SUMMER 2010

OEL CHECK

Öl Checker

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CONTENTS

VEM Sachsenwerk - generators for the wind energy industry

High-quality products from Dresden for the leading manufacturers

Wind energy is becoming increasingly important to power generation around the world. German companies, in particular, are in the vanguard of this technology. Manufacturers of wind energy equipment, nevertheless, on average export more than 80 per cent of their production. The VEM Group has made a significant contribution to this rapid expansion with its wind energy generators, azimuth gearboxes and cast products. VEM Sachsenwerk is one of the leading suppliers of systems operating in the highest performance range. REpower, NORDEX and Ge wind – the leading system manufacturers – use the Dresden-manufactured quality products. The five thousandth wind energy generator was supplied in 2009.

Apart from large generators, the VEM Group supplies azimuth gearboxes, low voltage motors for lifts, heat exchangers and radiators as well as hydraulic systems.

The generator has a very important role to play in the drive train of a wind turbine. The large rotor blades on the wind turbine convert the flow energy of the wind into a rotating motion of 6 to 15 revolutions per minute. Since generators cannot be coupled directly into the mains at these low speeds of rotation, a planetary gearbox is fitted before the generator, gearing the speed of rotation up from approximately 15 revolutions per minute to some 1500 rpm.

The generator itself is an energy converter. It converts the kinetic energy of the wind-driven rotor into electrical energy which can be fed directly into the mains. In technical terms, the generator is identical to an electric motor, although this conversely turns electrical energy into motion.

Two basic types of generators are used in wind turbines. Like its counterpart, the asynchronous generator, a synchronous generator is made up of two main components: a fixed stator, made from coils and thin steel sheet, in which a magnetic rotating field is generated, and a rotor (also known as an armature) fitted on a ball-bearing mounted shaft. The rotor can be excited with either permanent magnets or electromagnets.

The frequency of the electrical energy generated must generally be modified to that of the mains before it is fed into the mains. The following options are available to do this for a synchronous generator

Husum WindEnergy
The Leading Wind Energy Trade Fair
OEL CHECK
21.-25. September 2010
Wir sehen uns in
Halle 4A, Sta... 08

Check-up

Children's laughter instead of Christmas presents - for the sixth year in a row in 2009 we followed this motto and donated to children's projects. We donated 4,000 euros to the Brannenburg kindergarten association. A large, comfortable pram was purchased for trips for the two classes for small children.

We have now been able to experience in person how well our donation has been received and the amount of fun we have brought with it. On 11 June, the two prams each filled with six children visited OEL-CHECK. The „little urchins" and the teachers from the Brannenburger preschool classes expressed their thanks for our Christmas donation once again with posters they had painted themselves, a song and flowers. The smaller children can now sit comfortably in the prams on outings, while the bigger children walk. And if one of them gets tired, they just swap places. This visit by the children convinced us; our donation was well received and this year too we will be ensuring „children's laughter instead of Christmas presents".

Yours, Barbara Weissmann

which will always be operating at a variable speed of rotation:

- A converter connected downstream of the generator to modify the electricity to the mains frequency.
- The variable speed of rotation of the rotor is modified accordingly by a hydrodynamic transmission. In this case, the generator is connected directly to the mains.

Asynchronous generators were frequently used on wind turbines in the past. At the end of the 1990s, a new design came onto the market with the double feed induction generator. Unlike the conventional induction generator, it allows operation at variable speeds of rotation. Its stator is connected directly to the mains. In addition, its rotor circuit, also consisting of coils, is connected to the mains by means of slip rings and a frequency converter. Consequently, operation at variable speeds of rotation is possible. One advantage is that only the smaller part of the output is fed in via the converter which is therefore comparatively small and cost effective.

VEM develops and manufactures wind energy generators rated from 1.5 to 6.0 MW. They are always all designed and built to customer specifications. While customers have historically predominantly asked for induction generators, in future, synchronous generators which supply a more consistent frequency and voltage will be taking a significant share in the market. The more difficult conditions for connecting to the various power grids can be better mastered with them. But whatever their type, these generators, which are manufactured in Saxony, are characterized by their high energy yield thanks to electro-magnetic optimization, yet retain a small installation volume.

