Mobil

Grease: its components, consistency and compatibility

Greases are most often used instead of fluids where a lubricant is required to maintain its original position in a mechanism, especially where opportunities for frequent relubrication may be limited or economically unjustifiable. This requirement may be due to the physical configuration of the mechanism, type of motion, type of sealing or the need for the lubricant to perform all or part of any sealing function in the prevention of lubricant loss or entrance of contaminants. Because of their solid nature, greases do not perform the cooling and cleaning function associated with the use of a fluid lubricant. With these exceptions, greases are expected to perform all other functions of a fluid lubricant. While fluid lubricants are always preferable, the aforementioned mechanical circumstances will always exist and thus the need for grease will too.

Grease components

Greases are manufactured by combining three essential components: **base oil, thickener,** and **additives.**

Base oils: The liquid portion of any grease is a typical lubricating oil and may be mineral, synthetic, or any fluid that contains lubricating properties. These oils may range in viscosity from as light as mineral seal oil up to heavy cylinder stocks. The base oil comprises the largest component by volume (typically 80 to 97%) of grease and it is this portion of the grease that does the actual lubricating.

Thickeners: The thickener may be any material that, in combination with the base oil, will produce the solid to semi-fluid structure. Simply put, a grease thickener in combination with the base oil acts much the same way as a sponge holding water.

Principal thickeners used in greases include lithium, aluminum, calcium, clay, and polyurea either alone or in combination. Lithium is perhaps the most common thickener in use today.

Additives: As in lubricating oil additives, grease additives and modifiers impart special properties or modify existing ones. Additives and modifiers commonly used in lubricating greases are oxidation or rust inhibitors, pour point depressants, extreme pressure (EP) additives, anti-wear agents, lubricityor friction-reducing agents, molybdenum disulfide, graphite and dyes or pigments. Dyes or pigments impart color only and have nothing to do with a grease's lubricating capability.

Grease consistency

Consistency is defined as the degree to which a plastic material resists deformation under the application of force. In the case of lubricating greases, it is a measure of the relative hardness or softness and may indicate something of flow and dispensing properties. Consistency is measured in accordance with ASTM D 217, Cone Penetration of Lubricating Grease and reported in terms of National Lubricating Grease Institute (NLGI) grade.

Cone Penetration: Consistency is measured at a specific temperature, 25°C, and (normally) after the sample has been worked 60 strokes in the ASTM grease worker. After the sample has been prepared, a penetrometer cone is released and allowed to sink into the grease under its own weight for 5 seconds. The depth the cone has penetrated is then read, in tenths of a millimeter.

NLGI: On the basis of ASTM worked penetrations, the NLGI has standardized a numerical scale, in order of increasing hardness for classifying the consistency of grease — 000 for semi-fluid greases to 6 for block grease.

It should be clearly understood that consistency is due directly to the base oil and thickener ratios, not the base oil viscosity.

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Compatibility

Mixing different types of greases can sometimes lead to incompatibility problems. Grease incompatibility results from chemical interactions between the thickener or additive systems of the dissimilar greases. In some cases, grease incompatibility can lead to equipment failure or damage of the lubricated components. Mixtures of incompatible greases will exhibit excessive hardening or softening relative to the consistency of the individual pure greases.

The hardening or softening tendencies of the mixture will generally become more pronounced as the operating temperature increases or as the rate of shearing on the grease mixture increases. Incompatible greases may also exhibit excessive oil separation or "bleeding" tendencies at higher temperatures. The Chart below is a general guide and for information purposes only. When changing from one type of grease to another, it is always recommended to test the compatibility of different greases in a laboratory.

Grease compatibility chart

	Aluminium Complex	Barium	Calcium	Calcium 12-Hydroxy	Calcium Complex	Clay (Non-Soap)	Lithium 12-Hydroxy	Lithium Complex	Calcium Sulfonate	Polyurea (Shear Unstable)	Polyurea (Shear Stable)
Aluminium Complex		Incompatible	Incompatible	Borderline compatible	Incompatible	Incompatible	Incompatible	Incompatible	Borderline compatible	Incompatible	Borderline compatible
Barium	Incompatible		Incompatible	Compatible*	Incompatible	Incompatible	Incompatible	Incompatible	Compatible*	Incompatible	Borderline compatible
Calcium	Incompatible	Incompatible		Compatible*	Incompatible	Borderline compatible	Borderline compatible	Compatible*	Compatible*	Incompatible	Compatible*
Calcium 12-Hydroxy	Borderline compatible	Compatible*	Compatible*		Borderline compatible	Borderline compatible	Compatible*	Compatible*	Borderline compatible	Incompatible	Compatible*
Calcium Complex	Incompatible	Incompatible	Incompatible	Borderline compatible		Incompatible	Incompatible	Compatible*	Incompatible	Compatible*	Compatible*
Clay (Non-Soap)	Incompatible	Incompatible	Borderline compatible	Borderline compatible	Incompatible		Incompatible	Incompatible	Incompatible	Incompatible	Borderline compatible
Lithium 12-Hydroxy	Incompatible	Incompatible	Borderline compatible	Compatible*	Incompatible	Incompatible		Compatible*	Borderline compatible	Incompatible	Compatible*
Lithium Complex	Incompatible	Incompatible	Compatible*	Compatible*	Compatible*	Incompatible	Compatible*		Compatible*	Borderline compatible	Compatible*
Calcium Sulfonate	Borderline compatible	Compatible*	Compatible*	Borderline compatible	Incompatible	Incompatible	Borderline compatible	Compatible*		Incompatible	Incompatible
Polyurea (Shear Unstable)	Incompatible	Incompatible	Incompatible	Incompatible	Compatible*	Incompatible	Incompatible	Borderline compatible	Incompatible		Compatible*
Polyurea (Shear Stable)	Borderline compatible	Borderline compatible	Compatible*	Compatible*	Compatible*	Borderline compatible	Compatible*	Compatible*	Incompatible	Compatible*	

Incompatible   Borderline compatible   Compatible*

*NOTE: It is always recommended to test grease compatibility in the laboratory.

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