



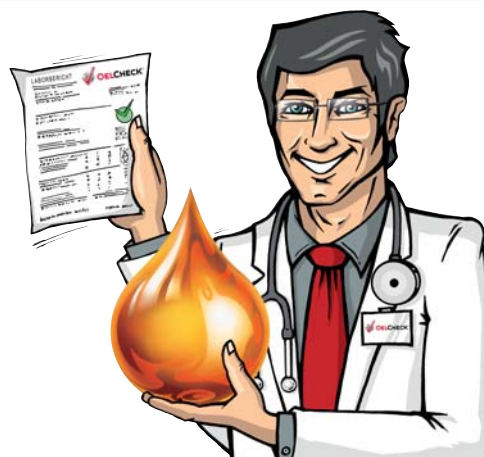
OELCHECKER

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Wirtgen Group – Technology leader in the construction machinery industry



deposits and technologies for processing of raw minerals and recycled materials.

The Wirtgen Group of companies are globally active in the construction machinery industry, with four long-standing brands.



- Wirtgen provides innovative solutions for road construction and material extraction, and for over 50 years it has been pioneering better performance on the job site for its customers everywhere in the world.
- Vögele has more than 80 years of experience in developing and producing road finishing machines and is today the leading manufacturer worldwide.
- Hamm offers a wide range of products for all segments of the earth-moving and road construction industry and stands for advanced machine and compaction technology.
- Kleemann specialises in the erection of mobile crushing and screening plants.

The sophisticated parent plants of the four mechanical engineering specialists are all located in Germany. All of the plants have specialised expertise accumulated over many decades. The entire production process in each plant, from machine development to assembly and quality assurance, is specifically aligned to the corresponding product portfolio of the associated brand.

Four strong brands; over 90 innovative products on display, of which 29 trend-setting world premiers; 10,560 m² of exhibition space; and more than 100 experts with application experience – these impressive figures characterise the presence of the Wirtgen Group at Bauma 2013

and clearly demonstrate the innovative strength of this company in the Road and Mineral Technologies sector.

Road Technologies includes technologies for road construction and maintenance. Mineral Technologies includes extraction technologies for mineral

Check-up

Each month we welcome over 100 companies as new customers thanks to word-of-mouth advertising. We presently have more than 15,000 satisfied customers. Thanks to the opening of our new laboratory in China, their numbers will soon grow even more. Ever since our company was established in 1991, we have planned its successful development consistently and with a focus on the future. After more than 20 years, we consider it necessary to take some decisive and trend-setting steps for the years to come, which go far beyond revamping our corporate design.



For many years already, our founders **Barbara and Peter Weismann**, both of whom are still actively involved in the company, have been grooming the members of the next generation for their management roles in the family-run businesses OELCHECK and OilDoc Academy.

Their son **Paul Weismann**, who studied chemistry in the U.S., joined the management ranks of OELCHECK in 2002. He is also responsible for managing the laboratory in China.

Their daughter **Petra Bots** has been handling the marketing and websites of both companies since 1998. Along with our seminar facilitator Rüdiger Krethe, she is now active in the management of the OilDoc Academy. She took over this role from Peter Weismann on the 1st of April, when Peter moved on to the Advisory Board.

Their son-in-law **Steffen Bots**, an industrial engineer who has been responsible for diagnosing analysis results at OELCHECK since 2004 and has headed the diagnostic team since 2010, will set up a sales and marketing department and put his practical experience to use in direct contact with our customers and prospective customers.

This creates a unique opportunity for an experienced mechanical engineer to assume the role of head of the diagnostic team at OELCHECK. You can find our corresponding job advert on page 8 of this issue, with detailed information available at www.oelcheck.de.

Yours, Barbara Weismann



A single workshop for all brands of the Wirtgen Group

For the customers, taking ownership of a machine marks the start of a long-term service relationship. The team of experts in the Wirtgen Group customer service department are always available to answer any questions about the machines and their operation. The service specialists at the subsidiaries and distributors of the worldwide Wirtgen Group, as well as the teams in the parent plants of Wirtgen, Vögele, Hamm and Kleemann, ensure short response times and quick solutions.

