

Tribology at Work

Since its inception in 1985, the South African Institute of Tribology has been actively involved in the promotion of tribology. Transfer of tribology technology in wear, materials selection and lubrication is achieved through SAIT membership and the ongoing programme of training courses, seminars, webinars and technical meetings. International tribology conferences are regularly hosted by the SAIT to keep in touch with international research and expertise.

One of the recent achievements of the SAIT is in the field of energy savings through tribology.

The Academy of Science of South Africa (ASSAf), was established in 1996 by the late President Mandela to provide evidence based scientific advice on issues of public interest to government and other stakeholders. In 2016 ASSAf was requested to complete a study of the state of energy efficiency technologies in South Africa. Although the focus of the report was on electrical energy efficiency, the study included tribology because the wide ranging interdisciplinary focus of tribology offers significant prospects to increase efficiencies and reduce energy wastage over a broad range of activities.

The ASSAf study considered tribology in respect to three important sectors, Energy, Manufacturing and Transport. A previous study completed by Eskom showed that the use of synthetic gearbox oil could reduce the power loss due to friction in gearboxes, and concluded that by converting all major gearboxes in Eskom's fleet of power generating stations a conservative saving of 20 MW or 140 000 GWh per annum could be achieved. Use of synthetic gearbox oil across industry could, depending on uptake, achieve savings of between 200 MW and 600 MW, or over 2 TWh per annum.

The South African car fleet is considered to be relatively old, and motorists are conservative when it comes to lubricant purchases. The DST funded Tribology Project 2010 found that upgrading the lowest quality crankcase oils to a more modern multigrade quality would result in savings of between 7 and 18 million litres of petrol per annum.

With the exception of some pockets of excellence, there is little knowledge across all levels of industry, mining and manufacturing of the proper use of lubricants, and the knock on effects that can be achieved by using the correct grade of lubricant. The Tribology Project 2010 noted the following major findings:

- Lubricant consumption averages 20% of installed capacity, against an international benchmark of 10%.
- Average drain periods are approximately equal to international standards, which, when considering the high average oil consumption, indicates that equipment failure rates are significantly higher in South Africa.
- Average bearing life has dropped by two thirds, and gearbox lifetime to overhaul by 80 to 90% over the past 20 years. This trend is ascribed to a lack of skills, resulting in poor alignment during assembly, and excessive dirt entry throughout the supply chain.
- There is general industry comfort with historic failure trends and costs, rather than understanding the root causes.
- A case study showed that concentrating on filter element quality and lubricant cleanliness improved hydraulic component life from 4 months to 7 years.
- Overall, if industry was able to get back to basics and focus on tribology, energy costs could be reduced by between 8 and 20%, and maintenance costs by 30 to 50%.
- Reduced production costs will stimulate industry in general and will increase employment.
- Increased employment and local production will increase GDP and will also have a calming effect on workplace conflict.
- Industry that is more globally efficient will increase South Africa's potential for export which can improve the balance of payments and economic growth.

Amongst many other recommendations, the ASSAf report made the following recommendations in respect of tribology:

Energy efficiency is an economically and environmentally attractive way to meet growing energy demands but needs support to make a significant contribution as it may not be aligned with the aims of energy producers. South Africa has made solid progress in energy efficiency over the past 20 years, with commensurate savings and increasing competitiveness. The South African National Energy Development Institute (SANEDI) should be mandated to develop appropriate policy interventions to consolidate and further develop these gains by ensuring that energy efficiency is a central part of the regulatory framework.

Tribology is a wide-ranging interdisciplinary field focusing on friction, wear and lubrication rather than directly on energy efficiency as such. Tribology research in South Africa has benefited from the establishment of a Technical Steering Committee on Tribology (TSCT) in 2013 that has fulfilled a coordinating role and compiled a Tribology Road Map. Various recommendations contained therein relate to the strengthening of research through the establishment of research chairs and a centre of excellence in tribology. Specific recommendations stemming from this study are to strengthen education on tribology by including tribology in the curricula of appropriate disciplines at universities and educating the existing industrial workforce on tribology. It is further recommended that collaboration on tribology within the BRICS countries be stimulated to leverage Chinese developments in this field.

The international trend is for governments to encourage and fund interdisciplinary tribology related research though initiatives such as the Chinese State Key Laboratory of Tribology at Tsinghua University.

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THE SOUTH AFRICAN INSTITUTE OF TRIBOLOGY
"understanding friction, lubrication and wear"

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