



Summer 2022

OELCHECKER



TECHNOLOGY FOCUS

Synthetic lubricants –
Types, properties and applications

PARTNER FORUM

Oil analyses for Liebherr –
Now even more reliable and faster

OELCHECK INSIDE

New testing procedures for
lubricants and coolants

AND MUCH MORE...



Adobe Stock – Darius



CHECK-UP

“ OELCHECK loves bees! Making honey is no easy task. Climate change and the large number of enclosed spaces are making life increasingly difficult for the army of bees in our mountainous region.

So, we decided to transform one of our company’s car parks into a large, unused space. And we didn’t just concrete over it, either, as we transformed it into a bright, flowering meadow – a paradise for our new tenants, a colony of honey bees.

Preparations for a beehive are already under way. Our beehive is currently being painted with organic-certified, coloured wood varnish by children from the Brannenburg children’s nursery, and we can’t wait to see what it looks like! Once it’s finished, it will be placed in the middle of the flowering meadow.

The bee colony has been given to us by amateur beekeeper Michel Linnerer. As he runs OELCHECK’s IT department for his day job, the beehive will also feature state-of-the-art sensor equipment – Beehive 4.0. We’ll then be able to use the OELCHECK website to view real-time data, such as the colony’s weight, the temperature and humidity inside the hive, the number of bees coming and going, and the colony’s health and mood.

Alongside this extensive, modern technology, we’ve also incorporated a traditional show window, where interested observers can open doors and take a look inside the beehive through a glass pane.

The OELCHECK bees will be looked after by Michael Linnerer and some of his colleagues, who are also experienced amateur beekeepers in their own right. Any honey harvested will be processed in Germany pursuant to the strict hygienic requirements of the German Honey Directive (HonigV). The OELCHECK honey produced will then be used in the company’s canteen. The bees still have lots of work ahead of them before it gets to that stage, however. After all, they have to pollinate eight million flowers for just half a kilogram of honey!

The busy bee colony is sure to be visited by the children from the Brannenburg children’s nursery, with excursions to see our bees already firmly in the diary. Maya the Bee will also be showing and explaining to the little ones how bees live and make honey. This will make taking a peek into the show hive through the safety glass and finding the queen bee all the more interesting!

Children will have loads of fun during their visits and learn about one aspect of a sustainable lifestyle at the same time.

Paul Weismann Barbara Weismann

“

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OIL ANALYSES FOR LIEBHERR EARTHMOVING AND MATERIALS HANDLING EQUIPMENT

NOW EVEN MORE RELIABLE AND SAFER

The name Liebherr has resonated with a wide range of high-quality products and services for over 70 years. The earthmoving equipment product segment comprises a broad portfolio of high-performance and high-quality products. This range includes mobile and crawler excavators, bulldozers and tracked loaders as well as pipe layers, telescopic handlers, wheel loaders and articulated dump trucks. In addition to mobile, crawler and electric material handling machines, the material handling equipment product segment also counts wheel loaders, telescopic handlers, bulldozers and wheel loaders among its extensive portfolio.

The technology and design of earthmoving and material handling equipment are based on the practical requirements gleaned from use worldwide. In so doing, Liebherr sets a high bar when it comes to the quality of its products. That's why components in Liebherr's mechanical, hydraulic and electrical drive and control systems are largely developed and manufactured in-house. In addition, the company also offers an extensive range of selected lubricants and operating fluids that are specially optimised for use in Liebherr machines and are constantly in development based on feedback received in practice. To enable operators to get the most out of Liebherr equipment, such as a long service life and optimal protection against corrosion and wear and tear, Liebherr recommends OELCHECK's all-inclusive analyses as the perfect companion when using their machines. Liebherr and OELCHECK then tailor the results of the analyses to the individual Liebherr machine components and lubricants.

OELCHECK analyses in the Liebherr range

The partnership between Liebherr and OELCHECK began back in the early 1990s, when Liebherr recognised the potential of OELCHECK lubricant analyses for optimising machine maintenance. As a result, Liebherr became OELCHECK's first major customer in the construction machine industry.

The all-inclusive analysis kits coming out of Brannenburg have since become an integral part of Liebherr's services over the years. Almost all of the analysis kits are tailored specifically to the company's machines and lubricants when it comes to scope and information content. The adapted sample information forms also speed up the time required to enter information, make it easier to dive into the detail for components and help contribute to the high quality of the sample assessment.

Limit values are essential in analytics

A laboratory analysis provides a whole host of values. However, to be able to assess these values in their entirety, you not only need experience, but also the following data so you can compare the values achieved:

- The reference values of the corresponding clean oil or clean lubricant
- Knowledge of how the product used has developed over time (if possible)
- Limit values for wear and tear, impurities and any degradation of additives

Establishing these limit values is one of the greatest challenges for any lubricant analysis. Although component and machine manufacturers, lubricant suppliers or associations may sometimes provide limit values and recommendations, such values often stand alone, are isolated from each other and only take part of the picture into account. Yet which values for a used lubricant are considered too high or unexpectedly low? Up to which point is a value still within tolerance levels for some time, and when will it become critical? Moreover, what influence do a machine or component's operating conditions have on the limit value?

OELCHECK uses limit values based on results from thousands upon thousands of analyses to assess the results returned by the oil analyses in practice. Also included in the definition of the company's own limit values are the specifications stipulated by the OEMs, institutions and lubricant manufacturers, which in any case must be taken into account for warranty conditions.

Limit values for Liebherr – Individual and precise

OELCHECK's database holds millions of datasets from a wide range of machines, lubricants and applications, and this number is growing on a daily basis. However, the limit values for Liebherr lubricants and operating fluids from the leading OEM's earthmoving and material handling machines hold a unique position. Liebherr and OELCHECK have worked closely together over the last decade to determine the corresponding limit values for these individual products. This allowed values to be generated with the maximum practical relevance thanks to differentiating between the individual machine series and the range of applications. These values are then statistically recorded, constantly validated and compared with repeated analyses of the individual components by Liebherr.



These individual limit values consider almost all aspects and further increase the accuracy of the analysis assessment. Since being selective with individual values inevitably leads to significant misjudgements, Liebherr and OELCHECK generally assess the interaction between the analysis values. This requires detailed knowledge of the lubricants and operating fluids used, the components, machines, their operating conditions and, of course, analytics.

As such, there are now individual limit values for the use of Liebherr lubricants and operating fluids in a wide range of components from almost all of the OEM's earthmoving and material handling machines. Operators benefit from these limit values in several ways:

- **High-precision diagnostics for Liebherr lubricants and components**

Thanks to the agreed limit values, Liebherr customers can receive detailed, tailored laboratory reports. As an example, individual limits are available for all key components for a single material handler. Whether it's the diesel engine, the hydraulics, the drive mode, the axles, the swivel gear or the derrick, its use is considered on an individual level when assessing a lubricant.

