

# Lubrication

## Grease Fact Sheet

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*An important message  
for industrial users of  
grease*

### CORRECT LUBRICATION -

- SAVES ENERGY
- REDUCES MAINTENANCE
- EXTENDS MACHINERY LIFE

*The purpose of this leaflet is to help you  
select the correct grease for the  
application.*



Correct lubrication can save plant engineers literally the price of many many thousands of pounds a year in reduced maintenance costs and extended life of plant equipment.

Aimed at those who consider 'a grease is just a grease', this leaflet explains the many different types of grease which exist, together with their particular application requirements.



### WHAT IS A GREASE?

The word 'grease' originates from the latin word 'crassus' meaning fat, since simple animal fats were probably the earliest known examples of lubricants and were used to lubricate the axles of chariot wheels by the Egyptians some 3,500 years ago.

Right up until the Industrial Revolution mechanisms were still being lubricated with vegetable oils and animal fats, but in the 19th century rapid developments in engineering developed a need for more sophisticated lubricants. Included in these lubricants, which were making increasing use of the newly discovered petroleum and its associated by-products, were the first of the modern greases.

A grease is defined as:

**'A SOLID OR SEMI-SOLID PRODUCT OF THE DISPERSION OF A THICKENING AGENT IN A LIQUID LUBRICANT. OTHER INGREDIENTS IMPARTING SPECIAL PROPERTIES MAY BE INCLUDED'**

Thus a grease is composed of three main types of ingredient, i.e.

#### Thickener Fluid Base Additives

The first greases consisted of a heavy mineral oil fluid thickened with simple soaps derived from calcium and animal fats, e.g. calcium stearate. By dissolving or forming the calcium soap in the oil at temperatures above the melting point of the soap and then cooling gradually, the dispersed soap solidified in the form of a fibrous structure, which retained the oil in a cohesive mass, in the same way that a sponge retains water.

These early greases, whilst having good lubrication and water-resistant properties, suffered from a very limited temperature range and could not be used at temperatures above some 60°C. Later, the calcium soaps were replaced by sodium soaps, which could operate at much higher temperatures, but had the disadvantage of being readily emulsified by water.

It was not until the 2nd World War that the most common grease of today was developed, namely, lithium soap greases, which had the ideal properties of water resistance combined with the ability to withstand high temperatures (up to 120°C).

### WHY USE A GREASE?

It is always preferable to use oil rather than a grease since it is easier to handle, flows directly to the part needing lubrication and conducts heat away from the moving parts. This is why oil makes up some 95% of the total lubricants market. However, the use of oil necessitates the use of an associated reservoir, sometimes together with a pump and piping, which is not always practicable, e.g. in wheel bearings of cars. In such cases, greases are preferred which can be sealed into the bearing and which are designed to last the lifetime of the bearing without re-lubrication.

The grease is therefore required to:

- Reduce friction and wear
- Protect against rust and corrosion
- Seal the bearing from possible contaminants
- Not leak, drip, or be thrown off
- Retain its consistency over a wide temperature range and for long periods
- Permit the free motion of moving parts
- Be compatible with seals and all other bearing materials
- Tolerate the presence of water without loss of performance

### WHAT ARE THE DIFFERENT TYPES OF GREASE?

Greases are in the main divided into soap-thickened and non-soap thickened varieties, and can be based on mineral oil (most common) or on other types of fluid base.

#### Soaps can include:

Lithium  
Calcium (Hydrous and Anhydrous)  
Sodium  
Barium  
Aluminium  
Lithium Complex  
Calcium Complex  
Aluminium Complex

#### Non-soaps can include:

Bentonite clays  
Silica  
Polyurea

#### Base Fluids can include:

Mineral Oils (Paraffinic and Naphthenic)  
Vegetable Oils (Rapeseed Oil, Sunflower Oil, etc.)  
Synthetic Fluids (Polyalphaolefins, Polyglycols, Polybutenes, Silicones, Ethers, Esters, Alkylates, Fluorocarbons, etc.)

#### Additives can include:

Antioxidants  
Anti-wear  
Extreme Pressure  
Anti-rust  
Solid lubricants (Graphite, Molybdenum Disulphide, etc.)

### HOW ARE THE DIFFERENT TYPES OF GREASE DEFINED?

All greases conform to some form of consistency specification, which indicates the softness or hardness of the grease. This is generally the ISO system (International Standards Organisation) or NLGI (National Lubricating Grease Institute) system, which are defined as follows:

DESCRIPTION	ISO 2137 Penetration	NLGI Grade
Very soft greases	445-475	000
	400-430	00
Soft greases	355-385	0
	310-340	1
Medium greases	265-295	2
	220-250	3
	175-205	4
Hard greases	130-160	5
	85-115	6

### HOW DO I SELECT THE MOST APPROPRIATE GREASE FOR THE JOB?

Selection of the most appropriate grease is not always straightforward, and the equipment manufacturer or grease supplier should be consulted if in any doubt. Selection must be based upon a number of criteria, including thickener characteristics, base fluid characteristics, additive content, compatibility with elastomers used in the equipment, compatibility with grease already present and cost.