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INSIDER INFO – PARTNER FORUM – TECHNOLOGY FOCUS



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## Prokon wind turbines – optimum service and secure earnings



Prokon generates high earnings for its 50,000+ investors. Reliable operations and maximum efficiency for the turbines are guaranteed by the the in-house Technical Service.

**The Prokon group was founded in October 1995. Today it has over 16 years of experience in project planning, funding, implementation and commercial business management and the technical operational management of projects in the area of renewable sources of energy and the sustainable use of natural resources.**

**Over 50,000 investors now have a stake in the company's success with Prokon participation rights. Subscribed capital will soon hit one billion EURs.**

Since 2002, Prokon has been maintaining, servicing and repairing the company's wind turbines. And since 2011, its own employees have been replac-

ing and reconditioning large components, such as gearboxes and generators. In addition, maintenance and servicing operations are carried out for the six in-house substations and their transfer stations and transformer stations. Prokon is able to guarantee reliable operations and maximum efficiency for the wind turbines with the in-house Technical Service. In the long term, this should mean higher earnings for the investors.

The company runs 47 wind farms with 289 wind turbines, of which 38 wind farms and 266 turbines are in six German states with the other nine wind farms and 23 turbines in Poland. From 1995 until spring of 2012, installed output was 479 MW producing a total of approximately five billion kWh. More turbines are either being planned or are currently being constructed.

Once a wind turbine has been brought into service, Prokon takes over the technical operational management. This includes: monitoring of the turbine's condition including data remote monitoring, communication with the turbine manufacturer, inspection and tracking of the turbine manufacturer's work, progress review for routine checks, execution or commissioning of safety-related checks (building cradle, crane, ladder, fire extinguisher, etc.), analysis of error frequency, performance charac-

# Check-up

The world of OELCHECK is truly international. Alone in our team in Brannenburg, in addition to our German employees, we have people from Bosnia, Kazakhstan, Kenya, Austria, Poland and Russia. In the autumn of this year, new colleagues from China will be visiting for training. The OELCHECK world is wonderfully huge and colourful with lots of fascinating characters. In our daily dealings with each other, we learn about lots of new customs, practices and attitudes towards life. That means that we have no preconceptions about people and are an open and curious team. We all benefit personally from our approach and can learn a lot of things that enrich our lives and broaden our horizons. Although we may all have a different ancestry, what matters is that we are all striving for the same goal: to deliver the highest level of service for all our customers, irrespective of where they are based.



Agility, flexibility and, above all, an enjoyment of working with other people are what's needed when we welcome visitors from other countries or take part in trade fairs and working groups in the USA, Russia, China or elsewhere. We are particularly excited about 22 January 2013 because that's the day that the second OilDoc Conference and Exhibition in Rosenheim will be opening its doors! In 2011 we had over 400 participants from 24 countries. We are looking forward to welcoming the many visitors, speakers and exhibitors from all over the world who will be giving top-class presentations and exchanging information with everyone there!

Yours, Barbara Weismann

teristics and technical availability, commissioning or drawing-up of expert reports as well as inspection of expert report processing.

At the end of the guarantee period, the repair work (maintenance and servicing) is also undertaken by Prokon. That's why service points with materials stores have been built in Schleswig-Holstein, Brandenburg, Saxony-Anhalt and Rheinland-Pfalz to ensure fast reaction times and high-tech availability. In total there are 21 service teams available for maintenance and service work including large component replacement and repair work on the wind turbines.

Prokon offers a gear and hydraulic oil change service for wind turbines all across Germany. A special oil change vehicle can deliver up to four different oils by type per application. Therefore the company can also carry out the oil service on its own wind turbines. Oil changes are carried out according to manufacturer specifications or depending on the condition of the oil based on oil analyses.

Multipurpose HVLP 32 hydraulic fluids are used in the wind turbines. By choosing them, Prokon is complying with component manufacturers' specifications and preferred suppliers lists, individual system requirements as well as operating conditions and is placing importance on high quality. Hydraulic oil fills depend on turbine designs and range from 15 to 315 litres. The hydraulics system, for example, optimises rotor blade performance, tracks the wind, brakes the drive train and even keeps the nacelle

in position in the event of crosswinds. Therefore not only are safety aspects fulfilled but also the energy output from the wind and hence the efficiency of a turbine can be controlled. In the event of particularly strong winds, there can sometimes be very high loads applied to the hydraulic oil. Above all, its viscosity must remain stable over a broad temperate application range and when faced with changing pressure loads of over 300 bar. HVLP hydraulic oils stand out due to a high viscosity index of over 180. Economically priced oils can also reach such a high VI with multipurpose additives. However, these are often not shear-stable. Their VI can drastically fall, for example, from 200 to 120 after just 50 hours of service. In turn, the viscosity falls from approx. 32 mm<sup>2</sup>/s to less than 25 mm<sup>2</sup>/s at

40°C which means that the oil becomes far too thin. The consequences for the hydraulics system can be serious. If the number of internal leaks is too high, for example, the oil can no longer delivery sufficient braking force. Due to adjusting mechanisms that have become inaccurate, the whole turbine ceases to work efficiently. Such lower-quality hydraulic oils are definitely not designed for wind turbines.

Prokon errs on the side of caution and intentionally uses only high-quality HVLP 32 hydraulic oils with multipurpose characteristics, because they:

- are very fluid, even at very low temperatures below -25°C
- contain shear-stable viscosity index improvers
- ensure maximum efficiency at operating temperatures of over 60°C and operating pressures of over 350 bar.

Besides hydraulic oils and gear oils, main bearing lubricating greases are also regularly checked by Prokon and their relubrication intervals are optimised.

If the operating parameters are no longer right, a problem which can manifest itself as unusual changes in the lubricants, there can be serious financial consequences. Therefore, since 2000, the company has been using OELCHECK lubricant analyses in order to find out about any damage to the components and changes in the lubricants' characteristics early as part of its monitoring operations. This way, the lubricants can be changed according to the condition that they are in and costs can be reduced. Monitoring hydraulic fluids is also not the only area where OELCHECK lubricant analyses have repeatedly excelled. Together with vibration measurements, they form an important element of condition monitoring for gearboxes. If there are noticeable signs of wear in the oil test and therefore damage to a gearbox's bearing or gearing, Prokon can immediately carry out a gearbox endoscopy. Over the last few years, thanks to OELCHECK lubricant analyses, a few wear problems have been discovered early. Prokon was able to plan the repair work properly and considerably minimise the financial burden.



Prokon currently operates 47 wind farms with 289 wind turbines. More turbines are at the planning stage.

## OELCHECK laboratory in the “workbench of the world” domain



We couldn't have picked a better location for our new laboratory in China. Guangzhou, the old canton, right next to Hong Kong in the south-east of the People's Republic of China, is the capital of the Guangdong province. This is where the industrialisation of China began back in the late seventies. After Beijing and Shanghai, this is still where the country's strongest economic growth is. Over 150 million people live and work in an area spanning 200 km. So many industrial companies are based in the region that the Guangdong province has also become known as the “extended workbench of the world”. This city, which is rich in tradition, plays host to China's largest trade fairs every spring and autumn. It takes just one and a half hours to get to Guangzhou and our new laboratory from any of the three international airports, Hong Kong, Shenzhen and Guangzhou. The official opening is expected to take place just before the Chinese New Year celebrations in January 2013.