- **Safety during condition-dependent oil changes**

Hydraulic fluids, for example, are changed with increasing frequency depending on their condition. As a rule, Liebherr Hydraulic HVI multi-grade hydraulic oil is changed after 3,000 operating hours. If, however, the oil is subject to oil analyses,

Liebherr recommends the oil be changed every 6,000 operating hours. In practice, however, such hydraulic fluids can also reach a life cycle of up to 10,000 operating hours. OELCHECK's oil analyses ensure the necessary operational safety. Finally, they also use the limit values individually agreed with Liebherr for the degradation of additives, any wear particles and foreign substances in the lubricant. While the examination of hydraulic fluid often focuses primarily on extended oil change intervals, for other components it's all about checking the oil quality, checking for signs of potential contamination as well as the individual state of wear and tear or detecting damage early.

The analysis of Liebherr operating fluids results in benefits in several areas: on the one hand, any extension to the service life of hydraulic oil is better for the environment and resources, while on the other, detailed monitoring of the lubricant ensures the reliable and safe operation of earthmoving and material handling equipment at all times due to the best possible maintenance conditions and optimised operating costs.

Liebherr – A family-owned company that sets standards

The Liebherr Group is a family-run technology company offering a broad range of products. The company is one of the largest manufacturers of construction machinery worldwide, while also offering high-quality and practical products and services in many other areas. Today, the Group boasts more than 140 companies across all continents. In 2021, the Group had over 49,000 employees

and generated consolidated sales totalling over €11.6 billion. Liebherr was founded in 1949 in Kirchdorf an der Iller, Germany. Since then, its staff have been striving to provide customers with sophisticated solutions and play a part in technological advancements.

See www.liebherr.com for further information.



NEW OELCHECK PRODUCT CATALOGUE

Our latest product catalogue is out now! Compact, clear and practical, it introduces you to our wide range of products, offers information about the respective test configurations of our all-inclusive analysis kits, and helps you select the right kit for your needs. It also gives you an overview of the products from our accessories shop as well as any additional tests, and explains all the benefits offered by the OELCHECK system.

www.oelcheck.de/produktkatalog



OELCHECK IS A PIONEER

NMR USED FOR THE FIRST TIME IN COMMERCIAL LUBRICANT ANALYSES

Magnetic resonance imaging (MRI), also known as nuclear magnetic resonance (NMR), is primarily used in the medical industry, and is likely the most powerful analysis tool of all in organic chemistry. Now, it can also be used for lubricant analyses for the first time, with OELCHECK having developed the foundations for doing so together with the Karlsruhe Institute of Technology (KIT). OELCHECK now offers the concentration of active, phosphorus-based, anti-wear additives in oils to be determined using phosphorus NMR as an additional test. This provides even greater certainty when deciding whether an oil needs to be changed or not, particularly when topping up using an oil boasting long operating cycles.

Throughout an oil's life cycle, its additives change – and the additives' structure correlates with their effect. Oil analyses can offer conclusions about the operational readiness of these active ingredients. Anti-wear (AW) and extreme pressure (EP) additives are particularly interesting, as they have to protect the lubricated components of the respective application within the tolerated limits. These additives are typically based on compounds containing phosphorus, which change over the oil's life cycle.

In the first instance, this concerns the additive content, which is traditionally determined in a lab using ICP-OES (inductively coupled plasma atomic emission spectroscopy). With the new phosphorus NMR, we can now also monitor the molecules of these phosphorus-based active ingredients in detail and identify any changes over an oil's service life. In particular, the phosphorus core is excited in a magnetic field and resonated via a radio frequency. These resonances depend on the molecule's structure and therefore provide what is known as a specific 'chemical shift'.

The assessment of the results always requires a comparison with the corresponding clean oil. This is then analysed and its additive components containing phosphorus are determined using the phosphorus NMR. The used oil samples are compared to the reference to determine any percentage decrease in the active phosphorus-containing AW and EP additives.

The phosphorus NMR therefore provides valuable additional information on traditional oil analyses. If any changes in the additive content are detected and the phosphorus NMR also shows significantly reduced – or even no – active AW or EP additives, that's a clear indication that the oil has been used to its capacity. In that case, the oil must generally be changed. However, the fall in the level of the active additive after an oil change is not, in itself, a reason to change the oil. Additives are designed to cover metal surfaces, which means it's normal for the additive content to drop after the oil has been changed.

The additional NMR test is highly suited to large quantities of oil with long life cycles. The additional information provided on the condition of the additives offers greater certainty when deliberating whether the oil needs to be changed. Yet the new process also proves its worth in a range of other instances. Among other things, it can be used in damage assessments and development projects, such as testing engines. OELCHECK can then determine the fall in anti-wear additives with the phosphorus NMR alongside a traditional oil analysis.



Dr Christoph Rohbogner
Head of Tribology



BRANNENBURG SKATE PARK GIVEN A NEW LEASE OF LIFE

This was the day the skaters had been waiting for. The renovated Brannenburg skate park reopened in May 2022, and the skaters couldn't wait to try it out. In addition to a new ramp, the skate park now features starts, additional obstacles and two rails. OELCHECK supported the skate park's modernisation and expansion by donating €5,300 to the cause, and it was finally time for the skaters to get back up to speed. The young people and youth representatives who came up with the initiative for the project are delighted with the new skate park.

THANK YOU, OELCHECK!



Present at the skate park's reopening: Matthias Jokisch (Mayor of the Municipality of Brannenburg), Paul Weismann (Managing Director, OELCHECK GmbH) and Stefanie Mikesch (Youth Representative at the Municipality of Brannenburg)

OELCHECK BUSINESS BIKES

It's time to get back in the saddle as the first OELCHECK Business Bikes have arrived. Wolfgang Beilhack, Diana Zaisserer and Benjamin Ludwig (from left to right) are the first members of staff to use them to get around, using the new bikes for their commute to work or private journeys instead of taking the car or public transport as much as they can. The OELCHECK Business Bikes allow us to promote an alternative form of mobility and encourage our employees to improve their health. And last but not least, together we're helping to reduce our carbon footprint!



SAMPLE INFORMATION FORMS

THE MORE PRECISE THE INFORMATION, THE MORE PRECISE THE DIAGNOSIS!

