SELECTION OF APPROPRIATE SEAL FOR BEARING HOUSING

IMPORTANCE

For efficient working of a bearing housing, its seal plays a very important role. A few main benefits of seal are:

- It protects bearing and helps in increasing life of a bearing by stopping ingress of dirt, moisture and foreign particle which can enter in housing and spoil the quality of lubricant.
- Also works as barrier to lubricant flowing out of the bearing housing during running of shaft and bearing.
- It increases the life of bearing and provides trouble free running of bearing and assembly.

Hence it is very important to select and use proper and efficient seal for a bearing housing. Wrong seal can prove very hazardous for bearing and assembly.

TYPE OF SEALS:-

1. Felt seal:
   a. Simple felt strip/ cord, FS or
   b. Felt hold in Aluminum half rings, TC
2. V Ring Seal
3. Four Lip Seal
4. Labyrinth Seal
5. Taconite Seal
   a. Radial Labyrinth
   b. Axial Labyrinth

Over and above, there are Special Seals also in use, which are developed as per application and requirement up on demand.

PARAMETERS FOR SELECTION OF A SEAL

In general, the following parameters are required to be considered while selecting a seal:

1. Type of Lubricant (Grease or Oil)
2. Operating Speed (i.e. Peripheral Speed of shaft in meter/sec)
3. Possible level of contamination at site
4. Possibility of misalignment of shafts with reference to housing
5. Operating temperature of bearing
6. Environmental temperature of surrounding
7. Type of service, continuous (round the clock) or intermittent (periodic)
8. Environmental condition, presence of moisture, humidity, dusty atmosphere, fine particle in air (like in coal mining or cement plant) or metal chips etc.
9. Possibility of splashing of water or liquid on housing assembly
10. Outdoor application or indoor application
11. Exposure to direct Sun light and heat
12. Ease of maintenance required and frequency of possible plant shutdown for maintenance.

SEAL SELECTION

FELT SEAL (FS/TC)

There are two versions.

a Felt Strip, FS:

b Felt held in Aluminum Half Ring, TC with O'Cord

c Felt seal is simple and very effective for general applications. It is a contact type seal which rubs on the shaft.

Selection Criteria:

1. It is effective only when grease lubrication is used.
2. A felt seal can be selected when max. circumferential speed of the shaft up to 4 meter/sec.
3. For the SN series, FC, the simple loose felt strip is selected.
   For SNA, SNH & SNL series, TC felt seal is selected, which is two held aluminum rings in which the felt strip is put. O'Cord is put in groove over the aluminum rings for proper fitment of TC seal in the housing.
4. Felt strip should be cut to correct length; it is soaked in hot oil for a few minutes before putting it in sealing groove in the housing.
5. Applicable temperature range for felt seal is -40°C to +100°C.
6. Felt Seal can be used upto max. misalignment of shaft by 0.5°.
7. It is advisable to change Felt seal during each 3 to 6 month maintenance cycle.

FOUR LIP SEAL (TL)

Four Lip seal TL is very efficient when shaft speed increases upto 13 meter/sec. Compared to two lip seal TG, the four-lip seal is much superior and robust in service. It has four lips to control leakage of lubricant. It is made from a special thermoplastic elastomer, which provides required flexibility along with rigidity for its operation.

Selection Criteria:

1. The Four Lip seal is selected when shaft speed is very high and yet a greater degree of performance is expected for sealing.
   It can accommodate circumferential speed of shaft upto 13 meter/sec.
2. It can be used for grease or oil lubrication in bearing housing.
3. The Four Lip seal is a split seal, so they can be easily installed in the housing.
4. For Four Lip seal, permissible angular misalignment so shaft dia ≤100mm is about 1°.
   For larger diameter of shaft the axial misalignment permissible is 0.5°.
5. Four Lip seal selection is much preferred because axial shaft shift relative to housing is not limited in this seal.
6. For Four Lip seal, the limiting temperature range is between -40°C to + 100°C.

SEAL SELECTION

V RING SEAL (TA)

V Ring Seal is composed of one V Ring of neoprene/nitrile rubber and a round steel sheet sealing washer which is vulcanized with rubber. The size of this washer sheet fits well into the sealing groove in the bearing housing. And the V Ring seal sits tightly on the shaft, whereas its lip securely touches the steel sheet

Selection Criteria:

1 V Ring Seal is selected for housing with grease or oil lubrication.

2 V Ring seal can be used for maximum circumferential speed of shaft up to 7 meter/sec very conveniently.

3 In case the Circumferential speed of shaft exceeds its limit by 7 meter/sec to 12 meter/sec, the V Ring seal should be located axially on the shaft.

4 For further circumferential speed of shaft, above 12 meter/sec a supporting ring must be put to prevent the lifting of V Ring seal. However, please note that for housing size 205 to 211 and 306 to 314 this seal cannot be used with a supporting ring. Hence V Ring is not suitable for these housing sizes at such speed and not suitable for operating speed above 7 meter/sec.

5 V Ring seal can permit angular misalignment is 1.5 degree for shaft diameter 50 mm. Further shaft dia ≥150 mm, the misalignment up to 1 degree is permissible.

