Building a Better Bearing

An innovative look at analysis, condition monitoring, mounting and maintenance.

Matthew Jaster, Senior Editor

With an "all-hands on deck" approach to maintenance today, engineers require the latest tools and technologies in the form of new software/apps to make MRO tasks easier. Turns out, technology is allowing your smartphones, tablets and computers to track bearing reliability and performance with an emphasis on sustainability, longevity and analysis.

SKF Bearing Assist App Offers Improvements

Every year, there are millions of bearing failures caused by incorrect mounting. Overcoming this can deliver multiple benefits to owners (operators) of rotating machinery, including reduced costs related to maintenance, fewer breakdowns, as well as a more sustainable operation of the machinery.

The *SKF Bearing Assist* app, on a smartphone or tablet, supplies step-by-step guidance, replacement instructions and an improved way to document and trace each replacement bearing. A detailed checklist ensures that each necessary step, such as planning and preparing the job and measuring associated components, has been completed.

Geri Palinkas, product manager, *Bearing Assist*, SKF caught up with *PTE* to discuss updates to the company's bearing app. Palinkas said there have been three major updates in the latest version:

1. The definition of bearing position has been added which helps the technician to keep products separated. This also provides more structure and clarity in the documentation.

2. The checklist has been refined to reflect the workflow in a more correct way and is placed as the centerpiece of the replacement activity. In the previous version the checklist was a sub task for a bearing.

3. SKF has also added a PDF preview so that the user can look at the result without sending it with email.

Regarding mounting performance, the app provides guidance for the user which creates confidence and speed. "The checklist also helps to prevent the user from forgetting important steps in the workflow. The documentation helps when investigating any future problems and can act as a reference in future replacements or in training," Palinkas said.

The *SKF Bearing Assist App* is centered around the workflow for the entire replacement process and not only the physical dismount and mount. In a replacement job the workflow is represented with a very clear checklist that guides the user and prevents important steps from being forgotten.

"There is also a digital measurement protocol that automatically makes the user aware of tolerance breaches. It's no longer mandatory (but still possible) to reference the job to a machine and finally it's easy to document the replacement with images and notes. The documentation can then be opened and shared as a nicely formatted PDF report," Palinkas said.

How is *Bearing Assist* changing MRO in general? Through the app SKF offers any industrial company a digitalized process and method to improve the planning, execution, and documentation of bearing replacements.

In the future, Palinkas said the app will offer more guidance in the different steps of the workflow as well as smoother and faster documentation of the job. SKF will also drive towards more self-service and self-education by helping with identifying bearings suited for remanufacturing, finding correct tools and suitable training, and suggesting help for alignment and condition monitoring.

The following is a list of additional apps that are noteworthy for rotating equipment:

- *Bearing Select*, is a tool for bearing selections and calculations is redesigned for a better user experience (*skfbearingselect.com/#/bearing-selection-start*)
- *Axios* is a simple, wireless and scalable end-to-end predictive maintenance solution from SKF and AmazonWebServices (*skf.com/group/products/condition-monitoring-systems/surveillance-systems/wireless/axios*)
- *IMx-1* can now also be used in hazardous areas (*skf.com/group/news-and-events/news/2023/2023-11-21-new-wireless-sensor-solution-from-skf-enables-automated-machine-monitoring-in-hazardous-areas*)
- The newly released *SKF Microlog Analyzer dBX* is the most advanced large-screen vibration analyzer offered by SKF today (*skf.com/group/products/condition-monitoring-systems/portable-systems/microlog-analyzer-dbx*)

"We are also working on new functionality in *Bearing Assist* bundled as an enterprise offer helping mid-size and large enterprises with structure, traceability and insights when it comes to bearing replacements," Palinkas said.