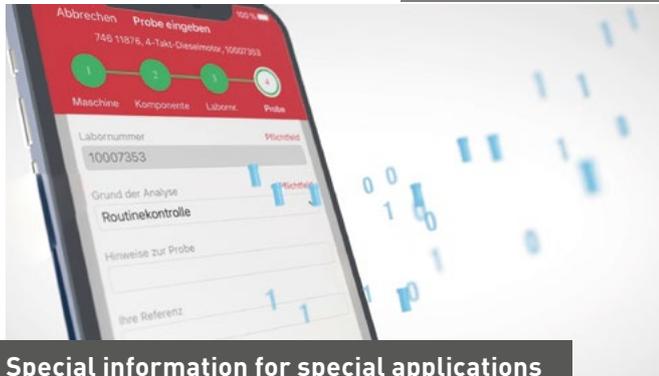
OELCHECK has been the leading laboratory for lubricant and operating fluid analyses in Europe and beyond for more than thirty years. By combining our experience and findings from years of work and state-of-the-art analytical methods, we produce clear analyses and recommendations for our customers.

And the more precise the sample information submitted, the more precisely the diagnosis and recommendation can be tailored to the specific application.

Tailor-made analyses

The machine type, operating fluid used, and ambient conditions – OELCHECK tribologists consider swathes of additional information when interpreting lab results. However, our tribologists can only consider all aspects when taken together as a whole and make tailor-made recommendations in the laboratory report if complete, accurate sample information is provided.

DIGITAL IS IDEAL!



Special information for special applications

A range of information is crucial depending on the application and machine type. At OELCHECK, you can provide relevant information for the intended use. You can receive a step-by-step guide for the data fields on our LAB.REPORT customer portal or the OELCHECK 4.0 app, with both tools also asking for additional information specific to the application.



Fully prepared for your applications

Included in all standard OELCHECK all-inclusive analysis kits, the universal sample information form can be used for any operating fluid and any machine. Whether you're using grease, coolant or gearbox oil, the universal form will have the correct fields. For more detailed information, please refer to our application-specific sample information forms.

Universal sample information forms now even clearer

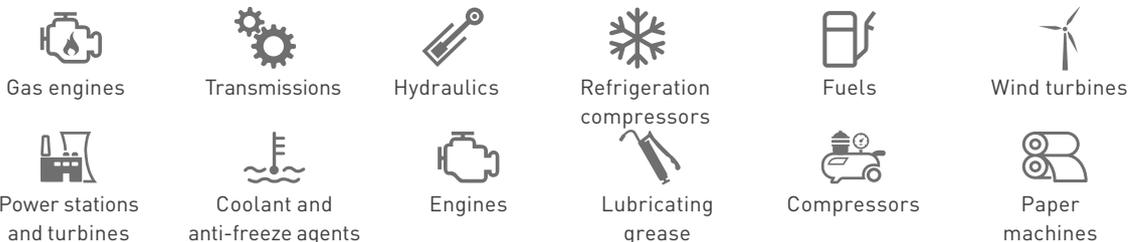
- Sample information forms should be clear and understandable, with four distinct areas for logging information on the sample, the machine, the components and the customer. A detachable document field serves as a reference for the sample sent in. Amendments to any designations mean there is a consistent process from paper to digital, with the same terms always having the same meanings.
- Our universal sample information form has all bases covered – 'oil' is therefore too short and is replaced by 'fuel'.
- Each field has a unique heading, with the corresponding fields to be filled in featured below. Making assumptions are a thing of the past.
- If a follow-up inspection is involved, the machine and component will already have been created in our system. The corresponding information on the sample information form can therefore be omitted. The 'Previous laboratory number' field will therefore be relocated to the centre of the sample information form for machine data.

Anton Kathrein
Head of Global Sales



OUR SAMPLE INFORMATION FORMS

In addition to the universal sample information form, which can be used for every type of lubricant and every machine, OELCHECK offers further special sample information forms. These are adapted to the respective lubricant application and can record special data. The special sample information forms listed below are currently available:





AWARE OF THE ENVIRONMENT AND EXTREMELY PRECISE

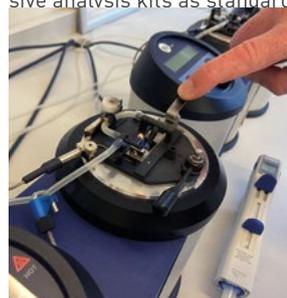
HOW OELCHECK DETERMINES THE FLASHPOINT

The flashpoint is the key criterion for the flammability of combustible liquids. Combustible liquids includes fuels such as kerosene, conventional diesel fuel and biodiesel, whose classification into hazard classes is based on their flashpoint and more. However, the flashpoint also provides valuable assistance when inspecting engine oils and heat transfer media. If significantly lower, it may indicate that engine oil has mixed with a fuel or, in the case of heat transfer media, the formation of volatile cracked products and the associated increased risk of fire.

The flashpoint is defined as the lowest temperature at which a vapour phase formed over a liquid can be ignited with a test flame or electric igniter. Yet the sample itself doesn't burn – only the vapour phase does, and the flame then goes out again immediately.

Determination with small, closed crucibles

Determining the flashpoint is included in some OELCHECK all-inclusive analysis kits as standard. Setaflash flashpoint test devices with a small, closed crucible for a flashpoint in the range of 30-300°C are installed in our lab for this purpose.



Ignition test in a Setaflash flashpoint tester

We therefore determine the flashpoint pursuant to DIN EN ISO 3679, ASTM D3828 or ASTM D7236 in several incremental steps, which

are then repeated to make sure we find the exact flashpoint. First, a sample quantity of 2ml (below 100°C) or 4ml (above 100°C) is placed into the crucible and tempered to the expected flashpoint temperature for 60 or 120 seconds. The tester's ignition device is then triggered. If a vapour phase has not formed at the temperature and cannot be ignited, the crucible is filled with a new sample quantity and tempered at a new test temperature. The next ignition attempt then follows, with this process repeated using clean sample quantities and different temperatures until the flashpoint is established.

Although the procedure is rather complex, determining the flashpoint using a small, closed crucible has several advantages:

- Volatile components in the sample do not go unnoticed. Our employees and the environment are protected from any harmful emissions.
- Only a small sample amount (30ml) is required.
- Each sample specimen is only tested once.
- The examination process is partially automated and therefore streamlined.



Determination using the Cleveland method with an open crucible



Preparation for determination using the Pensky-Martens method

Alternative methods as additional tests

In addition to the small, closed crucible method, we determine the flashpoint using the Cleveland open crucible method (DIN EN ISO 2592, ASTM D92 / application of 79-400°C) and the Pensky-Martens closed crucible method (DIN EN ISO 2719, ASTM D93 / application of 40-370°C).

These are offered as additional tests to the all-in-one analysis kits. However, the following must be considered:

- In the Cleveland method, the crucible is open. And according to the Pensky-Martens method, the larger, closed crucible must also be open for testing, too. In this process, parts of volatile components can escape without a flashpoint being detected.
- This means a minor ingress of fuel into an engine oil or an incipient accumulation of cracked products in heat transfer oils can quickly be overlooked.
- A sample volume of 200ml is therefore required during these test procedures, while a sample volume of 30ml is enough to determine the flashpoint with a small, closed crucible.

