# Topic Page: lubrication

Summary Article: **lubrication**
From *The Columbia Encyclopedia*

introduction of a substance between the contact surfaces of moving parts to reduce friction and to dissipate heat. A lubricant may be oil, grease, graphite, or any substance—gas, liquid, semisolid, or solid—that permits free action of mechanical devices and prevents damage by abrasion and “seizing” of metal or other components through unequal expansion caused by heat. In machining processes lubricants also function as coolants to forestall heat-caused deformities.

## Types of Lubricants

Lubricants can be classified by their origin—animal (e.g., sperm oil, goose grease), vegetable (e.g., soybean oil, linseed oil), or mineral (e.g., petroleum, molybdenum sulfide). From ancient times until the late 19th cent. lubricants were obtained from vegetable oils or animal fats and oils. Today most are derived from mineral oils, such as petroleum and shale oil, which can be distilled and condensed without decomposition. Synthetic lubricants, such as silicones, are of great value in applications involving extreme temperatures. In certain types of high-speed machinery films of gas under pressure have been successfully used as lubricants.

## Types of Lubrication

Differing widely in viscosity, specific gravity, vapor pressure, boiling point, and other properties, lubricants also offer a wide range of selection for the increasingly varied needs of modern industry. But whatever their derivation or properties, the purpose of lubricants is to replace dry friction with either thin-film or fluid-film friction, depending on the load, speed, or intermittent action of the moving parts. Thin-film lubrication, in which there is some contact between the moving parts, usually is specified where heavy loads are a factor. In fluid, or thick-film, lubrication a pressure film is formed between moving surfaces and keeps them completely apart. This type of lubrication cannot easily be maintained in high-speed machinery and therefore is used where reciprocating or oscillating conditions are moderate.

## Application of Lubricants

Efficient operation of machinery largely depends not only on the lubricant selected but also on its method of application. Lubricants formerly were applied by hand, but modern machinery requires exact methods that can be precisely controlled. For most machinery, different methods of lubrication and types of lubricants must be employed for different parts. In an automobile, for example, the chassis is lubricated with grease, the manual transmission and rear-axle housings are filled with heavy oil, the automatic transmission is lubricated with a special-grade light oil, wheel bearings are packed with a grease that has a thickener composed of long fibers, and the crankcase oil that lubricates engine parts is a lightweight, free-flowing oil.

### *Application of Liquid Lubricants*

Mechanical devices to supply lubricants are called lubricators. A simple form of lubricator is a container mounted over a bearing or other part and provided with a hole or an adjustable valve through which the lubricant is gravity-fed at the desired rate of flow. Wick-feed oilers are placed under moving parts, and by pressing against them they feed oil by capillary action. Horizontal bearings are frequently oiled by a

rotating ring or chain that carries oil from a reservoir in the bearing housing and distributes it along the bearing through grooves or channels. Bath oiling is useful where an oil-tight reservoir can be provided in which the bearing journal may be submerged; the pool of oil helps to carry away heat from contact surfaces. Splash-oiling devices are used where gears, bearings, or other parts contained in housings have moving parts that dip into the lubricant and splash it on the bearings or into distribution channels. Centralized oiling systems usually consist of a reservoir, pump, and tubes through which oil is circulated, while heaters or coolers may be introduced to change the viscosity of the lubricant for various parts of the system. Many oiling operations are automatically synchronized to start and stop with the machinery.

### *Application of Semisolid and Solid Lubricants*

Grease lubricants are semisolid and have several important advantages: They resist being squeezed out, they are useful under heavy load conditions and in inaccessible parts where the supply of lubricant cannot easily be renewed, and they tend to form a crust that prevents the entry of dirt or grit between contact surfaces. Grease is a mixture of a lubricant and a thickener; often it is made from a mineral oil and a soap. It may be applied in various ways: by packing enclosed parts with it, by pressing it onto moving parts from an adjacent well, by forcing it through grease cups by a spring device, and by pumping it through pressure guns. Solid lubricants are especially useful at high and low temperatures, in high vacuums, and in other applications where oil is not suitable; common solid lubricants are graphite and molybdenum disulfide.



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