We have acquired a large part of the third floor, covering approx. 550 square metres, in one of the two 38-storey towers of the Tian'an Headquarter Economic Center. Preparations for the installation of the new laboratory are already well underway. It's just the company registration that is not as straightforward as in Europe. But it should all be finished within three months. In the meantime, we are installing and linking up all the laboratory equipment in the OELCHECK headquarters in Brannenburg.

Extensive test runs to train the Chinese laboratory technicians have been scheduled to ensure that everything works just as it does in the main laboratory in Germany. In addition, all devices and processes will be integrated into our Laboratory Information and Management System. In terms of quality assurance, this is an absolute must. When the laboratory equipment has arrived in China and has been installed and tested on-site again by our German colleagues, we will get the official ISO 9001 and ISO 14001 certifications and the ISO/IEC 17025 accreditation, fulfilling the general expertise requirements for test and calibration laboratories. We also plan to be certified by CNAS, the China National Accreditation Service for Conformity Assessment.

This year, our Chinese colleagues are taking extensive training at the OELCHECK laboratory in Brannenburg. They will be getting to grips with the equipment that will be in their new laboratory and the work processes. Laboratory manager William Wang Wei Dong, who studied in Wuhan, has a bachelor's degree in Lubricants and Tribology. He has extensive industry knowledge and has already set up a lubricants analysis laboratory in China which he ran successfully for several years. Andrew Zeng An, who graduated from Hunan University as a mechanical engineer, will be in charge of marketing. He has worked for several years in a laboratory for used oil analysis and, amongst other functions, commented on analysis results. With his extensive technical know-how, he'll not only be able to tap new potential business areas but he'll also be qualified to answer queries. These two gentlemen will be supported by laboratory technicians and technical secretaries.



**It was high time for an OELCHECK laboratory in China!**

**NEW**

New machines are being imported from Germany. More and more European companies are setting up branches in China. Of the 5,000 German companies with subsidiary companies in China, over 2,000 are already OELCHECK customers. In addition to the usual questions, they and many other industrial companies want to know whether, for instance, the lubricants available in China are as good as those recommended in Germany. To date, there has been no comparable service available in the Far East. Indeed, there are a few laboratories which ascertain selected oil values, but such extensive tests, useful laboratory reports and comments on lubricants and their continued use, such as those provided by OELCHECK, are simply not available. However, at the same time, more and more Chinese companies are taking a proactive approach to maintenance. Hence, over the last few years, we have been receiving an increasing number of requests for lubricants analyses from Asia. However, transporting the specimens all the way to Brannenburg takes too long and is too expensive. So now we will be able to accommodate the needs of our clients.

When the OELCHECK laboratory in Guangzhou starts operations in 2013, all lubricant samples will be tested with the same devices and to the same standards as in Brannenburg. The established values will be immediately sent to our diagnosis engineers in Germany by data line. They will interpret the results individually and as a whole, taking machine and oil type, operational conditions and previous analyses into account. Customers will receive their laboratory reports in Chinese within 48 hours. All individual laboratory reports and sample data are available for our customers worldwide at any time on our online platform at [www.laborberichte.com](http://www.laborberichte.com).

## The rappers from the OELCHECK alpine pastures

This time, our team event took us to the Hohenegg Alps in the Allgäu. On Friday 27 July, early in the morning we went to Oberstaufen. From there we took the train up the mountain and, after a short walk, reached our destination. After a delicious lunch, we completed the orienteering adventure course, in glorious weather, with its many challenges such as archery, a milking competition and team standing see-saw. In between all of that, each of our six teams prepared for their evening performances as rapper groups. When we got started with the BBQ in the evening by the huge campfire, the atmosphere was just perfect! We

transformed into the OELCHECK alpine rappers and could have stayed up all night until the following day!

However, on Saturday, the next highlight awaited us. From the station at the bottom of the mountain railway we travelled to a rafting area. Equipped with neoprene suits, life jackets, helmets and paddles, we courageously launched our rafts down the river Iller. It may have been raining on and off but we didn't let that bother us as we were on a treasure hunt! We were eventually rewarded two-fold for our efforts. We found the treasure, a case full of Becks beer, and the sun was shining



once again. Finally, we reenergised ourselves with some coffee and cake and travelled home after two fun-filled days!



# Optimised technology and perfect service for gas engines – Storm August

**August Storm GmbH & Co. KG offers the perfect service for all gas engines which are run on natural gas, biogas or special gases from landfills, pits or wastewater treatment plants.**

The success story of the family-owned company which is headquartered in Spelle in south Emsland began in 1937. What was once a cylinder and crankshaft grinding shop is today one of the largest service providers for combustion engines which works independently of engine manufacturers. The company has over 300 employees. They maintain all types of popular engines within an output range of 100 to 7,000 kWh from stationary energy systems, ships, construction machinery, rolling stock, special-purpose vehicles and industrial plants. In addition, they repair engines, all engine parts, crankshafts, engine blocks, main bearing bores, pumps and gears. The company manages to provide a comprehensive service using their own employees through two branches and 10 support bases. In 2012, a subsidiary company was set up in the Netherlands to serve customers quickly and reliably there as well.

Gas engine operators are only too familiar with the particular challenges that they can face and really value the support they get from the experts at August Storm GmbH & Co. KG. From oil changes to major overhauls, the scope of servicing and repair works is designed in accordance with each partner's requirements and the situation at hand. The range of services also covers engine replacements and the optimisation of engines, installations and control systems. As a precaution there is always a wide selection of different replacement engines and parts in stock in order to minimise downtime. The maintenance of gas engines in the sense of preventive maintenance is one of the core competences of August Storm GmbH & Co. KG. The operating company just has to decide whether the scheduled maintenance work should be carried out in accordance with the OEM's specifications or in accordance with the situation at hand.

For some of the larger CHP plants, August Storm GmbH & Co. KG has installed an online monitoring system and can, if necessary, react extremely quickly. One of the most important elements of condition monitoring is, and has always been, lubricant analytics. Oil samples are regularly taken from all the gas engines that it maintains and sent to the OELCHECK laboratory for testing. If, in exceptional cases, the samples are taken by the operating

company itself and analysed by its oil suppliers, the experts from Spelle offer to check the results as a precaution and advise on measures to be taken based on the analysis results and engine history. Thanks to its longstanding relationship with OELCHECK, August Storm GmbH & Co. KG now has its own database with the results of over 1,500 oil analyses. These are used as reference analyses. This way, the company can offer its customers an even more comprehensive service and the best advice possible when it comes to engine oils and their service lives.

The main aim of the analyses is to ensure that the oil is changed only when it needs to be so that the engine oil is used as extensively as possible. Often a stable trend emerges from just a few analyses which means that subsequent analyses are mainly for monitoring purposes and for detecting any changes in the engine's operating behaviour early. What is important is that the overall picture in an analysis is consistent. If, however, in the case of a particular type of oil just one single warning value shows a strong level of acidification in the lubricant and therefore prompts an early engine oil change, the engine oil's acid neutralisation capacity will be questioned. If there is a better suited oil for the type of gas, the type of engine and the operating conditions, then a change will be recommended.