Dr Thomas Fischer
Scientific Director



Dr Raphael Grötsch
Scientific Team Assistant



MEET THE TEAM!



20-23/09/2022 | Berlin



27-30/09/2022 | Hamburg



24-30/10/2022 | Munich



15-18/11/2022 | Hannover



9-11/05/2023 | Rosenheim

Feel free to arrange an appointment with your OELCHECK contact person in advance by emailing sales@oelcheck.com!



COOLANT

UPGRADE FOR THE PREMIUM ALL-INCLUSIVE ANALYSIS KIT

Since July 2022, the Premium all-inclusive analysis kit for coolants and anti-freeze agents has included the HPLC-MS test. This has replaced the HPLC test and is included in the price to date. Using the HPLC-MS test, we can detect the degradation of additives, such as corrosion inhibitors, and any mixtures with even greater precision.



To aid the extended scope of testing, we have installed a new mass spectrometer (MS) in the lab and combined it with an existing high-performance liquid chromatograph (HPLC). Before now, this device had 'only' been equipped with a UV/Vis detector that uses the electromagnetic waves of ultraviolet (UV) and visible light (Vis). The coolant samples are then separated into their constituents on the chromatographic column, and the individual components are then analysed qualitatively and quantitatively using both UV absorption and mass spectrometers. The values specified are listed in the lab report in mg/l.

Connecting the mass spectrometer to the existing process enables measurements to be recorded with even greater precision. In addition, the HPLC-MS also expands the portfolio of components to be determined. This allows us to detect any mixtures more effectively and, above all, to detect an even larger number of additives, which are mainly used as corrosion inhibitors in the form of organic acids.

Coolants – Triple inspection

Coolants ensure optimum heat supply and extraction, protect against corrosion, cavitation and deposits, and prevent freezing at sub-zero temperatures. Like lubricants, the properties of aqueous coolants also change due to soiling and ageing. As they age, ethylene glycol degradation products act as acids in coolants. At the same time, the amount of organic acids added to coolants as corrosion inhibitors falls.

To date, we have already determined the following values as part of each coolant analysis:

- Classic glycol degradation products (acetate, formate, glycolate and oxalate) using ion chromatography (IC)
- The content of corrosion inhibitors or organic acids, such as azo compounds (benzotriazole, tolyltriazole, mercaptobenzothiazole) and aromatic carboxylic acids (benzoic acid, toluic acid) using an UV detector

The new MS detector allows us to determine additional substances also contained in some coolant agents and corrosion inhibitors:

- ➔ Nonanoic acid, decanoic acid, dodecanoic acid, pimelic acid, octanedioic acid and dodecanoic acid.

If an additional corrosion inhibitor is present in the sample, it is indicated on the lab report.

HPLC-MS opens up new perspectives when it comes to investigating coolants and anti-freezes. The Premium all-in-one analysis kit for coolants and anti-freeze includes the determination of further corrosion inhibitors. Yet the new HPLC-MS offers many more possibilities – and preparing to investigate additional additives is just one example.

Dr Christoph Heinzl
Scientific Team Assistant



RESEARCH PROJECTS AND STANDARDISATION GROUPS



OELCHECK is active on national and international research projects and in standardisation groups. We are currently actively involved in the following projects:

■ ipH value – Ring trial

The Technical Committee for Mineral Oil and Fuel Standardisation (FAM) is the DIN (Deutsches Institut für Normung e.V.) committee responsible for all standards relating to oils and fuels. FAM is responsible for more than 600 standards (DIN, DIN EN, DIN EN ISO, DIN ISO and ISO). Dr Thomas Fischer, Scientific Director at OELCHECK GmbH, is responsible for all titration methods in the used oil working group at DIN.

Every year, the Technical Committee conducts the 'large-scale FAM ring trial' in the areas of fuels and lubricants. In spring 2022, OELCHECK organised a ring comparison in the working group to determine the ipH value in accordance with ASTM D7946. This comparison serves to ensure the quality of the measurement procedure and the testing labs involved. To this end, OELCHECK has compiled five representative samples over the method's entire area of application, filled them and sent them to all participating laboratories. The final assessment of the ring trial results will be carried out by FAM.

■ Fluids for e-mobiles – Corrosion effect on copper

A modified test for testing the corrosive effect of e-fluids on copper is currently being examined by the Technical Committee for Mineral Oil and Fuel Standardisation in a comparative study. As OELCHECK is also involved in the standardisation of new, specific test procedures, we are actively taking part in this study.



THE WIDE RANGE OF 'SYNTHETIC LUBRICANTS'

TYPES, PROPERTIES AND APPLICATIONS

If the lubrication of a component or machine is to be optimised or the oil changed far less often, synthetic-based products are often the method of choice. Their synthetic base oils are created 'artificially' using chemical processes, while their molecules are tailor-made to measure and usually highly robust. This usually results in the oil having a longer service life and a higher viscosity index, which enables friction-reducing, thinner oils to be used. When combined with organometallic additives, these properties improve the energy efficiency of engines, hydraulic systems and transmissions, enable their more sustainable use and therefore contribute to reducing CO₂ emissions.

'Synthetic lubricants' combine a whole host of lubricants, although they differ in their composition and properties. However, they aren't always compatible – or can't always be mixed – with other synthetic lubricants or mineral base oils.

Like their mineral counterparts, synthetic lubricants aren't manufactured based on crude oil, but on natural gas derivatives or other raw materials. Polyalphaolefins (PAO), which rank among the most common synthetic base oils, are made from ethylene and unsaturated hydrocarbons, for example. These hydrocarbons are mainly extracted from natural gas, and their molecules are converted using a chemical process (polymerisation) under the influence of catalysts. The hydrocarbons' low-viscosity, low-molecular-weight compounds (monomers) are linked to lubricating macromolecules (polymers) through chain growth reactions.

Unlike mineral oils, where a single batch of oil can contain millions of different molecular structures, the molecular sizes and shapes present in a synthetic oil are far more homogeneous. In addition, the chemically converted molecules show significantly higher levels of consistency, proving far more resistant and able to better withstand the harsh operating conditions without oxidising or thermally decomposing. This results in one of the largest benefits of synthetic lubricants: they can be used for far longer than mineral lubricants (even at elevated operating temperatures), which contributes to engines and machines being run sustainably.

A further benefit of synthetic base oils is their higher viscosity index (VI). This is calculated using the viscosities measured at 40°C and 100°C. The higher the viscosity index of an oil, the lower its viscosity changes with the temperature. Due to their good viscosity temperature behaviour, synthetic lubricants can often be selected for certain applications requiring a lower viscosity than mineral lubricants. This minimises the inevitable splash and friction losses during lubrication, which in turn opens up huge potential for energy savings. The low-viscosity, synthetic-based, premium engine oils we see today are likely the best-known example of how synthetic lubricants can reduce friction and increase energy efficiency at the same time. Whereas in the past, multigrade engine oils previously had a viscosity of mostly SAE 20W-50, today it's often SAE 0W-20 and below. Low viscosity synthetic oils allow engines to run increasingly smoothly and consume less fuel.

