Transfer Case Oils

How to master the challenge of multifunctional Gear Lubricants

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FUCHS Schmierstoffe GmbH
FUCHS PETROLUB SE
at a glance

Established 3 generations ago as a family-owned business

- More than 5,400 employees
- Preference share is listed in the MDAX

No. 1 among the independent suppliers of lubricants

- Approx. €2.6 bn sales in 2018
- 58 companies worldwide

The Fuchs family holds 55% of ordinary shares

- A full range of over 10,000 lubricants and related specialties
We are where our customers are
in more than 45 countries
FUCHS Product Portfolio
our full range

- Industrial Oils
- Cleaners
- Cutting
- Forming
- Quenching
- Corrosion Preventives
- Greases
- Automotive
Multifunctional Challenge

for the transfer case oil
Transmission Oil Composition

Typical figures

- 5 - 20% Additives
- 80 - 95% Base Oils
Transmission Oil Composition

*base oils*

- **5 - 20% Additives**
- **80 - 95% Base Oils**

**Crude Oil**
- Destillations
- Group I (mineral)
  - e.g. Solvent Extraction
- Group II (mineral)
- Group III (HC)
- Group IV (PAO)
- Hydrogenation
- Isomerization
- Ethylene
Transmission Oil Composition

_additives_

- 5 - 20% Additives
- 80 - 95 % Base Oils

- Anti Wear + Extreme Pressure
- Friction Modifier
- Viscosity Modifier
- Corrosion Inhibitor
- Antioxidant
- Pour Point Depressant
- Detergents & Dispersants
- Anti Foam
Multifunctional Challenge

water compatibility
Multifunctional Challenge

*water compatibility*
Multifunctional Challenge

more torque
Multifunctional Challenge

more torque
Multifunctional Challenge

efficiency / fuel economy
Multifunctional Challenge

efficiency / fuel economy
Multifunctional Challenge

*sum of interactions (amongst others)*
Multifunctional Challenge

*sum of interactions (amongst others)*
How to develop a new oil

joint development **FUCHS + Customer**

**Project Specification**
- Chapter 1
- ... 
- Chapter 2
- ... 
- Chapter 3
- ...

**Formulation Development Lab Test + Component Tests**

**Application Tests**

**Next Generation Interactions**

**Application**

**Engineering**
Chemical & physical Oil properties (Laboratory)
test capabilities @ FUCHS

Viscosity

Cold Temperature

Electric Properties

Corrosion

Oxidation

and many many more
Transmission components (Test field)

test capabilities @ FUCHS

- Shear Stability (KRL)
- Synchro Performance
- Electric Properties
- Gear Protection (FZG)
- Bearing Lifetime (FE8)
- Pump Lifetime (Vickers)
Components and full transmission (Test field) test capabilities @ FUCHS

Since 2019: GK3 in China
Glimpses into recent Product Developments

<table>
<thead>
<tr>
<th>Oil</th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
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<tbody>
<tr>
<td>Reference</td>
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<td><img src="image6" alt="Graph" /></td>
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Phone Memo

Costumer:
“Your oil has 20°C less steady state temperature in the application compared to other state of the art oils.”
Fuchs Transfer Case Oil

Commercial example for a successful development
Fuchs Transfer Case Oil

Commercial example for a successful development

FZG A10/16.6R/90

FLS = 6

Kin. Viscosity

@ 100°C

≈ 6 mm²/s
Summary

- Variety of Base Oils and Additives to customise oil candidates to the application
- Additive Interactions force to balance the oil performance
- Joint oil development is the key
- Variety of test possibilities @ FUCHS
- Optimised Products are available
Thank you very much for your attention.