The South African Institute of Tribology
understanding friction, lubrication and wear

Newsletter – October 2018

Tribology plays a decisive part in any partnership with laser technology. Laser Technology has come a very long way since Danish physicist Niels Bohr won the Nobel Prize in 1922. The Bohr model of the atom reveals that light – a photon – is only emitted when an electron leaps from a higher energy level down to a lower level. Wavelengths of absorbed and emitted light correspond exactly to those quantum jumps that electrons make back and forth between different orbits.

The application of laser surface engineering to solve tribological problems is examined in detail in the 'Journal of Friction and Wear'. Here is the abstract:

'The methods of laser surface engineering, including laser cladding, laser alloying from pre-deposited layers, and laser alloying from the gas phase have been applied to increase the wear resistance and decrease the coefficient of friction of metallic surfaces.

Laser cladding has been applied to deposit metal matrix composites that consist of CuSn, stellite, stainless steel, and bronze, which act as solid lubricant reinforced with nanostructured WC ceramics with Co binding. Laser alloying of bearing steel with Sn increases the lifetime of oil turbo drills. Wear tests of Ti alloys doped with nitrogen from a gas atmosphere have demonstrated a viable possibility to apply the developed method to fabricate frictional couples.'

***Ref:* Smurov, I & Doubenskaia, Maria & Grigoriev, S.N. & Kurten, Gleb & Podrabinnik, Pavel. (2014). Application of laser surface engineering to solve tribological problems. Journal of Friction and Wear. 35. 470-476. 10.3103/S1068366614060129.**

October Technical Meeting:

"Diesel: A Tribologist's Nightmare?"

by Professor Philip de Vaal

Head of Department Chemical Engineering

University of Pretoria

Tuesday 2 October 2018 at 18:00

Science Park, 1 Northway, Kelvin, Johannesburg

Details/2…..

Philip de Vaal is a graduate from the Department of Chemical Engineering, University of Pretoria, South Africa, where he obtained Bachelor's and Master's degrees and a PhD all in Chemical Engineering. After some years in industry, he became a member of staff in 1980 and has been Head of the Department since 2004. He established the Tribology Laboratory in the Department of Chemical Engineering in 1990, which is entirely self-supporting. His specific interest is in laboratory evaluation of lubricant performance and in laboratory automation. He has been a member of the South African Institute of Tribology (SAIT) since 1987 and was a member of the Executive Committee of the SAIT from 1990 – 2004. He also served two terms as President of the SAIT (1992 - 1994). He has been chairman of the organising committee of 7 of the 11 International SAIT Tribology Conferences

Diesel fuel, and especially diesel fuel in South Africa, remains an interesting topic. During this presentation, an overview will be given on diesel, (both as fuel and as lubricant), interesting characteristics and some common misconceptions. Some interesting points on the future of the internal combustion engine, and the role of diesel and petrol, will be covered.

Refreshments will be served after the proceedings. ***For the purposes of catering, please ring Gill, Berice or Isabel at 011 804-3710 or e-mail secretary@sait.org.za or admin@sait.org.za to let us know how many plan to attend.***

ETT – Essential Tribology Terminology

More simple definitions for two of tribology's essential terms

- ✓ **Hydrostatic Lubrication** - A system of lubrication in which the lubricant is supplied under sufficient pressure to separate the opposing surfaces by a fluid film.
- ✓ **Hypoid Gear -** A combination of the spiral bevel and worm-type which is very quiet in operation. The motion of the teeth is a combination of rolling and sliding causing high loading pressure on the tooth faces, together with high rubbing speeds, and so demanding exceptional qualities of the lubricant.
- ✓ **Hydrolytic Stability -** The ability of products to resist chemical changes as a result of interaction with water

SAIT TRAINING – Smoothing the path to knowledge

Lubrication Engineering Courses, 2018 & early 2019

LE 118: 8 - 12 October 2018, Johannesburg
LE 119: 18 – 22 February 2018, Johannesburg

Costs/2…

Course Fees for SAIT Members:	R14 950.00
Course Fees for Non-SAIT Members:	R16 675.00
Course Fees for Students *(Proof of Student Registration Reqd)*:	R 4 600.00

For further information and a Registration Form, please go to: http://sait.org.za/events/training/ or email admin@sait.org.za

Further Course dates in 2019 (fees to be advised):

LE 120: 6 - 10 May 2019, Johannesburg
LE 121: 27 - 31 May 2019, Durban
LE 122: 22 - 26 July, Johannesburg
LE 123: 26 - 30 August 2019, Cape Town
LE 124: 7 - 11 October, Johannesburg

