Selecting the Right Grease for Extreme Temperatures

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Today, industrial manufacturers are specifically designing new equipment to be both extremely compact and capable of operating at the highest possible temperatures, under intense pressure. As a result, maintenance professionals can benefit from learning key tips that will help them choose the right grease to deliver the performance they need to protect their equipment over the long haul.

Below, Lucas Kerley, an industrial grease expert with ExxonMobil Lubricants & Specialties [1], provides some background on how greases are formulated and how companies can ensure that they choose the right grease for their needs.

How are greases formulated and when should you use grease instead of lubricating oil?

An easy way to think of grease is to consider it like a sponge soaked with lubricating oil. Upon application of external stresses, like heavy loads or high temperatures, the thickener (sponge) releases the oil to lubricate the mechanical parts; when the stress is removed the thickener re-absorbs a portion of the released oil for later use.

Typically, greases are applied to mechanisms in which a lubricant cannot stay in position, or re-lubrication is infrequent, difficult, or just plain not economical. A few examples include drive shaft couplings, universal joints, or fan shaft bearings.

Greases are typically formulated with three components: a base oil, thickener, and

additives. Since the base oil can account for more than 90 percent of the total product, it’s important to understand how well each of the most common base oils can withstand extreme temperature environments.

How should grease selection be considered for equipment that commonly operates in high ambient temperature conditions?

High temperature performance of grease is dependent on proper base oil selection and thickener technology. One of the driving factors that limits an oil's ability to provide lubrication at higher temperatures is proper viscosity and oxidative resistance. Oxidation is a chemical reaction that occurs between oxygen and the in-service lubricant, and is accelerated high temperatures.

A grease’s oxidation rate generally doubles with every 59 degrees Fahrenheit (15 degrees Celsius) rise in temperature above 140 degrees F (60 degrees C). This rule-of-thumb varies, based on the type of thickener used in the grease, and for soap thickeners—the amount of metal contained in the structure (lithium, calcium, aluminum, etc.). Typically, greases with synthetic base oils can provide a wider operating temperature range than conventional, mineral-based greases.

Take for example, Mobil SHC™ PF 462, a high performance, synthetic bearing grease. This grease uses perfluoropolyether (PFPE) oil, polytetrafluoroether (PTFE) thickener, and is designed to protect rolling element bearings at operational temperatures up to 500 degrees F (268 degrees C). You can consider PFPE oil as inert to oxidation, since all of the hydrogen protons found in hydrocarbons, which are degraded during the oxidation process, have been replaced with fluorine atoms. This difference provides stronger bonds and increased ability to withstand chemical oxidation reaction. Compared to molecules common in conventional greases, which typically degrade at temperatures as low as 175 degrees F (79 degrees C), the degradation of PFPE molecules begins at a much higher temperature (around 428 degrees F or 220 degrees C).

What about at low temperatures? How are different greases impacted by low-temperature conditions?

Again, as they do in high temperature conditions, synthetic greases are designed to outperform conventional, mineral-based greases in low-temperature conditions. The primary drivers for cold temperatures are proper viscosity and pumpability.

While conventional, mineral-based greases can be formulated to deliver effective performance for many applications, synthetics typically can deliver significant advantages over conventional, mineral fluids, including better performance in extreme temperatures and extended oil life. Most importantly, synthetics can deliver better performance and equipment protection for extended periods of time when compared to mineral-based greases.

While synthetics cost more at initial purchase than conventional, mineral-based fluids, the improved performance and durability that synthetics provide often make them a more valuable option in the long-run. Furthermore, when you consider the

costs and advanced technology in the types of equipment that many companies rely on for their everyday operations, it's easy to see why many successful companies choose to use high-performance synthetic greases.

What types of benefits can companies expect when switching to a high-performance synthetic grease?

We consistently hear success stories from customers that have made the switch to a Mobil SHC™ branded synthetic grease. One case that demonstrates the value of upgrading to high-performance Mobil SHC synthetic grease comes from a sawmill in Louisiana. This example shows how the right grease can help deliver significant performance and financial benefits.

The mill was experiencing routine bearing failures due to excessive heat on its production line, where bearings continuously operated at 280 degrees F (138 degrees C). These bearings had been lubricated with a polyurea thickened grease, due to the high dropping point and oxidation stability. According to the mill's maintenance team members, using this polyurea grease was causing an average of nine failures per year, each of which significantly delayed production. Thus, a team of ExxonMobil engineers and technical experts was asked by the mill's maintenance team to help provide a comprehensive analysis of the mill's operations and equipment maintenance practices.

The ExxonMobil team made specific recommendations on how to convert these bearings to Mobil SHC PF 462, including best practices for re-lubrication service intervals.

Mobil SHC PF 462 has since extended the re-greasing interval from weekly to quarterly. In the three years since Mobil SHC PF 462 was installed in the first bearing, there have been no bearing failures, therefore generating substantial cost savings. This bearing life improvement and streamlined re-greasing practices have also resulted in an average of 250 additional hours of increased production per year. This improvement has delivered a total benefit to the mill of more than $2 million.

For more information, please call 800.MOBIL.25 or visit mobilindustrial.com [1].

This Proof of Performance is based on the experience of a single customer. Actual results can vary depending upon the type of equipment used and its maintenance, operating conditions and environment, and any prior lubricant used.

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