



LUBRICANTS

THE RIGHT GREASE FOR ANY INDUSTRIAL APPLICATION

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Grease is a semi-solid and viscous lubricant used in machinery applications when typical lubricating oils will not stay in place. Selecting the correct grease will optimize friction and wear resistance, leading to longer component life, reduced downtime and lower operating costs. Numerous factors go into the selection of an appropriate grease, such as operating loads, temperature, speed and environmental conditions.

GREASE COMPONENTS

Grease is comprised of three major components:

(1) base oil, (2) a thickening agent and (3) performance additives.

The “base oil” may consist of naphthenic or paraffinic mineral oil (API Group I, II or III) or synthetic (typically PAO, but may include PAG and others dependent on specific applications) oils. The base oil type and viscosity plays a key role in preventing wear of the bearing in service and must be considered when evaluating the appropriate grease for a given application. Base oil type and viscosity also influence the low temperature mobility of a given product.

The thickening agent forms the “body” or “backbone” of the grease. The primary types of thickeners used in modern grease include simple and complex metallic soaps, which may include lithium, aluminum or calcium as well as non-soap thickeners like polyurea gel and organic clay. Several important properties and performance characteristics come from the thickener, such as high and low temperature performance, corrosion resistance, shear stability and extreme pressure (EP) performance.



Figure 1. The three primary constituents of an industrial grease. Source: Phillips 66

Performance additives enhance specific properties of the grease, dependent on the intended application. These additives may enable operation under high loads or pressure; improve wear resistance; inhibit oxidation, corrosion or rust; enhance tackiness to resist water spray off or sling off; improve base oil viscometrics; or affect the appearance, color and odor of the grease.

TYPES AND CLASSIFICATION OF GREASES

Greases are most often classified by their thickener type although other classifications may include base oil type (mineral or synthetic), industry (automotive, mining or industrial), environment (low temperature/arctic, high temperature or wet environment) or inclusion of solid additives (moly or graphite).

Some common types of grease include the following.

LITHIUM GREASE

Lithium grease is the most widely used multi-purpose grease globally. It is commonly used in automotive wheel bearings and chassis applications. It also has many industrial applications such as bearings in compressors, fans and pumps and home electric products. It is typically used where operating temperatures and loads are moderate.

LITHIUM COMPLEX SOAP GREASES

Lithium complex soap greases have improved properties compared to lithium greases, including excellent pumpability over a wide range of temperatures, as well as improved thermal stability and load carrying capacity. Over the past 25 years, it has become the most widely used grease in the U.S.

CALCIUM SULFONATE SOAP GREASE

Calcium sulfonate soap grease has excellent thermal stability, water resistance and load carrying capabilities. In addition, this grease offers extraordinary corrosion protection for use around fresh or saltwater. It is commonly used in automotive, agricultural, food, mining and steel mill applications. This grease is typically an upgrade to other multi-purpose greases such as lithium and lithium complex greases.

POLYUREA-BASED GREASES

Polyureabased greases have excellent thermal and shear stability and are commonly used in high speed applications such as electric motor bearings and filled for-life applications in bearings and joints. Drawbacks include reduced load carrying capability and corrosion protection, which keeps this type from being a good multi-purpose grease.

