry baseline

“90% [of Scope 3 emission in the lubricant industry] comes from big vertically integrated base oil and additive suppliers. We needed to get our suppliers involved — and our customers”

A discussion with

Apu Gosalia

Apu Gosalia is a columnist, keynote speaker and partner with the sustainability consultancy Fokus Zukunft. He is also Co-Chairman of the Sustainable Economy Commission in the Germany's Senate of Economy





Shifting lubricant markets needs

Raw materials used for esters can be based either **on petrochemical or renewable sources**



Aeronautic Industry generates 12% of the global emissions linked to transportation.



Due to changed global weather conditions, the need for **air conditioning** and **cooling devices** has been on the rise for years.



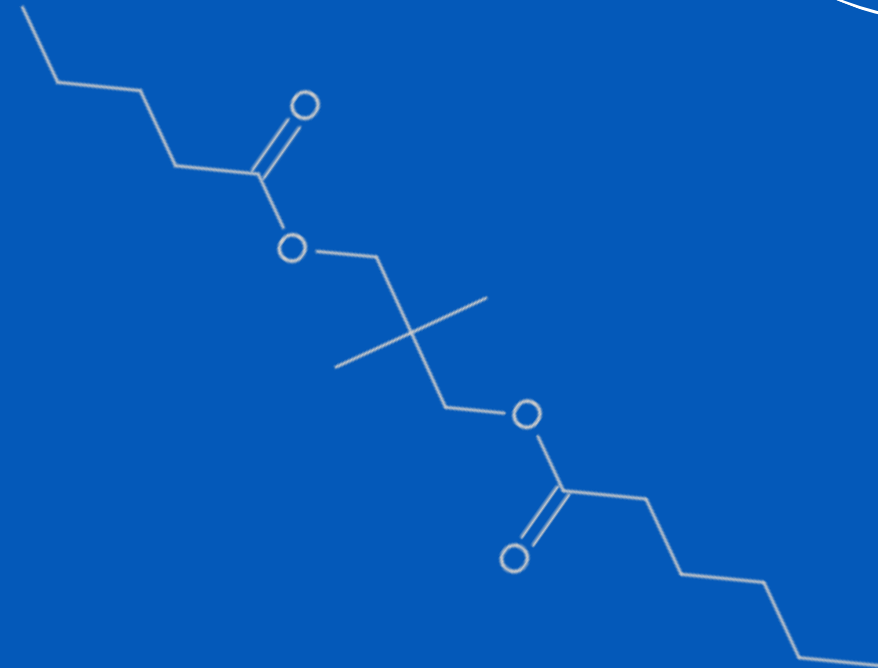
OEMs* are pushing for developments of new technologies including **products with a more environmental friendly footprint.**

Demand for battery cooling fluids will increase with the growth of electric vehicle sales.



Example : Neopolyol esters

- Neopolyol esters composition:
 - A polyvalent alcohol and
 - Carboxylic acids such as
 - Valeric acid
 - Caproic acid
 - Heptanoic acid
 - Nonanoic acid
 - Or others
- Carboxylic acids can represent more than 80% of the Neopolyol ester mass



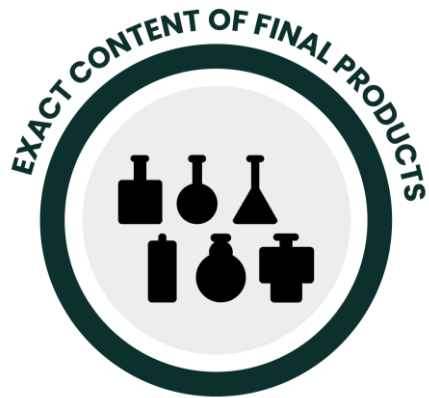
Production of Neopolyol esters - existing chains of custody

Case 1

Fossil based

Ester 100% crude oil based

Conventional
>50 years old



Case 2

Mass balance

Ester partially or 100% renewable

Transitional
5-10 years old



Case 3

Biobased (Segregated)

