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Plane Bearings

Historically, the plane bearing originated approximately 4,500 years ago by Phoenician seafarers. The wooden bearing was 100 percent lignum vitae. The evolution from wood to bronze to cast iron to many alloys, including powdered metals and the whole world of plastic bearings (since the advent of PTFE), are now available to engineers. These materials are described in the In-House Training Guide (IHTG) put out by the Bearing Specialists Association's Educational Services Committee.

Plane bearings are divided into three basic categories based on the lubricant system required for successful operation:

- Class I bearings are those that require oil, grease, or some other lubricant to operate. They receive this liquid or semisolid lubricant from an outside source.
- Class II bearings are those that contain the necessary lubricant within their walls: i.e., an olitie bearing or a plastic bearing such as polyacetal, which utilizes a silicone lubricant.
- Class III bearings are those that are in and of themselves the lubricant, such as metallized carbon graphite or anything with Teflon in it.

The IHTG goes on to explain the background engineering behind P (pressure), V (velocity), and PV for the job in the field under consideration. An important point to remember is to gather all of the information, as suggested by the IHTG, so as to ascertain which of some 80 different types of plane bearing materials that are available can be used.

The most important thing the reader will discover in the IHTG is that without changing the I.D. (the shaft) or the O.D. (the housing hole) or the centerbore (the length), materials can be substituted that carry loads from as little as 300 pounds per inch of projected area to as much as 35,000 pounds per inch of projected area (projected area is I.D. times length).

Dimensioning

Almost all manufacturers of plane bearings have standardized on the SAE numbering system. In this system, the I.D. is measured in sixteenths of an inch, the O.D. is measured in sixteenths of an inch, and the length is measured in eighths of an inch. For instance, a bearing that measures ½" x ¾" x 1" would be -0812-08.

Bearings are selected by calculating three basic characteristics of the job at hand. I.D. dimensions concerned with running clearance, coefficient of thermal expansion of the bearing material and the shaft, and the system of lubrication must all be considered. Most important is the surface finish of the shaft and the I.D. of the bearing. Wherever possible, the markings left by the machine work should be matched (i.e., a bored I.D. and a turned or ground O.D., which makes for the dimensions to be both annular in nature).

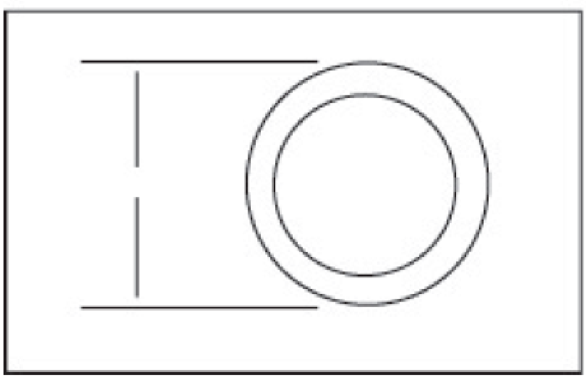
The next consideration is the O.D. of the bearing. The retention of the bearing (i.e., the interference fit) must be considered. This varies with all materials. The method of installation is also a consideration. Hopefully, there will be no usage of 2 x 4s and hammers, but rather an arbor will be used to put the bearing in place.

The seating of the bearing is also established by the arbor because the shoulder prevents the bearing from being installed too deeply. If you wish to center a bearing deeper into a housing, you can use a double step arbor. One (the smaller) will drive the bearing. The larger will drive the bearing in only until it picks up with the face of the housing. The step shoulder length on the arbor between these two dimensions will determine the depth the bearing is seated into the interior of the housing.

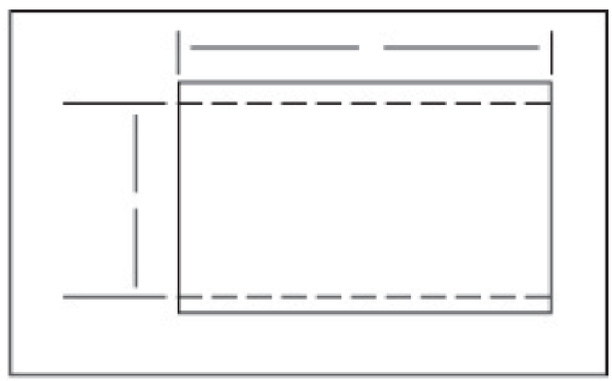
Another concern is the pressure to be applied to the bearing in question. This is spelled out in the many tables on P (which is the load over projected area).

The V characteristic of a bearing design is calculated by developing the surface velocity in SFM (the same as a rolling element bearing).

By multiplying the P and V in question, the PV number will indicate whether or not the bearing's PV is overloaded.



O.D. of a plane bearing



I.D. of a plane bearing

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