Sachsenwerk components are proving their worth all around the world. They can be found working in wind farms in the North Sea and the Irish Sea, in the dry and cold of the Gobi desert in China and in subtropical areas of Japan. They are exposed to the most extreme environmental conditions, depending on their location. Offshore wind farms, in particular, must operate very reliably, being located at least 40 kilometres from the coastline. Their maintenance must be minimal. VEM generators meet these customer requirements - thanks to the company's many years of experience in the offshore business and with the contributions of its trained and certified staff. The Arklow Wind Park off the coast of Ireland, built in 2004, is one of its reference sites. It is the first wind farm to meet all the conditions for offshore generation with its seven generators producing a total of 25.2 MW. For the offshore wind farms Talisman off the Scottish coast, Thornten Bank off the Belgian coast and Alpha Ventus off the German coast alone, VEM has supplied generators with a total output of 100 MW.

Generators are intended to produce electricity continuously. The amount of power produced depends on the wind conditions. Variable wind speeds and ambient temperatures consequently have a major influence on the loads and temperatures of the rolling bearings and the lubricating grease used for their lubrication. The rotor of a generator is mounted between two self-aligning roller bearings. Each individual rolling element of the bearing, which can contain up to 90 elements, can weigh 3 kilos. But the bearings are truly lightweights against the 18 tonnes that a generator for a 6 MW offshore wind turbine weighs. A bearing designed for a generator shaft some 500 mm in diameter will be filled with around 1000 grams of grease. Good general lubricating properties are not the only criteria in selecting the grease. The grease must ensure an easy start at extremely low temperatures of -40°C. At the same time, however, it must have good ageing stability with bearing temperatures exceeding 100°C. In addition, extremely good work stability is required, as it must not escape from the bearing or harden so that too little lubricant gets into the bearing tracks, despite the vibrations as the turbine turns.

VEM-Sachsenwerk's experts are thus particularly critical in selecting the initial lubrication and their recommendation for the lubrication of the generator bearings which are difficult to access. This is also true for the maintenance instructions. The generator bearings are regreased once or twice a year, depending on their type. This is done by the wind farm operators, or by service companies in most cases. Caution is advised in regreasing in particular. It may be the case that the two greases are not compatible if a bearing is regreased with a grease different to the original grease. In this case, both originally firm greases will become so soft that they will escape from the bearings prematurely. Enormous repair costs can be incurred if a bearing is damaged for lack of lubrication.

OELCHECK has developed a series of test methods especially for the inspection of greases from wind turbines. Where mixing is suspected, or in cases of premature bearing failures, VEM's experts take representative grease samples which will be able to provide information relating to incorrect regreasing or contamination with water. The cause of the damage can often be determined by analysing the grease. The specimens taken from drip pans are examined to determine optimum regreasing intervals. Analysis of production batches of the original filling grease contributes to operational safety.

VKA tests lubricity under high pressure

Many standards and specifications state a requirement for the VKA value. Lubricant manufacturers therefore state the VKA value in data sheets for industrial oils, greases and cutting fluids. It is determined using a four ball test (German: VKA) as specified in DIN 51 350. The method is used in particular for lubricants which must withstand great loads and pressures. They therefore contain active substances (EP additives) intended to allow high pressures in the mixed friction area. The VKA value is stated in N (newtons) for the property and weld load. The higher this VKA value of an oil or grease, the better its lubricating effect under pressure loading. For comparison: the weld load of a conventional industrial gear oil, CLP 320, is around 2200 N. Values in excess of 3600 N can be achieved by modern synthetic high performance gear oil of the same viscosity class.

Alternatively, the test can be carried out in such a way as to determine the anti-wear behaviour of a lubricant at lower forces and for a longer test time.

A VKA test is indispensable in the development and quality control of oils and greases which must be very stable under pressure. Additionally, if the situation in the testing equipment is only transferable into practice to a limited degree, the VKA test represents an important basis for the assessment of the lubricating effect of a lubricant under high pressure loading. The simple and cost-effective test thus permits direct conclusions to be drawn regarding the performance of the various EP additives and anti-wear agents.

The four ball apparatus

The test apparatus consists of one rotating ball and three stationary balls, a drive unit and a load arm carrying the test weights. The material and diameter of the balls is standardized. They are manufactured under stringent inspection. They are made from 100Cr6 bearing steel (G3) (material number 1.35054) with a hardness of HRC 63 ± 3. They are 12.700 mm in diameter. The stationary balls are held in a cup. The cup is filled with the lubricant to be tested (10 ml) completely covering the stationary balls are with lubricant. A horizontal arm supported on the casing prevents the cup rotating.