The overseas production sites of the Wirtgen Group, located in Brazil, China and India, meet the same high standards for machine quality and production efficiency.

Thanks to well-trained technicians and modern shop equipment, the subsidiaries are able to provide the full spectrum of reliable shop service. The range of services includes inspection, servicing and overhauling of machines, as well as repairs and corrective maintenance.

In order to be able to meet all the service requirements, the shops are furnished with special equipment adapted to the machines made by Wirtgen, Vögele, Hamm and Kleemann. Downtimes are minimised by the continual modernisation of the shops, high availability of all spare parts and wearing parts, sophisticated special tools, diagnostic software for fault analysis and optimised workflows. In addition, service centres close to customers, well-equipped service vehicles and the extensive expertise of the service technicians and specialists in the parent plants reduce machine downtime on the job site.

An OELCHECK universal five-sample kit

Every job site is different and poses different challenges to people and machines.

The machines made by Wirtgen

Group never work under standard conditions, so they need lubricants and filters perfectly matched to actual conditions.

Only lubricants that have been extensively tested by the Wirtgen Group are used for initial filling at the plant. Naturally, these engine, gearbox and hydraulic fluids, as well as the selected greases, are available for oil changes and relubrication. From the customer perspective, the lubricants that are used must ensure:

- reliable compatibility with the initial filling;
- optimal wear protection;
- perfect corrosion prevention;
- traceability in case of damage;
- extended change interval after oil analysis.

For many years the company has been relying on OELCHECK service for lubricant analysis.

A special analysis kit has now been developed for the Wirtgen Group. The silver-grey box holds five sample containers with grey lids, sample sheets and shipping pouches. What makes it special is that every kit can be used not only for assessing oil from diesel engines, gear units or hydraulic systems, but also for diesel fuel as necessary. With the practical „OELCHECK / FUELCHECK box“, the operators and service staff always have the right tool at hand, regardless of whether the objective of the analysis is to determine the reusability of an oil, signs of damage, contamination, or the quality of a lubricant or diesel fuel.

„Close to our customers“ is the value proposition of Wirtgen Group to its customers. The new OELCHECK universal five-sample kit is the latest example of how this promise is fulfilled.

For more information:
www.wirtgen-group.com



OELCHECK – A strong brand with a new look

After more than 20 years, it was time to give a fresh look to the OELCHECK logo and all other design elements. After all, our brand presence should clearly communicate the services and values of our company.

From now on, our brand presence will be much more eye-catching and dynamic than before. With its clear shapes, attractive colours and lucid layout, the OELCHECK design is unmistakable.

Even the popular „Oil Doctor“, with his aura of experience, now looks as young and active as he is in reality. You can get acquainted with him on the front page of this issue of OELCHECKER.

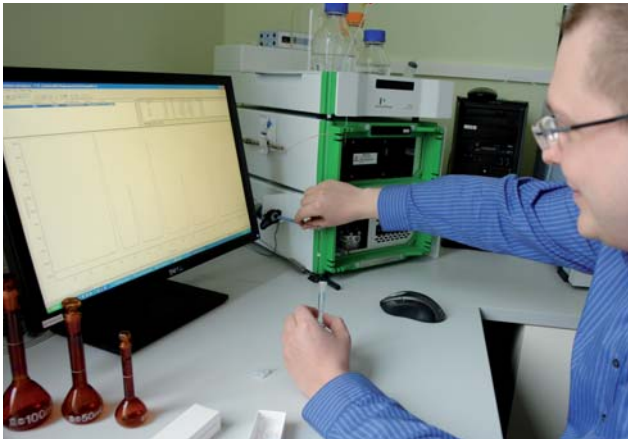
He is making his grand appearance **Bauma** stand in Munich. **We cordially invite you to visit us at Stand 531 in Hall A4.**



