

TECHNICAL CONCEPT



HIGH SPEED GREASE

One of the major challenges in industries faced is determining the grease for equipment running at high speed. Improper grease can lead to drag, seizure, heat generation, or premature failure in grease-lubricated components.

There are many industries that have high-speed applications and bearing rotating at a higher speeds than normal processing equipment. When it comes to the lubrication of this equipment, not every lubricant will behave in the same way.

The challenges faced by industrial facilities can be overcome by selecting a grease that can perform satisfactorily at high speeds and can help in minimizing potential failures caused by the contradiction of lubricant to the application.

Lubricants provide effective lubrication when the surface area (metal to metal or metal to plastic or plastic to plastic etc.) come in contact and prevalent speed at that moment allows for effective formation of oil film and temp the range falls within the limit. The limit for lubricants is regardless of base oil type and usually, it's the condition that causes a change in the state of the fluid that prohibits the formation of lubrication film.



HIGH SPEED APPLICATIONS

Usually, a high-speed application can be seen in various components. For instance, if pumps are directly coupled to the motor and have bearings lubricated, grease may spin in excess of 2000 rpm. Similarly goes for certain mixers, agitators, and blowers. Challenges would be faced if applied a multipurpose grease without much consideration of the needs of bearings. To understand better what bearing requires in lubrication, we must learn to determine the speed factor of bearing.

Let us see categorization of speed in term of slow, medium and high w.r.t to revolution per minute (rpm)

CLASSIFICATION	REVOLUTION PER MINUTE(RPM) APPROX VALUES
SLOW	30 - 1000
MEDIUM	1000 - 3000
HIGH	ABOVE 3000

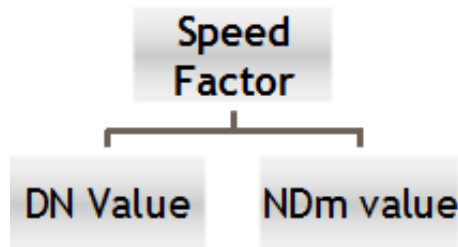
FOLLOWING FACTORS TO BE CONSIDERED FOR SELECTION OF HIGH SPEED GREASE

- Speed Factor
- Base Oil Viscosity
- Channeling Characteristics
- Type of Thickener
- NLGI Grade
- Drop Point



- **Speed Factor**

Speed factor is relationship of speed and size of bearing and it is a empirical number. One can determine Speed Factor by two ways



DN Value :

The bearing inner diameter multiplied by the speed at which rotates.

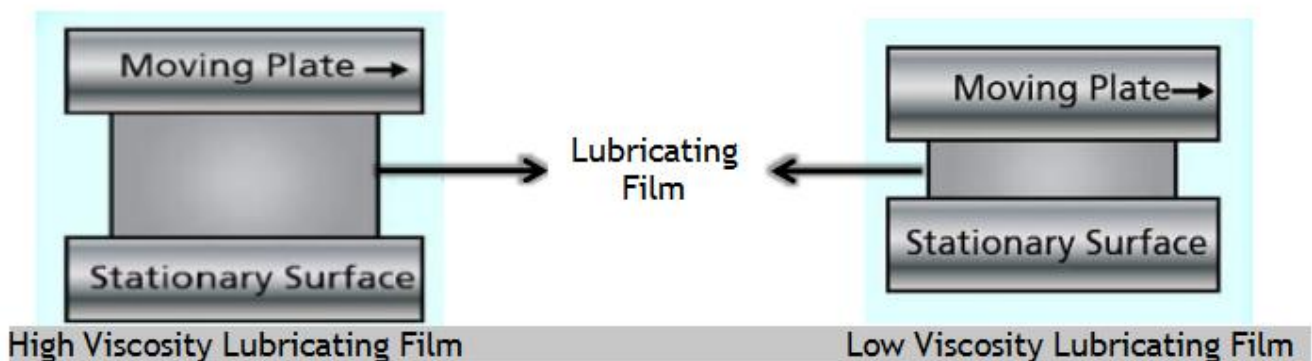
NDm Value :

Bearings median size, i.e pitch diameter and the speed at which it rotates.

The speed factor helps to determine the lubricant properties by which one can select the proper lubricant. These properties are viscosity and NLGI of grease for selecting for the application

- **Base oil viscosity**

The most important physical property of lubricating grease is base oil viscosity. Viscosity helps to determine how thick or thin the lubricating film will be formed based upon the load, speed, and surfaces in contact.