Ball cup with stationary balls – filled with oil

A vertically mounted test spindle is located vertically over the cup. There is a bracket for the rotating ball held in a ball holder at its lower end. The test spindle is driven by an electric motor and rotates at 1450 rpm. A circuit breaker interrupts the power supply once the test balls are welded together and prevent rotation. The lever mechanism for applying the test load is accommodated in the bottom part of the casing. The test load is adjusted by varying the weights applied and the lever length. The test load is applied directly to the cup through a vertical ram, pressing the stationary balls against the rotating ball.

Test procedure and result

The load that is expected to be good is initially applied as the test load when testing the lubricant. If no information is available, the approximate good load is determined in preliminary tests. A test run on the four ball apparatus lasts one minute, unless it is first interrupted by the balls seizing. If seizing does not occur, repeat tests are carried out with new balls, new lubricant and at an increased load. The highest load at which no seizure occurs is called the good load, the first load at which seizing occurs is called the welding load. Both loads must be confirmed by repeat testing. The result of the VKA test is stated as a VKA weld load or VKA value in accordance with DIN 51 350. If a material has a VKA value of 2400 N, for instance, this indicates that test load at which the balls first weld together. If the value determined is below 2000 N, it is only necessary to state: VKA weld load below 2000 N in accordance with DIN 51 350 (part 2 for oils or part 4 for greases). The test procedure can be modified to determine the long-term behaviour of EP and anti-wear additives. The ball rotates for an hour on the stationary balls under a relatively moderate loading of 150 N, for instance. Then the wear marks, which form as cups on the three stationary balls, are measured. An average wear diameter, e.g. 0.2 mm, is stated.

KRL shear stability test determines change in viscosity

Multigrade engine and hydraulic oils and some synthetic oils contain a VI improver. Long-chain molecules of this kind can, in part, be badly sheared in operation. The old oil is consequently much thinner than fresh oil. One method to determine the change in viscosity as a result of the destruction of the VI improvers is the KRL shear stability test.

The VKA apparatus has also been used for this modified method for more than 20 years. In the KRL test, the balls are replaced by a tapered roller bearing filled with the oil under test. Some 40 ml of the oil under test is subjected to the shear stability test at a temperature of 60°C with the roller bearing rotating at 1450 rpm for a time of 4, 8 or 20 hours in the immersion lubrication method. The speed of rotation, temperature and load remain constant throughout the test. The decline in relative viscosity at 100°C for a 4-hour test is stated as the test result in the form: KRL/A: 10.2%.

TOST test: Ageing behaviour of inhibited oils

The TOST ageing test (Turbine Oil Stability Test) is laid down in EN ISO 4263. It is used to determine the ageing behaviour of turbine, gear and hydraulic oils as well as HFC and synthetic fluids. There is a risk of oil ageing with the simultaneous formation of sludge and lacquer-like deposits in lubricants and hydraulic fluids that are in use over long lives of several thousands of hours. The TOST test simulates long-term service with its extremely long test times of 2000 hours or more. The test is therefore very important in the development of an oil. But it also allows conclusions regarding oil performance to be drawn from its comparison of new oil and old oil in the determination of the longest possible oil change intervals. The 2000 hour TOST test is a new special test from OELCHECK.

The test method exposes the oil to the stresses that also promote oxidation and depositions in practice using oxygen, water, high temperatures and metallic components. 60 ml distilled water is added to 300 ml of the oil to be tested for testing purposes. This mixture is constantly heated to 95°C. In addition, steel and copper wire coils are suspended in the testing tank as catalysts. Three litres of oxygen is passed through the oil-water mixture each hour. Small samples are taken from the mixture at regular intervals and their acid value is determined. This indicates the amount of potassium hydroxide required to neutralize the acids, which increase as a result of oxidation, contained in a gramme of oil. The test is ended as soon as an acid value of 2.0 mg KOH/g is reached. The time elapsed to this point is stated in hours as the test result. The smaller the value, the higher the tendency of the oil to oxidize rapidly. If the acid value remains below 2.0 mg KOH/g, even after a test duration of 2000 hours, the acid value measured on conclusion of the test is stated.

2000 m² more: New rooms for seminar attendees and staff

The Technology and Dispatch departments moved into our new building at the start of the year. It is just a few metres from OELCHECK House. The OilDoc seminars now take place in the state-of-the-art seminar room in the new building. A light-drenched caféteria with a view of the mountains joins on. Our staff now have an even bigger fitness gym with a wellness area available to them.

Space at last: 2000 m² allows us enough space for staff and those attending our seminars

Daily Technology discussion

The analysis sets you have ordered are put together especially for you in the dispatch department.