Meet us at Bauma:
Hall A4, Stand 531



Transformer oil furan determination indicates the condition of the insulating paper



Lab Manager Jan Hubrig starts a furan determination.

prevented by insulating paper. In order to assess the remaining service life of the transformer, a paper sample can be removed and analysed after the transformer is opened up. Furan determination of the used transformer oil now provides a much simpler and cheaper alternative. Cellulose degradation in the insulating oil gives rise to oil-soluble decomposition products, in part due to high temperatures, and they can be determined using chromatography. Since these substances cannot be con-

verted to the gaseous phase without decomposition, a gas chromatograph, as used for gas-in-oil analysis, is not suitable for determining paper ageing. For this reason, we have installed a new HPLC unit in the OELCHECK laboratory. The Perkin Elmer Flexar Pump uses the high performance liquid chromatography (HPLC) method. Using the DIN 61198 procedure, it determines furan derivatives dissolved in oil, which can originate from the insulating paper, in 10-ml oil samples. It distinguishes between 5-hydroxymethyl-2-furfural (5HMF), 2-furfuryl alcohol (2FOL), 2-furfural (2FAL), 2-acetylfuran (2ACF) and 5-methyl-2-furfural (5MEF). Based on the concentrations of the individual derivatives in mg/kg (ppm), conclusions can be drawn about the condition of the insulating paper. Internal inspection of the transformer is only carried out if elevated furan values signal the need for action. **Furan determination is now available as a special test.**

Direct contact between the copper wires of a transformer, which would lead to failure, is

Low particle quantification (PQ) index values are now shown as numerical data

We show the PQ index for every oil and grease sample under „Wear“ in each laboratory report. We have always indicated values below 25 as „OK“ because precise measurement is not possible below this level. Since an increasing number of customers are asking what numerical value stands behind this „OK“, from now on we will show „PQ < 25“ if the measured PQ index is below 25.

The PQ index provides information about magnetisable iron wear particles in the entire sample. When compared with the stated iron content in mg/kg, it enhances the diagnosis of the possible source of the iron and the origin mechanism. While the amount of iron measured with the ICP only relates to particles smaller than 3 µm, the PQ index provides information about all magnetic iron particles that are present, regardless of size.

Deposits in turbines and oil circulation systems

The MPC test is now an ASTM standard

Membrane patch colorimetry (MPC) is a proven test method for the detection and quantitative assessment of insoluble oil residues. Especially in turbines and large circulation systems, oil fillings of several thousand litres are often used for several years. Thanks to careful monitoring with the MPC test, sticky reaction products or sludge-forming and soft contaminants do not go undetected. OELCHECK has been offering the MPC test since 2010 as an additional special test. The American Society for Testing and Materials (ASTM) has now specified the MPC test in the ASTM D-7843 standard. OELCHECK also had a part in this, since we actively supported an extensive pooled test over many months.



Lubricants and Condition Monitoring – OELCHECK Recognises Future Trends

Lubricant analysis plays a vital role in the monitoring of machinery, or condition monitoring. It provides a wide range of physical and chemical characteristics that can be used to deduce the condition of both the lubricant and the components of the machine alike. However, lubricant analysis is set to become even more significant in the future as the demands placed on lubricants continue to increase. With regard to lubrication and its impact on production and maintenance, OELCHECK diagnostics engineers are confronted with trends that are bound to become increasingly important in the coming years.

Trend 1: Long-Term and Lifetime Lubrication

Oil is not a renewable resource, and the aim is now clearly to achieve substantially longer lubricant service life. Depending on the application concerned, the often advocated concept of lifetime lubrication is a potential option. But independent of this, the trend with regard to long-term use is primarily moving towards higher-quality base oils (group II or III). Formulated with highly effective oxidation inhibitors, these allow you to achieve even longer service life. Even today, use intervals of 10 years can be achieved with high-performance industrial gear oils. In the automotive sector, the aim is to eliminate the periodic changing of automatic transmission fluids.

