Pre-Tension Thrust Bearings

THE QUESTION

What is the recommended method of gripping a spinning shaft (with up to 130 hp of rotational energy) to install pre-tension thrust bearings and conventional thrust bearings (load = hundreds of pounds) when the shaft cannot have any high points because it must pass through an area of tight clearances to assemble? Will snap rings still withstand the harsh vibration of this environment?

Expert response provided by Norm Parker, bearing technical specialist for the driveline division at GM Milford (MI) Proving Grounds

Despite their unassuming demeanor, retaining rings are big business. Their relatively easy production — in addition to their massive global demand — make for an attractive market for many small manufacturers.

Retaining rings come in just about every shape and size imaginable, but we can break them into two main groups: internal and external.

Figure 1 Internal retaining ring.

Internal rings are installed on an internal housing bore; these are frequently used to retain a seal or bearing in a housing.

External rings — or rings that install on an outer diameter — are commonly used on shafts. The primary function of this style is to locate bearings, gears or other components on a rotating shaft. These are available in radial and axial installation styles, often referred to as "C" clips.

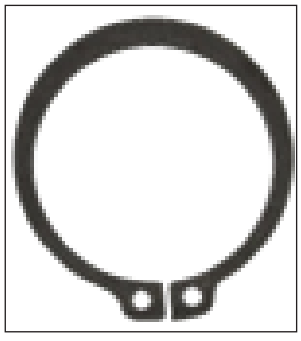

Figure 2 External axial retaining ring.

Retaining rings are available for just about every duty cycle needed — from lightweight retaining rings to rings that can hold several hundred thousand pounds of axial load.

Figure 3 External radial retaining ring.

The two main considerations in designing for a loaded retaining ring is the load capability of the retaining ring and the load capability of the groove the ring will be located in. Often, the groove is the weak point in the system.

All of the recommended groove dimensions and tolerancing will be listed for every snap ring in any basic catalog.

While all of the dimensions will be listed in the catalog for every retaining ring, it is often useful to do a little work up front to make some loose determination on what size ranges you will be looking at. The equations for ring shear and groove deformation can literally be done in a few minutes.

Based on the magnitude of load and precision needed, a wide range of thicknesses, precision and styles are available. However, many heavy-duty applications supporting full gear loads, clutch reactions, wheel ends, primary drive shafts, and many others use retaining rings in situations where solid shoulders on shafts and housings are not practical or feasible.

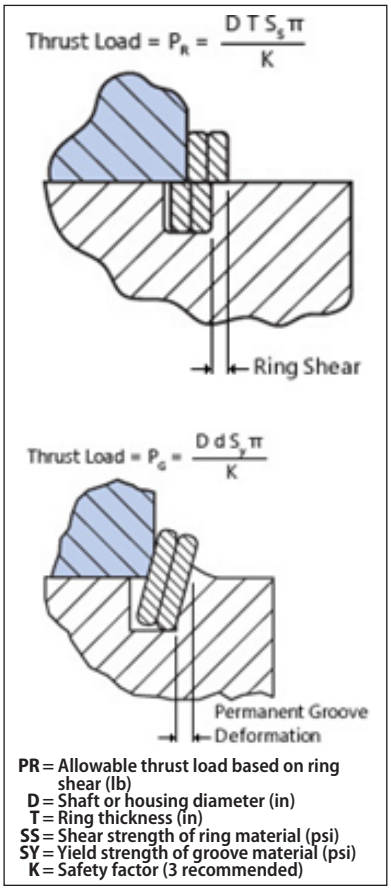

Figure 4 Groove deformation equation.

As a GM bearing technical specialist, **Norm Parker** is tasked with testing theoretical models in the real world, in real time. In keeping with his strong academic background, Parker has also developed a keen interest in the commercial and engineering aspects of the bearing industry. Parker plans to continue expanding his expertise and providing substantial personal contributions to bearing technology through metallurgy, design and processing.