

TB-2072

Issued: August 14, 2001
Re-Issued: May 10, 2010

ENGINE BEARING FUNDAMENTALS PART 3 “DESIGN”

Engine bearings may come in several different configurations. Crankshaft bearings are generally what we call “Half Shells”. These half shell type bearings are paired up to make a full round bearing surface. Half shells come in two different configurations; “Straight Shells” (figure 1) and “Flanged” (figure 2). Flanged bearings have three bearing surfaces; one on the ID and one at each end. The end faces, or flanges, are used to support thrust or end loads on the crankshaft, while the ID supports the shaft itself. Thrust loads can also be supported by separate “Thrust Washers” (figure 4). Some bearings are made in a full circle. These are referred to as “Bushings” (figure 5) and may be made either with or without a seam. Bushings are typically used wherever assembly permits the shaft to be inserted through the bearing such as with piston pins and camshafts. Half shells are used where the size or shape of the shaft requires that the bearings be installed around the shaft as with a crankshaft.



Figure 1

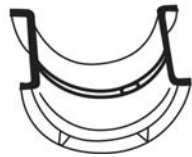


Figure 2



Figure 3

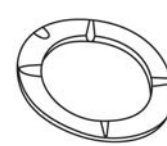


Figure 4



FIGURES

Use of the proper terminology is essential in describing the functions of various characteristics or features of a bearing. Figure 6 shows a typical flanged or thrust bearing with its various features labeled.

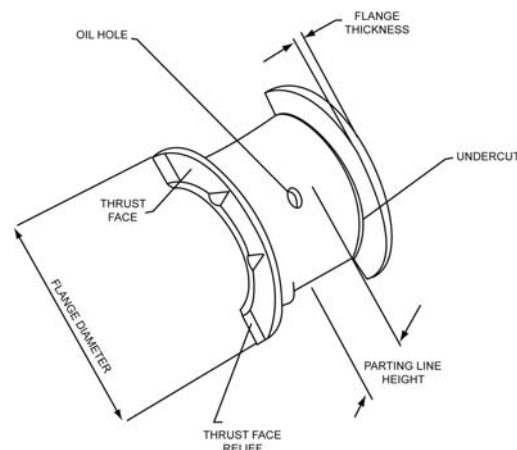
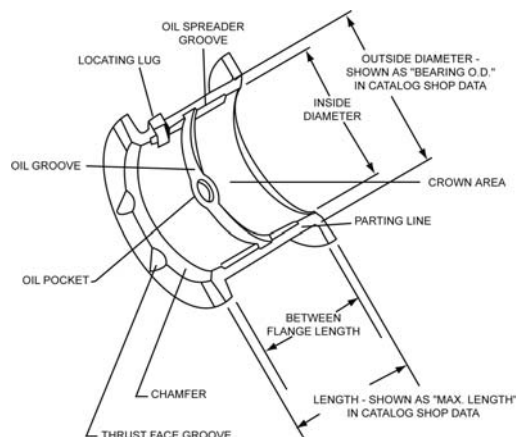


Figure 6

For further information contact:

Terminology for the straight shell bearings is very similar.

Oil is introduced into most main bearings through a hole in the upper (block) half. Upper mains generally have an annular groove to carry oil to the lower (cap) half and to provide pressurized oil to a hole in the crankshaft, which carries oil from the main to the rod journals or crankpins. Oil enters the rod bearings through a hole in the journal surface. As the crank rotates oil is spread around the inside eliminating the need for any grooving in rod bearings. Modern main bearings seldom have grooving in the highly loaded lower half because grooving tends to break up the oil film and reduces bearing surface area.

One of the most important factors in bearing design is a proper fit between the bearing and housing. Except for thrust washers, nearly all bearings are an interference fit. This means the bearing is slightly larger than the hole it fits into. In bushings, we refer to this as "Press Fit". In half shell bearings it's called "Crush". Figure 8 illustrates the principle of crush. On the left, the bearing ends extend slightly beyond the split line of the housing. On the right, the bearings are compressed or crushed down into the housing as the bolts are tightened. This creates a radial contact pressure that holds the bearings tight. Bushings are held by a similar radial pressure as a result of being pressed into their housing.

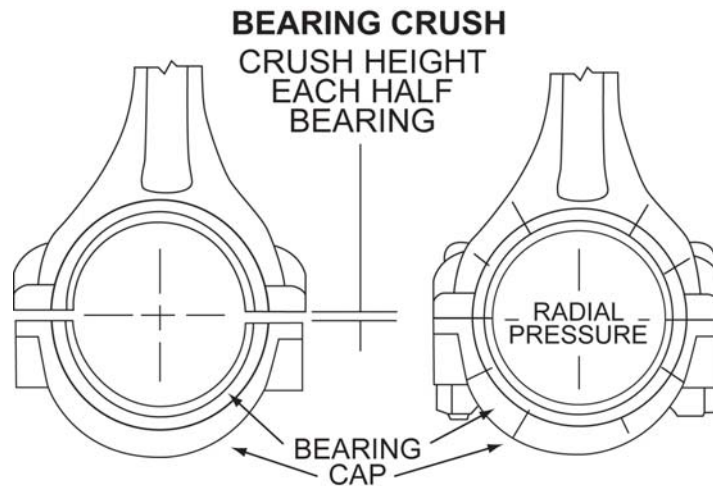


Figure 8

In our next installment, we will cover additional design features such as wall size, eccentricity and more.