Ester partially or 100% biobased

Advanced
Today





Different chains of custody for renewable feedstocks



ALLOCATION SYSTEM

- ✓ Renewable attributed products
- ✓ Can be up to 100% mass balance
- ✓ Third party certification for allocation

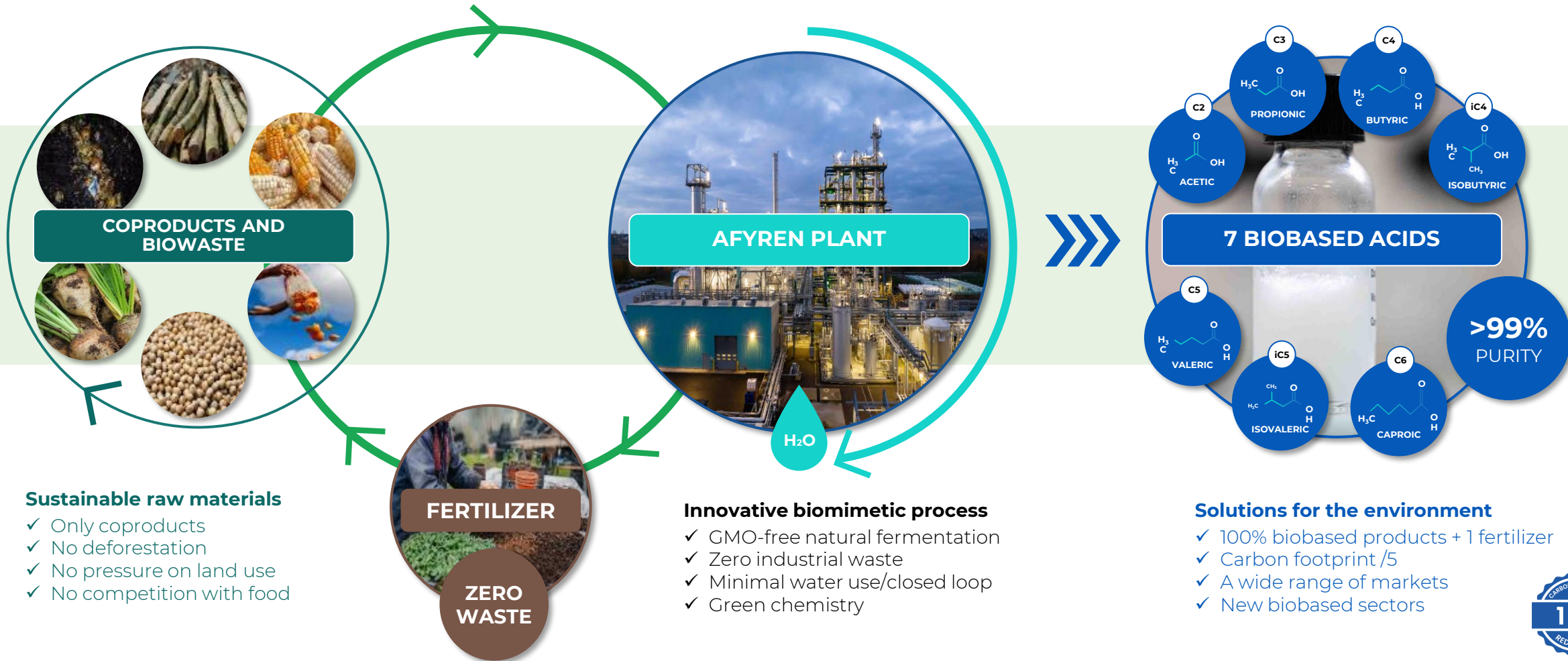


BIOBASED SYSTEM

- ✓ BIOBASED products
- ✓ Can be up to 100% biobased
- ✓ BIOCONTENT to be measured



Production of biobased organic acids based on the AFYREN proprietary technology platform