This principle also suggests that the operation of hydraulics, bearings and gears can also benefit from synthetic lubricants if, for example, a synthetic hydraulic oil HLP 32 is used instead of a mineral HLP 46, or a synthetic CLP 220 is used instead of a mineral CLP 320 for gear oils.

Thin oils also transfer heat better, which offers a few key advantages: The reduction in friction, which is further heightened with new, organometallic additives, means the temperature at the friction point and the amount of oil needed to fill the system falls. Tank volumes may be reduced during the design phase, thanks to the oil being under less thermal stress and oxidation and oil ageing slowing down. The oil also remains usable for longer. The lubricated component surfaces are smoother due to the influence of additives. A stable lubricating film that prevents abrasive wear forms more easily. This leads to components being less susceptible to requiring repair and their downtime being reduced.

→ Low-viscosity synthetic lubricants can reduce energy losses in such a way that energy-consuming production facilities need less energy in operation or energy-generating facilities produce greater amounts of electricity.

Overall, lubricants based on synthetic base oils enable a greater sustainable use of lubricants as well as the components supplied by them, which all contributes to reducing CO₂ emissions.

MINERAL OR SYNTHETIC – AN OVERVIEW OF BASE OILS

The base oils form the foundation of all lubricants and more than 75% of the main components. Depending on the area of application, these are supplemented with additives or active ingredients. These base oils must undergo a range of processing steps and differ both in terms of performance and price level. Base oils are divided into conventional mineral oils (Groups I to III) extracted from crude oil by refining, and synthetic oils (Groups IV and V) arising from chemical processes.

Group	Description	Price Factor	Operating Range [°C]*	Density 20°C [g/ml]*	Viscosity Index (VI)*	Compatibility / Miscibility
I	Solvent raffinates, from conventional refining	1	-20 – 100	0.8 – 0.9	75 – 100	→ Pay careful attention when changing oil types or using flushing oils. Even residual quantities of oils of the same base, but with different additives, can impair the air and water separation behaviour and more
II	Raffinates from catalytic deparaffination, low in aromatics	1.5 – 2	-25 – 110	0.8 – 0.9	85 – 115	
III	Semi-synthetic, hydrocracked raffinates, aromatic-/sulphur-free	2 – 3	-30 – 120	0.8 – 0.9	110 – 135	
IV	PAO-based synthetic oils	2 – 5	-30 – 140	0.8 – 0.9	135 – 160	→ Glycol-, silicone- and PFPE-based oils can only be mixed and are only compatible with oils of the same base
	Vegetable oils (HETG)	3 – 4	-10 – 80	0.8 – 0.9	180 – 200	
V	Synthetic esters	3 – 6	-30 – 170	0.9 – 1.0	140 – 190	
	Glycols (polyalkylene) PAG	3 – 5	-30 – 200	1.0 – 1.2	200 – 240	
	Silicones	50 – 100	-50 – 250	0.9 – 1.1	200 – 350	
	Perfluoropolyethers (PFPE)	100 – 400	-40 – 290	1.8 – 2.0	110 – 150	

*) Figures are approximate values from the manufacturer's product information. These values may change depending on the viscosity, additives and the intended use.

Groups I to III

Group I mineral base oils are vacuum distillates of crude oil and are now only used for applications with low technical requirements.

The base oils most commonly used today in **Group II** are low-aromatic and low-sulphur mineral oil raffinates. These are obtained under a hydrogen atmosphere by heat treatment, similar to Group I oils.

Group III comprises hydrocracked oils and strongly heat-treated, aromatic- and sulphur-free mineral oil raffinates. Hydrocracking is a catalytic cracking process in the presence of hydrogen at a temperature of 400°C and a pressure of 13-17 MPa. Hydrocarbon compounds are converted from gas oil or crude paraffin into long-chain molecules.

Group III base oils are the mineral base oils that are subjected to the most intense refining process. Compared to Group I and II oils, they are characterised by a significantly higher viscosity index of up to 150, greater oxidation resistance and improved behaviour in cold temperatures. The end products produced using their basis are often labelled 'HC synthetic oil', 'Semi-synthetic' or even 'Synthetic' by their manufacturers. In Germany, however (and unlike in the USA), the term 'synthetic oil' may not be used for HC oils, but only for PAO and ester base oils.

Group IV

Polyalphaolefins (PAO)

Polyalphaolefins are the most commonly used synthetic base oils. They are manufactured using an ethylene base, which is obtained from intermediary products from the process of refining petroleum and natural gas. As polyalphaolefins resemble mineral oils in their chemical structure, they are often also referred to as 'synthetic mineral oils' or 'synthetic hydrocarbons' (SHC).

Properties

- Good viscosity temperature behaviour
- Increased natural oxidation and thermal stability
- Low evaporation tendency
- Miscible and compatible with almost all mineral and ester oils
- Behaviour similar to mineral base oils with regard to paints and seals

Applications

Polyalphaolefins are used in 95% of the production of fully synthetic engine, gear and compressor oils. In addition, HEPR (hydraulic oil environmental polyalphaolefins and related products) biodegradable hydraulic fluids, for example, are based on them, too. PAOs are also contained in some physiologically harmless lubricants (NSF-H1) for the food and pharmaceutical industries.

Group V

Base oil group V is assigned to all other base oils not covered by Groups I to IV. The main synthetic base oils in Group V include polyglycols (PAG), synthetic esters, silicone oils and perfluoropolyether (PFPE) oils.

Polyglycols (PAG)

Polyalkylene glycols, known as polyglycols (PAGs) for short, are polyvalent alcohols and therefore not oils in the conventional sense. Compared to mineral-based, PAO-based or ester-based oils and most additive types, PAG oils have a significantly higher density of 1.0-1.2g/cm³ instead of around 0.9g/cm³. PAG-based oils cannot therefore be mixed with conventional oils, as they have a higher water solubility that does not settle and therefore cannot be removed. Some of these oils are even hygroscopic.

Properties

- Very good viscosity temperature behaviour
- Wide temperature range; good high and low temperature properties
- Very high ageing and oxidation stability
- Very good high-pressure (EP) properties – even without additional additives
- Cannot be mixed with other oils
- Compatibility with seals (except EPDM), paints and varnishes
- Problems with aluminium at the lubrication point possible

Applications

As polyglycol oils have a high natural capacity to absorb pressure, they are primarily used for lubricating roller and slide bearings and worm gears. As high-temperature oils, they are used, among other



things, in compressor and hardening oils, in metal processing and heat transfer fluids, as well as in lubricants pursuant to NSF-H1 for the food industry.

