The South African Institute of Tribology

understanding friction, lubrication and wear

Newsletter, February 2014

SAIT Programme 2014

25 March 2014, Proposed Afternoon Seminar on Oil Analysis is proposed. Full notice and request bookings.

9 May 2014: SAIT Annual Dinner – *Please diarise and make sure to book when details follow in the New Year.*

13 May 2014: SAIT AGM and Technical Meeting – *Please Diarise and make sure to book when details follow closer to the time.*

19 – 23 May 2014: 5-day Lubrication Engineering Course (89) - Sica's Guest House, 19 Owen Avenue, Mayville, Durban. *This course is registered with ECSA, SAIMM number 00661, and is awarded five CPD credits.* ***Book now to reserve your place – click here for the form … pdf,***

28 May 2014: Greases Course – *Details to follow*

2 – 6 June 2014: 5-day Lubrication Engineering Course (90) - Science Park, 1 Northway off Marlboro Drive, Kelvin, Sandton, Johannesburg. *This course is registered with ECSA, SAIMM No. 00662, and is awarded five CPD credits.*

25 – 29 August 2014: 5-day Lubrication Engineering Course (91) - Breakwater Lodge, V&A Waterfront, Cape Town. *This course is registered with ECSA, SAIMM No. 00663, and is awarded five CPD credits.*

15 – 19 September 2014: 5-day Lubrication Engineering Course (92) - Science Park, 1 Northway off Marlboro Drive, Kelvin, Sandton, Johannesburg. *This course is registered with ECSA, SAIMM No. 00664, and is awarded five CPD credits.*

19 & 20 November 2014: SAIT CLS Study Course – For those wishing to write the STLE CLS exam, attendance of this course is strongly advised, especially bearing in mind the imperial measurements that are used and the focus on steel industry lubrication. The course will be facilitated by a current CLS holder, and study modules can be made available before the course dates, if needed. The STLE exam standard is high and the pass mark is 70%. Global pass rates are around 50%.

21 November 2014: STLE - CLS, OMA & CMFS exams – Science Park, 1 Northway off Marlboro Drive, Kelvin, Sandton, Johannesburg.

For further details of all the above, please contact Gill or Isabel at 011 804-3710 or e-mail either secretary@sait.org.za or admin@sait.org.za

Course Attendance:

We ask that, should a delegate not be able to attend a course for which they have registered, they let us know as soon as possible so that we can accommodate people from the waiting list. Delegates can phone either Gill or Isabel at 011 804-3710, or e-mail Gill at secretary@sait.org.za or Isabel at admin@sait.org.za. We will be happy to carry your registration forward to a future course at no extra cost.

Lubrication Engineering Course (88), 24 – 28 February 2014: Report-back

The course ran smoothly and all those who attended found the content of great value.

The results will be published in the March Newsletter.

Delegates of Lubrication Engineering 88 with Lecturer Dave Gamble and SAIT Secretary Gill Fuller

'Gears and their Lubrication'

A dynamic seminar presented by five experts in their field.

By Leon Bradley, SAIT Member

The Seminar, held on Tuesday 11 February 2014, was Chaired by Patrick Swan of Aswan Consulting. Patrick set the scene with a brief over view of gearbox problems with the corollary that most can be resolved with correct lubrication.

Theolin Moodley of Lubrizol gave a comprehensive run down on Gear Oil Specification Trends. Gears may be splashed, sprayed, dipped or have lubricant pumped to them, whether they are spur, helical or worm gears. An additional factor is that bearings are usually lubricated by the same product as the gears, even though they are very different in their operation and lubrication requirements.

A gear lubricant's duty is to cool, reduce oxidation, protect from water, wash away impurities and of course, reduce friction. Examination of failures and improvement of products includes test for wear by measuring the loss of mass in a gear and examination of micro pitting of surfaces. Interaction of lubricants with often ignored items, such as seals, anaerobic thread sealants and the painted internal surface of a gearbox are factors considered in formulating lubricants.

Howard Benade, a post graduate student with Prof. de Vaal at the University of Pretoria, discussed gear testing of lubricants in various applications at their laboratories. Low temperature open gear and high temperature enclosed gear lubricants are examined for spray-ability and mobility. Running spur gears, in an enclosed rig with a controlled load, is done to give an empirical indication of a gear lubricant's efficacy. Load tests, particle contamination, solid additives, viscosity, flash point, boiling point and curve determination are tests they routinely conduct not only on lubricants but also on diesel fuel and metalworking fluids.

Patrick Swan spoke of the tremendous increase in use of wind turbines; Eskom intend to erect 46 on the Cape west coast. It is expected that 1.5 million megawatt will be

generated by wind by the end of this decade. Lubricant use is around 150 litres per megawatt! Interestingly, failure of wind turbine gearboxes is related to the tower height; the sway caused by wind, is a major factor in causing oscillation and severe vibration problems in these units. Lubricants are carefully chosen to reduce foaming and cavitation, they must have a high viscosity index and would be formulated with additives to protect both gears and bearings from corrosion and vibration.

