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

Improving longevity and sustainability of tribologically stressed systems

By Gregor Patzer, Optimol Instruments Prueftechnik GmbH, Munich, Germany

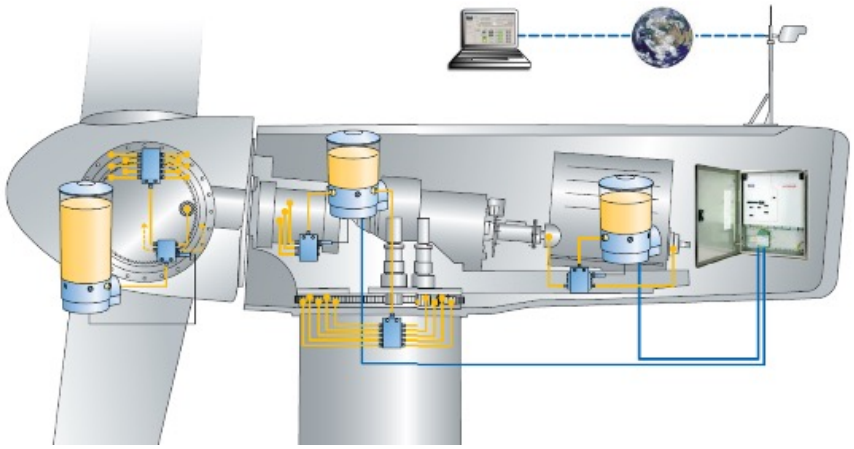
5 Reducing fretting wear in wind turbine bearings and gearboxes

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 extensive 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, since individual operating points such as temperatures or normal forces can be individually provided with data points (Read more).

Fretting wear in bearings and gearboxes of wind turbines

All bearings and variable-speed gearboxes in wind turbines are exposed to high loads with relatively slow movements, which are superimposed by high-frequency vibrations with small movement amplitudes. This results in so-called fretting wear. This results in surface damage, which can initially lead to efficiency losses, but also to bearing damage and increased failures. The “False Brinelling- effect” is a wear phenomenon in apparently stationary rolling bearings. Vibrations generated by micro-movements can cause these standstill marks in the running surfaces. This also causes surface damage to rolling elements and bearing raceways, which leads to premature failure and increased energy consumption of the system. By optimising the combination of materials and lubricants as well as the lubricant supply, these negative influences can be greatly reduced. (Schwack, Bader, Leckner, Demaille, & Poll. A study of grease lubricants under wind turbine pitch bearing conditions. Wear 454-455, https://doi.org/10.1016/j.wear.2020.203335.)



Typical components subject to friction and wear in wind turbines (SKF. Realize the lubrication potential for your wind turbines. Retrieved from https://www.skf.com/de/industries/wind-energy/operation-and-maintenance/windlub

Tribology

The two aforementioned tribological damage effects can already be modelled and tested in advance on a laboratory scale using suitable test methods.

Technology

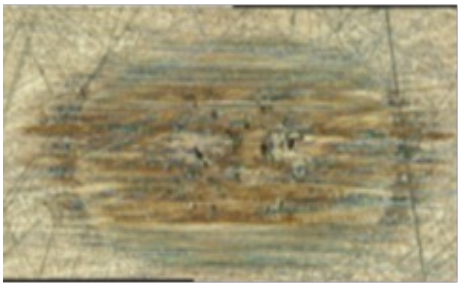
Optimols tribometers are the perfect tools to pre-screen the friction and wear performance of vibrating systems in lab scale.

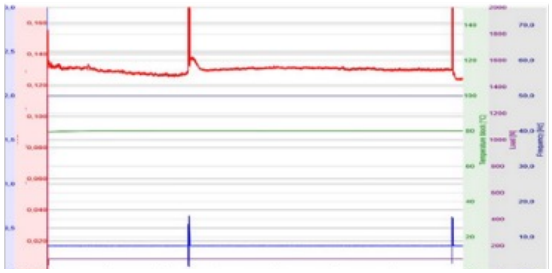
The world famous SRV® with more than 50 years of industrial use and more than 20 standard methods and specifications is the global standard for such screening tests. It delivers repeatable and globally comparable results (**Read more**).

The ETS - Easy Tribology Screener - (Optimol Instruments) is an easy-to-use benchtop tribometer. By means of real-time measurement of coefficient of friction CoF and wear depth in high precision, the ETS shows the performance of a tribological collective even during the test (**Read more**).

Test methodology and results

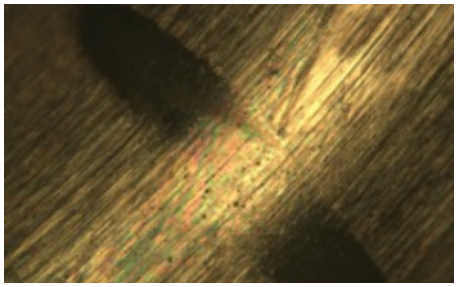
The figures show an example of the tribometric approach to the fretting issue according to ASTM D7594 as well as a test setup explicitly developed for the false brinelling effect.

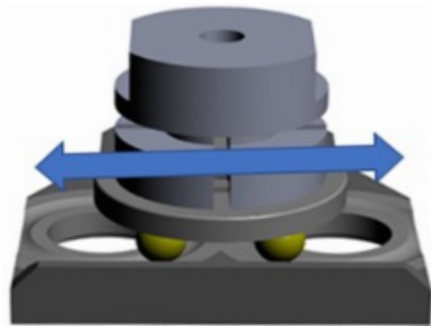




Fretting (ASTM D7594)

- High-frequency vibrations with short amplitudes can be the origin of wear mechanisms taking place





False brinelling

- Micro-oscillation causes wear
- First lifetime estimates possible

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