They also serve as the basis for flame-retardant hydraulic fluids as well as biodegradable HEPG (hydraulic oil environmental polyglycol) hydraulic fluids. However, since polyglycols quickly absorb water, the use of HEPG should be controlled. It is a different situation when they are used in brake fluids that are also manufactured using a PAG base (with the exception of type DOT 5).

Synthetic esters

Unlike natural esters, synthetic esters aren't based on vegetable oils or animal fats. Synthetic esters are built on carboxylic acids and alcohols, while natural esters are of a biogenic origin. They are mainly used as the basis for hydraulic oils of the type HETG (hydraulic oil environmental triglyceride), which are primarily used in agriculture, forestry and other environmentally sensitive areas. Although additives are also added to these products, their resistance to ageing is significantly lower than that of their synthetic counterparts. Synthetic esters can be 'tuned' to almost any desired structure and application, whether you want excellent oxidation stability, biodegradability, good lubricity, a higher viscosity index or good characteristics at low temperatures. Using the right synthetic ester means that most properties can be achieved with only a small number of additives required.

Synthetic esters are inherently prone to hydrolysis, a water-induced chemical reaction that can lead to a rapid increase in the acid number combined with a loss of viscosity. The tendency towards hydrolysis can, however, be prevented by using chemicals in the ester production process, in the form of branched carboxylic acids.

Properties

- Good long-term properties provide high ageing stability
- Tendency to hydrolysis; problematic in humid environments
- Can be mixed with mineral oils and polyalphaolefins (PAO)
- Ester-based paints may be dissolved
- Sealing materials tend to swell

Applications

Base oils based on synthetic esters are often used in refrigerator oils. They are also used for the production of high-temperature chain lubricants, low-viscosity metalworking oils, spindle oils and flame-retardant lubricants. Based on synthetic esters, the type HEES is currently the most commonly used biodegradable hydraulic oil. Synthetic esters can be combined with polyalphaolefins to improve the solubility of additives.

Silicones

Sharing a name with the element silicon and manufactured by chemical synthesis, silicone oils are polymerised siloxanes with organic side chains. Silicone oils can achieve an extremely high viscosity index and stand out due to their thermal and oxidative stability. However, these relatively expensive products are chemically inert, which means they do not react (or only react slightly) with potential reactive elements, such as metal surfaces. Additives with lubricating agents, which should remain in solution, are also problematic. The colourless silicone oils wet the surfaces with their creep properties, yet they cannot be removed by commercially available solvents. This means the test devices must be cleaned manually after undergoing testing in the laboratory. OELCHECK therefore only examines silicone oils using certain devices and samples must be marked with 'silicone oil'.

Properties

- Wide operating temperature range
- Extremely fluid even at low temperatures
- Excellent oxidation stability, high thermal stability
- Cannot be mixed with other base oils
- An addition of a few milligrams or kilograms can change the surface tension as an anti-foam additive
- Due to their inert behaviour, silicone oils are compatible with paints, plastics, seals and other materials

Applications

Silicone oils are mainly used in their pure form in heat transfer oils and insulating liquids. They are almost exclusively used as lubricants for plastics, while they serve as release agents and as a base liquid for sealing silicone greases. They also form the basis for some NSF-H1 hydraulic oils for the pharmaceutical industry. As defoamers, they reduce foaming, particularly in lubricants presenting a high concentration of additives. Silicone oils are also the main component of brake fluids pursuant to DOT 5. Silicone oils offer a higher dry and wet boiling point of at least 260°C or 180°C and a lower viscosity. These properties give the brake fluid faster reaction times and a longer service life.

Perfluoropolyether (PFPE) oils

The high-priced perfluoropolyether oils are produced by polymerisation of fluorinated alcohols. The atomic bond from fluorine to carbon is one of the most stable chemical compounds in its own right. The non-flammable PFPE products are extremely inert, chemically and thermally stable and therefore resistant to aggressive media and ionising radiation, even at temperatures above 200°C.

Properties

- High viscosity index enables high operating temperatures
- Absolute oxidative and thermal stability; highest across all base oil types
- No appreciable evaporation loss up to around 300°C
- PFPE oils cannot be mixed with any other base oil because of their density of around 2g/cm³
- The 'heavy' oils behave neutrally towards paints, plastics, seals and materials

Applications

Perfluoropolyether oils are used when conventional lubricants do not provide sufficient performance. This may be the case, for example, at lubrication points in radiation-intensive areas and in chemically aggressive environments. In vacuum pumps, such as those used in semiconductor manufacturing, aggressively corrosive gases destroy traditional pump oils after a short period of time. PFPE base oils can provide assistance here. Perfluoropolyether oils are also the lubricant of choice for lubrication points under oxygen overpressure (such as oxygen fittings) and for loss-of-chain lubrication at extremely high temperatures. As PTFE-thickened lubricating grease, they are suitable as sliding and roller bearing grease for hot air fans and for applications where lifetime lubrication is required, such as in the aerospace industry.

Peter Weismann
Technical Director (Advisory Board)





SWEDEN – TRANS-AUTO AB STARTS AS AN EXCLUSIVE AGENT FOR OELCHECK

When it comes to drive systems, industrial automation systems or equipment and lubricant management services in Scandinavia, Trans-Auto AB is right at the top of the list. Since 2021, the company has taken up the role of being the exclusive agent for OELCHECK in Sweden and Norway. The all-inclusive analysis kits from Germany are a perfect fit for the company's ambitious programme.

Trans-Auto AB works with some of the world's leading manufacturers of drive components for commercial vehicles and ships. Hydraulic systems and components form part of their range, which also includes oil filters, oil sensors and test kits for use in the field.

The experts at Trans-Auto AB are only too aware of the important role that sophisticated lubricant management plays in predictive maintenance. This made the decision to include lubricant analyses in the range an easy – and logical – one. After engaging in initial consultations with OELCHECK, it quickly became clear that getting oil analyses from the market leader was the best way forward if they were required. The OELCHECK system works – it's well thought-out, easy to use and offers users a wide range of additional services, such as the LAB.Report web portal and the mobile OELCHECK app. However, one fact was particularly crucial when opting for OELCHECK: not only do customers have access to the data results through the analyses from Germany, but OELCHECK tribologists also add well-founded comments to each individual lab report. Doing so gives customers reliable information they can use to help make other decisions further down the line. And because OELCHECK is an independent laboratory, free from being influenced by lubricant or machine manufacturers, the analyses are completely objective, too.

A customer base with potential

Founded in 1968, Trans-Auto AB focuses primarily on the B2B business. Mobile systems for the off-highway sector are at its core, and such systems include facilities and components for the construction industry, mining, agriculture and forestry, as well as for ships and railway vehicles. Trans-Auto's customers are mostly original equipment manufacturers, such as material handler manufacturer Cargotec or mining equipment supplier Epiroc. Whatever their size or industry, customers always seem to have one thing in common, and that's that they all value Trans-Auto AB as a reliable partner who provides sound advice.