Pieter Brand, Director of Higrotek, discussed the degradation of lubricants with emphasis on varnishing; that golden brown staining we've all seen on engines parts. Recently formulated superior lubricants, with anti-oxidants, are likely to cause varnish deposits. The thickness of varnish can build up to cause problems with increased insulation and capturing impurities to present an abrasive surface. Regular oil changes, filtering by an electro-physical separation process and monitoring (Pieter recommended Membrane Patch Colorimetry and RULER as alternatives that are available from Higrotek), can resolve the problem.

Mariaan Avis, Senior Chemical Technologist at Eskom, presented a case study of a recent failure on a Electric Feed Pump (EFP) at a power station. Lubrication to the feed pump was contaminated with water through a faulty seal; this resulted in bearing failure and subsequent damage of the gears of the voith unit.Regular sampling and analysis of lubricants will show increasing contamination levels; reacting to reports and following recommended corrective action, can prevent catastrophic failures. It was stressed that a failure is an opportunity to learn.

Each presenter, an expert in their field, imparted practical knowledge with dynamic and interesting presentations. Thanks to the sponsors, Carl Bechem, and to SAIT for organising the day.

Polymer Horse Shoes

By Howard Benade, SAIT Student Member

Howard on Horseback

The origin of the first horseshoe is unknown, but the concept has been around for a long time. The horseshoe used by the Romans in the first century was made from leather and metal. These shoes were called "hippo sandals", but it was not until the 6th & 7 th centuries when horseshoes were nailed to the hooves.

A Steel Horseshoe

The main function of the horseshoe is to protect the hoof against wear or damage during locomotion. This can be provided by steel horseshoes. Steel shoes,

however, limit the shock-absorbing properties as well as the flexibility of the hoof. The risk of injuries can be increased, since the steel shoes interfere with the deformations that occur during gait. The steel shoes also interfere with blood circulation and consequently increase the risk of injury. Not only is a decrease in the risk of injury beneficial, but for athletic horses, proper footwear can improve performance. This has led to development of alternative horseshoes. Light materials such as aluminium complex matrixes have been considered, but have been discarded due to massive wear and breakage.

Polymer materials have also been considered, which have a higher elasticity than steel shoes, as well as an enhanced capacity to fit the natural deformation of the hoof. They also offer higher damping properties. Polymer shoes are therefore more compatible with the hoof and its deformations. An example of a polymer horseshoe is shown in figure 1.

Figure 1

There are a few disadvantages. One is that polymer horse shoes have limited resistance to wear when compared to steel shoes. The wear on polymer horse shoes can be seen in figure 2b after 52 days. This is from the study done by Hofmann and Mischler (2003) on the wear of polymer horse shoes.

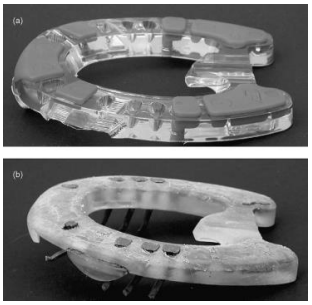

Figure 2: Shoes used by Hoffman and Mischler (2003) in their study on the wear of polymer horseshoes

The shoes consisted of two parts. A transparent base in the traditional horseshoe form with nail slots to fix the shoe to the hoof. This was made from commercial polyurethane of 72 Shore D hardness. The second part is a wear resistance insert (see figure 2a). This part was also made from polyurethane but with a Shore A hardness of 91 (softer than base). As can be seen from the figure, large amount of wear was obtained. This was observed, particularly in the front part of the shoe.

Furthermore, wear of horseshoes was also found to be affected by the horse and not only by the surface roughness or the distance. For some horses, the shoes wear down faster than others, while the shoes on the hind feet also show more wear. The mechanism of wear was identified as a combination of rolling/sliding wear and abrasion wear.

Other problems with polymer horseshoes are the possibility of little stones getting stuck between the hoof and the shoe. This can be remedied by more conscientious cleaning. The horseshoe can also stretch and if the hoofs are not properly rounded and shortened, may lead to cracks in the hoof.

Recent developments include horse shoes that become malleable when heated. This allows the shoe to be able to fit to the hoof shape and when the shoe cools down, it has the same toughness as the hoof itself and becomes part of the hoof. Some of the polymer shoes can also be trimmed to the shape of the hoof.

Another concept is shoes that can be glued onto the hoof. This has the advantage that it does not lead to lameness and can be used where the wall is of poor quality and shoes cannot be nailed on. It also has the advantage that the shoes can be placed correctly, which is not always the case for nail-on shoes. However, this method can affect the hoof wall and is recommended as a solution to a hoof-related problem and not as a long term treatment.

Plastic or polymer horse shoes can improve the performance of a horse by being more comfortable, if proper hoof care is maintained. The lifetime of the shoes are however still a

problem since the shoes have to be replaced more regularly than steel shoes.

