TROUBLE SHOOTING/TOOL BREAKAGE

The tool can be the weakest part of the routing system. When the router bit breaks, it becomes the first line of suspicion. However, almost 80% of breakage problems can be attributed to the following factors: 1) poorly maintained for worn equipment 2) improper tooling and fixturing. (Poorly maintained equipment includes: collets, collet nuts, spindle bearings, spindles, and spindle housings, slides and head control items. These points and others have previously been discussed).

POORLY MAINTAINED OR WORN EQUIPMENT

When breakage occurs, the first line of defense is to make a thorough inspection of the tool holding system. Inspection should include the cleanliness of the area and the condition of the collet and collet nut. Examine the shank of the tools for poor collet contact or "collet burn". This will show as brownish, burned marks on high speed steel and carbide tipped tools and appears as shiny marks on solid carbide tools. If the collet is worn or damaged, replace the collet or merely clean the area per the instructions in the Collet Maintenance section of this manual.

The following items require the machine to be turned off and the operating items shutdown for safety reasons. Grabbing the spindle by hand and checking it for play or looseness can be a quick check of the slides, bearings, and head mountings. This will point out most unacceptable conditions. If more accurate documentation is needed, the magnetic base indicator and test bar or plug gauge. This process involves indicating the spindle as well as several spots on the test bar as it is engaged in the collet. To further discuss this procedure, e-mail **www.techsupport@onsrud.com.**

IMPROPER TOOLING AND FIXTURING

The selection of inappropriate tooling for an application can lead to finish and breakage problems. Consult the Onsrud Cutter catalog, website, area distributor, or Onsrud Cutter representative to determine proper tool selection. Review the Spoilboard Techniques section to insure parts are being held rigidly in place and chip flow is enhanced by the spoilboard design. Poor finish many times can be the early sign of breakage or life problems. Check the feed direction. It should be conventional cutting for most applications. If the proper tool geometry is employed, climb cutting is not considered. Check for dull tools Tool life is short in some materials. Check for burrs on the cutting edge. Some materials will run faster and cleaner by using a roughing and finishing pass. Examples are expanded PVC and solid wood. Chipbreaker tools can be accompanied by a finishing tool pass producing superior quality parts in about the same cycle time as with one tool. Multiple spindles or tool changer is required.

TROUBLE SHOOTING POINTERS

PROBLEM	***CAUSE***	***SOLUTION***
TOOL BREAKAGE	Excessive Cutting Edge Length	*Use shortest CEL to achieve depth of cut*
	Improper Colleting	*Collet only on smooth surface of shank at the end of the flute fade out*
	Poor Maintenance of Collet, Nut & Spindle	*Identify proper procedure for cleaning collet nut & spindle*
		Change collets on a regular basis
	Cutting Edge Diameter Less Than Shank Diameter	*Go to straight through tool with CED & shank the same*
	Use of Adapter Bushings	*Utilize proper collet size*
	Machine Problems	*Check collet & spindle runout-Check for play in slides, bearings or head mountings*
	Part Movement	*Check vacuum hold down & clamping devices to insure part rigidity*
	New or Inexperienced Operator	*Part should be fed smoothly to allow router tool to cut freely*
	Poor Tool Selection	*Match tool with material being machined*

	Breakage Problem	*Have manufacturer do quality check*
TOOL LIFE	Poor Tool Selection	*Match tool with material being machined*
	Speeds & Feeds	*Make proper changes to improve chipload & heat removal*
	Poor Dust Collection	*Improve dust collection capability to remove chips & heat*
	Part Movement	*Check vacuum hold down & clamping devices*
	Machine Problems	*Check condition of collets, collet nuts, spindles, slides, bearings and head mountings*
	Material Being Machined	*Select right tool for the job*
PART FINISH	Dull Tools	*Check for edge deterioration & replace with new or resharpened tools*
	Tool Selection	*Double edge or multi-edge tools provide better finish* *Use shortest CEL available to make necessary depth of cut* *Use keener edged HSS tools on natural wood & some plastics to improve finish* *Use up/down compression spirals to improve top & bottom finishes on veneered or laminated materials*
	Feed Direction	*Should be conventional for most applications*

GLOSSARY

ABRASIVE WEAR – THE WEAR THAT OCCURS WITH FRICTION AND HEAT OF THE CUTTING ACTION THAT DULLS THE TOOL.

