Updated Life Cycle Assessment (LCA) for Regeneration of Waste Oil to Base Oil

MAIN FINDINGS FROM THE INSTITUT FÜR ENERGIE (IFEU) STUDY

September 2022

European Grouping of the Regenerative Industry (GEIR)
A member of the Union of the European Lubricants' Industry (UEIL)

Executive Summary

1. Context
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Context

Why it matters.

Waste oils represent the world's largest amount of liquid, non-aqueous hazardous waste.

Regeneration and treatment to fuel oil are two most common ways to treat waste oil.

Regeneration refers to the processing of waste oil to produce recycled lubricants, accounting for 62% of treated waste oil in Europe.

Treatment to fuel oil refers to the process of waste oil to produce fuel for transport, accounting for 24% of treated waste oil in Europe.

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Study's goals and methodology

Goal

- Provide an updated and more robust view on the environmental impacts of the treatment of waste oil.

Methodology

- Comparison of regeneration with (1) the production of virgin crude oil (primary raw materials) and (2) the treatment to fuel oil.
- Update from previous studies* with the latest data and current state of technologies. (GEIR has been committed over the last two decades to measure the performance of its activities by third parties).
- Extension of the scope from 4 to 6 companies, covering about 50% of regenerated waste oil in the EU.
- Comparison between 6 different regeneration techniques.
- LCA (Life Cycle Assessment) Analysis.

*Fehrenbach (2005) and Abdalla & Ferenbach (2018)

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Key findings

Impact reduction of regenerated waste oil compared to **virgin crude oil**.

Regeneration is significantly better for the environment than the process of virgin crude oil.

