



Issue 3: Bud's Take on What is Radial Preloading?

Radial preloading is a condition where the radial internal clearance (RIC) is reduced dramatically inside of the bearing, resulting in extreme frictional heat. This condition usually results in a catastrophic failure. Radial preloading can be a result of other failure progressions. A bearing that is subjected to extreme frictional heat exacerbates the radial preloading even further.



Picture 1: Visual damage of radial preloading.

It is common that the rings will heat to the point that they will become soft, cases have been found where the bearing well exceeds 600°F. This extreme temperature softens the rings to the point that once the bearings have stopped rotating the static load on the shaft from external components cause the rolling elements to sink into the inner ring raceway. Other conditions that could occur: spinning on the shaft, hollow ball, broken cages, etc.

What are the main root causes?

There are three main reasons for this type of failure: inadequate lubrication, improper fitting practices, excessive loading.

First we will look at excessive loading. If the load is too high the lubrication will not be able to maintain its necessary Elastohydrodynamic (EHD) oil film thickness. This will cause metal to metal contact, generating heat, lubrication failure and lastly the expansion will eliminate the RIC.



Picture 2: Damage from bearing spinning on shaft.

In an inadequate lubrication failure the EHD is not maintained. This also allows metal to metal contact and the same failure progression as excessive loading.

Lastly, in a fitting failure the shaft and housing fits either reduce the RIC or allow for spinning on the shaft. Both conditions generate heat causing lubrication failure and result in the same failure progression.



Picture 3: Elliptical pockets and parasitic thrust damage.

How do I prevent Radial Preloading?

Radial preloading is an overall maintenance type failure. The best way prevent this type of failure is to insure the proper shaft and housing practices are being used. It is also critical that the proper lubrication viscosity and amount are being used. Lastly, that the bearing is robust enough to handle the application conditions.

