8. Lubrication and storage

8.1 Lubrication

Bearing lubrication reduces friction and wear, acts as a coolant, minimizes contamination, prevents corrosion, and generally extends bearing life. Selecting the best lubricant for your specific application becomes a very important decision; however, choosing from the hundreds available can be an overwhelming task. FBJ's engineering staff is available to help make the right decision for your application.

8.2 Oil Lubrication

Oil is the basic lubricant for ball and roller bearings. The main adventage if an oil lubricant is that there is less bearing torque. The use of synthetic oils such as diesters, silicone polymer, and fluorinated compounds has improved volatility and viscosity characteristics and increased temperature properties.

Table 8.1 Reccomended Oils in Industrial Use

Manufacturer	Manufacturer Code	FBJ Suffix	Lubricant Base	Flash Point' C	Visocsity (cSt)	Operating TemperareºC
Anderson Oil Co.	Windsor Lube L-245X	OA01	Diester	215	14 (38ºC)	-55+175
Dow Corning Co.	SH550R	OD01	Methylphenly	316	125 (25ºC)	-40+230
Nihon Oil Co.	Antirust P21 00	ON-1	Mineral	166	13 (40ºC)	-20-+115
Shell Oil Co.	Aero Shell Fluid 12	OS01	Diester	235	14 (38ºC)	-50-+120
Shell Oil Co.	Aero Shell Fluid 3	OS02	Petroleum	145	10.2 (40ºC)	-55+115
Thenneco Chemicals	Anderol L-40 I D	OT01	Diester	220	12.7 (38ºC)	-60+125

Table 8.2 Greases used in FBJ Bearings

Manufacturer	Manufacturer Code	FBJ Suffix	Thickening agent	Lubricant Base	Drop Point' C	Consistency	Operating TemperareºC Range (ºC)
Caltex	Chevron SRI-2	GC01	Urea	Mineral	240	270	-30~+175
Dow Corning	Molykote 33M	GD01	Lithium	Silicone	210	260	-70~+180
	Molykote 44M	GD02	Lithium	Silicone	204	260	-40~+200
	Molykote FS 1292	GD03	Fluorotelomer	Phlorosilicone	232	310	-40~+200
	Molykote FS 3451	GD04	Fluorotelomer	Phlorosilicone	260	285	-40~+230
Esso	Andok B	GB01	Sodium	Mineral	260	285	-40~+120
	Andok C	GB02	Sodium	Mineral	260	205	-20~+120
	Andok 260	GB03	Sodium	Mineral	200	260	-30~+150
	Beacon 325	GB04	Lithium	Diester	193	280	-60~+120
Kyodo Yushi	Multemp PS2	GK01	Lithium	Diester.Mineral	190	275	-55~+130
	Multemp SRL	GK02*	Lithium	Ester	191	245	-40~+150
Nihon Oil	Multinocurea	GM01	Urea	Mineral	260	290	-20~+175
Shell Oil	Alvania No.2	GS01*	Lithium	Mineral	182	272	-25~+120
	Alvania No.3	GS02	Lithium	Mineral	1S3	233	-20~+135
	Alvania RA	GS03	Lithium	Mineral	183	252	-40~+130
	Aero Shell Grease No.7	GS01*	Microgel	Diester	260	288	-73~+149
	Aero Shell Grease No.15A	GS05	Fluorotelomer	Silicone	260	280	-73~+260
Shinetsu Silicone	Silicolube G40M	GS31	Lithium	Silicone	210	260	-30~+200

*These suffixes may not indicated in the bearing or bearing box when numbering.

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8.3 Grease Lubrication

For lubrication of rolling bearings, use is mainly made of grease, because the techniques of their employment are more simple, they do not require complicated sealing devices and demand less expenditures for the maintenance of mechanisms. When a machine or a mechanism is stopped, grease does not run off from the bearing but remains there and even seals the assembly isolating it from the surroundings. These and other advantages of greases are so decisive that allow the wear of bearings to be ignored. The use of grease brings about a more rapid wear than when operating with oils due to the accumulation of abrasive particles in the former.

Greases are obtained by solidifying lubricating oils with the aid of various thickening agents. Such silidification agent creates a structural framework of interwoven fibers which imparts plasticity to the lubricating material and retains lubricating oil in its cells.

