

How do we calculate bearing life? by Mike Mortensen - Director of Engineering RBI-USA

Bearing life refers to the amount of time any bearing will perform in a specified operation before failure. Bearing life is commonly defined in terms of L-10 life, which is sometimes referred to as B-10. This is the life which 90% of identical bearings subjected to identical usage applications and environments will attain (or surpass) before bearing material fails from fatigue. The bearing's calculated L-10 life is primarily a function of the load supported by (and/or applied to) the bearing and its operating speed.

There are many other factors which will have an effect on the actual life of the bearing; temperature, lubrication and improper care in mounting. As a result of these factors, an estimated 95% of all failures are classified as premature bearing failures.

Once you know the bearing you are interested in and its Basic Dynamic Load Rating, you still need to know the speed and load to be applied to the bearing. Although bearing life is affected by numerous application factors, the following formula can be used to calculate L_{10} bearing life in hours.

$$L_{10h} = a_1 \bullet a_2 \bullet a_3 \bullet \frac{16,667}{n} \left(\frac{C}{P}\right)^h$$

where:

 L_{10h} = Basic rated life, hours a_1 = Life adjustment factor for reliability (for L_{10} , a_1 = 1) a_2 = Life adjustment factor for material (typically a_2 = 1) a_3 = Life adjustment factor for operating conditions (for good lubrication conditions, a_3 = 1) n = Rotational speed, RPM C = Basic Dynamic Load Rating P = Equivalent dynamic load p = 3 for ball bearings, $\frac{10}{3}$ for roller bearings

Several manufacturers have special life adjustments and variations in their life calculations based on their research of special manufacturing, material and lubrication factors.

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