Workstations in the Technology office

Employee training in the new seminar room

Refuel in the caféteria

Action in the gym

Job changes

The head of the diagnosis team at OELCHECK GmbH for many years, Dipl.-Ing. **Rüdiger Krethe**, has taken up a new position. With effect from 1 July 2010, with Dipl.-Ing. Peter Weismann, he is joint managing director of OilDoc GmbH. With Mr Krethe as presenter and coordinator, the OilDoc academy offers seminars, inhouse training courses, expert opinions and individual consultancy on all aspects of the efficient application of lubricants, tribology and lubricant analysis. In addition, in February 2011, the company will be staging its first international symposium, the OilDoc Conference and Exhibition in Rosenheim.

Dipl-Ing. (FH) **Steffen Bots** will be taking over the role of Head of the Diagnosis Team. He has been with OELCHECK since 2005 and will be personally very familiar to many customers through contacts at trade fairs and training courses. Under the management of Mr Bots, laboratory reports will be assessed by our diagnosis experts on behalf of our customers and telephone support for questions in connection with lubricants will be further optimized. **Peter Weismann** also remains active as the Technical Manager for OELCHECK in addition to his duties for OilDoc GmbH.

Since demand for our professional education and consultancy services has shown continuous growth in recent years, it has made sense to separate the business into oil analysis, which is done by OELCHECK, and seminars and consultancy, which is the responsibility of OilDoc. This will mean that we can continue to guarantee in the future the high levels of professionalism in all our services – in both OELCHECK and OilDoc.

STLE Meeting in Las Vegas

The 65th Annual Meeting of the STLE took place in Las Vegas in May 2010. Over 1200 people participated in the Society of Tribologists and Lubrication Engineers event. The STLE represents the interests of more than 4000 technical experts from industry, science and government in the USA, Canada and many other nations. The event programme included 370 presentations dedicated to lubricants. The accompanying trade exhibition was fully booked with 80 stands. On the OilDoc information stand, Peter Weismann and Steffen Bots presented the Lubricant Conference to be held at the beginning of next year in Rosenheim. Visitor interest exceeded all expectations. The OilDoc Conference and Exhibition was presented to STLE's board members in two rounds of presentations at the invitation of STLE management.

from left to right: Peter Drechsler, Timken – STLE President 2010-2011, Steffen Bots – OELCHECK, Dr. Robert Gresham – Head of STLE Training, Peter Weismann – OilDoc, Ed Salek, Executive Director STLE

Guests of OELCHECK – the FVA's Lubricants and Tribology Working Group

On Tuesday, 29 June 2010, the German Drive Technology Research Association's (FVA) Lubricants and Tribology Working Group met at OELCHECK in Brannenburg.

The working group meets twice a year to consult on current projects and new research projects. Almost 80 members took up the invitation to Upper Bavaria. In the newly opened OELCHECK House, the Group discussed, among other matters, ongoing research projects and GETLUB, a conference on the subject of gearbox lubrication taking place in December 2010 in Würzburg.
Following a hard day's work, the party took the mountain railway up the nearby Wendelstein in glorious weather.

OELCHECK was the host for a Bavarian evening with alphorns, whip cracking and the Brannenburg brass band.

The following day, the OELCHECK laboratory once again took centre stage. Meeting attendees who had not had the chance to view it on the previous day took the opportunity of a tour of the pioneering laboratory in lubricant analysis.

The German Drive Technology Research Association is a non-profit making association with the purpose of common research in the field of drive technology. Organizationally a part of the German Engineering Federation (VDMA), the FVA is the world's leading drive technology network. Its members are manufacturing companies in the drive technology sector. The FVA's network includes the best research institutes working in drive technology. In recent years, over 750 projects have yielded research results which have been and continue to be successfully implemented in products Working together in research like this allows companies the opportunity of improving their technical knowledge and the quality of their products while reducing production costs. Some 100 ongoing projects each year are currently being coordinated by 23 active working groups collaborating with around 40 university institutes. Over 1000 expert representatives of the member companies are active in FVA committees.
The Lubricants and Tribology Working Group, with over 100 members including the representatives of the universities, is the largest of the very active FVA working groups. Its participants are taken from gearbox, bearing, seal, lubricant and additive manufacturers and OELCHECK, the specialist in lubricant analyses. The various research projects funded by the German government-backed AiF or by the Association itself cover fundamental topics in tribology and current questions relating to lubrication arising from practical drive technology applications.