Trend 2: Designed to Application

Simplification of the types of lubricants used must be on the wish list of almost every maintenance technician. However, the OELCHECK diagnostics engineers are often confronted with a counter-trend. It is called „designed to application“ and means that lubricants are tailored to specific applications. This is the case, for example, for roughly 85% of all automotive lubricants. Around 20 years ago, the proportion was only 25%.

Another example is industrial gear oils for modern high-tech gears. In the past, two types of base oil and four types of active ingredient were available for the formulation of lubricants. Nowadays, due to ever-increasing technical demands there are four different base oils and up to 23 additive combinations. These tailored products represent a major challenge for lubricant producers. They also increase the need for us as analysts, as the wide range of possible combinations and substances makes it increasingly difficult to assess the exact service times of used oils.

Trend 3: Higher Energy Efficiency

Lubricants have an immediate effect not only on engines and machine components, including their wear and service life, but also on energy efficiency. Low-viscosity, low-friction motor oils have been reducing fuel consumption for many

years. Motor oil developers will exploit this potential to a substantially higher degree in the future. More and more, the behaviour of industrial lubricants is being critically analysed with regard to the efficiency and performance of the machines.

For many suppliers of modern oils and greases, energy conservation is a key selling point because hydraulic fluids or gear oils formulated with specific additives can save thousands of euros in energy costs.

Trend 4: Increasing Demands on Environmental Impact

This primarily relates to hydraulic fluids for mobile hydraulic systems. However, it also affects total loss lubricants such as lubricating greases, adhesive oils or two-stroke mixtures. They must also meet a multitude of requirements. Biohydraulic fluids need to remain in use for as long as possible in order to drive down oil and maintenance costs. At the same time, they are expected to provide an optimum level of operational reliability. However, specific environmental requirements need to be taken into account when formulating biolubricants. And when it comes to using plant oils as more readily biodegradable base oils, understanding how extreme pressure (EP) additives work is a science in itself.

Trend 5: Lubricants that are Essential to Facilitate Technical Applications

Alternative construction materials, engines with catalytic converters or diesel particulate filters, and modern machining methods are just a few of the many technological developments that are only possible with specifically formulated lubricants or cutting fluids.

For instance, ceramics respond to additives in a completely different way than metals. Conventional oils and greases are only suitable to a certain extent for the lubrication of ceramic components used in piston rings, roller bearings, compressors, high-temperature gas turbines or other equipment.

Modern materials can be produced more precisely and can therefore be more resistant to temperature and wear than metals. However, their precise surfaces with low roughness require lubricants that are „thinner“ and therefore more energy efficient.

In machine tools, metals are predominantly machined using emulsions of water-miscible cooling lubricants. A trend towards dry machining is becoming increasingly clear here. This involves replacing the emulsion by a very small quantity of a fully synthetic high-additive oil that is dispensed directly and precisely through the tool to the cutting surface. In the case of engines, catalytic converters and particulate filters make it possible to comply with evermore stringent emissions standards. However, for best results and trouble-free operation these components require low-SAPS motor oils. These oils contain a lower proportion of sulphur and phosphorous additives, which are considered catalyst poisons, and therefore generate fewer deposits. Low-viscosity motor oils that have been developed with energy efficiency and environmental impact in mind are set to play an increasingly significant role in the future as formulas must be adapted to comply with the further tightening of emissions standards.

