As shown in our illustration, lube-related problems cost industry staggering amounts of money. Paying attention to lubricant selection and lubricant application should be one of our foremost priorities, and greases are among the topics of interest.

For instance, long-fibered type greases, or excessively heavy oils, will result in increased churning friction at higher speeds, causing bearing overheating due to the high shear rate of these lubricants. Excessive amounts of lubricant will also create high temperatures.

It's also noteworthy that using oils of adequate film strength, but light viscosity, or using channeling or semi-channeling greases has the benefit of substantially reducing the heat-generating effects of lubricants. The advantages of these greases rest in their ability to "channel" or be pushed aside by the rotating ball or roller elements of a bearing and to lie essentially dormant in the side cavities of the bearing or housing reservoir.

Channeling greases normally are "short-fibered" and have a buttery consistency that imparts a low shear rate to the lubricant. The low shear rate causes a relatively small increase in temperature and aids an operating bearing to establish temperature equilibrium, even if a lubricant is applied having a slightly higher viscosity than the application demands.

Higher fluid friction increases the temperature of the lubricant until the viscosity is reduced to the proper level. It should be noted, however, that short-fibered greases might lead to "false brinelling" damage in applications subject to vibration without equipment rotation.

Greases are fine dispersions of oil-insoluble thickening agents—usually soap—in a fluid lubricant such as a mineral oil. When a bearing lubricated with grease starts to move, the grease structure (created by the thickening agent) is affected by the shearing action, and lubrication is provided by the oil component of the grease. As the bearing slows to a stop, the grease regains its semi-solid structure. In non-moving parts of the bearing, this structure does not change.

The type and amount of the thickener, additives used, the oil, and the way in which the grease is made, can all influence grease properties. The chosen base-oil viscosity generally matches that for a fluid lubricant used for the same service—low-viscosity oil for light loads, fast speeds and low temperatures, and high-viscosity oils for differing conditions. The thickener will determine grease properties such as water resistance, high-temperature limit, resistance to permanent structural breakdown, "stay-put" properties, and cost.

Greases are classified on the basis of soap (or thickener) type, soap content, dropping point, base oil viscosity and consistency. Consistency is mainly a measure of the sealing properties, dispensability, and texture of a grease. Once the grease is in a bearing, consistency has little effect on performance. But despite this, greases are widely described primarily on the basis of consistency. They come in an endless array of formulations and with many different soaps. Suffice it to say that we will only describe some of the most common types.

Sodium-soap greases are occasionally used on small pump bearings because of their low torque resistance, excellent high-temperature performance and ability to absorb moisture in damp locations. Since all sodium soaps are easily washed out by water sprays, they should not be employed where splashes of water are expected.

(Continued on back)
Lithium-soap greases are generally water resistant and corrosion inhibiting, and have good mechanical and oxidation stability. Many automobile manufacturers specify such grease—often with additives to give wide protection against problems caused by shipment, motorist neglect, and now popular extended lubrication intervals. Widely used in centralized lubrication systems, these versatile greases are also favored in both sliding and rolling element bearings.

Simple calcium-soap greases resist water-washout, are non-corrosive to most metals, work well in both grease cups and centralized lubrication systems, and are low-cost lubricants. They are, depending on manufacturer and ingredients, limited to services cooler than 160°F to 200°F (~71°-93°C).

Complex calcium-soap greases, wisely applied, can provide multi-purpose lubrication at a fraction of the cost of a lithium-soap grease; however, misapplication of these greases will more likely cause more difficulty than the same error committed with lithium greases. Special-purpose greases are available for food processing (both the thickener and oil are nontoxic), fine textile manufacture (light colors for non-staining, or adhesive grades to avoid sling-off), rust prevention and other special services.

Aluminum complex greases have outstanding EP (extreme pressure) capabilities and excellent water resistance to both emulsion and water washout. They can be pumped at low temperatures, are stable at high temperatures, and have excellent oxidation stability. They have solved seemingly insurmountable problems in high-speed electric train wheel lubrication and other tough applications. However, aluminum greases are risky in retrofit situations because even small residual amounts of other grease formulations may cause unacceptable levels of adverse interaction.

Premium-grade polyureas are by far the best choice for electric motor bearings. They incorporate a synthesized hydrocarbon base oil with high temperature capability, excellent rust inhibition properties, low friction, and other desirable attributes. Recent studies confirmed that the re-lubrication intervals for polyureas exceed those of lithium greases by factors of two and more.

Keep it clean While choosing the RIGHT grease to use for your application is important, it is equally important to keep that grease clean and protected from outside contaminants such as airborne dirt and water. Lip seals provide fair protection, labyrinth seals provide better protection, and magnetically energized face seals provide the best protection against lubricant contamination.

With grease-lubricated pillow blocks often operating in dirt and water-contaminated environments, grease life is often compromised. Installing two MagTectas (as shown here) will often represent a smart and cost-justified choice for reliability-focused users.

About the author
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