Tool and Collet Maintenance

General Recommendations

- Tools should be changed at the first sign of edge deterioration causing finish degradation or increase in operator effort to maintain feed rates.
- Never allow the tools to dwell in a cut.
- The router bit should be fed in such a manner so that in moving through the work, it has a chance to bite or cut its way freely. If the feedrate is too fast, strain and deflection will occur. If fed too slowly, friction and burning will occur. Both decrease the life of the router bit and are common causes of breakage.
- The router spindle must be well maintained for any cutting tool to perform properly. Routinely check the collet for wear. Inspect tools for collet marks, indicating slippage due to wear or dust build up. Check spindle on a dial indicator for run-out. Collet and run-out problems cause premature tool failure and associated production difficulties.
- Do not use adaptor bushings to reduce size of the collet on a routing or production basis. Tools will not perform properly in bushings over an extended period of time. Bushings are for prototype, experimentation, test and evaluation and not for production.
- Wherever possible, use a coolant when routing. Heat buildup caused by action between the tool and workpiece will lead to premature tool failure
- Heat is a function of surface area per unit of time, thus, the more dense the material, the faster the feed rate to minimize heat. However a compromise must be reached between finish and heat.
- Tool life is affected dramatically by tool geometry. Rake and clearance angles, as well as cutting edge length should be examined.
- Router bit breakage is most often caused by a misapplication of the router bit. Do not assume the proper router bit is being used.

Note: To ensure trouble free operation, always insert the collet into the collet nut until it clicks in and thread it loosely onto the spindle prior to inserting router bit.

Collet Maintenance

Collet maintenance is one of the most common causes of inadequate tool life or breakage. There are up to six links in the chain that make up this critical tool holding system called a collet. As a chain is only as strong as the weakest link, a router bit can only be as good as the system that holds it properly. The small amount of time spent to regularly inspect and clean the collet system, will be more than offset by increased productivity and a reduction in overall costs.

The six critical components are as follows:

1. Internal Collet Clamping Surfaces

The most important link in the tool holder chain is the inside of the collet. Resin migrates up through the slits in the collet and then deposits itself on the inside of the collet. This resin build up, if not removed, causes the collet to grip inconsistently on the tool shank. By not applying equal pressure throughout the entire gripping range of the collet, the tool holder allows the tool to resonate inside, causing slippage inside the collet.

Slippage can cause “fretting”, a condition in which resins are deposited on the shank of the tool. Any resin buildup should always be removed from the inside of the collet.

2. Internal Spindle & Collet Taper

The inside taper of the spindle and tool holder is a critical surface which accumulates resin build up and should be cleaned at each tool change to maintain best concentricity. Felt brushes are available to fit most taper sizes and provide a quick means of removing short-term buildup.

3. External Collet & Tool Holder Taper

The outside taper of the collet and tool holder require regular inspection and should be cleaned of all deposits each time the tool is changed. Brass brushes work well for this application, but felt cloths can also be used if the tapers are regularly maintained and the buildup is minor.

4. Clamping Nut Surfaces

The inside of the nut should be clean and free of burrs on the surface. Any surface burrs or contamination will not only skew a collet but can also permanently ruin a new collet. The clamping nut should be cleaned with a brass brush during every tool change. Special care should be taken to examine the clamping nut threads on a regular basis.

5. Thrust Bearings

Some collet nuts have an integrated thrust bearing connected to the inside taper. This bearing serves to reduce friction wear between the collet and nut as the nut is tightened. The bearing’s seating surface is the most critical feature and must be kept clean. The bearings should also be kept in smooth operating condition. If there is rough movement, it is a good indication of contamination or abuse. Either instance is indicative of runout and poor operation.

6. Tool Holders

Tool holders such as the ISO 30 have additional matching and mating tolerances beyond those of the older tapers. Because of their unique design, these tool-holding systems can be more prone to runout caused by resin buildup. “Fretting” or “Bronzing” will cause inconsistent gripping in the taper and / or the flat mating surface and reduce consistency of tool life. If ignored, these conditions can eventually produce premature spindle failure. The mating surfaces should be cleaned regularly.

All six of these components are critical and should be regularly maintained. One more item not to be overlooked is that collets should be replaced on a regular basis, approximately every 400 to 600 run time hours. This means inspection for metallic damage such as bell mouthing or burrs with every tool change. If damage is visible, the collet should be discarded and replaced.

Also consider that even if there is no damage present the collet can be worn out through metal fatigue. Heat is directly transferred from the tool to the collet. These heating / cooling cycles remove the original tempering of the steel. Collets are made from spring steel allowing them to have a certain amount of elasticity to grip the tool. As the heat cycle is repeated this elasticity diminishes. Over time, a collet requires increased tightening to maintain the tool in proper position. As over tightening increases, the collet is distorted, creating eccentricities in the tool holder. Therefore, instead of over tightening older collets and creating a number of other problems, the collet should be replaced. Often the cost of a new collet can be offset by the cost of needlessly broken tools in one shift alone.