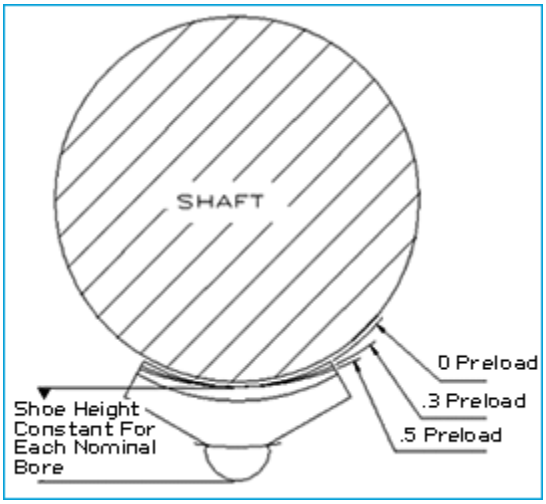
What is Bearing Preload?

Pivoted Shoe Journal bearings are designed with a preload. Preload describes the relationship of the bearing bore to the shaft diameter and bearing clearance. The calculation shown below defines this relationship.

$$\text{Bearing Preload} = \frac{(\text{bearing dia.} - \text{shaft dia.})}{(\text{shoe dia.} - \text{shaft dia.})}$$

Example: 1 – [(200-199.7)/(200.4-199.7)] = 0.57



The figure shown at the right displays how changes in the shoe bore diameter affect the preload value. If the bearing clearance and shaft diameter are held at fixed values, changing the shoe diameter will change the preload value. From this figure you can see that a shoe diameter larger than the shaft diameter provides larger preload value. As the shoe diameter approaches the same diameter as the shaft, the preload value approaches zero.

Typical Pivoted Shoe Journal bearings are designed with a preload value of 0.3. However, preload values can range from 0 to 0.6. Changes in preload value affect the oil film thickness and horsepower loss values of a bearing. Modifying the preload value can also change the dynamic characteristics or stiffness and damping coefficients of a bearing. Adjusting the preload is one way that equipment manufacturers improve the rotor dynamic stability of their machines.