The SAIT will host the STLE: CLS, OMA, CMFS EXAMS

On 23 November 2018

And the

SAIT CLS OVERVIEW

On 21-22 November 2018

Venue: SAIT - Science Park - Johannesburg

COST including VAT:

Exam R 6 095.00

Exam re-write R 3 105.00

Study course R 5 980.00

Books for STLE CLS Exam:

STLE Basic Handbook of Lubrication 3rd Ed: R 3 021.00 + Post or Courier

AIST Lubrication Engineers Manual 4th Ed: R 4 047.00 + Post or Courier

For a Registration Form, please go to: http://sait.org.za/events/training/ or email admin@sait.org.za

COMMONSENSE TIP

***As the temperature of gear oil increases, its ability to support a load decreases*.** This is due to the thinning effect temperature has on viscosity. The rate of change differs for each oil. The rate of change is expressed in oil's Viscosity Index (VI) number. The higher the VI number, the lower the rate of change.

A hot gear box that seems to have a low reliability rating needs checking to see if the oil has a suitable VI and can hold up under high temperatures. The viscosity at the operating temperature is important. High-temperature, heavily-loaded applications may require a high viscosity index gear lubricant – check your product datasheets. *Ref: Lube Tips – Noria.com*

INTERNATIONAL EVENTS

28-31 October 2018 – Chicago, Illinois, USA – 2018 STLE Tribology Frontiers Conference (Co-sponsored by ASME Tribology Division): Join tribology researchers from more than 25 countries in North and south America, Asia and Europe for the 2018 STLE Tribology Frontiers Conference (TFC) to be held October 28-31 October 2018, at the historice Drake Hotel in downtown Chicago. Co-sponsored by the Tribology Division of the American Society of Mechanical Engineers (ASME). The TFC's focus is the role tribology plays as the interface of physics, chemistry, materials science and mechanicalengineering. The conference will feature three keynote speakers who will present talks on areas at the forefront of tribological science, and include technical sessions featuring submitted presentations from leading tribology researchers and institutions from aaround the world. Go to https://www.stle.org/TribologyFrontiers for further information.

2 April 2019 – UNITI Mineral Oil Technology Congress – Stuttgart, Germany: www.umtf.de

DID YOU KNOW?

'A tribological tip-trip'

Nuts & bolts are totally dependent on friction.

Torque is everything in fastening – but it is essential to work with clean and slightly oiled parts.

Experiments have shown that about 50% of the tightening torque is used to overcome friction at the bearing face of the nut, and a further 40% is used to overcome friction between the mating threads, leaving only 10% to increase the axial load in the shank of a bolt, which is directly related to the clamping load, and hence the stress.

These are average values when using clean components: one can easily have a situation where the frictional resistance is so high that the shank does not get stressed at all. This happens, for example, when the components are dirty; it could also happen when the bolt is

*used without the designed washer, thus allowing the base of the head to dig into any softer material, such as aluminium**.***

The point is that one often sees nuts and bolts being retrieved from a dirty workshop floor, possibly with with sawdust floating around, or even heavily rusted, which interferes with torque readings.

SAIT member, Patrick Swan, points out that "Good quality fasteners are usually treated against corrosion and this oil film reduces friction during tightening. Solid film lubricant coatings greatly assist in controlling the torque/tension relationship of fastener installation. If not coated, a slight oil film on the bolt threads will reduce frictional resistance during tightening and provide a more accurate torque reading." He adds – "*A screw that is tightened in an over-greased or excessively oiled tappet-hole will create sufficient hydraulic pressure to crack the block around the tapped-hole because oil is not compressible."*

Reference: https://fleetwatch.co.za/previous/magazines/May2008/47-Maak%20vas.htm

Specialist Tribo-Info

Benchmarking – waypoints for intelligent, tribological decision-making.

What is the service life of a component in differing conditions?

Bill Bryson's excellent book, 'A Short History of Nearly Everything', assumes the service life of a human being as 650,000 hours – that's 75 years where reported average life expectancy in Russia is 65 years!

Back to tribological 'ground zero': The service interval and lube top-up frequency for a diesel engine depends on the work it does, not the distance it covers. Then factor into the equation the environment, ambient temperature, excessive engine idling, cooling efficiency, lube quality and among others, fuel consumption. The latter indicates how hard an engine works.

Imposing a standard kilometre or hour service interval is a poorly-informed benchmark. The final arbiter is oil analysis.

Lube top-up ratios are the measurement of oil consumption to fuel consumption. It seems, among OEM's that exceeding 1% of fuel consumption for lube top-up is an indicator of fraud or serious mechanical defects.

The SAIT would like to be the storehouse of informed benchmarking – **submit and debate!**