References:

1. *Marry Bellis (2012) "Horseshoes, Nails, Saddles, and Riding", http://www.About.com [2012, October 2012]*
2. *Mischler, S and Hofmann, M (2003) "Wear of polymer horseshoes: a field investigation" Wear 255: 1300–1305.*
3. *Klein, C (2009) "Heading out on plastic shoes", SA Horseman Vol 4, No 1, January February 2009.*
4. *Imprint Sport (2008) "Imprint Sport Plastic Horse Shoe", http://www.imprintsport.com [2008, February 2014]*
5. *EsponaShoe (1010) "Flexible Polyurethane Plastic Horseshoes", http://www.esponashoe.com [2010, February 2014]*
6. *Bob Judd (2012) "Glue-on Shoes for Horses", http://www.VeternaryPartner.com [2012, February 2014]*

International Tribology Events:

Hannover Messe Trade Fair, 7 – 11 April 2014:

The annual **Hannover Messe** trade fair is the world's leading exhibition for industrial technology. Featuring seven leading trade fairs, **Hannover Messe 2014** will focus international attention on core areas of industrial technology. Exhibitors benefit from the direct interaction with international potential customers, while visitors establish direct contact with suppliers and global decision makers.

Where: Hannover, Germany
When: 7 – 11 April 2014
Details: www.hannovermesse.de

The Seven leading trade fairs hosted by **Hannover Messe 2014** will be:

- Industrial automation
- Energy
- MobiliTec
- Digital Factory
- Industrial Supply
- Industrial GreenTec
- Research & Technology

Each trade fair hosts daily panel discussions, forums, keynote speakers and other events which further underline **Hannover Messe's** importance as the annual meeting platform for the world's industrial technology sector.

Hannover Messe 2013 attracted:

- 6,550 exhibitors
- 217,017 visitors

Visit Hannover Messe 2014: meet new suppliers and service providers. View the latest innovations to take your business to the next level.

Exhibit at Hannover Messe 2014: display your industrial technology products to international trade decision-makers and bulk buyers.

- Stand build costs
- Travel packages
- Visa information

PSI PROMOTIONAL WORLD 2014:

From simple give-aways to quality branded goods - PSI PROMOTION WORLD showcases the entire spectrum from promotional items to incentives. Just a few steps away from HANNOVER MESSE, companies specializing in promotional goods present the latest trends and innovations from all sectors of manufacturing industry. Find more information at http://www.hannovermesse.de/en/about-the-trade-show/program/events/search-events-overview.

For additional support, please contact:

Marc Cousins
Representative of Deutsche Messe AG Southern Africa
Southern African – German Chamber of Commerce and Industry NPC
PO Box 87078, Houghton, 2041
47 Oxford Road, Forest Town, 2193
Johannesburg, South Africa
Tel. +27 (0)11 486 2775

Fax +27 (0)866 550 8646
Email: mcousins@germanchamber.co.za
Email: info@hf-southafrica.com
Web: www.messe.de
Web: www.germanchamber.co.za

Special Symposium and Joint Sessions at STLE 2014, 18 – 22 May 2014, Lake Bena Vista, Florida, USA.

STLE2014 is the premier technical event showcasing the latest research in the field of tribology and lubrication engineering through technical presentation, education courses, discussion panels and much more.

In addition to all the great technical resources, this year's event will host 2 joint technical sessions and a special symposium.

Molecular Chemistry and Lubrication Rheology

This symposium invites presentation on exploration, understanding, and modeling of lubricants properties and performance based on molecular chemistry.

In Situ Tribology

(Materials Tribology and Tribotesting Joint Session)
This joint session will cover a multi-disciplinary range of topics encompassing the use of novel and emerging in situ techniques to provide greater insight about interfacial process and phenomena, materials characterization, and the mechanisms of contact mechanics and adhesion within a buried interface. [Click here for more details]

Nanoscale Phenomena In Materials Tribology

(Materials Tribology and Nanotribology Joint Session)
This joint session will cover a wide range of topics involving the use of nanotribological characterization techniques, with a particular interest in in-situ nanotribological methodologies, to provide a better understanding of the nanoscale interfacial process. [Click here for more details]

Interested authors can submit abstracts at the following link
http://stle2014.abstractcentral.com

LUBMAT 2014, 25 – 27 July 2014:

A conference and exhibition on Lubrication, Maintenance and Tribotechnology in the Hilton Manchester Deansgate Hotel, UK. For further information go to http://www.lubmat2014.org/.

X Anniversary International conference "Lubricants Russia 2014" - 1195 Euro*12-13 November 2014.

14 November 2014. International conference "Greases Russia 2014" - 450 Euro*

Accompanying Exhibition: Standard Exhibition Booth (3x2m) - 2250 EUR*

To register please contact Elena Konstantinova or Anna Lisak +7 495 502-5433 or +7 495 778-9332, or e-mail: Konstantinova.Elena@rpi-inc.ru or Lisak@rpi-inc.ru or visit our website: http://rpi-conferences.com