Grease is well held in place in a bearing, does not flow out under the effect of the force of gravity and resists the action of centrifugal forces attempting to throw lubricant away from the bearing during its rotation. The properties of grease are determined by the composition of the thickening agent.

For rolling bearing lubrication, use is normally made of grease in which mineral oil is solidified with the aid of sodium, calcium or lithium soaps.

Rolling bearings should be filled with grease just immediately before the unit is to be assembled. The decisive reason for this is very stringent requirements to the lubricant purity. The later the lubricant is put in, the lesser the danger of its getting contaminated.

The bearing type or design features of a unit may demand it to be filled with grease at a later stage.

Thus, for instance, if it is necessary to adjust the amount of clearance in bearings with a tapered inner bore, the required measurements can be only performed before the unit is filled with grease. It is also impracticable to put in grease before the bearing is heated for mounting. Preliminary packing a bearing with grease is only recommended when it is impossible to distribute grease over rolling elements and raceways after assembly.

Normally, a bearing as a whole and the free space in the unit housing is only partially filled with grease-from 30 to 50%. However, when using lithium-base lubricants for supports that are not subjected to strong vibration, the free space of the housings can be filled up to 90% disregarding the danger of overheating. When a support is filled with a larger than normal amount of grease, this improves the reliability of protection against contamination and prolongs the support's service life.

High-speed rolling bearings, for example, spindle units of metal-cutting machine tools mush be lubricated with a small amount of grease in order to limit the temperature of unit heating. In supports subjected to strong vibration, for example, in the hubs of motor car wheels and in the boxes of railroad car wheels, as well as in vibration machines, grease should fill not more than 60% of the free space.

The technique of packing a bearing unit with grease is selected depending on the bearing type.

Separable bearings (cylindrical, tapered, thrust-type) are filled with grease following the sequence of assembly, applying a thin layer on the raceway of the installed ring and then filling the space between the rolling elements.

In inseparable bearings, for example, in radial and angular contact bearings grease should be stuffed in form both ends. Self-aligning ball bearings and spherical roller bearings can be filled with grease by turning the ring and stuffing the lubricant in between the rolling elements.

8.4 Solid Lubrication

A solid film lubrication can range from simple sacrifical retainers, graphite, or molybdenum disulphide (MoS_2) powders, to complexion sputtering or plating. Each type must be ehgineered for the specific application. They are very useful in areas of temperature extremes, vacuum, radiation, pressure, or harsh environments where coventional lubricants would fail. Solid film lubricants do not deteriorate in storage.

8.5 Storage Of Bearings

Rolling bearings have high-quality working surfaces. Any deterioration of the surface quality results in a premature wear and reduction in the service life of bearings.

Bearings are made predominantly of ferrous metals, therefore, the main danger for them is corrosion which is absolutely intolerable on the working surfaces of bearings. To prevent in-storage corrosion, bearings are delivered to the customer in a preserved state, i.e., washed to remove dirt, contamination, slushed with corrosion-protective lubricant - mineral oil with an inhibitor, and packed in special packing.

The time this lubricant will be capable of protecting the bearing against corrosion depends on storage conditions. The customer's task is to store bearings in conformity to the Manufacturer's instructions.

The occurrence of corrosion of bearings during storage depends on two main factors:

1) relative air humidity in the storage place: the lower the humidity, the weaker the process of corrosion. No in-storage corrosion is practically observedc when relative humidity is below 40%

2) temperature gradient in the storage premises during the day. The smaller the temperature difference, the more favorable the storage conditions. Great temperature fluctuations are particularly dangerous when there is a high relative humidity. In this case moisture can condense on the surfaces of bearings, increasing sharply the probability of corrosion. These factors need to be considered when establishing requirements to bearing storage premises.

A room used for storage of bearings must be dry, heated, well ventilated, located far from places where the air contains trings of substances that cause metal corrosion-away from chemical, pickling, galvanic shops. The storage room air temperature must be kept, as far as possible, within 10ºC to 30ºC. The daily temperature variation should not exceed 5ºC.

Relative air humidity in the storage room should not be in excess of 60%. It is desirable that it should be as low as possible. The bearing storage conditions in the room (humidity and temperature) should be continuously monitored.

It is recommended to store large-size bearings with an inner diameter over 200mm placed on their end-faces to avoid possible deformation of the thin-walled rings.