Most general-purpose greases have around 150 cSt base oil viscosity and they can perform satisfactorily under moderate speeds and loads. As the bearing speed increases, the viscosity must be reduced accordingly. We can calculate viscosity by utilizing the DN factor by using standardized charts. High viscosity leads to excess heat generation and increased energy consumption. This leads to premature bearing failure since the hotter the bearing runs, the lower the viscosity of the grease becomes. This leads to increase grease run-out and decrease re-greasing interval adding to the cost of lubricant due to increased drag from excess viscosity. We can lubricate bearings until they reach speed factors greater than 500,000. Here specialty high-speed greases are employed.

When the bearing speed increases, the speed factor also increases. If the bearing speed and speed factor increase, the corresponding viscosity for the application will need to decrease.

Channeling Characteristics (Pump-ability):

It determines how it will lubricate at high speeds, defines the pump-ability of grease. Greases with channeling characteristics are more easily pumped out of the way of the elements, which leads to less churning and temperature gain.

Impact of bearing conditions on base oil viscosity selection				
ISO CG (cST@40°C)	Load	Speed	Oil separation	Pumpability
22	LOW	HIGH	HIGH	HIGH
100				
150				
220				
460				
1000				
1500	HIGH	LOW	LOW	LOW

Oil Separation and pump-ability are influenced by thickener type and consistency.

- **Type of Thickener:**

Apart from base oil viscosity, thickener also has an impact on the pumping ability of lubricating grease. Thickener is commonly referred to as the sponge that holds the oil. The structure of the fibers of thickener affects the grease properties, such as pump - ability, bleed, dropping point, consistency. Some thickeners have short fibers, while others have long fibers.

Short fibered thickeners have a smooth texture. More complex thickeners, as well as lithium, polyurea, silica, calcium, are short fibered thickeners. The lubricating grease with these thickeners have better pump - ability and are more easily pumped.

Long fibered thickeners are sodium, aluminium and barium and have worse pumping ability characteristics, The longer fibers get sheared through churning and also causes change in consistency and can result in increase heat affecting the bearing life.

- **NLGI Grade :**

The amount of thickener concentration and base oil viscosity greatly influences the NLGI grade of the finished lubricating grease. The higher the NLGI number, the thicker is grease. For high-speed greases for rolling element bearings, the NLGI grade tends to go up while the base oil viscosity goes down. The appropriate proportion ensures that there is no excess oil bleed from the thickener. Based upon bearing, speed factor as well as temperature in which bearing operates one can select the appropriate NLGI grade of grease.

- **Dropping Point :**

One of the most notable considerations when selecting a high-speed grease is the temperature at which bearing will operate. One can ensure that selected grease will perform satisfactorily at elevated temperatures by checking the dropping point of the grease. A higher drop point is important for bearings operating at elevated temperatures.

However, high drop point does not ensure base oil can withstand elevated temperature. One should always consider factor of safety between the temperature at which bearing operates and flash point of base oil besides drop point.

CONCLUSION :

Base Oil Viscosity - Ensure that Viscosity provides lubricating film but is not too thick which leads to excessive heat and drag.

Channeling Characteristics - The grease should have good pumping ability so that excess heat is not generated from the churning of grease in bearing.

Thickener Type - A thickener influences and can provide pump-ability, drop point and bleed characteristics.

NLGI Grade: Consistency influence the bleed and pump-ability of finished lubricating grease

Drop point - Drop point of the grease should be more than the operating temperature of grease to avoid bleeding and bearing failure.

High-speed applications tend to have higher temperatures, thus a shorter grease life, the overall grease properties should be designed to withstand these conditions. Because higher temperatures are expected in these high-speed applications, synthetic base oil and an advanced additive system are usually recommended, particularly if it's a critical bearing.

Depending on the application, different thickeners may be appropriate, if they have good channeling characteristics and don't contribute to excessive heat generation as the bearing speeds up.

Finally, one should keep in mind that bearing lubricant generally will not last as long with higher-speed bearings. For a healthy bearing life, it's best to replenish them with bearing grease more frequently.



MOSIL'S SOLUTION :

- BRB - 575 : A low viscosity synthetic grease with lithium thickener for high speed applications.
- BRB - 575 super : A low viscosity synthetic grease with lithium thickener formulated to offer micro film lubrication technology and doped with highly stable chemical additive for high speed operations.
- SAM - 2020 : An extremely low viscosity synthetic grease with additives which reduces fatigue and abrasive wear considerably under extreme dynamic load conditions where operating speed and temperature are too high.
- CSR - 300 RY : Speciality Fluid Grease with 000 consistency. Reducing wear and tear where operating speed is high.
- CSR - 100 : High Speed Grease and perform satisfactorily under extreme dynamic load conditions at high operating temperature and speed.



With range of MOSIL product for high speed application, One can exclusively select the product which will satisfactorily met the requirement of application and will optimize the same.