When choosing an engine oil and assessing analysis results during operating time, the following should be considered:

- With gas engines, regardless of whether they operate with natural gas, biogas or special gases, there are always high combustion final temperatures.
- In addition, gas engines for power generation work in continuous operation at full load.
- To increase operational reliability, gas engine oils have to prevent deposits, wear and corrosion.
- In the case of biogas and special gases, the quality of the gas can vary substantially and wear from hydrogen sulphide, impurities and moisture can develop.

In the case of natural gas, contamination from acidic components is lower compared to special gases such as biogas, sewage gas or landfill gas. However, over the last few years, it has become increasingly more common for proportions of various special gases to be mixed in with natural gas when delivered for operations to large CHP plants.



August Storm GmbH & Co. KG is one of the largest service providers for combustion engines

These acidic components put considerable strain on engines and oils. If a gas engine oil cannot or can no longer compensate for and neutralise these proportions, natural gas engines, which were able to operate perfectly under clean natural gas operations, can also be heavily affected.

Although some engine manufacturers do not make it a requirement for natural gas, August Storm GmbH & Co. KG take note of the AN (Acid Number or Neutralisation Number), the BN (Base Number) and the initial pH in OELCHECK's laboratory test results for oils from natural gas engines which have become contaminated with acidic components due to mixing with special gases.

The AN is a measure of the degree of oil acidification. The BN indicates the content of alkaline additives in the oil. It is a significant criterion for determining how many acidic components can still be neutralised and rendered harmless by the oil. Accordingly, the BN should always be higher than the AN.

If an engine oil is loaded with very strong acids, in its laboratory report OELCHECK will also point out the SAN (Strong Acid Number) if it can be measured. In gas engines which operate on biogas or very variable gas qualities, the initial pH provides additional information on the degree of acidification in the gas engine oil.

**Conclusion:** with the help of OELCHECK analyses, August Storm GmbH & Co. KG has been consistently able to optimise engine oil change intervals and, in doing so, reduce operating costs. By monitoring the trend in the analyses, system faults have often been spotted early so that action could be taken to prevent more serious problems from occurring. And if an engine does suffer some damage, OELCHECK analyses are an important tool for detecting and clarifying the cause.



# Viscosity –

## the single most important physical characteristic of any oil

**Viscosity is the most important physical characteristic of an oil. It plays the decisive role in the choice of accompanying lubricant as it describes its fluid characteristics. It is also dependent on temperature and can be influenced by special additives. Since it can change when an oil is being used, it is one of the most fascinating and extensive topics in lubricant analytics. OELCHECK principally assesses viscosity in oil samples at 40°C and 100°C and calculates the viscosity index from this. Several modern devices have been installed in the laboratory just for determining viscosity alone.**

Viscosity nowadays means a measurement of the flowability of a lubricating oil or hydraulic fluid. The higher the viscosity, the thicker the oil. And the lower the viscosity, the thinner the oil. Thin lubricating oils are mostly deemed to have low viscosity and thick lubricating oils are deemed to have high viscosity.

But viscosity isn't just measured for lubricating oils or paints and adhesives. Nearly all physical media and foodstuffs have a specific viscosity. The concept takes its name from the typically gooey sap that comes from mistletoe berries (viscum). Glue used to be extracted from the mistletoe for catching birds. "Viscous" therefore originally meant "sticky like birdlime". The viscosity of this paste was, however, altered in Roman times, for example with honey. Whether thin or thick, the viscosity of a modern lubricant is accurately adjusted nowadays to suit its intended use.

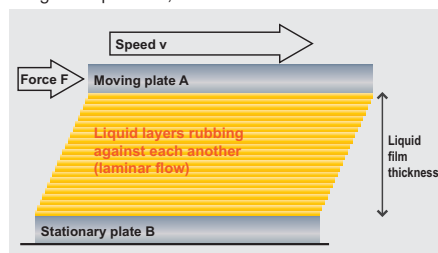
### Viscosity itself is not a characteristic of quality.

A viscosity reading simply tells you how thick or thin an oil is. At the same time, however, it is the most decisive key figure for describing an oil's capability to build a separating lubricating film between two moving parts. When a machine is started, the oil must not be too viscous because otherwise it will not reach the areas that need to be lubricated in time. Conversely, if it is too thin at the operating temperature, it will not be able to guarantee a sufficient lubricating film to protect it from wear. If an oil is used as a hydraulic fluid, it must in turn demonstrate particular fluid behaviours in order to enable the desired power transmission.

If the wrong viscosity is chosen, the catastrophic consequences can be more drastic and occur faster than if the wrong type of oil is used. If, for example, an ISO VG 320 oil is used in a screw compressor which should be supplied with an ISO VG 32 oil, usually the damage will occur after just a few minutes. If the compressor is lubricated using the wrong type of oil, such as an HLP 32 hydraulic oil, then problems will only become apparent after a few thousand hours.

### Viscosity: dynamic and kinematic

In physical terms, viscosity reflects the internal friction which ensues when neighbouring liquid layers are displaced. In highly viscous oils, these layers are bound together much more strongly and are therefore less moveable. In the case of dynamic or "true" viscosity, flow resistance within a liquid is measured. It is provided in data sheets or laboratory reports in mPas (millipascal-seconds) or cP (centipoise). For calculations, the uniform SI unit kg/m\*s is used. The idea for the model is that the force exerted to displace a liquid, which is located between two plates arranged in parallel, is measured.



Top plate A, which rests on the liquid film, is moved with force F at a constant speed v parallel to the base plate. The liquid film, which is directly under the moving plate, sticks to it completely. Due to internal friction in the liquid, layers which are further away are displaced a bit further in the direction of movement. However, this displacement decreases in the direction of the "base plate" with each layer. In turn, the very bottom layer remains motionless as the film, stuck to the base plate. The model diagram shows the displaced positions of the layers at the end of the test. The following formula, which is dependent on the number of liquid layers (h), applies for dynamic viscosity:

Dynamic viscosity =  
shear stress (force F / moving plate A) / shear rate  
(speed v / liquid film thickness h).

Dynamic viscosity often used to be determined using falling ball viscometers. Nowadays, rotational viscometers are also used whereby an object is rotated in the oil of a liquid by a motor or a solenoid.

This measures the required torque. From that and also from the exact geometry of the rotational object used and the external geometry, the viscosity can be calculated based on the rotational speed.

### Kinematic viscosity

Since it takes a high level of metrological effort to calculate dynamic viscosity, the practical kinematic viscosity calculation method was established.

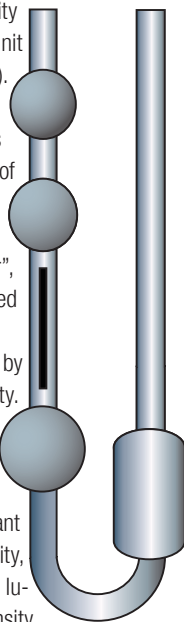
This describes the "viscosity-density ratio" and is expressed using the SI unit mm<sup>2</sup>/s or often the "centistoke" (cSt). The principle of measuring kinematic viscosity is based on the time it takes an oil to flow through a defined route of a capillary at a certain temperature using gravity. With the help of the capillary constant of the "viscometer", kinematic viscosity is calculated based on the flow time.

Kinematic viscosity is calculated by dividing dynamic viscosity by density. Dynamic viscosity is calculated by multiplying kinematic viscosity by density.