- 71% CO2 emissions

- 90% acidification

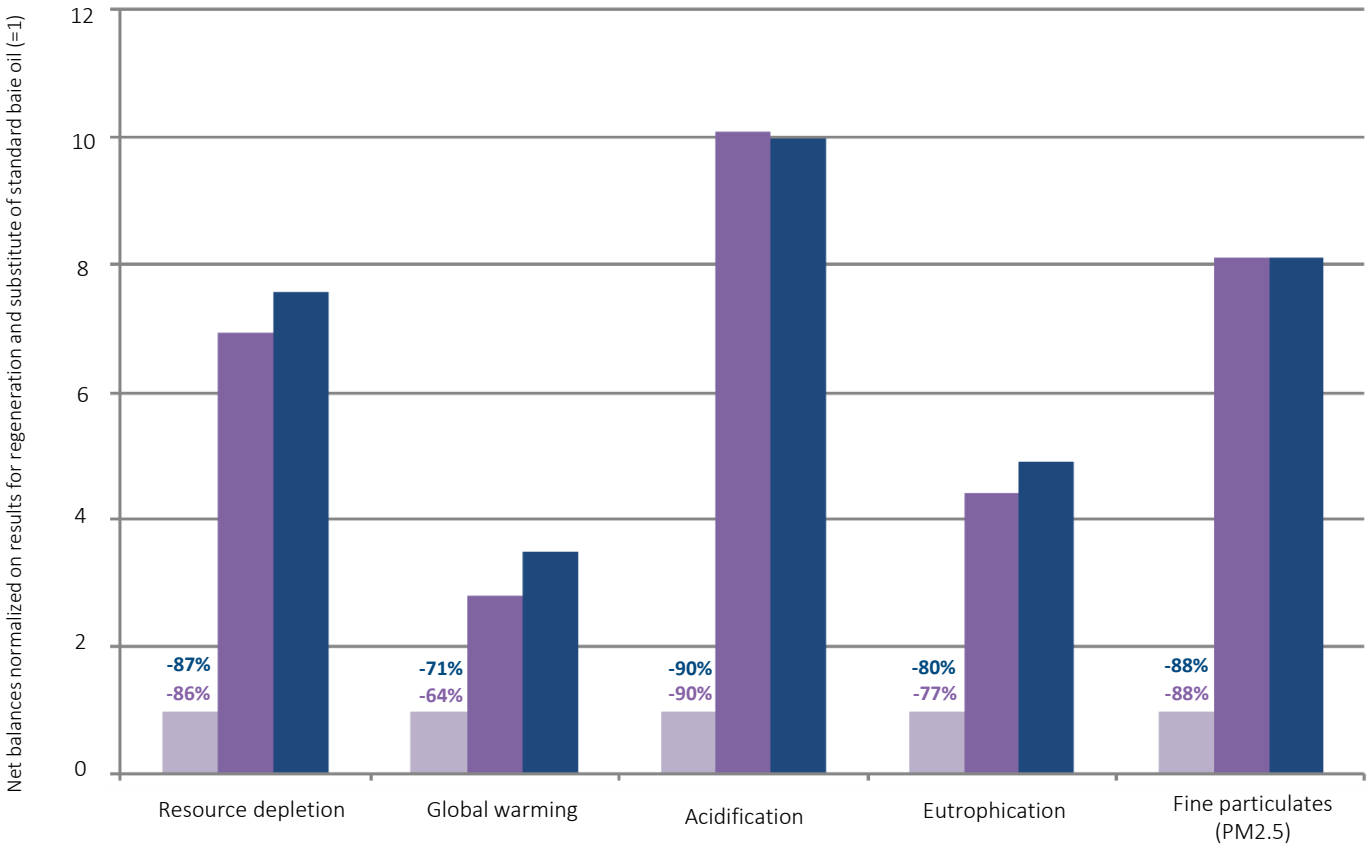
- 88% fine particles

- 80% eutrophication

- 87% resource depletion

Source
Abdalla, Fehrenback, Theis, *Life Cycle Assessment for Regeneration of Waste Oil to Base Oil*, Institut für Energie (2022)

Impact reduction of regenerated waste oil compared to **virgin crude oil**.



Reduction of impact of regenerative is indicated as a per centage, referring to savings in each impact category for regeneration of both base oil qualities against their primary product equivalents.

Source
Abdalla, Fehrenback, Theis, *Life Cycle Assessment for Regeneration of Waste Oil to Base Oil*, Institut für Energie (2022)

Impact reduction of regenerated waste oil compared to treatment to **fuel oil**.

Regeneration is also better for the environment than treatment to fuel oil.