A protected biobased technology enabling a 80% carbon footprint reduction¹

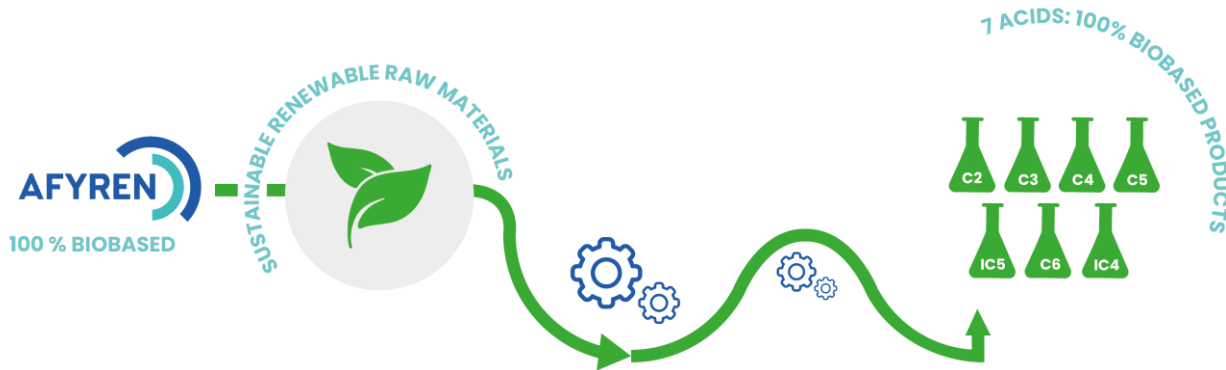
Note: (1) AFYREN & SPHERA - Life Cycle Assessment



AFYREN approach and contribution to lubricants

AFYREN offers a range of unique high quality biobased organic acids, as building blocks for high performance lubricants and functional fluids.

AFYREN is making 100% biobased carboxylic acids (SEGREGATED value chain)



100 % BIOBASED SYSTEM

- ✓ Physical content = claim
- ✓ Traceability in the supply chain
- ✓ Biocontent measured with C12/C14 method and identified
- ✓ Sustainable raw materials

AFYREN Valeric (C5), Isovaleric (iC5) and Caproic (C6) acids allow the production of Polyol Ester Lubricants in mass balance or biobased production mode.

Reduction of scope 3 emissions : acids carbon footprint reduced by 5

Additional benefits:

- ✓ Local sourcing,
- ✓ Full circularity,
- ✓ Biodiversity preservation
- ✓ Low water consumption
- ✓ Traceability of supply chain





The AFYREN concept

Biobased ingredients derived from the fermentation of renewable co-products

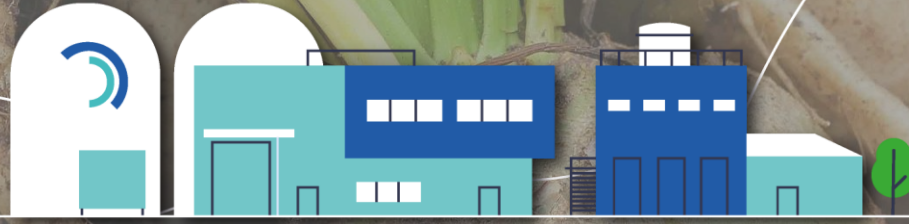
AFYREN

BIOBASED PRODUCTS

Food, feed, flavors & fragrances, life & material sciences, lubricants

RENEWABLE RAW MATERIALS

Agricultural & industrial by-products





Conclusions

- **Reducing Scope 1 and 2 emissions are not sufficient** to meet EU Green Deal climate neutrality targets
- **Innovative supply chains involving all stakeholders are inevitable** to maintain future competitiveness and foster sustainability
- **Use renewable raw materials is a solution**
- **Mass-balance approach likely to be an intermediate** step towards a fully segregated solution in the future
- **Drop-in alternatives become more and more industrially available** (biobased versions of existing petrol-based raw materials)



THANK YOU!

« We enable low-carbon, circular and regenerative industry by providing biobased solutions built with our partners to benefit the environment »



THANK YOU