With these calculations, it is important to note that, prior to this, the density, which is usually indicated at 15°C for lubricants, must be converted for a density at 40°C or 100°C or the operating temperature (xx) according to the formula  
 $d_{xx} = d_{15} - (xx - 15) \cdot 0.00067$ .

### Viscosity changes

Unlike water, which has almost the same flowability between 0°C and 100°C, the viscosity of oil varies hugely according to temperature. In addition, operating pressure or factors, such as oxidation or impurities, also influence viscosity. Unfortunately, it gets even more complicated, because the flowability of an oil does not change uniformly, i.e. linearly, with temperature.



## Viscosity-temperature behaviour

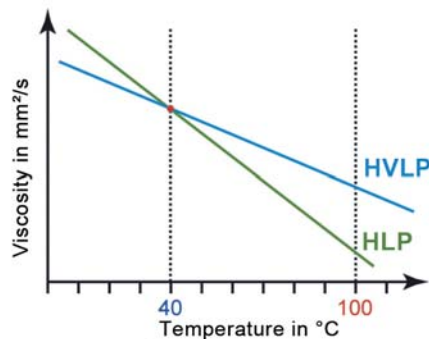
When the temperature drops, an oil will always become thicker, i.e. will have a higher viscosity. When the solidifying point is eventually reached, the oil will become so thick that it can no longer move at all. On the other hand, when the temperature increases, the viscosity drops considerably. The oil can become extremely thin. These temperature-dependent changes must be taken into account when choosing a lubricant. Particular care needs to be taken since viscosity-temperature behaviour depends on the type of oil. Even oils with the same viscosity at, for example, 40°C can behave totally differently at 0°C or 100°C.

A temperature-dependent viscosity change will not be linear but can be calculated "double logarithmically". Temperature differences of, for example, 10°C do not lead to identical number jumps in viscosity changes. The viscosity index (VI), which is calculated with the aid of kinematic viscosity measured at 40°C and 100°C, is used to describe an oil's viscosity-temperature behaviour. This parameter allows the viscosity behaviour of various oils to be better compared based on temperature. The calculation method described in ISO 2909 was developed approximately 60 years ago. In terms of the viscosity index, the worst mineral oils known at the time were awarded a VI of 0, and the mineral oils with the best viscosity-temperature behaviour were awarded a VI of 100. At the time, there were no synthetic or multigrade oils. Nowadays, viscosity can be influenced by so-called VI improvers or synthetic oils to such an extent that the viscosity index now extends far beyond 100. The following standard values illustrate how high the viscosity index can be taken by modern oils:

Oil or fluid type	Viscosity Index
Mineral oil	~ 95 - 105
Multigrade oil	~ 140 - 200
PAO oil	~ 135 - 160
Ester	~ 140 - 190
Vegetable oil	~ 195 - 210
Glycol	~ 200 - 220
Silicone oil	~ 205 - 400

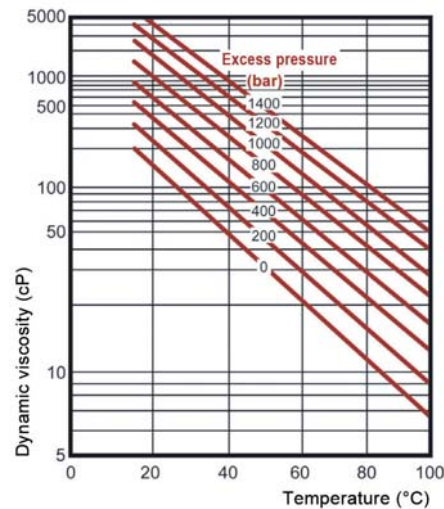
A simple and widely-used method for visualising viscosity-temperature behaviour is the viscosity-temperature diagram (VT diagram) according to Ubbelohde/Walther. Using the mathematical conversion (double logarithmical calculation), VT behaviour can be approximated to such a degree using a straight line through two points (usually at 40°C and 100°C), that viscosity at all other temperatures can be read from the diagram. Different fields of application can be illustrated using the VT diagram. HLVP oil with a higher

viscosity index can, for example, cover a broader temperature range.



## Viscosity-pressure behaviour

Oils also become thicker with increased pressure. Viscosity-pressure behaviour is also a lubricant-specific parameter which can however, for the most part, be neglected since, at pressures below 400 bar, it is virtually insignificant. The change in viscosity due to an increase in pressure of 100 bar is disproportionately less than that due to an increase in temperature of 10°C. Designers of high-performance hydraulic systems and components always consider the influence that pressure has on viscosity whilst also allowing for the temperature influence which occurs simultaneously.



Amongst other things, lubricants are tasked with protecting the surfaces of pairs of moving parts against wear by building a resilient lubricating film. There is the positive effect that, with traditional lubricating oils, the viscosity in the lubricating film is increased to such an extent on account of the prevailing pressure on it that the surfaces are kept apart.

In metrological terms, the viscosity of a lubricating oil, which has been changed on account of high pressure, is very difficult to determine. Only a handful of institutes, such as the RWTH in Aachen, can also actually carry out such measurements.

## Viscosity changes in oil applications

With regards to oil changes, the most important parameter in used oil analyses is the consideration of viscosity changes. The viscosity of an oil can change for reasons other than just temperature and pressure. If the viscosity of a sample differs from the initial values of the fresh oil or the reference of the previous analysis, the causes may be as follows:

### ■ Increase in viscosity

- During operations, the oil has absorbed oxygen on account of the temperature and has therefore been oxidised.
- Oxidation inhibitors, ageing-delaying additives have decomposed.
- Ageing and oxidation products, such as acids and oil-insoluble components have formed.
- Varnish-like deposits, such as resin and sludge, have built up.
- Soot, dust, water or residues from alternative fuels are contaminating the oil.
- The wrong oil was used or refilled.

### ■ Decrease in viscosity

- VI improvers, additives for improving the viscosity index, were not shear-stable and have decomposed.
- Unburned fuel (poor combustion) has diluted the oil.
- An oil which was too thin or the wrong type of oil was used or refilled.
- The system was cleaned with a thin flushing oil prior to being filled. Flushing oil residues have got mixed in.

## Viscosity classes or groups

Almost every oil denomination has a number, the so-called viscosity class for automotive oils or viscosity group for industrial oils. The groupings are a big help when it comes to choosing the viscosity for the "right-fit" oil. Just like a shoe size, a viscosity class simply represents a "value that fits". Just like when you're buying shoes and you have to make it clear what you need them for, for example walking, dancing, running, etc., when you're considering lubricants you have to know what machine they will be used in and what operating conditions they will be exposed to.

The SAE classes for engine oils, defined by the American Society of Automotive Engineers, were introduced back in 1911 practically all around the globe.

Prior to 1950, in Germany, industrial lubricants were distinguished from each other on the basis of their flowability at 50°C according to Engler degrees. By defining the ISO VG viscosity groups, in 1975 the International Standards Organization (ISO), together with other leading institutions, came up with a helpful tool for selecting industrial lubricants based on kinetic



viscosity at 40°C (instead of 50°C in Europe or 100°F in USA).

A comparison of viscosities according to ISO VG (at 40°C) and SAE (at 100°C or for winter oils in the bottom temperature range) is limited since the thresholds of viscosity classes are not congruent. It is particularly difficult in the case of multigrade oils.

