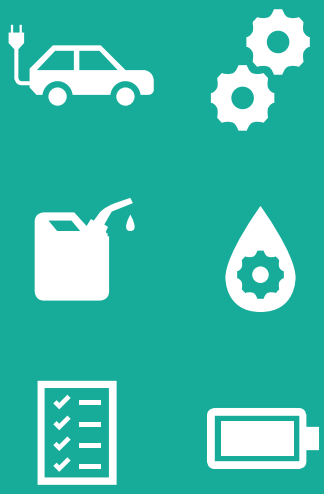
Fluids for next generation EV drivetrains

Tuneable, Group V base oils for next generation electric vehicle gearboxes, transmissions and e-axles

Cargill®

Learn more with our on-demand webinar ***"Electrified drivetrains: Formulating fluids with esters for performance benefits".***
Presented by Dr Gareth Moody
Scan the QR code to register.

Fluids for electric vehicles - overview



- The automotive market is rapidly changing and interest in vehicle electrification is growing as countries enact new emissions legislation and move to ban new sales of internal combustion engine (ICE) vehicles.
- Standard automatic transmission fluids (ATFs) are not optimised for electric vehicles (EVs), and further development of fluids is needed to meet the requirements of EV drivetrains.
- Lubricant standards are still being developed for EVs and there are many competing technologies and designs for their drivetrains.
- EV transmissions are subject to high torque at low speeds, electrical fields, high voltages and greater localised heat loads which requires novel fluid solutions.
- Fluids must have specific performance requirements including low electrical conductivity, low viscosity and low traction as well as protecting against wear and having good thermal heat transfer properties.

How can we help?

We already manufacture Group V ester base oils for low wear, oxidatively stable automotive lubricant formulations and are developing base oils for the next generation of electric vehicles. Our ester technology is tuneable to your exact needs and improves performance of Group III and Group IV based automatic transmission lubricants.

New product developments

We are developing products in two main categories:

Very low viscosity Group V ester base oils offering a very low coefficient of traction when formulated into Group III, IV or V base oils. Suitable for for formulating next generation gearbox and e-axle lubricants.

Unique Perfad™ traction reducing co-base fluids to reduce traction and wear in a Group III, IV or V based formulation, while thickening and increasing viscosity index. Suitable for replacing PAO 100 and standard high viscosity esters.

DE 10766: Very low viscosity Group V ester base oil

In Group III and Group IV base oils, the addition of 20% DE 10766:

- Reduces traction even under high loads and slow speeds
- Reduces wear
- Improves add-pack solubility

20% DE 10766 reduces traction even in very harsh conditions

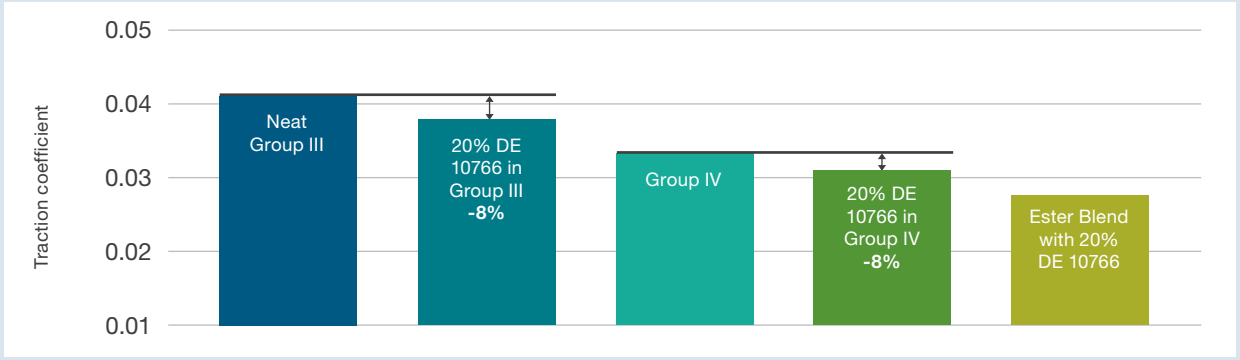


Figure 1 Adding 20% of DE 10766 reduces traction by 8% vs. an untreated Group III or IV base oil. All formulations 4.5 cSt.

Parameter	Value
Speed	0.2 m/s
Temperature	40 °C
Load	25 N
SRR	50%

Compared to a neat Group III or Group IV base oil, DE 10766 has:

- Significantly lower NOACK volatility
- Higher breakdown voltage
- Significantly increased oxidation stability
- No adverse impacts on copper wire insulation materials and elastomer seals

