A BARDEN

Precision Bulletin

Number 5B

This is the second in a series of three technical bulletins on the subject of bearing lubrication.

GREASES FOR PRECISION BEARINGS

Grease is a semisolid lubricant consisting of an oil and a thickening agent. Its primary advantage over oil is that bearings can be prelubricated with grease, eliminating the need for an external lubrication system. This grease is often adequate for the life of an application. On the other hand, grease can be expected to increase the initial bearing torque and may exhibit a slightly higher running torque.

The purpose of the thickener in a grease is to hold and meter the fluid lubricant present; thus the performance will be determined by the properties of the lubricating fluid, while the life will be determined by the properties of the thickener.

There are dozens of bearing greases in current use; their characteristics vary widely to meet different application requirements.

SPEEDABILITY

Speedability is expressed as a dN value, with dN being:

dN=bearing bore in mm multiplied by RPM

The greatest dN that greases can normally tolerate for continuous operation is approximately 650,000. This value is influenced by factors such as type of grease, loads and temperatures.

Grease Base		Maximum dN
Oil	Thickener	
Petroleum	Sodium	650,000
Diester	Any	400,000
Fluorocarbon	Any	400,000
Silicone	Any	200,000

TEMPERATURE

Most greases are limited to a maximum temperature of 300°F, some only to 250°F or 200°F. Specifically formulated high temperature greases can operate at 450°F or 500° for short periods. For all greases, life is severely penalized by operation near their temperature limits.

In general a temperature increase of 20°F (10°C) will reduce grease life by a factor of ½.

CONSISTENCY (STIFFNESS)

Stiffer, channelling type greases are required for high speed applications to minimize heat generation due to churning. Also, stiffer consistency greases are beneficial for applications with outer ring rotation where centrifugal force tends to sling grease out of the bearing, and those vertical axis applications (bearings installed horizontally) where gravity pulls grease away from its intended position.

Channelling type greases have the property of being displaced during initial running and maintaining a relatively fixed position during life. Other things being equal, high speed torques with channelling greases will be lower. Non-channelling greases will tend to give high torque at low temperatures and high pumping losses at high temperatures.

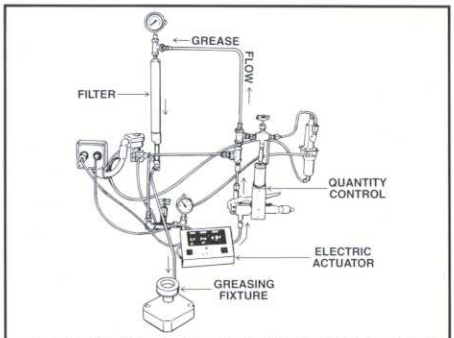
Grease consistency is measured by penetration; the softer the grease, the higher the penetration and vice versa.

COMBINATIONS OF FACTORS

To maintain a normal grease life expectancy, adverse operating conditions must not be present in combination. Thus, at high temperatures speed and load should be low. Or, at maximum speeds, temperature and load should be low.

In certain applications, such combinations are unavoidable and tradeoffs are necessary. For example, if speed and temperature are both high, loads must be low and life will be short.

Grease thickeners. There are several types of thickeners, each with its own special characteristics and advantages for specific applications. The most common types used in precision bearing applications are:



BEARING GREASING SYSTEM

Sodium thickeners—channelling type; good for high speeds to 650,000 dN; are water soluble.

Lithium thickener—non-channelling; rated to 4000,000 dN; offers good water resistance; generally soft.

Polyurea thickener—non-channelling; water resistant; rated to 400,000 dN.

Clay thickener—non-channelling; rated to 400,000 dN; water resistant.

Teflon thickener—non-channelling; rated to 400,000 dN; water resistant; chemical inertness; non-flammable, excellent oxidative and thermal stability.

GREASE QUANTITY

"If a little is good, more is better!" Not always true! Too much grease can cause ball skid, localized over-heating in the ball contact area, cage pocket wear, and rapid bearing failure under certain conditions of operation. Generally, for precision high speed applications, grease quantity in a bearing should be about 25 to 35% full based on the free internal space in a specific bearing. This quantity may be modified to meet the requirements of the application regarding torque, life, and other specifics.

GREASE FILTERING

Greases for precision bearings are factory filtered to preclude loss of precision, noise generation, high torque, and premature failure in the application. There is no intermediate grease container following the filtering operation since the in-line filter injects the grease into the bearings immediately prior to bearing packaging.

Grease filter sizes range from about 10 to 40 microns depending on grease variables such as thickener and additive particle size.

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