

## Life cycle assessment for regenerated base oils for LPC S.A.

On behalf of LPC S.A

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### SUMMARY

LPC S.A., has commissioned IFEU GmbH to conduct a life cycle assessment (LCA) for the re-refining of waste oil into re-refined base oils (RRBO). The focus of this LCA is the re-refined base oil produced by LPC in the year 2022 and constitutes a cradle-to-gate system view. The LCA is carried out according to ISO 14040:2006 and ISO 14044:2006 (including annexes that have been supplemented in the meantime). The critical review was carried out by Dr. Birgit Grahl (chair), Chris Foster and Tobias Brinkmann.

The study examines one kilogram of base oil produced by two techniques: re-refined base oil produced by LPC in 2022 compared to a generic reference product, a primary base oil with the same functionality by means of comparable Viscosity Index (competing product).

In all the impact categories under study, the environmental advantages of re-refined base oil compared to primary base oil production are apparent, with the results for the fossil-based reference system exceeding the regenerated LPC product system by several factors. In respect to global warming potential:

- For each kg of LPC's re-refined base oil used instead of equivalent primary base oil, more than **1,2 kg CO<sub>2-Eq</sub>** are avoided.
- This is more than **66% reduction** in global warming potential.
- Annually, LPC's activity avoids emissions of about **36.000 tn CO<sub>2-Eq</sub>**. This is equivalent to the annual adsorption of CO<sub>2</sub> by 1.4 million trees.

Thus, LPC's products have significantly reduced Product Carbon Footprint and help our clients to reduce their Carbon Footprint towards decarbonization.

**Table:** LCA results for all investigated variants and impact categories applying impact assessment according to PEFCR EF3.0 in combination with energy-based allocation (100:0 system allocation)

Impact categories	Unit (per kg product)	LPC product	Cat. I primary Base Oil	Cat. II primary Base
Ressource use, fossil	MJ	3.21	65.59	71.71
Climate change	kg CO <sub>2</sub> -Eq.	0.62	1.86	2.33
Acidification	mol H <sup>+</sup> eq	0,0011	0.014	0.014
Terrestrial Eutrophica-tion, terrestrial	mol N eq.	0,0021	0.011	0.013
Particulate Matter	Disease incidence	5,6E-09	5.0E-08	5.2E-08

**Figure:** LCA results for global warming potential applying impact assessment according to PEFCR EF3.0 in combination with energy-based allocation (100:0 system allocation)

