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Headgear

All images: N. Bergmann/Exsys

The importance of maintaining live tool heads for CNC turning centers.

Every user of the same product applies it differently. That's why it is often difficult to determine how many operating hours a rotary, or live, tool head can be run before it needs routine service. You can stay on top of this by tracking the head's use and maintaining a record of its condition. Obvious signs of wear help predict when an outright failure will occur.

Realistically, you can run a live head into the ground with continuous use and it will still be repairable. This article includes some helpful hints for inspecting live heads to see if they can be salvaged.

Failure Modes

If you never have a live head serviced, it will eventually fail. Failures

occur for many different reasons, but the most common is heat buildup. If the unit gets too hot, for example, to physically handle and pull out of the turret, the heat ruins the seals that hug the rotating shafts, or spindles, by deforming the contact surface area of the seals. If this happens, the coolant being used and the fine metal chips generated will contaminate the head. Contaminants can cause friction to increase, and friction is one of the catalysts to heat buildup. Therefore, it is important to take a hands-on approach to the way tooling "feels," in other words, how smoothly it rotates.

Coolant also can wash out the lubricant that bearings depend on to function properly. In addition, chips create pits in the rolling elements and raceways of bearings when they contaminate a

head. In both cases, the bearings need to be replaced or repacked. Otherwise, they will rust and seize.

Other signs of bearing failure to watch for are the cutting tool imparting a rougher finish than usual, the tool not running true because of too much play in the output spindle and excessive operating noise. To get maximum rotary head life, preventative maintenance is required.

Inspection Risk

Take an in-depth look at your live head to detect any problems before they worsen. The best way to find out if the seals are worn is to remove the easily accessible cover and examine the inside for any signs of contamination. Note the type of seal, or sealant, used around the cover. The cover must be refastened correctly to form a solid seal around the entire cover. In the



Different manufacturers use a variety of seals and sometimes sealant is used instead.



Note the location of the indicator and base. Mounting the base directly to the holder helps avoid an inaccurate reading.

event there is no cover to remove or it is not easily removable, you will have to rely on the “feel” of the tool as it rotates. Rotary tool heads in proper condition rotate smoothly and don’t exhibit any binding.

If you have the means to use an indicator, rest the tip of the indicator on the inner surface of the collet pocket and rotate the live head. Try to rest the tip on the taper’s farthest point from the live head. The tolerances may vary, depending on the construction of

the tooling, its size and, of course, its manufacturer.

Check for excessive runout and “play” in the head’s spindle. It helps to directly mount the indicator on the live head to avoid moving the entire head and having that show on the dial. If you are able to joggle the spindle and have the movement show on the indicator, then you have a problem. There are numerous causes of this problem. Excessive runout and end play do not always mean a bent spindle. The prob-

Bearing types

Bearings support most of the stress exerted on live heads and allow energy to be transferred without too much friction. The three main types of bearings are tapered roller bearings, angular contact bearings and deep-groove ball bearings.

Tapered roller bearings come in two pieces that mate together. One piece is the cone, or separable raceway. The other is the bearing, which consists of a cage, rolling elements and tapered raceway with two flanges to catch the rollers. TRBs can accommodate an axial load in only one direction. This means there must be a counterbearing to pull the TRB in the raceway. These bearings are rigid and a runout of less than $1\mu\text{m}$ can be achieved. For TRBs, the preload needs to be adjusted, as does the clearance to the raceway.

Angular contact bearings are designed as one piece. ACBs, too, can only accommodate an axial load in one direction. It is critical to be able to identify the proper direction when installing these bearings. Improper mounting proce-



All bearings must be kept in the best condition possible to achieve the desired results. The bearings on the left are no longer usable; those on the right are new.

dures can lead to premature failure. ACBs are high-precision bearings manufactured with a specific preload, tolerance grade and contact angle. Any deviation to these settings can cause the bearings to perform improperly.

Deep-groove ball bearings are produced to meet a wider range of applications, so they are lower in cost than, and not as precise as, the other types. DGBBs meet ISO standards and accommodate both axial and radial loads. Like ACBs, DGBBs are designed as one piece, but because they incorporate a pressed steel cage, DGBBs do not have the same surface contact area with the race as ACBs. DGBBs are suitable as a complement to the TRBs.

—N. Bergmann

lem might be fixed simply by replacing the bearings.

Live heads with minor problems should see service as many times as possible before being disposed of, but, generally speaking, this should only include replacement of the bearings and seals, unless the head experienced a crash.

It is important to inspect all of your moneymaking equipment to make sure it performs properly and lasts. This inspection may require adding a procedure to the protocol. On short jobs, this can be impractical, so it is critical to establish a live-head-con- dition

Inspect at your own risk

When live heads need service, it is not practical to have employees burning up time learning about maintaining them, so it is a good idea to out-source the work to a service department with specialized technicians to handle routine maintenance. A properly trained technician can save a fortune in time and increase longevity of the live head.

Additionally, inspection is done at the risk of the customer. If a live head is under warranty, be sure that you send it to the factory to be serviced before doing any disassembling on your own. It is never recommended to disassemble the unit completely.

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ity to easily remove the cover plates and rotation ease on a scale of one to 10, with one being unmovable and 10 being like brand new.

This procedure can be viewed as a way to create a higher-quality working environment. Although this is a small portion of your environment, it is imperative to start somewhere. And where better than the live heads that hold the rotary tools that make the parts? \triangle

About the Author

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Although rotary tooling is a small part of the big picture, they make machining easier and more profitable.



Under rigorous working conditions, contamination can take the life out of bearings almost immediately.

tracking system that fits your facility's schedule. The condition can be characterized by runout, end play, the abil-

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