New FVA code of practice – Oil changes in transmissions

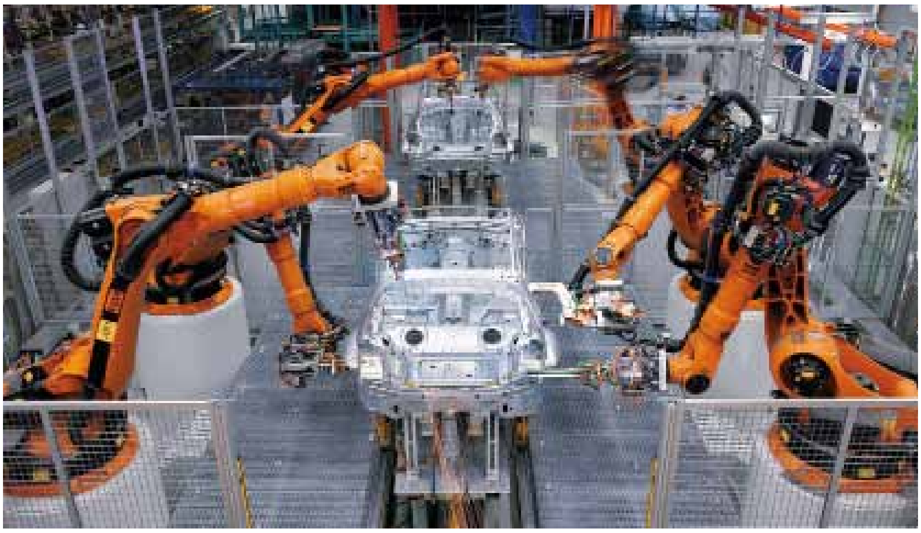
Service engineers' risk of an error when changing oil is increasing as a result of the great number of different transmission types and the new gear oils. The German Drive Technology Research Association (FVA) has therefore drafted a special code of practice drawing attention to the points to be considered when changing gear oil. It offers the information needed in particular by designers, operators and service engineers to correctly change lubricants in transmissions. OELCHECK engineers contributed to the drafting of the new code of practice with their expertise in the area of the analysis of old oil in conjunction with oil changes.

The code of practice is a guideline to the details to be taken into consideration when changing the oil in gearboxes. It is not, however, a list of recommended lubricants. The only valid lubricant recommendations are the relevant specifications issued by the manufacturer of the transmission in consultation with the manufacturer of the lubricants.

Transmissions lubricated by grease are not covered by the code of practice. It applies to oil changes in industrial transmissions of all types and for transmissions in marine applications – whatever the lubricating oil used. The specifications issued by the manufacturers should be observed for gear oil changes in road and rail vehicles, construction and agricultural machinery. The code of practice can, however, be helpful here.

The new code of practice is available for download from www.fva-net.de.

KUKA – All that moves in automation



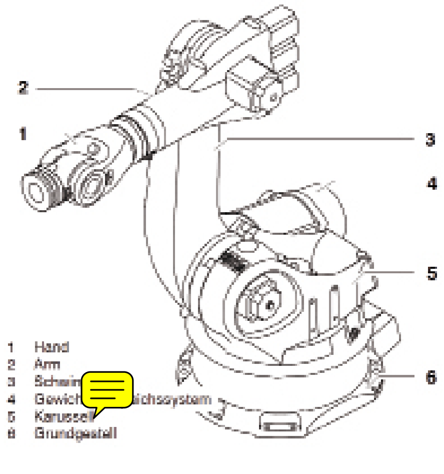
KUKA robots spot welding in a car plant

Compared with other technical inventions, the robot is still comparatively young. The first industrial robot in the world was not installed until the middle of the 20th century. Following the hydraulic robots that were generally produced in Japan, the first electrically driven and microprocessor controlled robot came onto the market in 1974. KUKA made the quantum leap in the development of industrial robots in 1996.

This was when the first PC-based controller developed by KUKA was launched. This launched the age of “true” mechatronics, characterized by the meticulous interplay of software, controller and mechanism. All that moves in automation comes from KUKA. Whether in logistics, the plastics or metal industries, medical technology or in the entertainment sector – KUKA robots are in use practically everywhere.

