We will be exhibiting at Lubricant Expo & The Bearing Show on **stand 872.**

Improving longevity and sustainability of tribologically stressed systems

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6 Improving fluid compatibility and reducing fretting wear in the electric drive train in the stator-hairpin-housing system

Both the selection and optimisation of friction systems offer potential for reducing friction losses and improving service life. The parameters “coefficient of friction” and “wear coefficient” allow statements to be made about the functional performance of the materials and operating materials under consideration. In this way, the tribological damage effects can already be modelled and tested in advance on a laboratory scale using suitable test methods.

In the classic product development process, many products are still tested directly in the field in real use or on unit and component test benches. In terms of rapid prototyping, however, as much detailed and high-resolution data as possible should be made available for software simulations. With modern tribometers and the comprehensive ready-to-use methodologies, on the one hand the testing cycles can be greatly simplified and shortened by suitable pre-selection on a laboratory scale, and on the other hand more precise data can be supplied for software simulations, as individual operating points such as temperatures or normal forces can be individually provided with data points (Read more).

Fluid compatibility and fretting wear in the electric drive train in the stator-hairpin housing system

A tribological topic that has been underestimated to date is the stator-gearbox of the electric drive train. For reasons of weight saving and standardisation of operating materials, in the most common applications the electric drive motor and the transmission of the EV are installed in one housing (see below). Both the gearbox and the electric motor are exposed to the identical operating material. On the one hand, the lubricant must have the typical performance of a gear lubricant, and on the other hand, it must have a high cooling effect on the electric motor. In addition to compatibility with classic gearbox materials, this new operating fluid for the electric drive train (EDF) must also have excellent material compatibility with copper and the organic insulating varnish that is applied to the stator wires - the so-called hairpins. Furthermore, micro-movements generated by vibrations occur between the housing and the stator coils during operation, which in turn generate fretting wear.

Schematic structure of the stator-gearbox in the electric drive train (Source: Shutterstock)

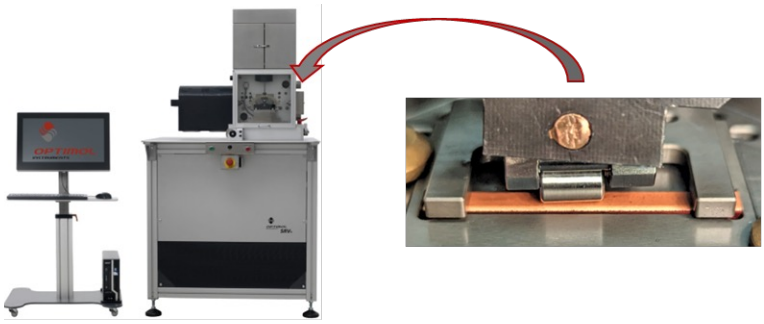
With modern tribometry, all the aforementioned requirements and challenges of the electric drive can already be represented on a laboratory scale in pre-screening tests and thus a pre-qualification of EDFs as well as materials and insulating coatings used can be carried out.

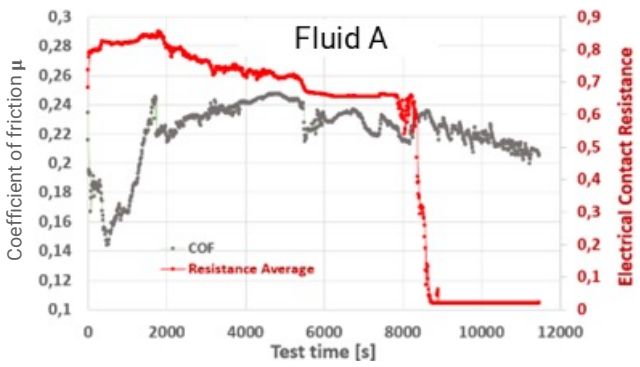
Technology

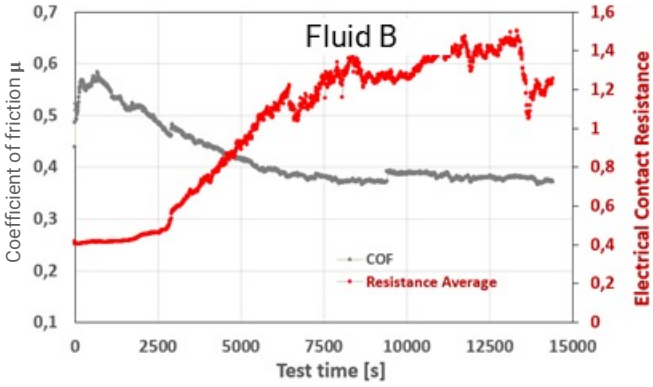
The patented test principle of the SRV®5 tribometer allows high-precision friction and wear measurement of lubricants, materials, coatings and components. It stands for decades of experience, worldwide use, highest precision, reproducible results and a high degree of versatility in SRV testing (**Read more**).

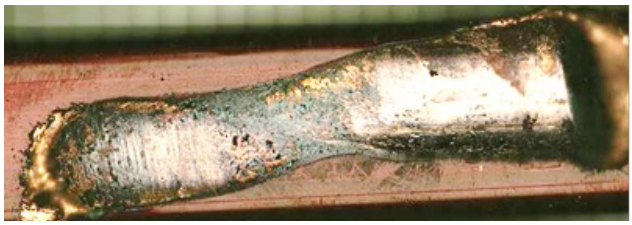
Test methodology and results

- Original hairpin wires
- Online ECR measurement indicating break through
- High load testing for lifetime prediction
- Low load testing for fretting performance
- Shows chemical compatibility between coating and fluid and adhesion performance of the coating
- Can be extended by temperature variation between 30°C and 350°C









Test methodology for tribological compatibility of EGFs with hairpin materials

For further information on this topic and/or your individual question, please contact us!

About Optimol

Optimol is a leading international company for the development and distribution of tribological model testing systems and test benches. We are a reliable partner for our customers with innovative technology, tried-and-tested solutions, competent advice and comprehensive services. With the world-renowned SRV® test system, we have created the industry standard for tribological model testing.

To find out more about tribology and Optimol: *Improving longevity and sustainability of tribologically stressed systems*

1 How tribometry contributes to net zero emissions -Selection of sustainable, low friction tribo-systems - Future moves and requirements for tribometric test methods

2 Save time and costs in product R&E and QA - Facing the challenges with ETS

3 Functional performance of used lubricants - Qualification of lubricants with regard to their service life in terms of acceptable energy losses and damage risks

4 Design of new nontoxic and water-resistant greases for water mixer taps

5 Reducing fretting wear in wind turbine bearings and gearboxes

6 **Pre-qualification of materials with regard to fluid compatibility and reduction of fretting wear in the electric drive train in the stator-hairpin-housing system**