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Fluid Solutions Innovative and sustainable hydraulic fluid concepts

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Abstract.

Hydraulic fluids are an important design element in stationary and mobile hydraulic equipment. Based on different sustainable base oil concept, FUCHS has developed new hydraulic fluid concepts which in addition to offering "hydraulic performance" have a low carbon footprint value. The product carbon footprint (PCF) of the relevant ACT (Advanced Circular Technology) fluids is significantly lower than vigor oils. Additionally, the C02 footprint of different fluid concepts during the application phase of hydraulic fluids will be discussed, based on a life cycle assessment (LCA) study. This presentation will provide an overview of the latest developments in hydraulic fluid technology. Energy-saving potential, lifetime aspects and performance levels will also be discussed.

1. INTRODUCTION

Hydraulic fluids are a significant group of lubricants in Germany. The fluid group includes in general mineral oil based hydraulic fluids, fire resistant, biodegradable, food-grade and multigrade hydraulic fluids as well as other specialties. The diagram shows the total market development of hydraulic fluids in Germany. Mineral based hydraulic fluids can be classified according to API base oil groups: Group 1, Group II and Group III. Conventional hydraulic fluids are based on Group I base oils, also known as solvent neutral (SN) base oils. New innovative hydraulic fluids are based on Group II/Group III, hydrotreated or hydrocracked which have a lot of technical and sustainable advantages (high lifetime, no aromatics, low sulphur content, etc.).

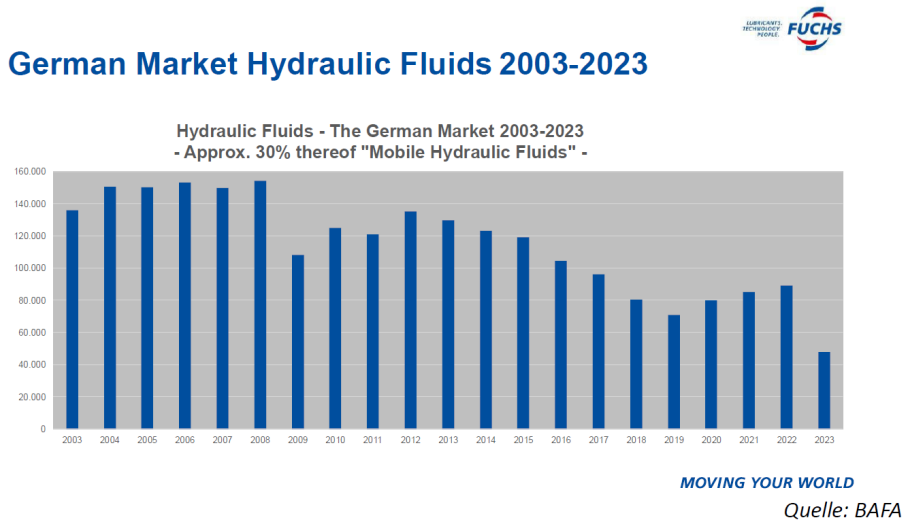

Figure 1.1. German Market Hydraulic Fluids 2003-2023

2. NEW INNOVATIVE MINERAL OIL BASED HYDRAULIC FLUIDS

Today, more than approximately 30% of mineral oil based hydraulic fluids are based on hydraulic fluids made from hydrotreated, hydrocracked Group II/ Group Ill. These high-performance fluids have a very long service life (2-3 times longer than comparable conventional fluids based on Group I), a low sulphur content, no aromatics, and a slightly higher viscosity index.

They also have low/ no varnish potential due to their extremely high oxidation stability. The hydrotreated fluids of the new generation of base oils are also increasingly important worldwide for industrial lubricants (e.g. Asia, America, Europe).

Diagram 2.1. shows the extended service life of these high-performance fluids.

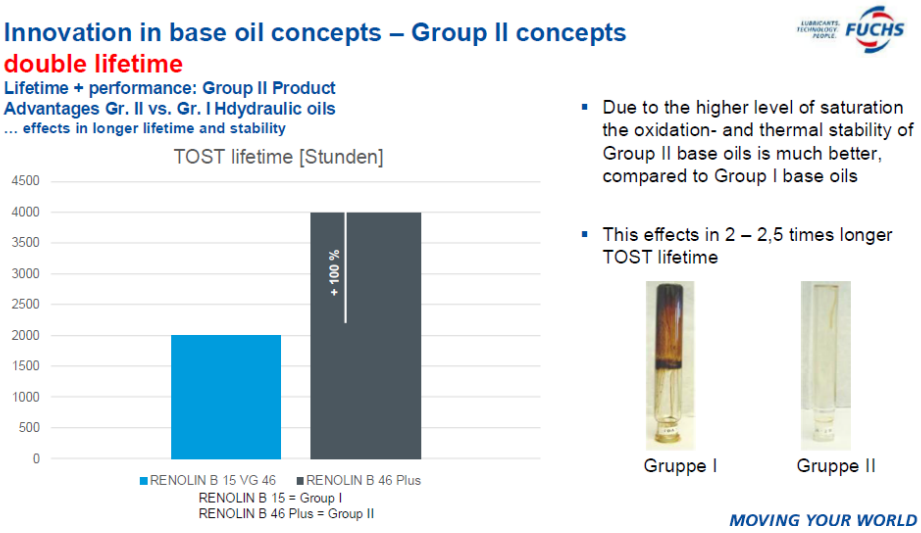

Diagram 2.1. Innovation in base oil concepts – Group II concepts

3. SUSTAINABILITY ASPECTS PCF VALUES, TRENDS

In general, sustainability, energy-saving and additive labeling aspects must be considered when formulating hydraulic fluids.