Robots are increasingly contributing to the optimization and flexibilization of vehicle production in the automobile industry. Here they mainly take on tasks such as welding, painting and bonding. If they are fitted with special dirt and heat-resistant foundry equipment, they can even work as an intelligent assistant in the manufacture of engines in the foundry. Over 1000 robots are active in the production of a car model in a car plant. So 4000 units are not unusual in a large plant. Robots score over their human colleagues with their economical production processes, reduced costs, higher output and constant quality. The more rotational and translation axes a robot has, the greater is its mobility. Current models with six axes are able to grip and handle almost any position in space. The robot is programmed by the controller. Its movements are executed by the interplay of the various axes. The tool required (e.g. a welding gun) can be mounted on the robot‘s hand at the end of the robot‘s arm. One drive on each axis is responsible for the movement of the axes. It consists of a motor, gearbox and controller.

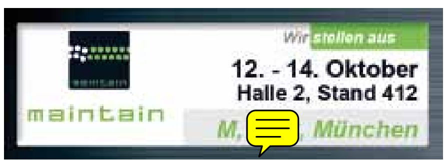
KUKA series 2000 robots are used in the automotive industry for spot welding body panels, among other tasks. This process joins two thin metal panels together. A continuous weld is not required. An electric current concentrates high energies on a small area of a workpiece.
High pressure then creates an unbreakable joint. The entire process takes only a fraction of a second, is easy to handle, requires no other materials such as gas or wire and can be automated without problem. However, the weld points must always be accessible from both sides. This is child‘s play for KUKA robots, as the welding gun almost becomes a seventh robot axis and so the movement of the gun and the robot are programmed and operated synchronously.



Design of a six axis KUKA robot

Almost all KUKA robots have six axes and therefore also the same number of transmissions, each of which are lubricated with 15 to 17 litres of synthetic gear oil. The oil is changed every five years or after 20,000 hours of operation. In the automotive industry, this operation is generally performed directly by the vehicle manufacturer‘s own service engineers. As the capacities of the transmissions are not very great, there is frequently no routine lubricant analysis for all transmissions. Yet the oil is subjected to high loads. The robots are in continuous use. Their movement is jerky and thus generates shocks in the transmission. The average temperatures in the transmissions is around 80°C. It is accordingly important that only lubricants recommended by KUKA are used. Only those gear oils that KUKA has previously thoroughly tested in practical tests supported by oil analyses are approved. Consistent performance by the lubricant ultimately contributes to reliability of production and the service life of the transmissions.

The screening of gear oils clearly illustrates the high priority oil analyses have in KUKA‘s quality assurance. The ambition is to replace the gear oils in the robots with lower friction lubricants changing from mineral oil-based gear oils to synthetic lubricants to achieve longer oil change intervals and to improve efficiency.
To this end, samples from more than 1000 robot transmissions were analysed by OELCHECK before it was possible to approve the synthetic gear oil for long-term use. – An impressive example of the great care that KUKA Roboter GmbH takes with its quality assurance.



CLS
CERTIFIED LUBRICATION SPECIALIST

New training for CLS – Certified Lubrication Specialist

Unlike Europe, the USA already has challenging training and certification programmes for lubrication and oil monitoring specialists. These certifications to become a Certified Lubrication Specialist (CLS) and Oil Monitoring Analyst (OMA) are run by STLE – the Society of Tribologists and Lubrication Engineers in the USA.

STLE represent the interests of more than 4,000 technology experts in the industrial, scientific and administrative sectors in the USA, Canada, and many other countries. CLS and OMA are internationally recognized certifications that are also highly valued in Asia, Africa and Latin America. It is high time that Europe set up similar professional development opportunities. OilDoc GmbH has recognized the great importance of a uniform standard in the examination of knowledge of lubrication. From 2011 it will be the first academy in Europe to offer, in co-operation with STLE, seminars covering lubrication and comprehensive examinations for certification following the American model.

The incorrect use of lubricants is a cost to the economy and the environment

The capabilities, reliability and efficiency of practically all machinery and equipment nearly always depends on the lubricants used. The important role of oils and greases in the reduction of friction and hence in efficiently saving energy is also increasingly being recognized.
Modern lubricants are playing an ever bigger role in maintenance schedules. Nevertheless, today Germany's economy alone is burdened with costs arising from unnecessary wear in excess of 150 billion euros. To this must be added the enormous consequential costs arising from machine shutdowns, quality problems, etc. These can be estimated to multiply costs by four or five times. Over 70% of the causes of failures caused by wear can be traced back to servicing and operation in which lubrication plays a significant role. In addition to this, an intelligent lubricant management scheme is very important. Oils and greases are overwhelmingly based on non renewable resources. The oil change intervals can be safely controlled and generally significantly extended nowadays with lubricant analyses. This means that the consumption of new oil and the volume of old lubricants decline to the benefit of the environment.

