TECHNI/TIPS

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PLAIN BEARINGS

Plain bearings are shafts riding in journals. They may be precision inserts such as engine bearings or they may be bronze bushings or poured babbitt surfaces. Each has its advantages and disadvantages.

LUBRICATION. Plain bearings are lubricated with both oil and grease. The result is much the same under either condition. If the bearing can be enclosed in a case, then oil will be used. Otherwise, grease is necessary in order that the lubricant is retained in the bearing.

Plain bearings require more lubricant than antifriction bearings. However, if they are properly installed and lubricated, they can run for many years under heavy loads and poor operating conditions with only small amounts of wear or attention.

Plain bearings of proper size, proper clearances and good lubrication are better than antifriction bearings for carrying heavy loads or shock loads. Plain bearings can carry extremely high loads.

This is possible because of the large bearing area. Also, when running, the bearing surfaces should be completely separated by a film of lubricant (hydrodynamic lubrication). When starting up and running under improper conditions, the hydrodynamic film can be lost so that the plain bearing has only boundary lubrication (some metal-to-metal contact). Boundary lubrication, or thin film lubrication, will quickly ruin most plain bearings. When the bearing is moving and correctly lubricated, friction decreases to almost the low point of antifriction bearings.

Most of the remaining drag or friction is from fluid friction in the lubricant. It is usually quite small, but this low friction exists only over a moderate speed range. Fluid friction increases as the square of the speed. This means we will find high friction at high speeds. While some journal bearings run at 15,000 or 20,000 rpm, this is extremely unusual.

LOAD AND SPEED. These are always factors. There are very few cases where heavy loads travel at high speeds. If there were, the mechanical problems and the lubrication problems would quickly become impossible to handle.

For example, some steam driven turbine electric generators are never stopped. Even though they are not generating, they must continue turning to prevent the long, heavy shaft from causing slight damage to the bearings. This, of course, would lead to immediate failure at operating speed. Smaller and more convenient to use equipment, presents few lubrication problems.

Most lubrication problems are not because of extremely large equipment or extremely small equipment or even with unusual applications. They usually come with the lack of proper maintenance and the use of improper lubricants or too much lubrication.

FAILURES. Plain bearings can run for fairly long periods of time, even with misalignment. Mis-alignment, however, is a common cause of failure. When failure does occur, the cause is some-times obvious if the machine can be observed before it is torn down. The damaged bearing itself will often give valuable information. However, many times plain bearings are so badly battered by, failure that they give no information.

Dirt or foreign material is the greatest cause for bearing failure. Large, hard particles will plow grooves in the softer bearing alloy. The tracks are plainly visible either as large, long straight grooves, or as smaller particle tracks that wander. Numerous small, hard particles will cause many small, straight scratches, often resulting in excessive wear. If the foreign material is large or hard, it may become imbedded.

Misalignment between journal and shaft is usually easy to see. The wear pattern, if carefully studied, will show an unbalanced or skewed pattern. Sometimes a thrust load is also indicated.

Metal fatigue is often responsible for premature failure. It can sometimes be recognized by the development of many fine cracks in the bearing surface. Other structural failures, such as bond failure, can occur. Oil grooves must be cut and kept open. The bearing must fit the shaft. With sintered bearings, there must be no organic impurities in the metallic powder. Gas produced from organics by the heat of manufacturing may cause porosity and failure. Corrosion is rare, but may occur from organic acids or electrolytes. The bearing surface then becomes rough and pitted.

Lack of lubrication, or poor lubrication will show in a plain bearing as rapid wear - often in one spot - until a complete breakdown of the surface takes place. This can also happen because of misalignment or overloading, or both, and it can also occur without any evidence of cracking. As the action continues, the softer lead (if a babbitt bearing) is sweated from the bearing structure and can be seen at the bearing edge in little beads.

The average journal has some tendency to be self-healing, and this is seen best at the time the new bearing is run in. Any initial wear, scratching, etc., will often be burnished out as the bearing wears in.

LUBRICANTS. The lubrication of plain bearings is not complex, but as in all applications, the use of quality lubricants prolongs life.

LE's recommendations include: LE's 3751 or 3752 ALMAGARD® Vari-Purpose Lubricant; LE's 1250 ALMASOL® High Temperature Lubricant; LE's 1274 or 1275 ALMAPLEX® Industrial Lubricant; LE's 1232 ALMATEK® General Purpose Lubricant, 4622 MONOLEC MULTIPLEX® Lubricant or any of LE's ALMASOL®, MONOLEC® or SYNOLEC® Gear Lubricants or LE's MONOLEC® Gear Oils.

The ALMASOL and MONOLEC additives are very helpful in lubricating plain bearings, thus helping to reduce operating temperatures considerably in the bearings while extending bearing life: They are very effective in reducing wear during the critical start-up and shutdown periods of operation.

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