

Get your bearings

Selecting the right bearings for plant and equipment is a nicety that plant engineers under pressure often sidestep, in favour of personal preference. Steed Webzell provides some advice

It's easy to take bearings and seals for granted, and we've all done that. However, the correct specification, installation and lubrication of what are, in fact, process-critical components could not be more important.

"In 99.9% of cases, bearings don't commit suicide; they're murdered," states Dr Steve Lacey, engineering manager at Schaeffler UK. "Yes, engineers can buy a replacement bearing, stuff it full of grease and replace it – job done. However, very few applications are this straightforward."

Indeed, operating conditions are different for almost every application. With regard to load, for example, if this is higher than the capability of the specified bearing, it can result in short fatigue life. Conversely, too low and a skidding situation can emerge, leading to heat, distress and, again, failure.

"Anyone can buy cheap bearings," warns Lacey, indicating a common pitfall, "but, compared to premium bearings, they will fail pretty quickly. That's generally either because of cheaper bearing materials or less well developed manufacturing processes. Also, the quality controls are likely to be less rigorous."

As for other important factors

to consider, they include the presence of any external contamination, such as dust – a situation that would demand contacting seals or shields. However, be aware that these can introduce extra friction and temperature hikes that restrict the maximum speed of the bearing.

"Extreme temperatures in the surrounding environment present another hazard," continues Lacey. "Here, the tolerance fit of the bearing on the shaft and within the housing becomes extremely important, as does the selection and application of lubricant. Applying too much grease is a common mistake. This can cause a churning effect that elevates temperature and leads to failure. Some bearings benefit from lubrication at pre-set intervals, but this is dictated by the application."

Training is critical

Indeed, Dr Lacey asserts that fatigue failures in bearings are relatively rare – citing poor lubrication, contamination and incorrect handling and/or fitting ("big hammers do damage") as far more common reasons for breakdowns. To help provide a remedy, Schaeffler UK now runs courses at its recently opened training centre, with subjects extending from the basics of bearing selection, through to vibration analysis and condition monitoring.

"Customers are recognising the benefits of condition monitoring, which enables plant engineers to detect the early signs of bearing deterioration and make a service exit plan," he explains. "This avoids a costly wrecked shaft or gearbox."

Back on bearings themselves, though, as with all technologies, improvements tend to change thinking over time. According to Revolve, the shift from solid to split roller bearings is increasingly being seen as paying huge dividends across several sectors, particularly the extraction industries.

Why so? Well, according to Adrian Menzies, sales director at Revolve, it can take as little as 30 minutes



Devices such as SKF's System 24 automatic bearing lubricator can make a big difference





Keep the ball rolling

Bearing technology is in a state of constant evolution. For instance, notable among many recent innovations is NSK's range of 7300 series angular contact bearings for industrial pumps. Here, basic dynamic load has been improved by 13% by reviewing ball diameter and optimising the internal design of the bearing rings. As a result, NSK says that bearing life has been extended by approximately 50%, in comparison with standard bearings.

Enhancements also extend to the bearing cage. By improving the shape and guiding method of the copper alloy cage, the space between the rings and cage has also been optimised, resulting in better properties of inflow and discharge of lubricant.

Meanwhile, over at Schaeffler, recent development has focused on a new angular contact ball bearing that prevents the premature failure of ball screws in short-stroke applications – particularly those that occur due to false brinelling. This occurs if the corresponding axes are at a standstill for extended periods of time or if they perform strokes between 0 and 2mm.

Schaeffler's new ZKLF-HC hybrid angular contact thrust ball bearings use ceramic rolling elements, so there is no possibility of the metal-to-metal contact that leads to false brinelling. In addition, the limiting speed is increased and Schaeffler claims a threefold increase in grease operating life.

Last, but not least, the latest generation of SKF System 24 automatic lubricators offers improvements, such as tool-free set-up, easily detachable batteries, improved dial readability, a redesigned top ring for better grip and a deactivation mode for maintenance.

to replace a split roller bearing and even less time to inspect. Solid bearings, on the other hand, routinely take hours, if not days, to replace and are notoriously difficult to inspect in situ. Hence, whole-life costs for split roller bearings are far lower, he argues, despite their higher initial purchase price.

Unlike solid bearings, split roller bearings are totally split to the shaft. They allow the shaft to be supported by the lower section of the bearing, while the top section can be removed, simplifying bearing inspection and avoiding the need to remove drives or the shaft itself.

Another emerging trend, this time according to NSK, is the adoption of low-torque bearings. NSK says it is able to quantify savings in energy and cost when low-torque bearings are applied over standard. And the firm makes the point that this is particularly important when plants are being audited, for example, for their carbon footprint.

Yet another trend to be aware of concerns bearing materials – for instance, resulting from improvements to the steelmaking process that reduce impurities and achieve a decrease in oxides. Bearings manufactured from the resulting Z Steel (now standard for NSK ball bearings) are said to have an extended service life, compared to vacuum degassed steel – in fact, up to 1.8 times longer.

Advanced materials

Z steel also benefits from more uniform response to heat treatment, which ensures good hardness and resistance to wear. Furthermore, enhanced surface geometry aids optimum oil film formation, while best-practice machining ensures good, compressive stress levels and high abrasion resistance.

Beyond that, NSK says it has improved the efficiency of its ball bearings, with low torque V seals. The V seal is an innovation that seals effectively, without any increase in torque or operating temperature. The non-contact lip of the V design

reduces drag in the bearing – an important advantage where power loss is critical.

Finally, for those thinking that a spent bearing means a one-way trip to the scrap bin, think again. SKF says that too many bearings are discarded, when they could be remanufactured to cut costs and boost sustainability. "To discover what is and isn't viable, engineers first need to understand the different stages of wear that occur during the life of a bearing," advises Phil Burge, communication manager at SKF.

SKF's remanufacturing process begins with disassembly and cleaning, followed by visual and microscopic inspection, and measurement of ring hardness. Dimensional inspection completes the assessment phase, which is concluded by the submission of a report recommending treatment. This typically involves grinding or polishing faces and diameters, refitting new rolling elements, and cage re-plating.

According to the company, cost-benefit analysis has shown that remanufacturing can exact a saving as great as 80% against the cost of a new bearing. As for sustainability, estimates indicate that remanufacturing 100kg of used bearings leads to a reduction in CO₂ emissions of about 350kg. Surely, few can argue with that. **PE**