`skf.com/us/support/engineering-tools/bearing-assist`

Romax Software Updates Bearing Capabilities

Hexagon recently released *Romax DT 2023.1*, as part of the full Romax software suite. Bearing specialists require independent tools supplying innovative rolling element bearing analysis. These tools will provide the insight needed to design and select bearings for optimum performance and durability, as part of a whole system model. Whether selecting the appropriate bearings for a concept design, designing a custom bearing for a specific application, or performing root cause analysis of a bearing failure, engineers need reliable prediction of bearing performance to make key decisions. In addition, bearing suppliers and OEMs must be able to collaborate and share data with each other, while being independent and preserving valuable IP.
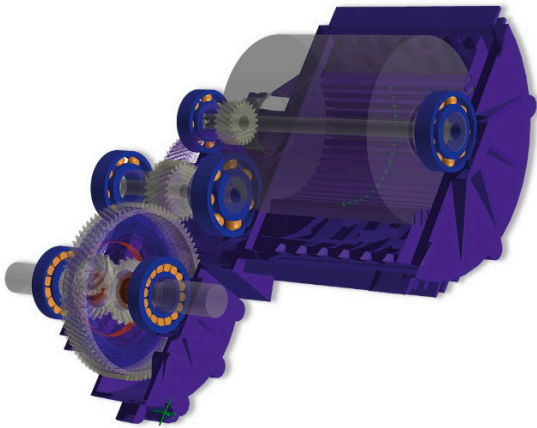
Romax Spin, for example, features detailed modeling of rolling bearings, fast and intuitive modeling of full drive systems, and advanced contact algorithms that accurately capture the non-linear behavior of bearings. Users can calculate load and stress distributions, film thickness, standard ratings such as ISO 281 and ISO/TS 16281 and run dynamic simulations to study phenomena such as skidding and cage dynamics.

Dr. Michael Platten, Senior Product Manager—Romax, explains some of the highlights from the 2023.1 release of the Romax software suite which includes updates to *Romax Spin*.

Modeling and Usability: The 2D Worksheet now shows which bearings have 1D raceway connections. This allows users to quickly check all the bearings in a model to see which are configured to have 1D raceway flexibility and which do not. (Note, a similar visual check if bearings have 3D (FE) raceway flexibility is enabled.)

Journal Bearings: The operating temperature of the journal bearing lubricant film can now be directly specified. In previous versions, the journal bearing operating temperature was determined as the mean temperature of its shaft and housing. This can now be overridden with a custom value, for example, obtained outside of Romax software, and this temperature will affect the lubricant viscosity used in the journal bearing component calculations.

Rolling Element Bearings: Multi-lobe ovalization and custom bearing ring distortion. Rolling bearings may be radially deformed by design from a circular shape to a bi-lobe, tri-lobe, or other geometry to limit skidding. Previously it was possible to define ovalization (i.e. bi-lobe shape) in Romax software. Now, this has been extended to allow multiple lobes and custom shapes, primarily to enable the modeling of tri-lobe raceways, but more lobes or an entirely custom shape are also enabled. This allows parametric investigation of the applied raceway distortion and its impact on load and stress distribution and ring deformation.

Previous bearing dynamics capability in *Romax Spin* has a simplified representation of cages. The cages are considered rigid and they were only allowed to rotate about their own axis. This development addresses one of these limitations by adding lateral and tilt degrees of freedom to the cages, in addition to the rotation about their own axis. This would allow engineers to analyze the lateral motion of a cage and its stability by looking at the whirl orbits under various operating conditions.

A new bearing catalog from NTN has been added to Romax software. It is available alongside existing bearing catalogs and offers matching functionality. The catalog data is based on the General Rolling Bearing Catalog issued separately by NTN. As with other bearing supplier catalogs, limited data has been provided by NTN and the rest of the bearing internal and advanced data has been estimated by Romax.

The EP Additives setting is now reported alongside the lubricant name and level of contamination in the reports ISO 281 and ISO/TS 16281 Results to give the user more context when reviewing bearing life results. This feature minimizes the effort required to check the status of EP additives on individual bearings.

The EP Additives setting is now reported alongside the lubricant name and level of contamination in the reports ISO 281 and ISO/TS 16281 Results and Bearing Certification Report (ISO 281 and ISO/TS 16281) to give the user more context when reviewing bearing life results. This feature minimizes the effort required to check the status of EP additives on individual bearings.