Fantastic network within the Axel Johnson Group

Trans-Auto AB has been part of Axel Johnson International since 2014. The Swedish industrial group is part of Axel Johnson AB, which acquires and grows companies in strategic niche markets. Axel Johnson International boasts almost 100 companies and experts in a wide range of fields, including industrial pumps, heavy lifting equipment, load securing solutions, ball bearings and gears, and components for heavy-duty commercial vehicles. Most Axel Johnson International companies are market leaders in their respective sectors or geographic markets. Run with an entrepreneurial spirit, they focus on long-term solutions to add value for their customers. Companies belonging to Axel Johnson International are part of a large network and put their synergies to good use to the benefit of customers wherever possible.



Service of the highest quality

Trans-Auto AB is located in Södertälje, a city around 30km south-east of Stockholm. The city is home to well-known companies such as Scania, one of the largest commercial vehicle manufacturers worldwide. Södertälje has excellent transport links and is ideally situated. Around 50 employees work on-site in administration, the large warehouse and the workshop. Trans-Auto AB is also an authorised service centre for Dana Spicer Off-Highway, Twin Disc, Reich and Hamilton, to name but a few. The support team also supports customers by offering expertise, advice, repairing systems using original parts, performing tests on their own test benches, and setting great store by the quality of all service work.

The OELCHECK team at Trans-Auto AB

Trans-Auto AB has been OELCHECK's exclusive agent for the Swedish and Norwegian markets since June 2021, with lubricant analyses proving the perfect complement to the company's Oil Management division. Two Trans-Auto AB members of staff are the contacts for customers.



Lisa Lövgren provides advice over the phone and answers any and all questions about practical handling.



Product manager John Kjerrmann provides support in selecting the right all-inclusive analysis kits and explains the practical benefits for users.

Thanks to excellent preparation and presentation of the partnership with the German market leader, OELCHECK lubricant analyses are already firmly established among existing and many potential new customers.

Finally, the service provided by the OELCHECK team at Trans-Auto AB is impressive. All widely used, all-inclusive analysis kits and all accessories for sampling are in stock in Södertälje and available for shipment to customers. Customers send their samples to Trans-Auto AB, who in turn sends them to Germany as soon as possible. Customers then receive the lab reports directly from OELCHECK. Trans-Auto AB can, however, access the reports via LAB.REPORT, OELCHECK's customer portal. If a lab report indicates conspicuous changes or an urgent need for action, Trans-Auto AB is informed immediately and can offer customers rapid support.

Q&A...



SAFETY DATA SHEET PRIOR TO THE ANALYSIS

Before analysing a lubricant that we sent you for the first time, you asked us for a safety data sheet. Why could that be?



The analysis values and therefore the composition of most of the lubricants and service products we have examined are stored in the OELCHECK database. However, if we receive samples without a product designation or the area of application specified, for example, we must either request a clean oil sample or a product description with a safety data sheet (SDS) before carrying out analysis. This is the only way for us to gather essential information about the properties of the various substances contained in a lubricant or service product. As an example, an SDS provides information about potential hazards or incompatibilities that may arise from the product described. In the lab, an SDS increases the safety of our staff, the constant availability of our devices and the accuracy of the values determined.

Logistics in the lab

Up to 2,000 samples arrive at our laboratory in Brannenburg for testing on a daily basis. To help us cope with that sizeable number, we have installed our very own logistics system.

Each sample we receive comes with its very own lab number or barcode, which guides the sample safely to the designated test stations. The different product types are separated from each other right from the start to avoid damage to laboratory equipment and interruptions to the routine process.

SDS – A packaging insert for greater safety

A wide variety of samples have a flawless journey through our well-organised lab. However, certain 'outliers' repeatedly cause disruptions to the process. These are usually samples that haven't been clearly declared or even samples whose content is unknown.

These samples are sorted as soon as possible. Prior to running the analysis, we request additional information from our customers, and this information usually includes the safety data sheets for the products concerned. The safety data sheets have a uniform structure and provide information on the following:

- Potential hazards, such as aspiration hazards, skin irritation or flammability
- The composition/information regarding the components pursuant to REACH
- The physical and chemical properties
- Stability and reactivity, such as incompatibilities with certain materials or any inert behaviour (product doesn't react with solvents, etc.)



Information is king

The following examples show how important it is to know exactly what is contained within an OELCHECK sample container:

- A heat transfer oil arrives at our laboratory and is only declared as such on the sample information form. Information about the manufacturer, product name and viscosity is missing. However, if this oil contains silicone and we load it into the testing equipment, the equipment will be contaminated. The instruments must then be thoroughly cleaned and as such, are unable to analyse the following samples. If the equipment is not cleaned, parts of the extremely penetrating silicone oil will remain in the device and skew the results of any samples examined subsequently.
- If a sample vessel allegedly contains a coolant, but in reality contains an industrial cleaner, it represents a risk to our high-performance liquid chromatograph (HPLC). Unlike gas chromatography, which is a very good separation method for vapourisable substances, HPLC can also be used to analyse non-volatile substances. In the OELCHECK laboratory, we use it to identify differences in the molecular composition of additives in coolants. However, if a cleaner is added to the HPLC instead of a coolant, the unit can be severely damaged. Further investigations must be carried out and the machine will have to be repaired at an extremely high cost.

These examples illustrate just how important it is to provide accurate information about the samples you send in. Finally, if we discover something that's not familiar to us in the large number of arrivals to the OELCHECK lab, we will usually request a safety data sheet (and potentially a clean sample, too).

OELCHECK also answers your questions on the topics of lubricant and operating materials analyses and tribology.
Contact us by email (info@oelcheck.de) or fax +49 8034 9047-47.



OilDoc
Conference & Exhibition

May 9-11, 2023
Bavaria · Germany

Lubricants
Maintenance
Condition Monitoring

Europe's trendsetting event on the themes of lubrication, maintenance and condition monitoring will once again take place as a live, face-to-face event in Rosenheim from 9 to 11 May 2023!

Key themes



In 2021, the OilDoc Conference & Exhibition not only had to be postponed due to the pandemic, but also had to be held as a hybrid event. But in May 2023, our event will return to the big stage once more!

We look forward to many exciting presentations, stimulating discussions and personal encounters! This time round, we'll focus on the themes of lubrication, maintenance and condition monitoring. The current challenges faced in the maintenance world will have a huge role to play, as will energy efficiency and sustainability.

Petra Bots

An ambitious programme awaits you at the OilDoc Conference & Exhibition 2023: On the first two days of the English-speaking event, you will benefit from the lectures and presentations of renowned speakers, two evening events and a large accompanying exhibition. On the third day, you will have the choice of participating in practical workshops or heading out on an excursion to the Rosenheim area.