ANGLE – THE AMOUNT OF DIVERGENCE BETWEEN TWO STRAIGHT LINES THAT MEET AT A VERTEX. MEASURED IN DEGREES AND MINUTES.

ARBOR – A MACHINE TOOL SPINDLE SHAFT EXTENSION USED TO HOLD GRINDING WHEELS OR MILLING CUTTERS.

AXIAL LOAD – THE VERTICAL DEPTH OF CUT PERPENDICULAR TO THE CENTER LINE OF THE CUTTING TOOL, NORMALLY EXPRESSED IN A PERCENTAGE OF THE DIAMETER OF THE TOOL.

AXIS – THE CENTER LINE (REAL OR IMAGINARY) PASSING THROUGH AN OBJECT ABOUT WHICH IT COULD ROTATE. A REFERENCE POINT OR LINE FOR A SYSTEM OF CNC MACHINE TOOL COORDINATES (I.E. X, Y, Z).

BACK-OFF – A SHOP TERM MEANING TO PUT RELIEF OR CLEARANCE LAND BACK OF THE CUTTING EDGE OR BEHIND THE PRIMARY CLEARANCE.

BACKLASH – LOST MOTION (PLAY) IN MOVING PARTS, SUCH AS THREAD IN A NUT OR THE TEETH OR MESHING GEARS CAN REEK HAVOC WITH SIZE CONTROL.

BALLNOSE – A 180 ARC GROUND ON THE PLUNGE POINT OF THE TOOL

BALL RADIUS – USED IN THE DESCRIPTION OF "O" AND SPIRAL FLUTES. THE MAXIMUM FLUTE DEPTH FROM FLUTE CENTER TO A LINE PERPENDICULAR TO THE CUTTING EDGE. IF THE ARC IS CONTINUED AROUND TO COMPLETE AN IMAGINARY CIRCLE OR BALL IT BECOMES THE BALL DIAMETER AND IS SOMETIMES DESCRIBED AS SUCH.

BINDER – THE METALLIC CONSTITUENT IN CARBIDE WHICH HOLDS THE GRAINS TOGETHER.

BODY – THE ACTIVE PORTION OF A ROUTER BIT WHICH INCLUDES THE CUTTING EDGE AND ALL CLEARANCES NECESSARY TO ACHIEVE A SPECIFIED CUTTING DIAMETER.

BRAZING – THE JOINING OF METALS BY HEATING A NON-FERROUS METALLIC ALLOY, COMBINED WITH A SUITABLE FLUX, TO ITS LOWER MELTING POINT TO BECOME THE BINDING MEDIUM. ADVANTAGE, NEITHER METAL JOINED IS DEFORMED. ONSRUD TECHNIQUES INVOLVE A COPPER-SILVER ALLOW COMBINED WITH A BORAX FLUX.

BURNING – OVERHEATING OF THE TOOL AND RESULTANT SURFACE DISCOLORATION CAUSED BY EXCESSIVE SPEEDS AND FEEDS.

CARBIDE TIPPED TOOLS (CT) – CUTTING TOOLS WITH TUNGSTEN, TANTALUM, OR OTHER CEMENTED CARBIDE INSERTS BRAZED TO A SOFTER STEEL FLUTE FACE.

CENTERLESS GRINDING – A SPECIFIC GRINDING PROCESS WHERE THE WORKPIECE IS SUPPORTED BY A BLADE REST AND NOT HELD BETWEEN CENTERS. WORKPIECE FEED RATE IS CONTROLLED BY A REGULATING WHEEL.