- 47% CO2 emissions

- 34% acidification

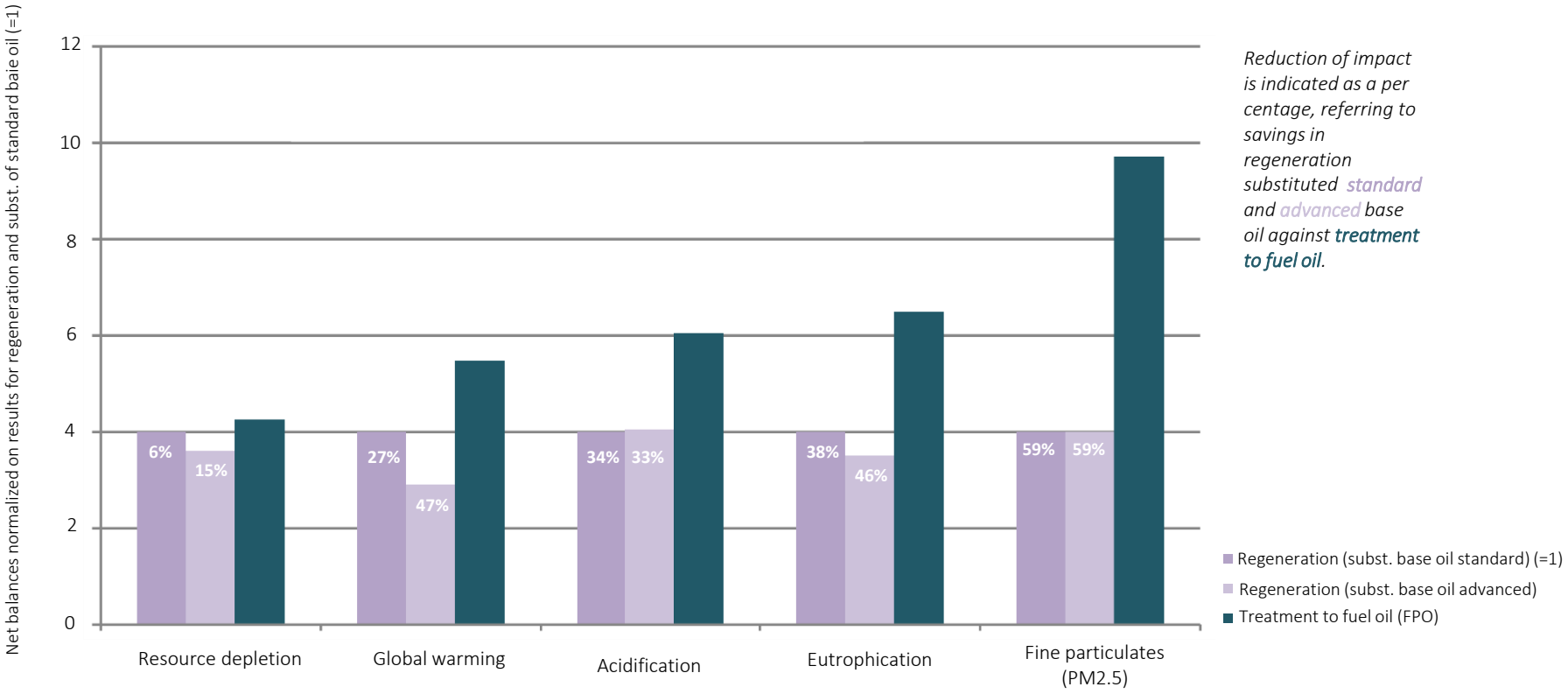
- 59% fine particles

- 46% eutrophication

- 15% resource depletion

Source
Abdalla, Fehrenback, Theis, *Life Cycle Assessment for Regeneration of Waste Oil to Base Oil*, Institut für Energie (2022)

Impact reduction of regenerated waste oil compared to treatment to **fuel oil.**



*Reduction of impact is indicated as a per centage, referring to savings in regeneration substituted standard and advanced base oil against **treatment to fuel oil**.*

Source
Abdalla, Fehrenback, Theis, *Life Cycle Assessment for Regeneration of Waste Oil to Base Oil*, Institut für Energie (2022)

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Conclusions

Main conclusions

- ✓ Clear advantage observed in favour of regenerated oil when compared to virgin crude oil.
- ✓ Clear advantage observed in favour of regenerated oil when compared to treatment to fuel oil.
- ✓ Even assuming a significant innovation breakthrough for the fuel oil treatment alternative (-50% energy consumption), the Global Warming Potential net-balance would be still in favour of the regeneration.
- ✓ This LCA study thus confirms and strengthens the findings from previous studies – that is, regeneration is still the best environmental option.

Source
Abdalla, Fehrenback, Theis, *Life Cycle Assessment for Regeneration of Waste Oil to Base Oil*, Institut für Energie (2022)

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Policy recommendations

Policy recommendations

- Regeneration shall be the favoured way because it has the less environmental impact across all categories.

- The EU waste hierarchy needs to be respected. The study supports the higher ranking of regeneration/recycling versus energy recovery – in line with the waste hierarchy required by EU policies.

About recycled lubricants: getting Europe to move sustainably

Lubricants are oil-based products that improve mechanical equipment's lifetime by lessening materials' wear and tear while reducing binding and friction.

GEIR member companies, representing 80% of the European waste oil regeneration industry, are active throughout Europe in supporting the collection and regeneration of waste oils back to valuable base oils for the lubricant market.

Our industry is thus entirely integrating the circular economy philosophy into its daily business. This help significantly reduces fossil fuel consumption , import dependencies, and CO2 emissions.

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