Trend 6: More Effective Monitoring and Maintenance of Lubricants

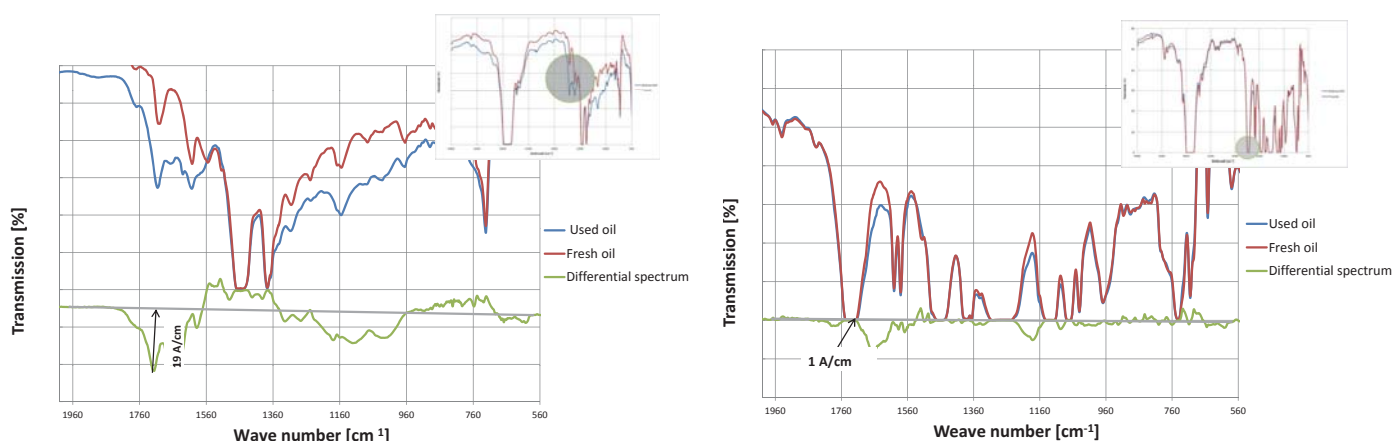
An essential factor for longer operating life is even more careful maintenance and monitoring of lubricants. Contamination of oils and greases by wear particles and other contaminants also increases over time. Monitoring and maintenance measures are mandatory because the machines and equipment, and in turn production reliability, are ultimately dependent on these measures. Accordingly, increasingly fine full-flow and partial-flow filters are being used, and analysis both onsite and in the lab is becoming indispensable.



Oxidation of gas engine oils

Why does infrared spectroscopy sometimes come up short?

In assessing how much longer a gas engine oil can be used or whether an oil change is necessary, oil ageing or oil oxidation is a crucial factor. Long periods of oil use, relatively high operating temperatures or rising contamination levels aggravate oil oxidation and the associated formation of acidic reaction products. Oils in gas engines fuelled with biogas, landfill gas, sewage gas or wood gas are often exposed to acidic gas components. Since the composition of these gases often varies, changing the oil at fixed intervals can be risky, in contrast to the situation with relatively clean natural gas. Oils in biogas engines must therefore be monitored constantly using lubricant analysis according to manufacturer specifications.



Valid oxidation determination according to DIN 51453 (left) and similar oxidation determination spoiled by ester components (right).

A DIN standard that is no longer effective

For a long time infrared spectroscopy was the only method for measuring oil oxidation. With the mineral oils predominantly used around 20 years ago, the spectrum indicated the oxidation so clearly that values determined using the IR method according to DIN 51453 were specified by gas engine manufacturers. This was based on the fact that ageing is accompanied by the accumulation of oxygen on the molecular chains of the hydrocarbon oils and the formation of new molecular chains. When they are illuminated with infrared light, they absorb it differently than fresh oil. A clear peak is visible in the IR spectrum of an oxidised mineral oil at a wave number of about 1,710 cm⁻¹. After the fresh oil spectrum is subtracted from the used oil spectrum in this region, the oxidation is stated as the IR absorption referenced to a one-centimetre oil layer thickness (A/cm).

However, this logical procedure does not work with some modern gas engine oils. In region of wave number 1,710 cm⁻¹, the IR spectrum also indicates the double bonds typical of synthetic oils containing esters or some oil additives. Oxidation products and esters cause peaks in the same region, with a distinct overlapping of the ester peaks and the oxidation peak.

