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Long-term performance of plant and machinery owes a great deal to using the right lubricants in the right quantities at the right time – and monitoring their effectiveness. Get it wrong and it could prove very costly, warns Brian Wall

It goes without saying that plant depends on the reliable performance of its moving parts, no matter how apparently incidental. And, with equipment increasingly using modern materials and tighter tolerances, that means your choice of lubricating oil is becoming increasingly crucial.

What matters most is the lubricant's flow characteristics and its ability to offer protection, in terms of wear and corrosion prevention, and thermal dispersion. At the simplest level, if it's too viscous, bearing motion may be suboptimal and your machinery may consume undue energy. Equally, a 'thin' fluid may not maintain the requisite film for protection and smooth running. Either way, the result will be unnecessarily high cost, due to breakdowns, repairs and downtime.

But how do you choose the right lubricant? One answer may be to spend time investigating the market and testing lubricants. Certainly, you will eliminate the poor performers – but at an obviously high cost. Alternatively, you can rely on lubricant specialists' sales engineers and their published data, tempered by the specification and brand recommended by your original machinery manufacturer.

Right: Dr Steve Lacey: schedules for replacing rolling bearing grease can now be planned precisely into maintenance periods

But whatever you choose, how you put your lubricant to work is equally important. Most bearings, for example, operate on very thin films of lubricant, which must be maintained intact to ensure that they meet their design life. That means ensuring adequate application at all times – and that the lubricant remains in a good clean condition.

As Nick Dowding, applications engineering manager at The Barden Corporation, puts it: "Neglect or failure in any of these areas will seriously increase the risk of premature bearing failures, and will interfere with the trouble-free running that is now of such crucial importance in modern plant and machinery."

He reminds us that bearing lubricants generally fall into three main categories: oils, greases and solid dry film, the latter usually being limited to moderate speed and very light loading. Greases, because of their convenience, are by far the most widely used, and have been the focus of most development, in terms of formulations, over the last decade.

"The primary advantage of grease over oil is that bearings can be pre-lubricated, eliminating the need for – and the cost of – an external lubrication system," Dowding points out. "Grease also requires less maintenance and has less stringent sealing requirements than oil systems. Grease tends to remain in proximity to bearing components, metering its oil content to operating surfaces, as required."

On the other hand, its drawbacks are that it does not conduct heat away from a bearing as efficiently as oil. "Also, grease can increase the initial torque within a bearing and cause running torque to be slightly higher," he advises. "The speed limits for greases are generally lower than for oils, due to the plastic nature of grease that tends to cause overheating at high speeds."

While grease lubrication is inherently simpler to

Weathering the ups and downs of oil performance

Plant engineers will already be mindful of how some oils are poor at withstanding changes in temperature or other variations in working conditions. The risks include: corrosion and sludge build-up; increased wear; cavitation; filter blocking and valve sticking; and increased oil use.

These problems can, in turn, lead to: equipment damage; premature failure and replacement of components; loss of operating precision; excessive noise; increased maintenance; and expensive downtime.

Plainly, plant that is required to operate under variable conditions – and that includes outdoor applications, where temperatures can fluctuate, or mobile plant transported from site to site – can be vulnerable. Be aware of that when specifying lubricants.

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manage than oil, there are plenty of applications where oil is the better choice. In high-speed spindle and turbine applications, for instance, oil needs to be supplied continuously to provide cooling, as well as lubrication. "A further example is instrument bearings having extremely low values of starting and running torque," explains Dowding. "These require only a minimal, one-time lubrication, each bearing receiving just a few milligrams of oil – a single drop or less."

What's new?

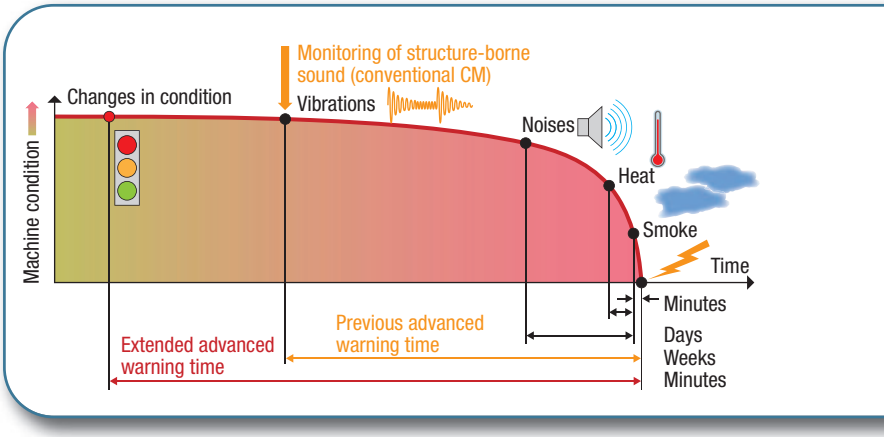
Shell Lubricants recently launched what it describes as a new, improved range of industrial and transmission lubricants and greases. General manager Trace Baker says it's the result of a three-year process that has restructured and refreshed its offerings. "Research into the way customers choose and use lubricants revealed that they often find the array confusing," he explains. "While recognising the importance of correct lubricant choice and application, they also welcomed changes that would make the process simpler."

With this in mind, Shell has redesigned its range, removing products with overlapping applications – or where technology has been superseded, with more advanced formulae – as well as improving choice by adding speciality and synthetic products. Just as important: Shell's new range is accompanied by 'old to new' conversion tools, making the transition easier for existing plant users.

Elsewhere, for critical equipment located in difficult-to-access areas, bearings group Schaeffler believes it has an answer, in the shape of a novel sensor, developed with lubricants specialist Klüber Lubrication and Freudenberg Dichtungs und Schwingungstechnik. The sensor incorporates "an electronic evaluation system" that monitors grease condition from the inside. It is positioned in the rolling bearing, immersed in the grease, and works while the bearings are operating.

"This is a significant breakthrough, as the schedule for replacing rolling bearing grease can now be planned precisely into maintenance schedules," explains Dr Steve Lacey, engineering manager at Schaeffler. "Any changes in the condition of the grease are detected early – long before any damage can be caused to the bearings," he adds.

As for how it works, the new grease sensor uses near-infrared reflection. This technology was originally developed with the Fraunhofer Institut for Electronic Nano Systems (ENAS) in Germany – and is used by laboratories to measure grease quality – but has now been significantly developed for online measurements. In fact, the sensor's diameter is just 5mm and its length 40mm. It has been designed to detect four parameters: water content, opacity, wear (thermal or mechanical) and temperature.



"From these parameters, the sensor's electronics generate an analogue signal [4–20mA], which displays the condition of the grease," states Lacey. "By setting alarm thresholds, digital signal outputs can also be generated, indicating whether the grease quality is poor or good," he adds. PE

Preventive maintenance

For many years, oil analysis has been employed to determine whether the lubricant in question is suitable for ongoing use – and, just as important, to establish wear material loading, in order to establish plant condition. "ANAC [ANAnalysis Compensated] has taken this to a higher level, using oil analysis as a diagnostic tool. This is done by using over 30 years' worth of data to measure overall wear of diesel engines, compared to expected wear," explains Bob Field, a service engineer with Total UK.

ANAC has saved a number of large diesel engines – for example, on straddle carriers used in the container ports in the South of England, as well as diesel generating sets, he reports. "ANAC is a valuable tool that can highlight possible future problems, so that maintenance can be undertaken, avoiding unplanned work in busy periods."