

A 'Friction Fest'

'After gravity, tribology is the second most important property of matter; it is a complex science that impacts every person in almost every situation, and has a tremendous effect on industry at large, from energy consumption and wear in the largest machines to the joints in our bodies. Tribology is the study of friction and wear. Without friction the world as we know it would not exist: we would all slide around endlessly' – from 'SA Tribology Project 2010', a paper presented at the recent international conference.

What happens at an international event, such as the recent 10th SA Institute of Tribology (SAIT) 2011 International Conference, is an exposure of friction and wear by an impressive guest list of luminaries who are passionate tribologists, meaning everything to do with friction and wear and nothing to do with human tribes. Ranging from the tiny nano- and micro-particle studies, through to the large – micro-dosing – and the massive – Eskom power station condensers – there's no holy territory that a serious tribologist will not examine to minimise wear and reduce friction. That was the range of presentations that the SAIT dealt with at host venue Pretoria University from the 5-7 April 2011.

Today and growing in fashion, 'Green' is the word. And tribology is all about being green. After all we do need measured friction to brake the world's vehicle population – forecast to hit 1,2 billion (that's right, billion is the word) by 2020. The outcomes of this forecast from Forrester Research are fairly axiomatic and tribology can play a significant role in meeting these challenges:

- The world's vehicle population is expected to double in next 15 years
- This will cause several problems for resources and environment
- The oil supply won't be enough to satisfy demand
- Traffic injuries and deaths will escalate
- Scrap metal retirement will become a major problem
- China will be the engine of much auto industry growth

But to smooth that path where energy is required to move forward, there's a 'green' function for tribology, and that was the keynote message to the SAIT conference from Prof. H Peter Jost, the man who gave birth to the word 'Tribology'.

And if you are not aware of it, there is a Tribology Chair at Pretoria University under the guidance of Prof. P L de Vaal. A tour of the University's facilities was undertaken following a paper presented by the University of Pretoria; The Tribology Laboratory at UP - Collaboration between Academia & Industry.

New tribological terms for your use:

Nanotribology – the study of friction and wear processes on the nanometer scale; the engineering of matter at a scale approaching that of individual atoms.

Teratribology – movement of plates on which the continents rest.

A copy of this paper is available from the SAIT. While South Africa has recently suffered a flight of intellectual capital it's good to know that we do have a centre for this specialist knowledge and that industry has the opportunity to move out of its arrogant shell and talk to academia.

A summary paper of a 2010 SAIT study was presented at the conference. Sponsored by the South African Department of Science and Technology, and titled 'SA Tribology Project 2010' the study/report objective was to determine the cost and energy saving potential of tribology to South Africa. One serious aspect that emerges from this study is the really concerning state of lubrication practices in South Africa.

Here are a few key findings affecting every aspect of industry, mining, agriculture and transport in South Africa today:

Root-cause failure analysis is not typically performed in industry hence the true value of lubrication related failures cannot be determined. There are however a number of individual operations that are conducting root cause analyses and have reliability engineers for failures above a certain value. Most failures and breakdowns that occur are typically due to:

- Contamination, water or dirt ingress
- Alignment
- Poor maintenance
- Lack of greasing/ lubricating
- Policies and control

The major component failures are gearboxes, pumps and bearings.

Typically up to 35% of the failures are caused by shaft misalignment. Laser alignment equipment is normally available, but is not always used by the maintenance personal, unless the reliability department insists and checks that this occurs.

An example in one plant was fans with double spherical bearings that were failing: 30% were due to misalignment and 70% due to balancing. Bearing life in the 18 fans was 2-3 months. With correct alignment and balancing this was reduced to approximately one failure per annum. These failures indicate the lack of skills, attitudes and training of artisans and artisan helpers. It is believed that this could be the cause of up to 60 -70% of all failures.

This study has shown that, in general, equipment life has been reduced by a factor of three over the past 15 to 20 years. The loss of equipment life is a lack of traditional maintenance skills. 'Modern' maintenance has forgotten that dirt does not lubricate, that shafts must be correctly aligned and that oils and greases are not all the same. The report goes on to point out the desperate need to get back-to-basics:

- A need to calculate the correct viscosity grades throughout to minimise energy wastage
- To understand the difference between grade and type of lubricant

Education is a priority, from the boardroom to artisan level. Tribology is currently only taken as a research subject by Post Graduate students. A lubricator is one of the most important persons on the plant, and must be trained and recognised accordingly.

Here are three items for policy-makers –

- Total cost of ownership of assets should be a philosophy that is implemented
- Filters and filter management is CRITICAL in improving system cleanliness and improving component life
- Design of systems from an operation and maintenance perspective is essential to minimise dirt contamination of systems during maintenance

Tribology must have a strategic and not just operational value!

It's a tragedy that lubrication is perceived to have no strategic value. It's all compounded by lubrication costs that are such a small part of operating expenses and applied by the most unskilled labour available ('grease monkeys'). Management only notices lubrication and unnecessary friction when the 'wheels stop or fall off' productive plant and machinery.

Weak lubrication practice has a severe impact on machinery life, productivity and operating costs, which means it's time to make lubrication a strategic and policy-driven issue.

The 21-page paper on the 'Tribology 2010' report is broad-brush stuff but worth the read and available FOC – Free of Charge! It might change your mind about how we think about friction. But importantly, make friction (rather tribology – your new word) a strategic issue – this elevates the subject to the level of being policy-driven, environmentally-friendly, energy-conservative and concerned with life-cycle costs.

This SAIT 'friction fest' is a well-organised and documented event. There's the usual range of presenters from those that make post-lunch drowsiness an even worse drag, to the enthusiasm of others who get your personal and physical tribological aspects pumping. The material ranges from the very esoteric to absolutely practical with an overall approach that is very objective. Site visits are also included on the agenda and a visit to a thermal spraying plant was a real eye-opener – it's good to know this type technology still exists in South Africa when we seem to spend all our resources on stadiums and casinos while importing everything from China.

Three days of intellectual output is too vast to condense into one short overview. If you are really serious about being 'green', have a lubrication or friction problem and want to pursue a solution, then direct yourself to the SA Institute of Tribology. Papers from the International Conference are available and the SAIT will be happy to assist your enquiry.

References & acknowledgement:

Swan PG, Fitton JC; South African Institute of Tribology; SA Tribology Project 2010'

A copy of this paper can be obtained from the SA Institute of Tribology

Report by Dave Scott - SAIT Member

The SAIT will once again be hosting the highly-regarded STLE CLS exam on the 18th November 2011 at Science Park. For those of you who are unfamiliar with this arrangement, the SAIT is affiliated with the US-based Society of Tribologists and Lubrication Engineers (STLE) who created and administer the Certified Lubrication Specialist (CLS) qualification. It is a broad-based lubrication and tribology qualification, designed to test and acknowledge an individual's knowledge and expertise in these fields. Over the last decade a number of SAIT members have successfully tackled this tough exam, and benefited from the recognition provided by this qualification. As in previous years, the SAIT will be running a two-day preparation (not training) course leading up to the exam. The course will be held at Science Park on the 16th and 17th November and will be facilitated by a current STLE CLS graduate. As 7 of the 10 places available on this course have already been filled, make sure you guarantee your place by booking as soon as possible. Contact Gill or Isabel at the SAIT (secretary@sait.org.za).

For further information about the STLE and the CLS, visit the website www.stle.org.