For gas engine oils based on petroleum, IR spectroscopy still provides reliable information on oil ageing and the limits specified by the DIN standard are still valid. But since many modern gas engine oils contain synthetic group I or group II base oils and most of them also contain low-ash additives, IR spectroscopy in accordance with the DIN standard cannot provide any useful oil oxidation values for these oils. Base oils and additives may contain thermally stable ester-based synthetic oils that distinctly overlap the oxidation peak at the specified wave number of 1,710 cm⁻¹. If such a peak is already present in the fresh oil, subtraction often does not provide a meaningful oxidation value. Even heavily oxidised oils will yield a value of 1 A/cm. The value at 1,710 cm⁻¹ often lies on a shoulder of the peak, giving rise to what appears to be strongly varying oxidation values. For example, a value of 1 A/cm, 18 A/cm or even 27 A/cm might be calculated for oils with the same degree of oxidation using the standard-compliant method.

High time for a new, uniform rule

Engine manufacturers and insurance companies are still specifying that the oxidation value has to be determined using IR spectroscopy in accordance with DIN 51453, and most of them set a limit of 20 A/cm. This is counter-productive for assessing some modern oils. It is high time to define a

standard test method for determining oxidation that is also valid for modern gas engine oils. It should be defined such that it can be implemented worldwide in any laboratory for used oil analysis.

Until then, we at OELCHECK wish to assure our customers that when assessing the ageing of modern engine oils we do not rely solely on oxidation as determined in accordance with DIN 51453, which is not usable in this situation. Instead, we presently use trend analysis of a combination of several analysis values as a reliable way to evaluate ageing. Along with the engine type, the gas type and the engine oil used, the findings from IR spectroscopy are augmented by viscosity, AN, BN, and ipH data. In making this assessment, OELCHECK diagnostic engineers benefit from their extensive experience and our comprehensive database. Our customers can therefore rely on accurate oil ageing information in the laboratory reports. However, a standardised redefinition of the test method is urgently needed.

P.S.: The situation with modern gas engine oils is not the only one where determining oxidation by subtracting peaks at a specific wave number causes problems. New synthetic gear oils, such as those used in wind turbine gear units, present a similar problem in oxidation determination because many of them also contain synthetic base oils or ester-based additives.

Oil can talk – now even in China, and in Chinese

Guangzhou (Canton), southern China, 22/03/2013 – At exactly 10 a.m., the doors of OELCHECK China Ltd. swung open in the first of the two 38-storey office towers of the Tian An Hi-Tech Ecological Park. The first of more than 150 guests had already arrived to join us in celebrating the official opening of the new OELCHECK laboratory in China. After being welcomed by the entire management team of OELCHECK, the guests could hardly contain their astonishment. The laboratory and associated offices occupy an impressive 550 square metres on the third floor of the tower. In the past few months, the premises had been fitted out with water and electricity installations, special air conditioning and oil-resistant floors. After thorough preparation and many test runs, some conducted together with the Chinese laboratory staff, all the equipment for the laboratory had been flown in from Germany. The OELCHECK laboratory presented to our guests in Guangzhou is virtually identical to the one in Brannenburg. Customers can also draw on the

experience of the engineers in Germany, since the data acquired in China is transferred to the German system over a secure data link and interpreted there right away by the German engineers. During a guided tour, the test equipment was presented and the guests were told how the data is obtained from the oil. The three-hour seminar programme, in which our specialists talked about modern lubricants and the many different analysis methods, met with great interest. The talks triggered discussions that extended past the end of the main programme and were continued almost with out pause during the typical Bavarian buffet.

As in Germany, customers in China can now benefit from the advantages of OELCHECK lubricant analyses. Naturally, this also takes into account the fact that the formulas and characteristics of the lubricants do not necessarily match those in Western Europe. Most oils and greases used in China are produced in China and are largely unknown to us.

