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BEARINGS

When correctly installed and efficiently lubricated, bearings require little but thorough, attention during service, to ensure a long working life. The majority of bearings used in aircraft engineering are of the sealed or shielded type. These bearing are designed to prevent the ingress of foreign matter, which will damage or contaminate the bearing contact surfaces.

CLEANING AND INSPECTION OF BEARINGS

Cleaning Before a bearing can be checked it must be cleaned thoroughly to remove any dirt and the old lubricating fluid. The manual will dictate the cleaning process including use of any solvent, but a typical method is as follows.

- Remove any excess grease with clothes and dry compressed air, whilst ensuring that the rolling elements remain stationary or only rotate slowly.
- Soak the bearing in an approved solvent, such white spirit, to remove the remaining grease. The solvent may be applied as a forced jet if necessary.

- Lightly lubricate all bearing surfaces with oil to prevent the onset of corrosion.

Testing

Testing a bearing is usually restricted to rotational checks and excessive backlash or free play. Slow rotation of the rolling elements and raceway will highlight any roughness due to damage, corrosion or wear. A serviceable bearing should have a smooth actuation. Free play should be tested in both a radial and axial direction and is normally done by using a DTI. Some wear is usually permitted and will depend

the grade of fit, but any wear that leaves excessive backlash in the system is unsatisfactory. The rate of this wear depends on the speed the bearing is rotated at, with high speed bearings failing quicker than those which rotate slowly or through distances of less than one complete revolution. A bearing that has any indication of a fault should be discarded immediately.

- Due to their construction internal inspection of shielded bearings will be restricted. Taper bearings can

➢be dismantled and a thorough inspection of the rolling elements and raceway surfaces can be completed.

INSPECTION OF BEARINGS

Once clean the bearing should be inspected for signs of failure, some of the more common being:

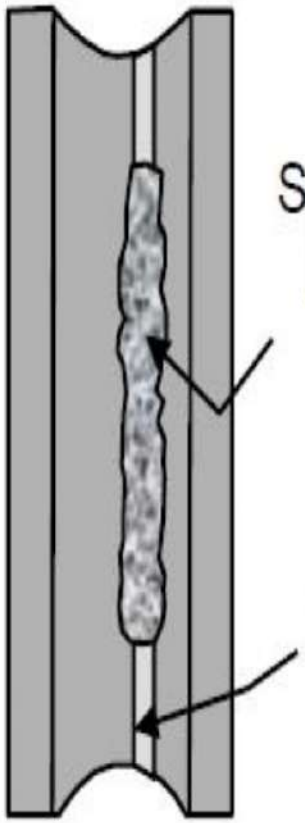
1. Normal Fatigue
2. Excessive Loading
3. Installation and Misalignment
4. Loose Fitting or Spinning
5. Brinelling
6. Overheating and Lubrication Deficiency
7. Contamination and Corrosion

Normal Fatigue

Normal fatigue failure is often shown as a fracture of the running surface, with subsequent removal of small particles of metal and is commonly called spalling.

(Refer Fig. 1)

It occurs on both rolling elements and raceways, and is always accompanied by an increase in vibration. Moderately spalled areas show the bearing has reached the end of its normal service life.


Spalled
Area
Ball
Path

Excessive Loads

Excessive loading of a bearing is usually the same as normal fatigue, but the rolling elements wear path is usually heavier. There is also increased evidence of overheating with a widespread and deeper fatigue or spalled area. This often causes premature bearing failure.

Installation and Misalignment

Installation damage is usually the result of an impact that occurs when a bearing is fitted incorrectly. This may be due to a sharp strike from a drift or pressing the wrong raceway when mounting the bearing. Misalignment damage can be seen on the raceway of the non-rotating ring because the rolling element wear path is not parallel to the raceway edge. Excessive misalignment can cause high temperatures as well as heavy wear of the cage.

Loose Fit

A bearing should always be mounted onto a shaft or housing with an interference fit. If the raceway becomes loose then it will rotate on these surfaces and cause fretting. This fretting will remove metal particles, which oxidize and leave a distinctive brown color. It usually occurs when the bearing outer raceway rotates inside a worn housing. The external surface of the raceway will be scored and discolored as a result of a loose fitting bearing. (Refer Fig. 2)

Fig. 2
Loose Fit Damage

Brinelling

Brinelling marks on a bearing raceway resemble the indentations that result from a Brinell Hardness Test. They are described as being either True Brinell or False Brinell marks.

True Brinelling occurs when loads on the bearings raceway exceed the elastic limit of the raceway material. Brinell marks are indentations on the rolling element caused by an excessive static or dynamic loads.

The indentations can be seen on the raceways and will increase bearing noise and vibration, which leads to the bearings premature failure. The damage is often caused by dropping the bearing or installing it incorrectly. (Refer Fig. 3 Left)

False Brinelling occurs when there is only small relative motion between the rolling elements and raceways during non-rotation periods. It is characterised by elliptical wear marks in the axial direction at each rolling element position (Refer Fig. 3 Right).

If the bearing is not turning then an oil film cannot be formed to prevent raceway wear. False Brinelling marks are normally perpendicular to the line of motion, well defined and maybe surrounded by debris.