Gatco, Inc.

Grease Lubrication Recommendations for Gatco Rotary Bushings and Tool Holders

Data Sheet 1009-1

Lubrication

Proper lubrication is essential for successful performance of rotary bushings and tool holders. Gatco Rotary Bushings require very little maintenance. Only in severe applications or contaminated environments will they require re-greasing. Although a frequency calculation is provided re-lubrication must be determined by the end user based on the environment, loads applied and running speed as well as other variables. Recommended grease lubricant is Alvania #2 by Shell Oil (or equivalent). The lubricant's purpose is to reduce friction, prevent bearing wear, dissipate heat and prevent corrosion between the bearing races and rolling element.

This Data Sheet is intended to provide the customer with general lubrication guidelines. Due to the overwhelming number of lubricants, lubricating systems and environments it is best to work directly with the in-house lube engineer, bearing companies and auto lube system suppliers for specific recommendations.

Grease Lubrication

Grease lubrication is usually the first choice of lubricant. As technology advances the thinking on lubrication has changed. The major oil companies now formulate greases that combat against the deterioration, and the washout ability that coolant causes in machine operations.

Grease lubricated rotary bushings are suitable for a wide range of speeds. Lubricating high-precision bushings and tool holders with suitable quantities of good quality grease permits relatively high-speed operation without an excessive rise in temperature.

The use of grease also means that the design of a bearing arrangement can be relatively simple because grease is more easily retained in the bushing. Grease also protects the bearing by contributing to sealing against solid contaminants and moisture. Grease provides an effective, inexpensive means of lubricating rotary bushings and tool holders. Housings are simplified as opposed to oil lubrication and eliminates the need for motors, pumps, lube lines, metering valves and nozzles.

Lubrication Benefits

- Minimizes friction at points of contact within the bushing.
- Prevents Corrosion from forming within the bushing or Tool Holder.
- Aids in Dissipating Heat.
- Eliminates bearing and spindle wear.
- Provides extra sealing to exclude Contamination.
- Forms a thin film between the rolling element and the bearing race which is capable of supporting load.
- Prevents Premature failure of the bearings.
- Dampens running noise.

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Re-greasing Frequency

Re-greasing quantity and frequency are two of the most common questions when referring to the application of grease in rotary bushings and tool holders.

Some applications do not require re-greasing at all, but most others should be re-lubricated periodically to replace grease that has deteriorated, leaked away, or become contaminated. In practice, these factors are extremely important to bearing performance, as both undergreasing and overgreasing can lead to major maintenance issues. Undergreasing can cause metal-to-metal contact between the rolling element and the bearing race, resulting in pre-mature failure. Overgreasing can cause overheating, seal damage, and dissipation due to grease churning.

Re-greasing *frequency* calculation is somewhat more complex than the calculation for re-greasing quantity, and it largely depends on the operating conditions of the application. Factors that affect the re-greasing frequency include: temperature, quantity of grease in the bushing or tool holder, size and speed of the bearing, vibration, exposure to contaminants, effectiveness of seals and the grease's suitability for the particular service.

A common calculation for re-lubrication frequency, which incorporates the operating conditions, is:

$$\text{Regreasing Frequency (hours)} = \left(\frac{14{,}000{,}000}{(\text{shaft rpm})\sqrt{(\text{bearing ID})}} - 4(\text{bearing ID}) \right)(F1)\,(F2)\,(F3)$$

Where:

- Bearing ID = bearing internal diameter in mm
- F1 bearing type = 1.0 for spherical or thrust bearing, 5.0 for cylindrical bearing, 10.0 for ball bearing
- F2 temperature = 1.0 for under 70°C, divide by two for every 10 above 70°C (e.g. 0.25 for 90°C)
- F3 contamination = 0.1 to 1.0 depending on the level of contamination

Using this example, for a spherical bearing application operating at 80°C, with shaft speed 1000 rpm, a bearing internal diameter of 100 mm and minimal contamination, the frequency at which an operator should re-grease the bearing can be calculated.

$$\text{[Example] Frequency (hours)} = \left(\frac{14{,}000{,}000}{(1000)\sqrt{(100)}} - 4(100) \right)(1)\,(0.5)\,(1) = 500 \text{ hours}$$

Grease Volume

In most applications adequate lubrication is assured if the amount of grease is maintained at 25%-35% of the free space of the bearings and the space adjacent. This is the volume of grease pack maintained when bushings and tool holders are shipped from the factory. Extremely contaminated applications dictate that the bearing be packed full if the operating speed is low. At start up after re-greasing, grease will continue to purge past the seals and will stop when the bearings have purged themselves. (Grease meters are commercially available for accurate grease volume.)

An industry accepted equation for grease volume:

$$cm^3 = \left(f \times 10^{-5} (D^2 - d^2)\, B \right) C$$

Where, Approximate filling amount (cm3)

D: Nominal outside diameter (mm)

d: Nominal bore (mm)

B: Nominal bearing width (mm)

f = 1.5 for Needle Roller Bearings, Tapered Roller Bearings, Cylindrical Bearings

f = 1.7 for Angular Contact Bearings, Deep Groove Bearings

C = Quantity of bearings in unit

10^{-5} = .00001