### ISO viscosity groups for industrial oils

The system covers 18 viscosity ranges. In accordance with DIN 51 519, the minimum and maximum kinematic viscosity for each class is defined in mm<sup>2</sup>/s at 40°C. The thresholds for each class account for a ± 10% deviation from the midpoint viscosity. No VI or second viscosity is provided. Therefore, the ISO VG cannot make any claims about viscosity-temperature behaviour. With the exception of multigrade hydraulic oils, specified in DIN 51524-3, the multigrade characteristic is of secondary importance in the field of industry not least because industrial machines are operated at a constant temperature.

ISO VG	Midpoint viscosity mm <sup>2</sup> /s 40°C	Kin. viscosity min. mm <sup>2</sup> /s 40°C	Kin. viscosity max. mm <sup>2</sup> /s 40°C
2	2.2	1.98	2.42
3	3.2	2.88	6.52
5	4.6	4.14	5.06
7	6.8	6.12	7.48
10	10	9.00	11.0
15	15	13.5	16.5
22	22	19.8	24.2
32	32	28.8	35.2
46	46	41.4	50.6
68	68	61.2	74.8
100	100	90.0	110
150	150	135	165
220	220	198	242
320	320	288	352
460	460	414	506
680	680	612	748
1,000	1,000	900	1,100
1,500	1,500	1,350	1,650

### SAE classes for automotive oils

Previously, engine oils were changed according to the time of year. In accordance with SAE J-300/DIN 51511, oils for the automotive industry still have a W in their name if they are designed for use at low temperatures.

Thanks to appropriate base oils and the addition of modern viscosity index improvers, multigrade oils such as 5W-30 meet the viscosity class criteria of a W-oil (with the required low-temperature viscosity) as well as a high-temperature requirement (with an indication of minimum viscosity at 100°C).

SAE	Kin. viscosity min. mm <sup>2</sup> /s 100°C	Kin. viscosity max. mm <sup>2</sup> /s 100°C
0W	3.8	-
5W	3.8	-
10W	4.1	-
15W	5.6	-
20W	5.6	-
25W	9.3	-
20	5.6	<9.3
30	9.3	<12.5
40	12.5	<16.3
40	12.5	<16.3
50	16.3	<21.9
60	21.9	26.1

Automotive gear oils were grouped by the organisation SAE according to the same system as automotive engine oils. It can, however, be misleading if the same column of figures has an extremely viscous SAE 60 engine oil and then extremely thin SAE 75W or 80W gear oils, in accordance with SAE J-306/DIN 51512. The classification for gear oils with their particularly high numerical values cannot therefore be seen as a simple continuation of the engine oil classification. An SAE 80 gear oil is also not twice as "thick" as an SAE 40 engine oil. However, gear oils that are suitable for use at low temperatures are also denoted with a W.

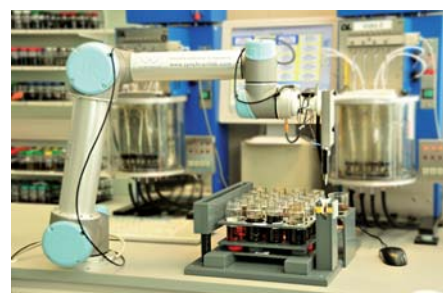
The table for gear oils wasn't updated until the end of 2005 with classes SAE 110 and SAE 190. It became necessary to do so on account of the broad viscosity range of the "old" SAE 90 (18.5 cSt up to <24 cSt at 100° C) and the old SAE 140 (24 cSt up to < 41 cSt at 100° C). The range meant that the actual viscosity of the different oils could deviate heavily although the oils were grouped in the same SAE class. The new, more tightly defined, viscosity classes SAE 110 and 190 increase the accuracy of viscosity specifications for gear manufacturers.

SAE	Kin. viscosity min. mm <sup>2</sup> /s 100°C	Kin. viscosity max. mm <sup>2</sup> /s 100°C
70W	4.1	-
75W	4.1	-
80W	7.0	-
85W	11.0	-
80	7.0	<11.0
85	11.0	<13.5
90	13.5	<18.5
110	18.5	<24.0
140	24.0	<32.5
190	32.5	<41.0
250	0	-

### Viscosity and the VI in the OELCHECK laboratory

The determining of kinematic viscosity at 40°C and 100°C as well as the resulting standardised VI calculation are fixed components of the scope of analysis for each and every OELCHECK analysis set. In contrast to many other service laboratories, as a matter of course, we take measurements at both of these two temperatures. This is because

the change in viscosity value can only be assessed in context through a change in the viscosity index. Our laboratory operates six baths (3 x 40°C and 3 x 100°C), each with 4 capillaries, in order to regularly measure kinematic viscosity. These ISL Houillon viscometers have been retrofitted with synchronous robots. They take exact doses of less than 1 ml of oil per capillary and do this for over 1,000 samples a day.



We normally determine dynamic viscosity only in exceptional cases. If an oil is so heavily contaminated that we suspect that the capillaries with diameters of approx. 0.1 mm are clogged, we use a Nametre Viscoliner 1710 to investigate dynamic viscosity at room temperature and at approx. 70°C and with the help of the temperature-corrected density we calculate kinematic viscosity at 40°C and 100°C. That way, it is possible to observe a trend even in heavily contaminated liquids.

However, a designer sometimes needs more than just the viscosity-temperature curve for an oil, as displayed in a graph. In order to design bearings, lubrication holes, pump pressures or tooth widths, for example, they often need the actual dynamic viscosity at precisely defined upper and lower threshold temperatures. With the Anton Paar Rheometer Physica MCR 301 we therefore create a precise viscosity-temperature profile for the lubricant and measure its viscosity at intervals of 10°C within the temperature range of -30°C to +110°C.

#### Please note:

- Even if viscosity is not a direct characteristic of quality, it represents one of the most important key figures of an oil.
- For every oil sample, OELCHECK assesses viscosity at 40°C and 100°C and calculates the viscosity index from that. That's the only way that conclusions can be drawn on the causes of viscosity changes with sufficient accuracy.
- OELCHECK laboratory investigations can ascertain whether:
  - an oil with the prescribed viscosity was actually used.
  - it is a synthetic, mineral, single-grade or multigrade oil.
  - a viscosity change has taken place, which was caused, for example, by: oils being blended, contamination, decomposition of viscosity index improvers, dilution due to unburned fuel, oil ageing and a viscosity increase often associated with that.
- If the viscosity deviates too heavily from the value of the fresh oil or the previous sample, we urgently recommend carrying out an oil change. Depending on the oil type, what the oil is used for and its operating time, our warning values for viscosity changes are between 5% and 15%, but are even lower in the case of some sensitive applications (turbine lubrication and oil circulation systems).