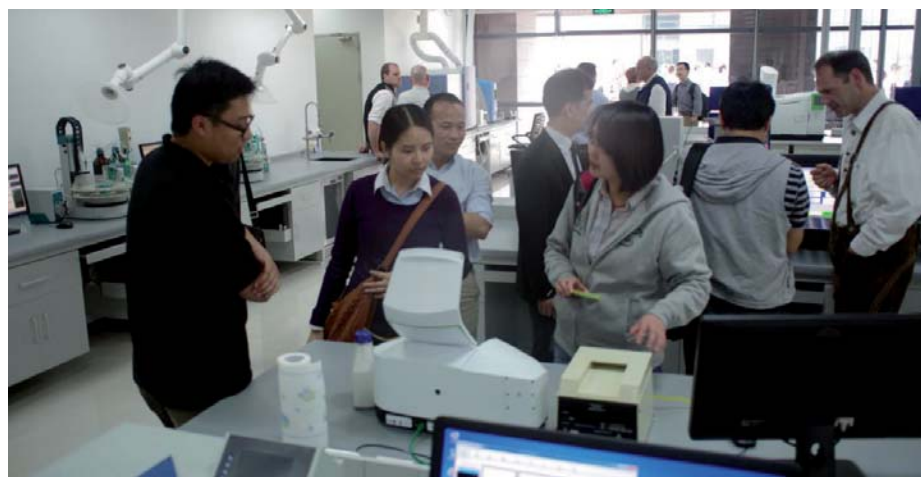
However, even lubricants from well-known international manufacturers can have a completely different composition here than in Europe or the USA. The team led by Laboratory Manager William Wang Wei Dong, who has a bachelors degree in Lubricants and Tribology, was trained for several weeks at OELCHECK in Brannenburg and is well prepared. He and his colleagues perform lubricant analyses using the same types of equipment, the same quality standards and the same software, and just as accurately as for OELCHECK customers in Germany. With only a small delay, our German diagnostic engineers add their comments to the values determined in China.

The procedure in China is just as simple as it is in Germany. Customers buy analysis kits in advance from OELCHECK China Ltd. and send their samples to the laboratory by prepaid courier service. Within two working days, they receive the laboratory report in Chinese. On the web portal www.lab-report.com, they can also translate the report into German or English. In this way, they can find out which actions – such as better filtering, an oil change, a different type of oil or repairs – they should take in order to secure the operational reliability of their plant.



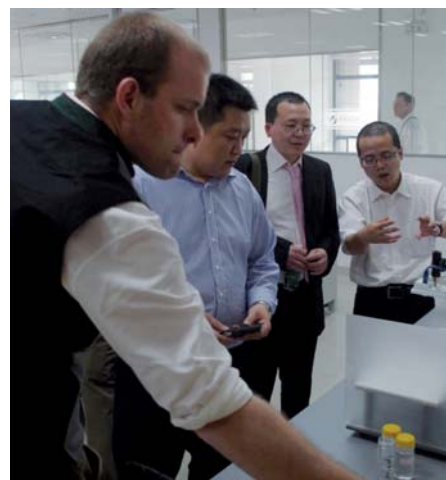
There was a great shower of confetti for the OELCHECK team after they cut the red ribbon together and Peter and Paul Weismann unveiled the company signboard. After this, the guests were treated to a three-hour seminar programme.





The new OELCHECK laboratory in Guangzhou is virtually identical to the one in Brannenburg. During a guided tour, Dr Thomas Fischer (bottom left in the picture) and Paul Weismann (bottom right in the picture) provided information on the capabilities of oil analysis.

**Welcome to
OELCHECK in Guangzhou!**
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Although the buffet with Bavarian specialities was quite exotic for the Chinese guests, it was very much appreciated.



Looking forward to big things after the official opening: the team members of OELCHECK China Ltd.

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Q & A

For years we have been using your analyses to monitor the hydraulic fluids in our excavators. Poor oil purity, contamination or excessive water content have been found repeatedly. However, we recently received a laboratory report from you which shows high wear values but completely normal purity classes, to our considerable surprise. Shouldn't the purity of the fluid be significantly worse with a relatively large increase in wear metal?

