BEARING

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INTRODUCTION

A **bearing** is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts . The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may *prevent* a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also *facilitate* the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

The term "bearing" is derived from the verb "to bear";[1] a bearing being a machine element that allows one part to bear (i.e., to support) another. The simplest bearings are bearing surfaces, cut or formed into a part, with varying degrees of control over the form, size,roughness and location of the surface. Other bearings are separate devices installed into a machine or machine part. The most sophisticated bearings for the most demanding applications are very precise devices; their manufacture requires some of the highest standards of current technology

Ball Bearing

TYPES OF BEARINGS

1) Plain Bearings

Plain bearings are the simplest type of bearing and are composed of just the bearing surface with no rolling elements. They have a high load-carrying capacity, are generally the least expensive and, depending on the materials, have much longer lives than other types.
Friction in plain Bearing Depends on materials and construction, PTFE has coefficient of friction ~0.05-0.35, depending upon fillers added.
Widely used, relatively high friction, suffers from stiction in some applications. Depending upon the application, lifetime can be higher or lower than rolling element bearings.

2) Rolling Element Bearings

Rolling element bearings place balls or rollers between two rings - or "races" - that allows motion with little rolling resistance and sliding. These bearings include ball bearings and roller bearings.Ball bearings are the most common type of rolling element bearing.These bearings can handle both radial and thrust loads but are usually used where the load is relatively small. Because of its structure, there is not a lot of contact with the balls on the inner and outer races. If the bearing is overloaded the balls would deform and ruin the bearing. Roller bearings are able to handle a much heavier, radial load, like conveyor belts, because they don't use balls.

Instead, they have cylinders allowing more contact between the races, spreading the load out over a larger area. However this type of bearing is not designed to handle much thrust loading.

3) Spherical Roller Bearings

Rollers used in spherical roller bearings are thicker in the middle and narrow at the ends, and its race is shaped to match. They can adjust to support misaligned loads.
The construction of spherical rollers are complex and difficult to produce so they are expensive. Apart from that these bearings have higher friction compared to ball bearing because different parts of the spherical rollers run at different speeds on the rounded race. Thus there are opposing forces along the bearing/race contact increasing the friction.
Spherical bearings are used in numerous applications where rotational motion changes the alignment of its axis of rotation. One of its important example is a tie rod on a vehicle suspension. Other important uses of spherical bearings have been in car suspensions, trackballs, computer mouse, heavy machinery, sewing machines, drive shafts, etc.

4) Thrust bearings

Thrust bearings accommodate loads that are predominantly in the direction of the shaft. The bearings are typically classified by the type of rolling element and shape of the raceways.
hrust bearings are designed to manage thrust (axial) loads and provide high-shock-load resistance in a variety of applications. Timken offers seven basic thrust bearing types: ball, crossed roller, cylindrical, machined tapered, stamped tapered, spherical and needle.
A **thrust bearing** is a particular type of rotary rolling-element bearing. Like other bearings they permit rotation between parts, but they are designed to support a predominately axial load.

5) Flexure Bearing

A typical flexure bearing is one part joining two others, like a hinge, in which motion is supported by a load element that bends. These bearings require repeated bending, so material selection is key. Some materials fail after repeated bending, even at low loads, but with the right materials and bearing design the flexure bearing can have an indefinite life. Another

notable characteristic of this bearing is its resistance to fatigue. Many other bearings that rely on balls or rollers can fatigue as the rolling elements flatten against each other.

6) Ball Bearings

Ball bearings are the most common and most used type of bearing found in a number of objects. Also known as anti-friction bearings, ball bearings are small metallic or ceramic spheres used to reduce friction between axles and shafts in numerous applications. These bearings are able to handle both thrust and radial loads, and are used for applications where the load is relatively small. Load in a ball bearing is transmitted from the outer surface to the ball, and from the ball to the inner surface. Since the ball is spherical in shape, it contacts the inner and outer race at a very small point, which helps it spin evenly and smoothly. But the contact area holding that load is very small, so if the bearing is overloaded then the balls can deform, ruining the bearing. Ball bearings are often used in individual cages to reduce friction in axle assemblies or in a series to absorb the weight placed on a moving part.

HOW BEARINGS WORK

The bearing makes many of the machines we use every day possible. Without bearings, we would be constantly replacing parts that wore out from friction. In this article, we'll learn how bearings work, look at some different kinds of bearings and explain their common uses, and explore some other interesting uses of bearings.

The concept behind a bearing is very simple: Things roll better than they slide. The wheels on your car are like big bearings. If you had something like skis instead of wheels, your car would be a lot more difficult to push down the road.

That is because when things slide, the **friction** between them causes a force that tends to slow them down. But if the two surfaces can roll over each other, the friction is greatly reduced.

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