

Tackling Tribology Greening Challenges

Tribology is an ancient science but was only recently defined in the mid-sixties by Dr H Peter Jost. It's the study of friction and wear that goes well beyond lubrication to include the properties and nature of the surfaces that are rubbing together. We require friction – either increased or minimised – in every aspect of our lives, such as vehicle braking systems or the rolling resistance that a tyre pattern creates. Tribological output is wear, heat and waste by-products. And a sound principle of well-applied tribology is that less is more. One litre of used oil has the potential to contaminate one million litres of water.

With the environment at the top of the agenda, SAIT recently held a one-day seminar at Science Park entitled 'Lubes & The Environment'. Expert subject presenters dealt with topics ranging from managing used oil in South Africa to micro-dosing lubricants, correct lubricant storage and handling, identifying and management of Polychlorinated Biphenyl (PCB) in insulating oils, low friction bearings and energy-savings in hydraulic systems – to name a few of the key issues.

Only recover an estimated 70% of the 120 million litres of used oil



Raj Lochen
CEO of the ROSE
Foundation

ROSE foundation

The Rose Foundation is Africa's only used oil recovery programme 'ROSE', which stands for Recycling Oil Saves the Environment, is a Section 21 (Non profit) company established in 1994 consisting of 19 members from the lubricants industry. In spite of their structured efforts at used lubricant recovery, the Foundation provides a sobering perspective for used oil pollution in South Africa.

"Annually around 300 million litres of new lubricants is sold into the South African market. This in turn results in approximately 120 million litres of used oil becoming available. The Rose Foundation through their partners NORA-SA only recover an estimated 70% of the 120 million litres of used oil. 36 million litres of used oil remains to pollute our waterways and underground water. This is a cumulative problem that will only grow and it concerns everyone."

PCB what?

On the green front, Polychlorinated Biphenyls (PCBs) are a whole subject on their own that few

are aware of. Polychlorinated biphenyls (PCBs) are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl, which is a molecule composed of two benzene rings. The chemical formula for PCBs is $C_{12}H_{10-x}Cl_x$, where $x = 1-10$. PCBs were widely used for many applications, especially as dielectric fluids in transformers and capacitors and coolants. Due to PCB's toxicity and classification as persistent organic pollutants, PCB production was banned by the United States Congress in 1976 and by the Stockholm Convention on Persistent Organic Pollutants in 2001.

It's no wonder then that Eskom imposed a trade ban on PCBs in 1977 and has a specialist program dealing with this poison. Note that PCBs are governed by SANS 0290 – a National Standard on the management of polychlorinated biphenyls, mineral insulating oils. Recently published in 2007, SANS 0290 provides a national best practice guide on the management and phase-out of PCBs in dielectric fluids. This indicates the stuff is still out there and waiting to contaminate unsuspecting handlers.

MQL – it's a 'no-brainer'

And if you like to believe that less can be more, then look no further than lubricant micro-dosing. This subject flies in the face of an African commonplace practice of over-lubricating to prevent excessive wear and failure. Micro-dosing is the technique whereby minute quantities of lubricant are applied in an industrial operation, leaving an almost dry product and production environment. Micro-dosing is also referred to as "near dry" or "Minimum Quantity Lubrication or MQL" or "mist lubrication".

MQL requires special micro-pumps that can deliver between 3 and 30 micro-litres per pulse – 30 micro-litres is an average volume of a drop. By adding pumps, changing the pulse rate, dosing parameters can be established to meet the specific needs of the operation, ie, metalworking, lubrication of bearings, chains, dies etc. Dosing is accompanied by carefully-controlled air to disperse lubricant at the exact point of lubrication, to blow away chips (metalworking) and to provide cooling of the tool.

Hydraulics – an unexplored frontier

Patrick Swan, CEO of Aswan Consulting, points out

in a paper on hydraulic efficiency that 'Hydraulic fluids account for approximately 14% of all lubricants marketed in South Africa, but over time hydraulic fluids have entrenched themselves as commodity fluids, generally sold on price, where a minimum of technology is expected and received. Hydraulic fluids are not only lubricants, but are also the prime medium used to transfer energy in hydraulic systems, and over the past few years have become a major research area to reduce energy losses when transferring energy in a system.'

Careful attention to hydraulic fluid specification can result in significant savings in the energy required to move payload units.

In most cases these energy savings are combined with other performance benefits such as oxidation stability, wear protection, corrosion resistance and improved air release. Case studies have proved that modern, widely cross-graded hydraulic fluids are no longer commodity items, but if used correctly, have the capacity to contribute significantly to overall energy efficiency.

Cascading

And then there are many other savings from using



low-friction bearings, effective storage of lubricants and becoming 14001 compliant – it's for serious minders of the planet.

SAIT has rubbed a vast knowledge surface that needs cascading into every aspect of life. How to get these strong messages into the market – that's the challenge!

Dave Scott, SAIT Member

Gill Fuller, Tel: (011) 802-5145, Fax: (011) 804-4972, Email: secretary@sait.org.za, www.sait.org.za

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