ALUMINUM COMPLEX SOAP GREASES

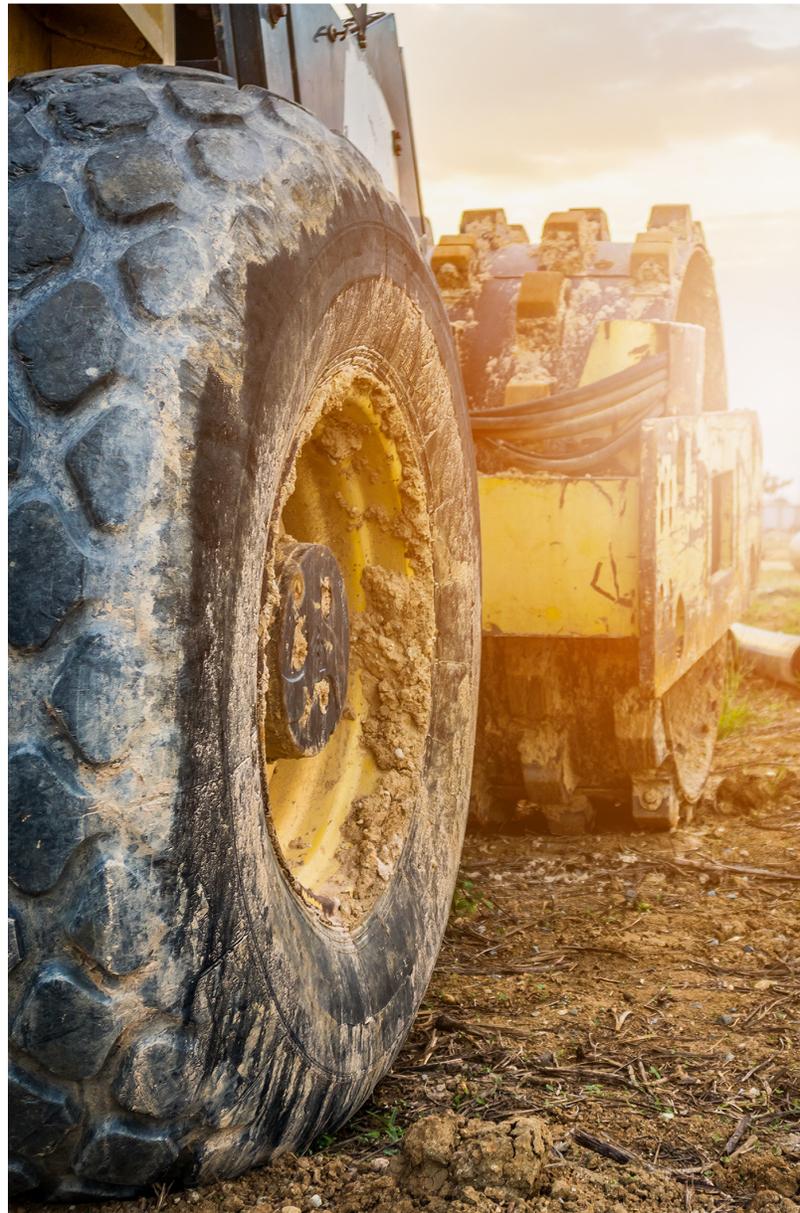
Aluminum complex soap greases have excellent oxidation resistance and good water resistance, but relatively low thermal resistance. These greases are typically used for food-grade applications.

MOLYBDENUM (MOLY) GREASE

Molybdenum (Moly) Grease contains molybdenum disulfide as an additive, and is used for industrial and specialty applications that require a grease suitable for oscillating movements and frequent starting and stopping.

BENTONITE CLAY- THICKENED GREASE

Bentonite Clay-thickened grease is a non-soap grease that does not lose its structure even at extremely high temperatures. However, its applications are limited because they offer poor corrosion resistance and have poor high-speed performance.



MATCHING THE RIGHT GREASE FOR THE APPLICATION

The numerous lubricants, thickeners and additives in greases enable the end user to ideally match the grease for the application. Some of the important considerations include:

- **Operating temperature**

Excessive temperatures can cause grease to soften and flow away from bearing surfaces and result in oxidation or carbonization.

- **Speed**

Grease forms a film on the bearing surfaces that lubricates the parts. Typically, high speed bearings have low loads and require low viscosity. Excessive viscosity will lead to internal heat generation and increased energy consumption.

- **Load**

It is essential that bearings operating under high load utilize a grease with an adequate protective film layer that supports the load and minimizes wear. Typically, low speed, high load applications require a higher viscosity base oil.

- **Exposure to corrosive environments**

Grease can provide protection for bearing surfaces from corrosives. However, if the grease is not adequate, bearing surfaces can corrode, causing contamination of the grease, leading to reduced lubrication capability.

- **Maintenance intervals**

During operation, the base oils and additives in the grease become depleted, causing increased wear of bearing surfaces. As a result, regular maintenance is required to replenish the grease.

- **Cleanliness requirements (food or pharmaceutical grade)**

Greases used in food- or pharmaceutical-grade equipment must satisfy certain requirements imposed by the Food and Drug Administration and other regulatory agencies.

End users must account for each of the above considerations in order to select the proper grease for the application and industry demands.





Phillips 66® is a diversified energy manufacturing and logistics company with unique businesses in lubricants, refining, midstream, chemicals, marketing and specialties. Phillips 66 Lubricants offers greases with superior performance for all major industrial and transportation segments that can satisfy diverse customer requirements and operating conditions. The selection of the best combinations of thickeners, base oils and additives have ensured that our products meet the combined challenges of harsh operating environments and challenging running conditions.

Phillips 66 has a professional sales staff with application specialists and engineers that can assist end users in the specification and selection of an appropriate lubricating grease for their applications.

More information can be found on the Phillips 66 [website](#) or by contacting their Lubricants Technical Hotline at 877-445-9198 - DF-P66-2001.