While the procedures for certification as a Certified Lubrication Specialist (CLS) and Oil Monitoring Analyst (OMA) have been tried and tested over 15 years, there is only quite modest provision for CPD in lubricants and lubrication engineering in Europe. Vocational colleges offer hardly any professional information about lubricants and their applications. Universities and technical universities teach only a little practical knowledge of tribology and lubrication engineering. To this is added the fact that many mineral oil suppliers have largely withdrawn from training end users and now only provide technical information to their major customers and employees.

Both company and employee gain by certification as a CLS

Service engineers in particular will enhance their CV by following a training course connected to the CLS examinations. After all, this qualification is evidence of an above-average knowledge of the field of tribology. The CLS has a solid knowledge base. His tasks include:

- The selection and comparison of the lubricants to be used in all machines, motors, transmissions and hydraulic systems.
- Supporting the purchasing department by providing a comparative selection of the best suppliers at the best conditions.
- Regular monitoring of all lubricants used and improving all lubricating equipment and lubricating systems.
- Drawing up lubrication schedules for all machines and ensuring efficiency by reducing the number of grades.
- The dissemination of practical, but well-founded, knowledge about lubricants and their application from procurement to disposal.
- Instruction and training of staff entrusted with lubrication, filtration and oil servicing.
- The development and optimization of quality assurance plans concerning the use of lubricants and handling old oils and greases.
- Troubleshooting when problems occur with components in which lubricants are in contact with the part affected.

One important precondition for his work as a CLS is his absolute independence from particular manufacturers of lubricants, oil servicing equipment, etc. Ultimately, only an objective CLS is in a position to lower the costs of lubricants while simultaneously preserving natural resources.

The Certified Lubrication Specialist CLS – preconditions, training, certification

As in the USA, the European programme will also require at least three years of practical experience in the lubrication of plant and machinery. Just as STLE does at the international level, OilDoc will offer CPD seminars with content which will assist in passing the difficult CLS examination. However, complementary study of technical literature is also recommended. Anyone who thinks that he has sufficient knowledge of lubrication can register for the exam. The exam takes three hours and comprises over 150 multiple choice questions. However, it is not an easy exam for the students. At least 50% of the candidates in the USA fail.
OilDoc will probably be offering suitable training for the European CLS at the end of 2011. Some of the content to be covered in the seminars will include:

- The fundamental principles of lubrication, friction and wear
- Synthetic and mineral oil based lubricants and their applications.
- The production, handling and storage of lubricants
- Agents added to reduce friction and wear
- Oil monitoring, longer oil change intervals and the reduction of consumption
- The operation and lubrication of: motors, transmissions, bearings, chains, hydraulic systems, compressed air systems
- Fluids used in metal machining, heat exchange oils
- The use of lubricating greases and regreasing intervals
- Assembly pastes, non-friction coatings, cleaners and solvents
- Interaction of lubricants and seals, paints, finishes
- Drawing up lubrication and maintenance schedules

The test questions for CLS certification are prepared in collaboration with STLE. Just as those in the USA, they meet the standards published by NOCA (National Organization for Competency Assurance) complying with ISO 17024. The content of the seminars and the examination questions will, however, be adapted to European conditions, partly thanks to the active collaboration of Peter Weismann in the CLS board. CLS certification is valid for three years. At the end of this period, the candidate takes a refresher certification to ensure that his CLS knowledge is always kept up to date.

Öl Checker

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QUESTION TIME

We have the oil in our biogas motors analysed on a regular basis. Studying the trends, we have noticed that in some analysis results a SAN (Strong Acid Number) is indicated in the laboratory report alongside the AN or TAN we normally expect to see. Why is this value given and what is its significance?