# Öl Checker

**ÖlChecker – a magazine from OELCHECK GmbH**

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## QUESTION TIME:

**We have been using OELCHECK lubricant analyses for several years now and couldn't manage without them. But why do you not indicate any "limit values" in your laboratory reports, in particular for wear metals? You only give the values for the current sample and previous investigations. If limit values were also provided, we could draw conclusions on the condition of the oil or the machine even faster ourselves and with greater accuracy.**

### OELCHECK:

The suggestion to provide the limit, threshold and warning values for wear metals or even for lubricant additives was a hot topic in our last customer survey. But unfortunately we cannot grant this wish as limit values, which are independent of time, do not reflect application-specific scenarios. In conclusion, every machine, with its own operational conditions, needs to be considered on an individual basis. For this, not only do we have to take into account the machine type, the actual lubricant used, its maintenance and the amount to be filled – above all its operating time as well as environmental conditions influence threshold limit consideration. In the case of complex systems, this is often even more complicated. This is because some manufacturers purchase components from alternate suppliers which may have the same features but are made from different materials. Also, if partial-flow filters have been installed, large amounts of oil have been refilled or additives have been added retrospectively, fixed limit values are no longer helpful.

Limit values with corresponding limitations are published only in a handful of cases by machine and engine manufacturers. Therefore, with the help of our own database, which

contains over two million samples, we decided to make the complex topic more transparent for our diagnosis engineers. Meanwhile, for assessing the examined samples, we use internal wear threshold values for over 150,000 different machines. In the event of a deviation or change in a single component of a device, we create a new database. For this specific machine type, however, we won't have threshold values until we have conducted at least 50 analyses for the same or a similar type of machine.

Because even though such detailed knowledge on limits for wear metals may be available, it is not sufficient for assessing an actual sample. This is where our know-how comes into play because all values must also be considered together as a whole. A diagnosis that is based solely on comparing laboratory data that has just been established with limit values can quickly become misleading. Values will look different if they are assessed after 20, 200, 2,000 or 20,000 hours. In order to rule out the time-related risk, for example, we do not publish threshold values as a matter of principle.

How complex the contexts can be overall is illustrated in the following examples:

- Not all elements and metals detected in a sample necessarily suggest wear. Some (e.g. copper) can also be additives that are found in lubricants. First of all, a comparison of the used oil values with the additives from the fresh oil, together with the IR spectrum, gives an indication of additive decomposition. Perhaps just a single active component from the whole additive package changed by forming a new type of bond with wear particles.
- It is essential that even the threshold limits typical for impurities for silicon and water are examined. For example, if silicon is detected in the oil, it usually means that the oil has been contaminated with dust. Silicone is also

specifically added as an anti-foaming additive to almost all oils. In new or overhauled engines, silicon can be a component of silicone-containing assembly pastes or sealants. Additionally, it is an alloy component of aluminium and therefore possibly a wear element in full-aluminium engines. How can a threshold value, which needs to be generally applicable, be created as a benchmark here if all these possible contexts are not taken into account?

- Too much water in the oil can, for example, promote corrosion, cavitation or oil oxidation. Even mineral-oil-based fresh oil has 50 to 500 ppm water, depending on oil type or production plant to various extents and with varying relative humidity. Depending on their intended purpose, oils also deliberately possess demulsifying or emulsifying characteristics. The level at which water content becomes risky depends on the oil type, its performance requirements and its operating time.

Limit values, which you may get from the OEM or lubricant manufacturer, are only useful to a certain degree in our diagnoses. If at all, they display the values from different perspectives. What is most important to the manufacturer in this case is the warranty, for the oil manufacturer it's the oil service life that's important, and a lubricant laboratory like OELCHECK mainly considers the values from a condition monitoring perspective. Warning and threshold limits also play a role but you achieve a consistently positive effect, primarily, with our trend analyses. If we analyse an oil, which is used in a machine, on a regular basis and over a long period of time, we can quickly and accurately detect the tiniest of deviations and specifically warn you before any dangerous levels are exceeded.

**OELCHECK will also answer your questions on tribology and lubricant analyses.  
Send us your questions by e-mail (info@oelcheck.de) or by fax (+49 8034/9047-47).**



**HUSUM  
WindEnergy**

Meet us in hall 7A  
Booth 7A03.

18 – 22 Sept. 2012  
Husum, Germany



**maintain**

Meet us in  
Hall 2, booth 514.

16.-18. October 2012  
M,O,C, München



**BioEnergy** Decentral

Weltweiter Treffpunkt für dezentrale Energieversorgung

Meet us in Hall 22, booth F21.

**Hannover**  
13. - 16. November 2012





# OilDoc

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## Dr Lutz Lindemann Keynote speaker at the OilDoc Conference and Exhibition



**Our keynote speaker at the OilDoc Conference and Exhibition 2013 will be Dr Lutz Lindemann, member of the board for FUCHS PETROLUB AG. The title of his opening speech at our conference will be: "Lubricant development in the context of new raw materials".**

Dr Lindemann has thereby chosen a very hot topic. Tailor-made new fully synthetic base oils and sophisticated active agent combinations are



## OilDoc Conference & Exhibition

**Lubricants  
Maintenance  
Tribology**

opening up a plethora of new prospects in the targeted development of lubricants. However, contexts and interactions are extremely complex. A lubricant with a high concentration of additives is more than just an agent between two moving parts – it's an important design element. A lot of machine and engine technology used today can be used only with a specially formulated lubricant. One such example is engine oils which have been developed for use in modern vehicle engines. Catalytic converters and soot particle filters used in such engines are able to meet the ever more demanding emission standards only by using Low SAPS engine oils.

Dr Lutz Lindemann is a graduate chemist and a leading figure in the international mineral oil industry. His career began in 1988 at Mobil Oil AG, in Hamburg. In 1995 he became a senior advisor/project manager at Berger & Partner in Stuttgart, and then from 1996 to 1998 was a product manager at DEA Mineralöl AG, in Hamburg. From 1998 to 2008 Dr Lutz Lindemann was a member of the group management team for FUCHS PETROLUB AG with regional responsibility for Germany, Eastern Europe (incl. Russia) and Scandinavia and was also chairman of the executive board of FUCHS EUROPE SCHMIERSTOFFE GmbH, in Mannheim, the largest subsidiary company of FUCHS PETROLUB AG. Since January 2009 Dr Lutz Lindemann has been a member of the board for FUCHS PETROLUB AG and is responsible for technology, supply chain and OEMs.

### With our guidelines you won't miss any of the many highlights!

More than 90 presentations and a huge trade show wait! Top speakers from all over the whole world have submitted their suggestions for topics. An international committee has compiled an ambitious programme from the huge number of top-class presentations. It is so eclectic and interesting that you should already be planning ahead which talks are going to be particularly interesting for you.

To ensure that you don't miss any of the highlights, our guidelines will recommend a schedule just for you. You will find guidelines for the following key topics under the menu item "Guidelines" at [www.oildoc-conference.de](http://www.oildoc-conference.de): power generation, gears, hydraulics, maintenance, lubricants, lubricant analytics, tribology, combustion engines and wind turbines.

### Register now to secure your Early Bird Price!!

Until 30/9/2012 only 850 euros, plus VAT.

Registration is quick and easy:  
[www.oildoc.com/conference-2013](http://www.oildoc.com/conference-2013)

After 30/9/2012, the  
attendance fee increases  
to 945 euros, plus VAT.