Don't miss out on the next OilDoc Conference & Exhibition!
Register before **30 November 2022** and receive an **early bird** discount!



The countdown has begun! If you would like to present at the OilDoc conference, please send us your ideas by 31 October 2022 at the latest!

The presentations are scheduled to last 20 minutes, followed by a discussion of up to 10 minutes. The conference will be held in English.

Seize the opportunity and present to an international trade audience:

- Your practical examples of success
- Groundbreaking solutions in the areas of condition monitoring, fluid management and maintenance
- Innovative products and services
- The latest trends from the world of tribology.

All the information for speakers is available on our website

Rüdiger Krethe

www.oildoc-conference.com

Successful exhibitions and successful advertising

Our event is the perfect platform to reach out to your target group directly. Whether you're an exhibitor or partnering up as a sponsor, you can certainly put yourself in the spotlight! However, we know from experience that the system stands go just as quickly as our extraordinary opportunities for effective advertising sponsorship. Please make sure you book promptly to secure your success! We'll be happy to help!

Condition Monitoring & Maintenance 4.0

Gears • Turbines and turbomachinery • Engines • Hydraulic systems • Roller and slide bearings • Special applications

Fluid Condition Monitoring

Oil, grease and anti-freeze analyses • Sampling • Assessments • Oil sensors • On-site measurements • Problem-solving and case studies • Digitalisation • Artificial intelligence

Asset & Fluid Management

Sustainability • System and lubricant management • Lubrication schedules and programs • Concepts for professional oil care • Storage, transport and handling of lubricants • Disposal • Lubrication procedures, equipment and systems

Tribology – Research in Practice

Friction and wear • Materials, surfaces and contact mechanisms • Tribometry • Hydrodynamics and EHD, minimum quantity and dry lubrication • Tribology of machine elements and assemblies

Lubricants – Current Developments

Base oils • Additives • Lubricating greases and pastes • Solid lubricants • Lubricating varnishes • Dry lubrication

Electromobility and Lubrication

Lubricants for e-mobiles • Powertrain • Bearings • Anti-freeze agents • Concepts and solutions • Energy efficiency

Lubricants – Design to Application

Engines • Landfill gas, sewage gas, biogas and wood gas engines • Gears • Hydraulic systems • Bearings • Turbines • Wind turbines • Compressors • Energy-efficient lubrication • Sustainability

Lubrication in Metal Processing

Aqueous and non-aqueous liquids • Multifunctional fluids • Minimum quantity lubrication and dry machining • Modular systems

Lubrication under Special Conditions

Environmental and health aspects • Lubricants for the food and pharmaceutical industries • Flame-retardant fluids • High- and low-temperature applications • Vacuums

Functional Fluids

Insulating oils • Heat transfer fluids • Anti-freeze agents • Anti-corrosion agents • Detergents



SEMINAR HIGHLIGHTS IN AUTUMN 2022

Current dates		
26-29/09/22	Expert knowledge for lubricant professionals CLS Certification Course (in English)	€1,390
11-12/10/22	Professional lubricant management	From €720
13/10/22	Coolant – the underestimated operating fluid	From €450
20-21/10/22	Lubrication and oil monitoring for wind turbines	From €720
25/10/22	Sustainable machine lubrication in practice	From €450
10-11/11/22	Infrared spectroscopy in practice – Understanding and interpreting IR spectra	From €720
14-17/11/22	Expert knowledge for lubricant professionals – CLS certificate course	€1,390
22-24/11/22	Lubrication and oil monitoring for hydraulics	From €1,050
28/11/22 - 1/12/22	Monitoring of machinery with oil analysis – MLA certification course	€1,390
17-18/01/23	Lubrication and oil monitoring for stationary gas engines	From €720

Your contact for further training:

OilDoc GmbH
Petra Bots, Rüdiger Krethe
Kerschelweg 29
83098 Brannenburg
Tel. +49 (0)8034 9047700
info@oildoc.de

All of the current dates, detailed seminar content and conditions of participation as well as the links to uncomplicated online registration can be found on our website:

oildoc.com/seminare

Fundamentals of lubricant application – Compact basic knowledge I

31/01/23-2/2/23: 3-day seminar

We provide you with valuable basic knowledge on the most important topics of mineral oil application technology, such as: Oil monitoring during operation • Analysis methods for new and used lubricants • Sampling and oil sample information • Base oils in comparison • Turbine oils • Compressor oils • Gas engine oils • Greases • Roller bearing lubrication

The 'Fundamentals of lubricant applications I' seminar is just as suitable for beginners as for participants who would like to expand or refresh their knowledge. It is also part of the OilDoc #Machine Lubrication Expert# certification course with a total of four units.



Infrared spectroscopy in practice – understanding & interpreting IR spectra

10-11/11/22: 2-day seminar

The infrared spectrum of a used oil sample provides information on changes in the oil or impurities compared to the spectrum of a new oil or reference oil. In addition, conclusions can be drawn about oil ageing, the base oil type and any mixtures. Infrared spectroscopy is therefore one of the most important investigations in lubricant analysis, and for good reason. At first glance, infrared spectra often look like a book with seven seals. Yet it's not that difficult to read IR spectra for oils and lubricating greases and to better understand many correlations. For the first time, our seminar gives an overview of the fundamental principles and the practice of FT-IR spectroscopy of new and old lubricants. Real-life examples deepen the newly acquired knowledge. You can use this immediately when viewing IR spectra, as shown in every OELCHECK laboratory report, for example.

Expert knowledge for lubricant professionals

Optional: Certified Lubrication Specialist (CLS) certification

A Certified Lubrication Specialist (CLS) holds the most prestigious certificate on an international level in the lubrication industry. This means the holder has extensive knowledge of lubrication-related relationships as well as in-depth knowledge of lubricant applications. As a CLS, you are in the best company of internationally recognised experts – as there are currently more than 130 Certified Lubrication Specialists in Germany alone.

It is particularly worthwhile for experienced maintenance staff and lubricant salespeople to obtain this high-level certificate and show off your knowledge. Our 'Expert knowledge for lubricant professionals' course provides the ideal preparation for gaining the certificate. Since 2016, our trainer Rüdiger Krethe has successfully prepared more than 200 international participants for their examination!

26-29/09/2022 'Expert knowledge for lubricant professionals' course (4 days) *English*
14-17/11/2022 'Expert knowledge for lubricant professionals' (4 days) *German*

Following the certification course, the official CLS examination can be taken in German or English via the STLE online examination portal.

See www.stle.org for more information.



OUR ADVANTAGES AT A GLANCE



Quality



Speed



Expertise



Experience



Customer focus



Innovation



Individuality



Independence



All-inclusive analysis kit



International

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