Tribology for a greener future – A bearing company perspective

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The importance and urgency of using knowledge and research to make real impact for our environment has never been greater. In order to make a green transition for the rotating shaft business several research disciplines and functions need to work together. In SKF the focus is to move from possession and waste to joint ownership and partnership using cross-competence approach to leverage with speed. Some concrete examples of these are described here.

Keywords: Green tribology, rotating shaft, collaboration, modelling

1. Introduction

Rotating shaft is one of the most common machine applications in many parts of our society. This means that making energy and materials savings, (i.e. 'green' progress) in this area can make a major impact for our environment and economy. From a bearing company perspective, the green tribology [1] is a vital part of our future success and in combination with digitalisation, artificial intelligence and new manufacturing techniques quicker advancements can be achieved. To maximise the speed and impact of sustainability implementation in rotating equipment performance and bearing components life cycle, a cross-competence approach is essential. Advanced experimental methods, high-tech equipment and development of modelling capabilities are the requirements for making successful implementation of green technologies with high impact. In this paper we will present some practical examples from machine life cycle analysis with a direct environmental impact.

2. Maximise rotating equipment performance and minimise earth's resources.

The challenge today is how to move away from looking at reliability from discipline silos into the situation where all disciplines come together to keep the machines running and to maximise the usage of each of the components. In order to do this in an efficient way we need to make use of digitalisation methods connecting the physical asset to a virtual "health" check where our knowledge comes together in order to maximise uptime, minimise waste in the different assets of the full value chain in terms of energy, component materials, lubricants etc. (Figure 1). This allows engineers to judge how to plan maintenance in order to minimise environmental impact but also how to fix problems at a much earlier stage than before. Combining condition monitoring, analysis and fix-the-problem methodology by also using advanced remanufacturing and oil reconditioning techniques major improvement possibilities are seen in various industries. To illustrate it better, two examples are shown. One is focusing on detecting early stage of damage in rolling bearings and via modelling of physical phenomena, predicting its progression in time as a function of the operating conditions. The material and energy waste are minimised via remanufacturing. The second example is about next generation refrigerants to be used in a closed system.

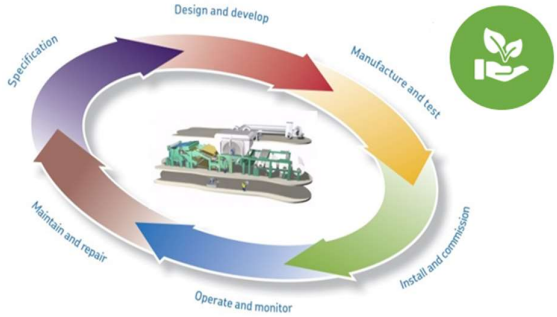

Figure 1. Asset Life Cycle Process

3. Speed of research implementation

In theory it seems straightforward but it's the details and selection of the right approach for the right problem which is the challenge. At SKF the speed of research implementation and screening of sustainable solutions are carried out with experts from various fields and using advanced equipment and models. The key being the combination of SKF research staff from several disciplines and backgrounds working together with our customers, suppliers, academic partners and other SKF colleagues from various functions through the full value chain. Such approach makes it possible to challenge the problem and address it on various levels in order to reach the best, efficient and green solution. This is the modern, responsible way of working to minimise the negative environmental impact and at the same time bringing value.

4. Discussion

Working for a greener future is a joint mission where all competences and different organisations must work together and silos have to be removed in order to maximise the speed, minimise waste and environmental impact. The examples given show how the best solutions can be achieved by applying those principles.

5. References

[1] Green tribology: principles, research areas and challenges, M. Nosonovskyand, B.Bushan. Philosophical Transactions of the Royal Society. A (2010)368,4677-4694 oi:10.1098/rsta.2010.0200