6 While selecting V Ring Seal, please note following limits of Axial shift allowed :

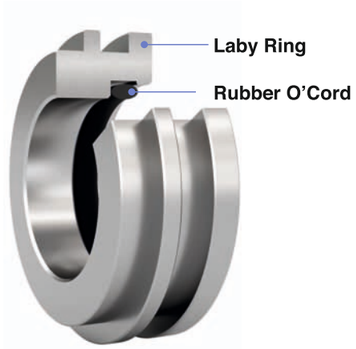
Axial shift of shaft by ± 1 mm up to shaft Dia 65mm

Axial shift of shaft by ± 1.2 mm up to shaft Dia 100mm

Axial shift of shaft by ± 1.5 mm up to shaft Dia larger than 100mm

7 The limiting temperature range while selecting V Ring seal is -40° C to +100° C

LABYRINTH SEAL (TS)



Labyrinth seals are very efficient and reliable one for the application where higher speed as well as higher temperature is the criteria. Labyrinth seal is basically metallic ring seal having two rectangular shape steps arranged radially on its outer diameter. The inner step of seal groove in the housing and the steps of Labyrinth seal form a gap when assembled. These gap forms a labyrinth where in grease is filled for free movement as well act as barrier for lubricant from the housing.

Selection Criteria:

1 Labyrinth Seal, TS can be selected for smaller bearing housing as well as large bearing housing. It is available for shaft size 20mm to 140 mm (e.g. for SN, SNA, SNH, SNL)and for further bigger shaft dia 150mm onwards also(e.g. for SD, SDJ, SBD, THD, SAF, Large SNL etc.).

2 It has wide application for variety of bearing series which are used in application where speed is high and bearing temperature is also high.

3 Labyrinth seal can be selected for operating temperature from +50°C to +200°C

4 While selecting Labyrinth seal it is very important to check the possibility of angular misalignment of shaft for smooth running of bearing housing. Labyrinth seal can accommodate angular misalignment of shaft only upto 3°.

5. It is important to note that in case of Labyrinth seal the axial movement of shaft with respect to housing, is not limited. The Labyrinth seal is held on the shaft by O'Cord and still allows freedom for movement under load, however it holds the shaft securely to rotate with it.

6. For specific applications, Labyrinth seal can be provided from Aluminum material instead of cast iron or cast steel.

TACONITE SEAL

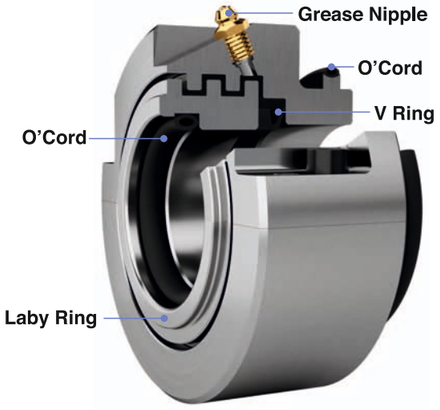
There two varieties

a) Radial seal b) Axial seal

Taconite seal is a heavy duty seal which is the widely preferred in Industries for application having arduous operating and surrounding conditions. Taconite seal is developed by using multiple sealing elements like modified Labyrinth seal, V seal, Grease as seal and also in some cases felt seal put together to act as one unit.

RADIAL TACONITE SEAL

It has one non rotating ring which is supported in housing. A radial labyrinth seal sits on the shaft held fit by using O'Cord. Its radial steps fit well inside the groove of non-rotating ring. In between the two, a V Ring seal is inserted.



The Labyrinth seal and V Ring seal rotates with the shaft. The Labyrinth steps of seal are filled with grease to use it as barrier for fine particle. A grease nipple is provided for re-greasing purpose.

1. Taconite seal is selected mainly for arduous and fine dusty environment like in mining services, coal handling units etc. where fine grained material becomes difficult to seal against them and protect bearing and lubricants.
2. Taconite seal is very effective when there is very fine grained particle which is extremely difficult to handle by standard or usual seal.
3. For bearing application which has to operate under very arduous service conditions, the Taconite seal is the first choice for industries.It is designed for heavy duty services and it is widely used for such requirement in the field.
4. Taconite seal can allow angular misalignment of shaft upto 0.5°.
5. The permissible operating temperature range for Taconite seal is in range of -40°C to +100°C
6. The axial shift of the shaft relative to housing is limited to +/- 1 mm for shaft diameter up to 65mm and further +/- 1.2 mm for larger shaft diameter.

AXIAL TACONITE SEAL (TNC)

1. The other version of Taconite seal is having Labyrinth stages arranged axially instead of radially. It is re-lubricated through lubricating holes and grease nipple fitted in the housing cap.
2. While selecting Axial Taconite seal, it is important to note that the axial shift of shaft relative to housing is very limited, only few mm.
3. The permissible misalignment of the shaft relative to housing for Axial Taconite seal is about 0.5°.
4. For Axial Taconite seal, the limiting operative temperature range is -40°C to +250°C.