## OilDoc news

### Highlights of the Summer 2012 edition:

- OilDoc Conference and Exhibition 2013
- Seminars & symposia in autumn/winter 2012
- Intensive lubricant specialist seminar
- OilDoc at IHA's maintenance and service conferences
- Customised seminars and consultation service for REpower



The OilDoc executives:  
Rüdiger Krethe (certified engineer)  
and Peter Weismann (certified engineer)



## Autumn/winter 2012 – full programme at the OilDoc Academy

### Seminars

There are still another 12 top-class events on the OilDoc Academy programme which will all be held by the end of the year! As well as proven **classics**, such as **lubrication and oil monitoring for industrial plants or hydraulics or combustion engines**, we also hold seminars and symposia on very specific topics, which, in terms of their content, are offered exclusively by the OilDoc Academy, for example, the seminar on **“the lubrication and machine monitoring of wind turbines”** and the intensive seminar entitled

**“lubricant specialist”** which has the option of CLS certification afterwards. As opposed to the classic lubricants seminars which focus on the lubricants themselves, the **“CLS lubricant specialist”** seminar looks at the specialist area in its entirety. It starts with technical application, covers lubricant selection, use, handling, monitoring of lubricants through oil care to disposal without forgetting topics such as sealants and lubrication systems, etc.. The seminar is therefore geared towards lubricants advisors who have a firm grasp of their customers' tech-

nical environment and can think out of the box as well as maintenance workers or OEM service technicians who need basic training in lubrication technology and oil analytics. You should definitely register quickly for the event **“Infrared spectroscopy in practice”**. It provides know-how for the practical interpretation of IR spectra for lubricating oils, hydraulic fluids and lubricating greases. The seminar is unique, both in terms of its content and design, and therefore experience has shown that it always gets booked up in no time.

### Symposia

In the case of our specialist **symposia**, leading experts from the areas of maintenance and construction, tribology, lubrication technology, sensor technology and of course the mineral oil industry meet at the OilDoc Academy in Brannenburg to present new products and solutions. Each symposium covers a specific topic or is held for a specific sector. At the heart of it all is the opportunity for maintenance workers, manufacturers of compo-

nents and system equipment, oil manufacturers and service providers to share experiences on lubrication, oil analytics, maintenance, condition monitoring, new system components or solutions and oil care. The aim is to increase system availability and reduce maintenance costs through smart solutions. External speakers make valuable contributions to the events with their specialist knowledge of areas other than oil.

OilDoc Academy symposia are excellent platforms for meeting participants from the same sector and discussing solutions to problems. During the breaks and an evening event, there is plenty of opportunity for participants to exchange experiences with individuals and for networking.

In autumn 2012, we will be scheduling three of these symposia.

## Paper machine symposium – 15 - 16/10/2012

### Speakers and topics

- ✓ **Rudi R. Apic, Hansa Flex AG**  
Hydraulic oil care in practice
- ✓ **Steffen Bots, OELCHECK GmbH**  
Ageing mechanisms in circulating lubrication systems of paper machines
- ✓ **Steffen Haubold, Esso Deutschland GmbH**  
Mobil DTE PM Excel – the latest paper machine oil technology
- ✓ **Rüdiger Krethe, OilDoc GmbH**  
Oil can talk: online sensors and oil analyses

- ✓ **Lothar Nagel, Internormen Filter GmbH**  
Effective methods for oil dewatering
- ✓ **Rudolf Kühl, SKF GmbH**  
Roller bearings and lubricating oils for circulating lubrication in paper machine drying sections
- ✓ **Christian Puhl, Fuchs Schmierstoffe GmbH**  
Lubricants for the paper industry/paper machine oils
- ✓ **Hans-Georg Weber, SKF AG**  
Oil circulating lubrication systems for paper machines

- ✓ **FAG Industrial Services GmbH, N.N.**  
Condition Monitoring
- ✓ **Pall GmbH, N.N.**  
Filtration concepts for the paper machine industry



### Another highlight: Technology you can touch

As part of a guided tour of the Mondi Raubling GmbH paper mill, you can get an immediate impression of the machines and systems involved in the manufacture of paper.

## Symposium for power plants and the chemical industry – 26-27/11/2012

### Speakers and topics

- ✓ **Jo Ameye, FLUITEC N.V.**  
Five steps for testing for impurities in the lubricating oil systems of turbines and compressors
- ✓ **Norbert Becker, N. Becker Ingenieurbüro**  
Oil oxidation deposits in turbine systems. How do they form and how can you prevent them?
- ✓ **Wolfgang Bock, Fuchs Schmierstoffe GmbH**  
Lubricants for the energy industry/turbine oils
- ✓ **Dr Klaus Defren, PALL GmbH**  
New approaches to filtration, water removal and oil care

- ✓ **Michael Jäger, Elektronik-Kontor Messtechnik**  
Online monitoring of transformers using DGA analysis
- ✓ **Stefan Jochum, HYDAC Filtertechnik GmbH**  
Electrostatic phenomena in hydraulic and oil circulation systems
- ✓ **Tomas Klíma, ECOL Sp. z o.o.**  
Hydrodynamic high-pressure cleaning with oil at high flow rates

- ✓ **Rüdiger Krethe, OilDoc GmbH**  
Oil can talk: online sensors, on-site testing methods and oil analyses
- ✓ **Stefan Mitterer, OELCHECK GmbH**  
Condition monitoring of electrical transformers using gas-in-oil analysis
- ✓ **Dr Franz Novotny-Farkas, OMV GmbH**  
Varnish and sludge accumulation and the causes

## Symposium for the cement and building materials industry – 03-04/12/2012

### Speakers and topics

- ✓ **Dr Edwin Becker, Prüftechnik Condition Monitoring GmbH**  
Condition monitoring is more than just vibration analysis
- ✓ **Steffen Bots, OELCHECK GmbH**  
Analysis and diagnosis of used lubricating greases
- ✓ **Hans Bärtschi, HOLCIM Group Support Ltd.**  
Preventive maintenance in the cement industry – challenges and best practice
- ✓ **Hans-Joachim Haak, ADDINOL GmbH**  
Gear dimensioning and manufacturing deviations for low-wear gear operations
- ✓ **Günter Huschitt, Fuchs Lubritech GmbH**  
Cost containment in the basic materials industry
- ✓ **Rüdiger Krethe, OilDoc GmbH**  
Oil can talk: online sensors and oil analyses
- ✓ **Rudolf Kühn, competence in lubrication**  
Lubrication of roller bearings in the cement industry
- ✓ **Marcos Meinecke, Klüber Lubrication KG**  
Modern lubricants in open drive
- ✓ **Christian Specht, Schaeffler AG**  
Roller bearing lubrication in the cement industry
- ✓ **Martin Stöckl, Specialist Office**  
Opportunities for condition testing on drives from practice (CM-videoscopy-oil analytics)



### Another highlight: Technology you can touch

As part of a guided tour of the south Bavarian Portland cement plant, Rohrdorf, you can get an incredible, personal impression of the machines and systems and specific operating and working conditions involved in cement manufacturing.