OELCHECK:
In all laboratory reports relating to engine oil analyses we state the base number (BN) and/or the acid number (AN), depending on the scope of analysis required. These are supported by an initial pH value, the i-pH value, for the oil from gas motors. The determination of these values is generally sufficient for a determination of the optimum oil change time, which is heavily dependent on the composition of the gas. If, however, the gas includes aggressive acids, which get into the oil from landfill gas, bio gases, or digester gas, the method for the determination of the AN is extended. The pH value is then less than pH 4 at the start of titration. Only then can an SAN (Strong Acid Number) be determined at all. The consumption of potassium hydroxide required to reach a pH of 4 is stated as the SAN. Titration then continues up to the neutral point (around pH 7) and the consumption to this point is stated as the AN. The SAN, a measure of very strong acids in engine oil, is only stated in the laboratory report if these aggressive acids are present in the oil. The AN always appears in the report, as ever.
Oils age during their use. Oxidation, in which the oxygen molecules change the hydrocarbon compounds in the oil, is one of the consequences of this ageing process. This gives rise to organic products of oxidation which are acid in their reaction. These reactions take place very slowly at room temperature and only have a minor influence on the oil's condition. The speed of the reaction is, however, considerably greater at the elevated temperatures found inside an engine. Products of combustion and wear particles in the oil also act as catalysts. If residues from the combustion of gases containing harmful products such as are found in bio gases, landfill gas or digester gas then condense in the engine oil, this has an additional influence on the increase in the acid products created. This ultimately damages the engine to the extent that it needs to be repaired.
One of the tasks of the engine oil is to neutralize acid constituents. The engine components that are vulnerable to attack are thereby protected against corrosive attack from the free acids. To ensure that this acid neutralization succeeds over the longest possible period, the oils contain alkaline additives the modification of which is recorded in the oil analysis in the form of the BN. If these base additives have been used up or are present in the oil in insufficient volumes, the strong, extremely aggressive acids directly attack the vulnerable engine components such as the bearing metals. At the same time, an increase in oil viscosity and the formation of lacquer-like deposits on hot surfaces (e.g. the inside of the piston crown) may be observed.
Monitoring of the oil in respect of its alkaline reserve and the acids present in the oil is therefore decisive in determining the optimum time for an oil change to protect the engine. Such oil values are also taken into consideration alongside wear values and contamination in the diagnosis of the oil. Thus the BN or base number is an important criterion for the quantity of acid constituents that can still be neutralized and rendered harmless by the oil. This BN potential is compared with the acid AN potential and the i-pH value in the analysis of the old oil. At the OELCHECK laboratory, unlike the laboratories operated by oil and engine manufacturers, we use an extended analysis method for the titration curves to distinguish between the Strong Acid Number (SAN) and the Acid Number (AN) to trace the very aggressive acids that occur in particular in special gas-powered engines.
In the laboratory report we only state the SAN if it is at all possible to determine a value because of the presence of strong acids. This is fortunately generally not the case. However. as soon as a SAN (stated in the laboratory report with values > 0.01 mgKOH/g) is measured, the oil must be changed without delay. At the same time it is recommends that the oil change interval should be shortened so that no SAN occurs the next time. A measurable value means that there is an acute risk of corrosion for all engine parts from the oil that has become too acid.

OELCHECK is always ready to answer your questions about tribology and lubricant analyses.
Send us your questions by e-mail (info@oelcheck.de) or by fax (+49 8034/9047-47).

SEMINARS

OilDoc

New from OilDoc:
Symposium on paper machinery and refrigeration seminar

Under the co-ordination and leadership of the new managing director Dipl.-Ing. Rüdiger Krethe, OilDoc will, for the first time, be holding seminars and symposia using external speakers, in autumn 2010. The Refrigerating Equipment seminar will offer all there is to know about refrigeration compressor types and media, their maintenance and care, oil changes, oil grades and their selection and information from oil analyses.
The Paper Machinery symposium will bring news from the point of view of the manufacturers of paper machinery, calenders and bearings. Best practice in filtration, new lubricants, optimized central lubricating systems, correct greasing, online sensors and on-site methods of analysis as well as information obtained from oil analyses will also be presented by speakers who are specialists in the subject.
All the events take place in the new OilDoc Seminar Centre in the Upper Bavarian town of Brannenburg, 60 km south-east of Munich. In addition to this series of events, OilDoc also offers individual seminars with content customized to your company, here or on your premises.
For detailed information and registration forms, please visit www.oildoc.com. Mr Rüdiger Krethe and Ms Kathrin Gottwald look forward to discussing your individual needs on phone number +49 8034 9047 700 .

Seminar dates

13-15.09	Machine Monitoring by Oil Analysis for Hydraulic Systems
16.09.	Advanced Seminar: Hydraulic Systems
04-06.10.	Machine Monitoring by Oil Analysis for Engines
07.10.	Advanced Seminar: Engines
25-27.10.	Optimal Lubricant Management
08-10.11.	Machine Monitoring by Oil Analysis for Industrial Applications
11.11.	Advanced Seminar: Industrial Applications
15-16.11.	Machine Monitoring by Oil Analysis for Refrigeration Equipment
22-23.11.	Machine Monitoring by Oil Analysis for Paper Machinery