In addition, new fluid types must also meet economic criteria.

An important sustainability value is the Product Carbon Footprint (PCF) of hydraulic fluids, the PCF value. FUCHS evaluates the PCF value of the products within the cradle-to-gate boundaries.

Through the targeted use of sustainable base oils (e.g. re-refined base oils: Group I, Group II and Group III), the PCF value of sustainable products can be specifically reduced significantly (PCF reduction of up to 70%).

Diagram 3.1. shows different PCF values of virgin and sustainable base oil based hydraulic fluids.

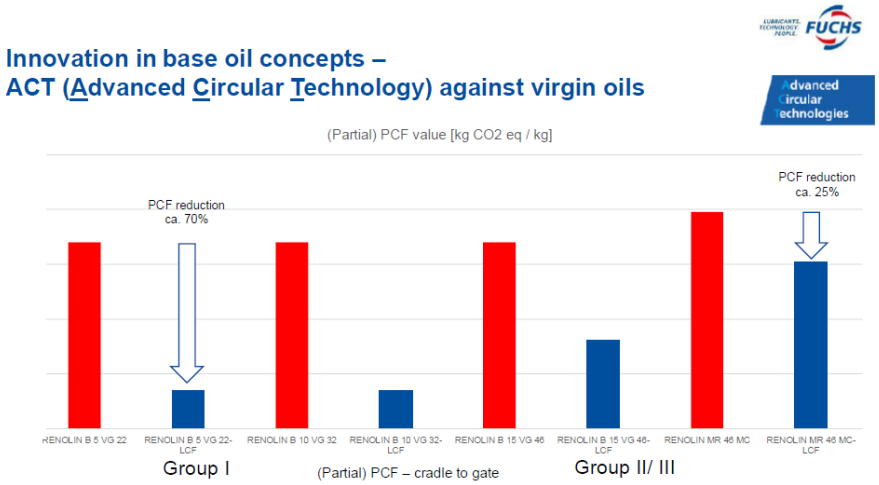

Diagram 3.1. Innovation in base oil concepts – ACT against virgin oils

4. SUSTAINABILITY PERFORMANCE PARAMETER, LIFETIME, ENERGY SAVING, LCA-STUDY, CUSTOMER STUDY

The sustainability of fluids can be assessed from various perspectives. The specific PCF of a product/ (per year of use) fluid, the overall lifespan, the use of re-refined base oi ls (RRBO), the use of renewable raw materials (for bio hydraulic fluids with the EU eco-label, > 25%), and additive systems that are not labelled acc. To CLP regulation.

In addition, life cycle assessment studies (LCA) - (comparison of mono- to multigrade hydraulic fluids) can provide information on the CO2 footprint of the products used during the application phase.

Figures 4.1. to 4.3. show the different aspects of sustainability in hydraulic fluids and the results of a LCA study.