Unique Perfad™ traction reducing co-base fluids for EV oils

Reducing traction vs. a PAO 100 thickened formulation in Group III

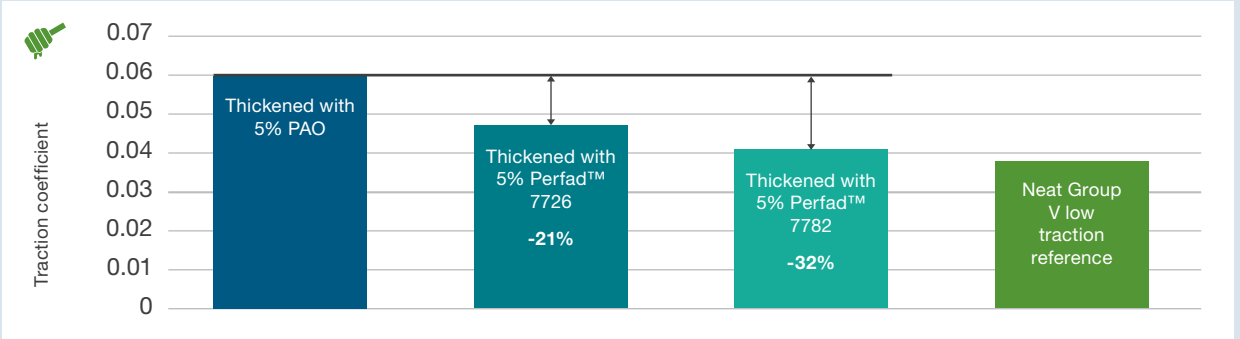


Figure 2 Adding 5% Perfad 7726 or Perfad 7782 offers up to 32% reduction in traction coefficient vs. a PAO 100 thickened formulation in Group III. All tested at a KV40 of 26 cSt.

We used an oxidatively stable polyol ester solubiliser to ensure complete solubility of the additives.

Parameter	Value
Speed	0.1 m/s
Temperature	60 °C
Load	60N
SRR	40%
KV40	26 cSt

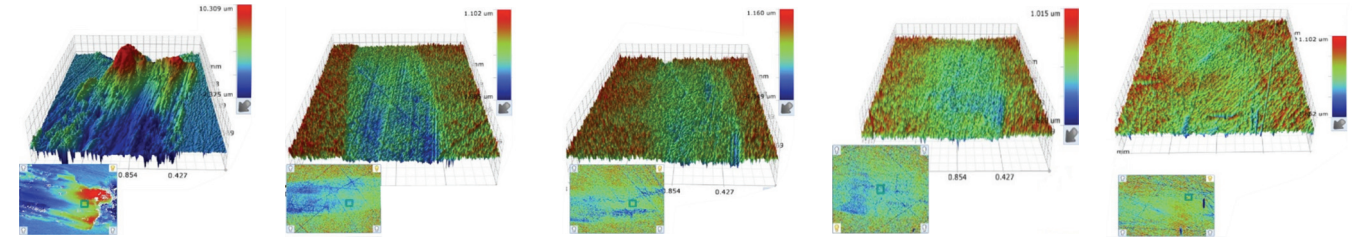
In Group III and Group IV base oils, the addition of 5% Perfad 7726 or Perfad 7782:

- Reduces traction coefficient by up to 32% vs. a PAO 100 thickened formulation
- Improves pressure viscosity coefficient of fluid, increasing film strength and wear performance
- Improves viscosity index
- Maintains viscosity in the KRL shear loss test (20 hours, 40°C)

Formulating with both 20% DE 10766 (low viscosity base oil) and 5% Perfad 7782 (traction reducing co-base fluid) in Group IV:

- Reduces traction further compared to just the addition of DE 10766
- Reduces wear even further vs. 20% DE 10766 only
- Using the same additive package, DE 10766 and Perfad 7782 improves FZG A10/16.6R/90 results by 2 load stages in a Group IV formulation

Visualising wear reduction in the FZG SRV gear contact mimic test



Group III failed at 78 minutes	20% DE 10766 in Group III	20% DE 10766 + 5% Perfad 7782 in Group III	20% DE 10766 in Group IV	20% DE 10766 + 5% Perfad 7782 in Group IV

Other application areas:

We are developing a portfolio of products for electric vehicle applications, including:

Lithium-ion battery additives: Including next generation dispersants for the efficient manufacture of carbon slurries

Low viscosity dielectric coolants for immersion cooled EV batteries and drivetrains

This document is a short overview of a larger dataset.

Please contact us for further information.

Who are we?

The Energy Technologies business in Cargill Bioindustrial creates, makes and sells specialty chemicals and additives for the global energy market. Working in close collaboration with our customers, we apply sustainable concepts and deep scientific expertise so that together we can efficiently power the world of tomorrow.

At our core, we are experts in synthetic ester and polyalkylene glycol chemistries, taking products from lab scale through to full manufacturing. Investing in the development of new chemistries allows us to support our customers in meeting new industry challenges.

For those who dare to imagine a brighter future, we establish long lasting relationships and create bespoke industry solutions through our integrated research & development and global manufacturing capabilities. Being both global and local, you have direct access to our network of technical experts. We look forward to talking to you.

Further information

Cargill Bioindustrial sales and distribution are coordinated through an extensive worldwide network of technical and commercial experts. For further information or guidance please contact us:

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