Learn more here: *simcompanion.hexagon.com/customers/s/article/Whats-New-Romax-DT-2022-1*

Schaeffler's OPTIME Ecosystem Balances Plant Assets

OPTIME is an easily scalable condition monitoring system that consists of wireless, battery-powered vibration sensors, a cellular gateway and an app to visualize the resulting data. This information, which is captured by the sensors, is analyzed using proprietary algorithms that draw on Schaeffler's technical expertise, its extensive library of physical models developed and refined over many decades, and the experience in condition monitoring that Schaeffler has built up during its bearing servicing operations.

OPTIME is designed to provide advance warning of potential damage to machines such as electric motors, fans and pumps. It also offers early notification of imbalance, misalignment, and loose-fitting components. The OPTIME mobile app displays trends in graph format and visualizes the severity of incidents using traffic light colors, alarm states and other information. Assets can be grouped according to the user's requirements, and their condition can be presented in a range of user group-specific views. With OPTIME, in-house maintenance personnel and external service contractors receive specific recommendations regarding the steps required to remedy any issues, enabling them to easily plan their maintenance activities, manpower requirements and spare parts procurement in a timely and cost-effective manner.

Frank Mignano, Schaeffler condition monitoring sales manager for North America, recently discussed some of the new updates and future considerations for OPTIME:

## How the OPTIME Ecosystem works

The Ecosystem consists of many elements including user interfaces, cloud and analytics, existing customer ecosystems, other Schaeffler measuring devices, condition monitoring, mesh network, smart lubrication and more.

The latest updates include vibration/temperature sensors for all "balance of plant" assets; a Smart Lubricator which reports status of single-point lubricators—full, empty, days left, clogged, excessive temperature; a cellular gateway for unimpeded connectivity to the Schaeffler Cloud; a Cloud application for implementing Schaeffler-proprietary diagnostic algorithms on the mountains of collected data—thereby converting data into actionable information; a web dashboard and smart phone application to help manage the asset health and maintenance planning activities.

In addition, the ProLink multi-channel monitoring solution, designed for more critical assets, can also be sent to the same Cloud so the end user can manage all their asset health information in one place.

Food and Beverage Boiler Fan Application

A machine critical to the food and beverage industry—boiler fan in the fryer area—can cease production on any failures. Prior to enabling the "learning mode" alarm set points, OPTIME uses the ISO velocity recommendation (based on machine size) which alerted the customer to a higher-than-normal vibration on the machine. Utilizing the "Expert Viewer" application, the customer was able to identify the peaks in the demodulation vibration plot as lining up with the outer race frequency of the bearing. The peaks were prevalent in both the standard acceleration and the demodulation signal processing technique, indicating an advanced defect. Maintenance plans were scheduled for the fan resulting in cost savings of at least 20,000 CDN. The pilot OPTIME project identified this issue within two weeks of initial install.
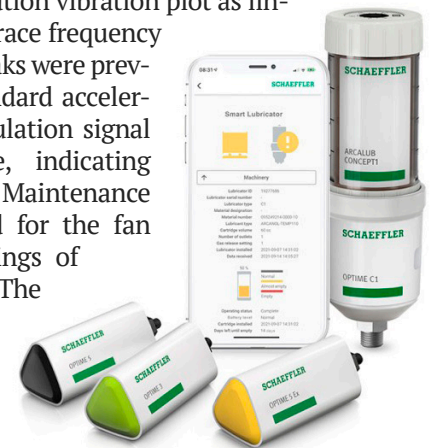
Future Considerations

Mignano offered a few planned features for future updates including: a simple drop-in, 4-port smart lubricator—connecting directly to the Ecosystem; lubrication on condition from the 4-port lubricator; dynamic mode and high dynamic mode for intermittently operating machinery (cranes, etc.) as well as significant, automated diagnostic enhancements (AI, machine learning) and electric motor-specific monitoring capabilities.

medias.schaeffler.us/en/monitor/optime-ecosystem

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