OELCHECK:

This conclusion appears to be correct. In theory, all of the values should increase. However, this depends on whether the detected metals are really particles which originate from abrasive wear. In the case of your hydraulic excavators, this does not appear to be the case. The wear values which we measured, with higher levels of copper, chromium and iron, are clear. However, these metals do not result from the wear of bearings, pumps or valves. For example, a high level of iron or copper does not always mean that there is something

wrong with the pump. Wear in a pump, when it does occur, is fostered by factors such as dust (silicon) or other wear particles. In such case, the purity class clearly indicates that the filtration is deficient.

However, in a hydraulic system wear can also result from chemical processes. Lubricants and hydraulic fluids can attack elastomers, especially if the fluids contain synthetic components or detergent additives. Sealing rings and guide rings, hoses or other synthetic materials are composed of more than just plastic. In addition to the raw polymer, they contain up to 25 other components such as carbon black and oil, fillers and swelling agents, plasticisers, wetting agents, pigments or glide enhancers. There are good reasons why seal compatibility tests are specified in the standards for hydraulic fluids. If the „chemistry“ between the seals and the lubricant is not optimal, metallic elements may be dissolved out of the seal material. For example, O-rings may contain iron oxide, hoses may contain zinc oxide, or guide rings may contain chromium or copper compounds with particles in the nanoscale range. If these are leached out of the elastomer, they remain in solution in

the oil. In the ICP tests used to determine approximately 30 elements with particle sizes down to 3 µm, they appear in the laboratory report as elevated levels of iron, zinc, chromium or copper. Elastomer particles can be so extremely small that even in elaborate tests, such as those which we perform with scanning electron microscopy, we are unable to filter them out even with an especially fine filter with a pore size of only 0.25 µm. This also explains why they cannot be seen at all in the particle count. For the determination of the purity classes according to ISO 4406, particles are only counted if they are larger than 4 µm.

If the levels of wear metals are outside the usual range but the purity classes indicate that better filtration is not required, we must rely strongly on our expertise and instinct. Our diagnostic engineers have extensive knowledge of where the elements or metal oxides dissolved in the oil may come from. Thanks to their experience and supported by the information in the large OELCHECK database, they can provide a clear indication of the origin of the elements, and if necessary they can point out the harmless wear of seals and guide rings without sounding an alarm about pump wear.

If you have questions about tribology or lubricant analysis, OELCHECK can answer them. Send us your questions by e-mail (info@oelcheck.de) or by fax (+49 8034-9047-47).

For our engineering department we are looking for a **Diagnostic Team Manager**

Your job profile

- ✓ You coordinate a team which presently consists of 6 engineers, and you ensure that the laboratory results with their comments are received by customers on the following day.
- ✓ You are responsible for the warning levels and limit values for oils and the plants in which they are used, and for related comments.
- ✓ You initiate measures to fulfil high demands for diagnostic services
- ✓ You assess and comment on laboratory findings on request and on your own initiative, and you generate diagnoses and expert reports for lubricants and machines.
- ✓ You use your expert knowledge of lubricants to provide technical advice to customers. Together with the chief scientist, you check the quality of the laboratory findings.
- ✓ You support our speakers at OilDoc Academy seminars or give talks yourself.
- ✓ As a department head you report directly to senior management.

Your professional and personal skills

- ✓ As a qualified mechanical engineer you have profound knowledge of engines, plants and machinery in which lubricants are used.
- ✓ You have at least 5 years of professional experience in fields concerned with lubricants, lubrication technology or tribology.
- ✓ You are a team player, able to work under pressure, flexible and have management experience.
- ✓ You are able to respond quickly to enquiries from various sectors of industry.
- ✓ You are proficient with standard PC programs.
- ✓ OELCHECK is internationally active. You therefore have a very good knowledge of English.
- ✓ You are prepared to relocate to one of the most beautiful areas of Bavaria.



Please send your complete application documents to:

Barbara Weismann, OELCHECK GmbH
Kerschelweg 28, 83098 Brannenburg, Germany

For further information, visit www.oelcheck.de