



Technical Topic

Grease Compatibility – To Be or Not To Be!

What's the issue?

Mixing different greases, even those with similar thickener types, can sometimes lead to ineffective lubrication resulting in damage of the lubricated components. If not spotted soon enough this may lead to equipment failure. These situations occur due to chemical or structural interaction between the thickener or additive systems of the different greases which would be classified as “incompatible”.

Symptoms of incompatibility come in various forms. Most frequently grease mixtures will exhibit a change in consistency relative to that of the individual pure greases. This tendency will be more pronounced as the operating temperature or the rate of shearing of the grease mixture increases. Incompatible greases may also exhibit abnormal oil separation or “bleeding” at higher temperatures. If greases that are incompatible are mixed in application it could lead to grease or oil leakage, premature aging, or insufficient oil bleed in the contacting zones. Although less probable but not unknown, the greases’ performance additives may act antagonistically, adversely affecting the lubrication performance such as protection against friction, wear, rust or corrosion.

Lab investigations

Industry Standard ASTM D6185 defines a protocol to evaluate the compatibility of binary mixtures of lubricating greases by comparing their properties or performance relative to those of the neat greases comprising the mixture. The principle of the test is to blend and shear under controlled and identical conditions the two greases at various ratios, determining after a short period of rest at room temperature any change in STRUCTURAL stability compared to the fresh greases’ stability. Three properties are evaluated in a primary testing protocol using standard test methods: (1) dropping point; (2) shear stability by 100 000–stroke worked penetration; and (3) storage stability at elevated temperature via change in 60-stroke penetration after storage. The overall assessment of the test results determines if greases are compatible (all changes within the repeatability of the least performing grease), borderline compatible (change beyond the repeatability but still within the test reproducibility of the least performing grease) or incompatible (change beyond the reproducibility of the least performing grease).



For compatible mixtures (those passing all primary testing), a secondary testing scheme is suggested when circumstances indicate the need to qualify the performance level of the grease mixtures for the considered applications.

Many Labs will perform a simplified version of ASTM D6185 without the secondary phase, or in some cases an internally established grease compatibility test matrix. Whichever the test performed, beware! The test carried out presents several limitations! For instance, these physical tests do not determine if the mixture will effectively protect seals, prevent against rust and yellow metal corrosion or reduce wear under high loads. Neither do they predict long term effects potentially resulting from chemical interactions between additives from the different greases. These could potentially result in synergies in some ideal cases, or more likely antagonisms impacting the grease mixture’s ability to perform in application as desired.

What does the compatibility test tell me for converting grease on my equipment?

The generic chart in Table 1 is common within industry and reflects the compatibility result trends related solely to structural stability of the grease mixture. It should be used with due diligence considering its limitations: true compatibility of greases is also affected by the field operating conditions

such as temperature, shear rates, the state of the used grease replaced, and the ratio of the greases in the mixture. Two greases rated as “compatible” in this grid implies there is a LOW risk these greases will present structural instability within a short timeframe during which both are present in the same application; particularly if operating conditions are mild. Conversely, if greases are “incompatible”, the likelihood is HIGH that significant hardening or softening of the grease mixture or oil separation would result after a short time in the application. This grid is merely a guide to aid in the risk management of co-mingling greases in application against the severity and criticality of the application. Therefore when changing from one type of grease to another, it is always best to clean and fully regrease the bearings or thoroughly purge out the old grease with the new grease. If this can not be carried out,

mitigating actions should focus on minimizing the amount of the grease being displaced remaining in the application, such as by increasing relubrication frequency to facilitate a purge of old grease in a timely manner. To avoid over-greasing (most frequent cause of bearing failure) when forcing grease out of bearings, always have relief plugs removed during the 1st hour of operation to allow excess grease to freely flow out of the bearing housing. Regular monitoring of temperature, vibration, and visual checks for leaks will prompt for corrective actions if the mixture presents an incompatibility in application. Obviously, application of these best practices is even more strongly recommended if the greases are deemed not to be compatible.

Table 1: Grease Compatibility Generic Chart

	Aluminum Complex	Calcium Complex	Calcium Sulfonate	Lithium 12-Hydroxy	Lithium Complex	Polyurea	Clay
Aluminum Complex	C	I	M	I	I	M	I
Calcium Complex	I	C	M	I	M	C	I
Calcium Sulfonate	M	M	C	M	C	I	I
Lithium 12-Hydroxy	I	I	M	C	C	M	I
Lithium Complex	I	M	C	C	C	M	I
Polyurea (shear stable)	M	C	I	M	M	C	M
Clay	I	I	I	I	I	M	C

C: Compatible
M: Moderately Compatible
I: Incompatible

NOTE: This matrix is based on information commonly used in industry. It provides a general assessment of grease compatibility based upon the structural stability of mixtures of different grease thickeners. It does not address potential additive related incompatibilities or other performance features. Classification may differ for specific greases depending on composition and manufacturing process. It is always recommended to thoroughly remove and clean out any old grease remaining in application prior to converting to a different grease.

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