2012 dates		2012 dates	
24-26/09/2012	Lubrication and oil monitoring for hydraulics	05-07/11/2012	Lubrication and machine monitoring for wind turbines <b>*NEW*</b>
27/09/2012	Workshop day: hydraulic systems	08/11/2012	Workshop day: wind turbines <b>*NEW*</b>
8-10/10/2012	Lubrication and oil monitoring for industrial plants	19-21/11/2012	Lubrication and oil monitoring for combustion engines
11/10/2012	Workshop day: industrial plants	22/11/2012	Workshop day: combustion engines
15-16/10/2012	Paper machine symposium	26-27/11/2012	Symposium for power plants and the chemical industry <b>*NEW*</b>
22-24/10/2012	Fundamental principles of grease lubrication and machine monitoring through lubricating grease analyses	03-04/12/2012	Symposium for the cement and building materials industry <b>*NEW*</b>
25-26/10/2012	Lubrication and machine monitoring for refrigerating machines	10-12/12/2012	Intensive lubricant specialist seminar <b>*NEW*</b>
29-30/10/2012	Infrared spectroscopy in practice		



## Intensive lubricant specialist seminar Available afterwards: CLS certification



A good understanding of lubricants is important! In everyday practice, however, you need more than just that. Only those who have a knowledge of lubricant processes, oil monitoring and care, the functional principles of the most important machines and a lot more can really expect to do well in practice. If you would like to master all of these topics, then the new OilDoc Academy seminar is just the ticket for you!

### Content and aims

From 10 to 12 December 2012 we will be holding our new intensive seminar "The basic principles and practice of lubrication" for lubricant specialists. The motto of the event is: Technology – Lubricants – Environment! Participants acquire a broad basic knowledge of lubricants and their uses as part of an overall perspective. During the event, you will be provided with up-to-date expert knowledge in the form of talks and discussions with experienced OELCHECK engineers.

They will broaden or refresh their knowledge of:

- ✓ composition, selection and use of lubricants

- ✓ functional principles and lubricant requirements of important technical machines, assembly groups and machine elements from industrial and automotive fields of application
- ✓ procurement, storage and handling
- ✓ lubricant behaviour, oil monitoring and oil care
- ✓ introduction of effective lubricant programmes

### The speakers

Our speakers are all experienced, successful practitioners, and are all still working in their chosen professions. They share their extensive knowledge in a comprehensible manner and answer participants' questions. OilDoc Academy is also certified in accordance with international standard DIN ISO 29990, which is proof of the high level of our advanced training events.

### Participants

The new seminar has been specifically geared towards:

- ✓ specialist staff and managers from maintenance and servicing
- ✓ experts on damage analysis and machine failures

- ✓ purchasers of lubricants and operating materials
- ✓ sales engineers and salespeople from lubricants manufacturers and their resellers
- ✓ safety officers responsible for the storage and disposal of oils.

### An additional opportunity!

Our intensive seminar is also the ideal way to prepare for the CLS (Certified Lubrication Specialist) exam. If applicants register before 29/11/2012, they will be able to take the CLS exam in German after the seminar. Exam candidates must, however, have at least three years' professional experience in the field of system and machine lubrication. The internationally recognised "Certified Lubrication Specialist" certificate is highly valued in the industry. It is the only independent certification for lubricants experts in the world. It represents extensive knowledge of lubrication fundamentals and in-depth knowledge of lubricant applications.

**Let us know if you would like any more detailed information on our new intensive seminar and the CLS certification – we'd be glad to help!**



## OilDoc at the IHA's maintenance and service conferences

The IHA (International Hydraulic Academy GmbH), which is headquartered in Dresden, offers application-oriented development and testing of products, processes and technology in the field of hydraulics as well as a comprehensive programme for employee qualifications.

The IHA runs a number of training sessions in German and Austria, a particular highlight being the maintenance and service conferences. After events in Dresden and Weiterstadt, a follow-up session in the Hansa-Flex centre in Duisburg is scheduled for March 2013. Maintenance staff and machine oper-



Ulrich Hielscher, IHA managing director: *OilDoc Academy engineers are experts in lubricants and hydraulic fluids. They have even more extensive industry knowledge in this area than us at IHA. We have therefore been working together with them for years. At our maintenance and service conferences, Rüdiger Krethe explains what an important design element hydraulic oil is today.*

ators, as well as representatives from professional associations, profit from the informative and useful talks on operations and maintenance of hydraulic systems.

Highly productive production plants are operated with hydraulic controls. Faults can be very expensive if they are recognised too late and the cause is not determined quickly enough. This is where the role of oil in the hydraulic system becomes particularly important. That's why the IHA will also be actively supported at the maintenance and service conference in Duisburg for the third time in a row by the OilDoc Academy.

Rüdiger Krethe, a certified engineer from the OilDoc Academy, will explain what a decisive role the design element hydraulic oil plays, discussing the tasks and requirements of hydraulic oils, oil types and their fields of application, the various ingredients as well as miscibility and compatibility. Every hydraulic fluid ages during use. Rüdiger Krethe explains the processes taking place in the oil. What happens, for example, with the additives? And what are the causes and consequences of impurities? How do air bubbles, foam and cavitation occur? What is behind the so-called "diesel effect" exactly?

Since an oil also imparts valuable information, we can show how lubricant analyses give it a voice. Today, oil analysis is one of the most important elements in modern condition monitoring. Rüdiger Krethe presents typical case examples and explains how wear metals in the oil tell us about wear and machine condition. In addition, there are impurities which are often a good starting point for proper oil care. Base oil condition and additive decomposition determined as part of the analysis are presented as key to oil change decisions. Rüdiger Krethe's contribution is rounded off with more important practical tips in connection with the Hansa-Flex fluid service.



Find out everything you need to know about the IHA and its extensive services at:

[www.hydraulik-akademie.de](http://www.hydraulik-akademie.de)

## Customised seminars and consultation service for REpower



REpower – local wherever you are!

REpower is one of the leading system providers of onshore and offshore wind turbines. The global company develops, produces and sells wind turbines ranging from 1.8 to 6.15 megawatts and rotor diameters ranging from 82 to 126 metres. REpower also offers its customers project-specific solutions in the areas of service and maintenance, transport, installation and foundation layout. Since it was founded in 2001, REpower has manufactured and installed over 3,800 wind turbines worldwide.

The wind turbines are developed and constructed at the TechCenter in Osterrönfeld near Rendsburg. REpower also coordinates services from

here which the regional service teams provide all over the world. REpower engineers and experts know from their day-to-day work what an important role lubricants play in operating wind turbines. REpower has been using OELCHECK lubricant analyses to regularly monitor gear and hydraulic oils as well as lubricating greases for many years now.

OELCHECK and OilDoc Academy engineers are also at hand to help REpower assess or choose the best-fit lubricants. Since they have extensive practical experience and detailed knowledge of the company's systems, they can offer a wealth of valuable practical tips. Taking a grease sample from the rotor bearing of a wind turbine with a view to reproducibility and comparability was always a real challenge for service employees. During an on-site inspection with one of the experts from Brannenburg, the problem high up in the sky was solved in no time.

Thanks to regular training, REpower employees are constantly kept up-to-date with the latest developments, processes and discoveries in the operation of wind turbines.

In terms of lubricants, their performance capabilities, selection and monitoring, the company uses individually designed OilDoc Academy seminars.

For two days, everything revolves around oils and greases for use in wind turbines. Participants learn everything worth knowing about lubricants and analysing them. In addition, they are shown how to draw conclusions from laboratory results for their day-to-day work.

After several successful seminars the series will now continue. This way, the largest possible number of REpower employees here and abroad can acquire a broad and in-depth knowledge of lubricants and make better use of the decisive advantages of lubricants analyses in their day-to-day work.

For further information, visit [www.repower.de](http://www.repower.de)



Onshore and offshore wind turbines