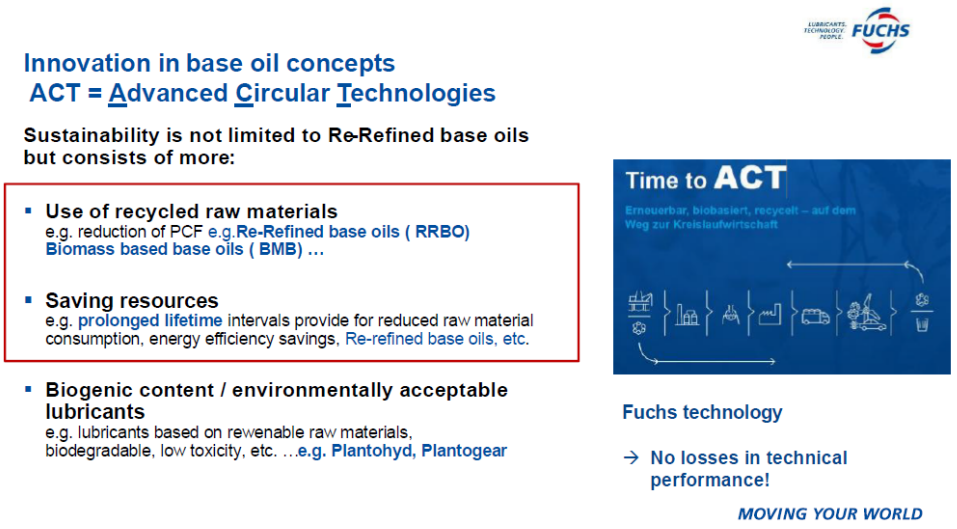

Figure 4.1. Innovation in base oil concepts

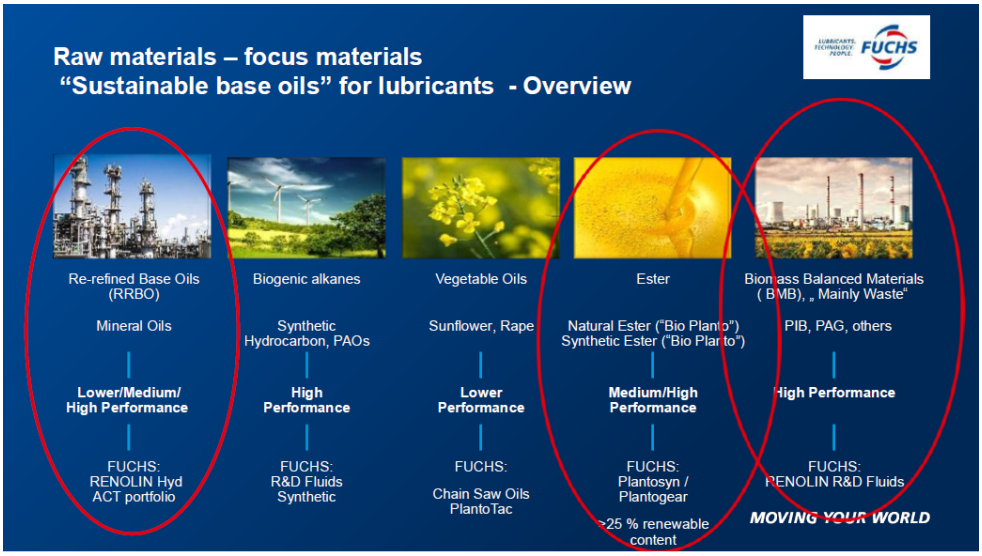

Figure 4.2. Raw materials – focus materials

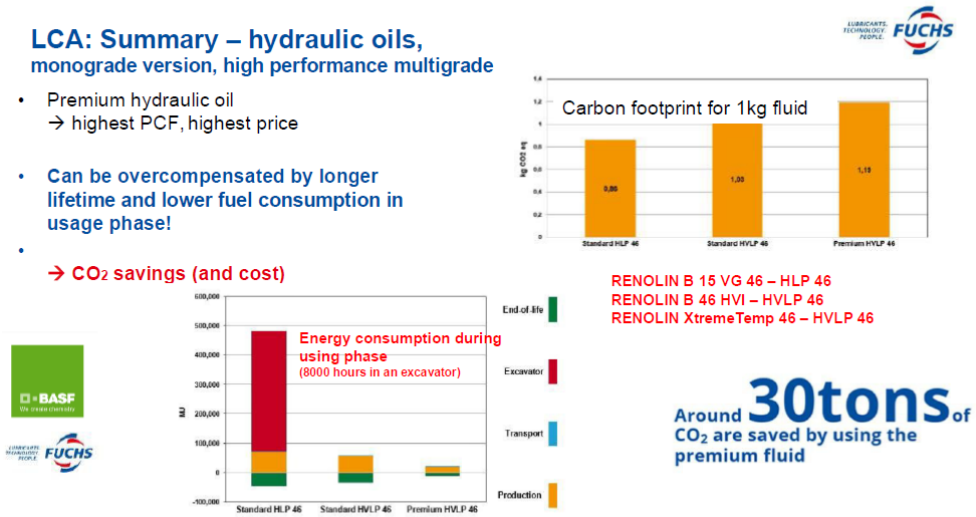

Figure 4.3. LCA: Summary – hydraulic oils, monograde version, high performance multigrade

5. CONCLUSION

Sustainability aspects should be considered when selecting hydraulic fluids. The product carbon footprint value (cradle to gate) is a meaningful parameter for assessing the carbon footprint of a product.

Other aspects such as energy efficiency, flu id lifetime, LCA considerations, and the labeling of additives must be considered and will become very important for products and users of fluids in the future.

Biographies

Wolfgang Bock is a Mechanical Engineer (Dipl.-Ing.) who graduated from the University of Applied Sciences Mannheim. After gaining experience in various professional roles, he joined Fuchs in May 1991. Since then, he has held several positions within the Fuchs Group, including Application Engineer, Product Manager, and Project Management Lead (PML). Over the years, he has worked for Fuchs Mineralöle, Fuchs DEA, Fuchs Petrolub, Fuchs Europe, Fuchs Lubricants, and Fuchs SE. Within PM4, his main areas of responsibility include a broad product portfolio with a focus on GPM-Senior topics, refrigerants, and turbine applications. He is an active member of several professional associations, including DIN, FVA, VDMA, FKT, and VGB.