

# END MILL TROUBLE SHOOTING

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
<u>CHIPPING</u>	<ul style="list-style-type: none"> <li>• FEED RATE TOO HIGH</li> <li>• UP MILLING (CONVENTIONAL)</li> <li>• CUTTING EDGE TOO SHARP                             <ul style="list-style-type: none"> <li>• CHATTERING</li> <li>• LOOSE TOOL</li> </ul> </li> <li>• WORKPIECE RIGIDITY                             <ul style="list-style-type: none"> <li>• TOOL RIGIDITY</li> </ul> </li> <li>• LOW CUTTING SPEED</li> <li>• LOOSE TOOLHOLDER</li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE FEED RATE</li> <li>• CHANGE TO DOWN MILLING (CLIMB)</li> <li>• HONE CUTTING EDGE OR ALLOW BREAK-IN                             <ul style="list-style-type: none"> <li>• REDUCE RPM</li> <li>• REMOVE, CLEAN, AND RETIGHTEN</li> </ul> </li> <li>• TIGHTEN WORKPIECE HOLDING METHOD</li> <li>• SHORTEN LOC, PLACE SHANK FURTHER UP HOLDER                             <ul style="list-style-type: none"> <li>• INCREASE RPM</li> </ul> </li> <li>• REMOVE FROM SPINDLE, CLEAN AND REPLACE</li> </ul>
<u>WEAR</u>	<ul style="list-style-type: none"> <li>• HIGH CUTTING SPEED</li> <li>• LOW FEED RATE</li> <li>• UP MILLING (CONVENTIONAL)                             <ul style="list-style-type: none"> <li>• HARD MATERIAL</li> </ul> </li> <li>• POOR CHIP EVACUATION</li> <li>• IMPROPER CUTTER HELIX                             <ul style="list-style-type: none"> <li>• POOR COOLANT</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE RPM</li> <li>• INCREASE FEED RATE</li> <li>• CHANGE TO DOWN MILLING (CLIMB)                             <ul style="list-style-type: none"> <li>• USE COATED TOOL</li> </ul> </li> <li>• REPOSITION COOLANT LINES, USE AIR BLASTING</li> <li>• CHANGE TO RECOMMENDED HELIX ANGLE</li> <li>• REPLACE COOLANT OR CORRECT MIXTURE</li> </ul>
<u>BREAKAGE</u>	<ul style="list-style-type: none"> <li>• FEED RATE TOO HIGH</li> <li>• DEPTH OF CUT TOO LARGE                             <ul style="list-style-type: none"> <li>• POOR TOOL RIGIDITY                                     <ul style="list-style-type: none"> <li>• TOOL WEAR</li> </ul> </li> </ul> </li> <li>• POOR CHIP EVACUATION</li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE FEED RATE</li> <li>• REDUCE DEPTH OF CUT</li> <li>• SHORTEN LOC, PLACE SHANK FURTHER UP HOLDER                             <ul style="list-style-type: none"> <li>• REPLACE/REGRIND SOONER</li> </ul> </li> <li>• REPOSITION COOLANT LINES, USE AIR BLASTING</li> </ul>
<u>CHATTERING</u>	<ul style="list-style-type: none"> <li>• SPEED AND FEED TOO HIGH</li> <li>• POOR TOOLHOLDER RIGIDITY                             <ul style="list-style-type: none"> <li>• POOR SPINDLE RIGIDITY</li> <li>• WORKPIECE RIGIDITY</li> </ul> </li> <li>• RELIEF ANGLE TOO HIGH</li> <li>• DEPTH OF CUT TOO LARGE                             <ul style="list-style-type: none"> <li>• POOR TOOL RIGIDITY</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE FEED RATE</li> <li>• REPLACE WITH SHORTER/MORE RIGID HOLDER</li> <li>• USE LARGER SPINDLE OR DIFFERENT MACHINE TOOL</li> <li>• TIGHTEN WORKPIECE HOLDING METHOD</li> <li>• REGRIND WITH SMALLER RELIEF ANGLE                             <ul style="list-style-type: none"> <li>• REDUCE DEPTH OF CUT</li> </ul> </li> <li>• SHORTEN LOC, PLACE SHANK FURTHER UP HOLDER</li> </ul>

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<u><b>PROBLEM</b></u>	<u><b>CAUSE</b></u>	<u><b>SOLUTION</b></u>
<u><b>SHORT LIFE</b></u>	<ul style="list-style-type: none"> <li>• CUTTER/WORKPIECE FRICTION                             <ul style="list-style-type: none"> <li>• HARD MATERIAL</li> </ul> </li> <li>• POOR MATERIAL CONDITION</li> <li>• IMPROPER CUTTER ANGLE                             <ul style="list-style-type: none"> <li>• POOR COOLANT</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• USE COATED TOOL</li> <li>• USE COATED TOOL</li> <li>• USE COATED TOOL, CLEAN MATERIAL SURFACE</li> <li>• REGRIND WITH PROPER PRIMARY RELIEF ANGLE</li> <li>• REPLACE COOLANT OR CORRECT MIXTURE</li> </ul>
<u><b>CHIP PACKING</b></u>	<ul style="list-style-type: none"> <li>• FEED RATE TOO HIGH</li> <li>• LOW CUTTING SPEED</li> <li>• INSUFFICIENT CHIP ROOM</li> <li>• INSUFFICIENT COOLANT</li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE FEED RATE OR INCREASE SPEED</li> <li>• INCREASE RPM OR REDUCE FEED RATE</li> <li>• USE TOOL WITH LESS FLUTES, INCREASE HELIX                             <ul style="list-style-type: none"> <li>• INCREASE VOLUME OF COOLANT</li> </ul> </li> </ul>
<u><b>POOR SURFACE FINISH</b></u>	<ul style="list-style-type: none"> <li>• FEED RATE TOO HIGH</li> <li>• LOW CUTTING SPEED                             <ul style="list-style-type: none"> <li>• TOOL WEAR</li> <li>• EDGE BUILD UP</li> </ul> </li> <li>• DEPTH OF CUT TOO LARGE                             <ul style="list-style-type: none"> <li>• CHIP WELDING</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• REDUCE FEED RATE                             <ul style="list-style-type: none"> <li>• INCREASE RPM</li> </ul> </li> <li>• REPLACE OR REGRIND TOOL</li> <li>• INCREASE RPM, SWITCH TO HIGHER HELIX TOOL                             <ul style="list-style-type: none"> <li>• REDUCE DEPTH OF CUT</li> <li>• INCREASE VOLUME OF COOLANT</li> </ul> </li> </ul>
<u><b>BURRING OR WORKPIECE CHIPPING</b></u>	<ul style="list-style-type: none"> <li>• TOOL WEAR</li> <li>• IMPROPER HELIX ANGLE</li> <li>• FEED RATE TOO HIGH</li> <li>• DEPTH OF CUT TOO LARGE</li> </ul>	<ul style="list-style-type: none"> <li>• REPLACE OR REGRIND TOOL</li> <li>• CHANGE TO RECOMMENDED HELIX ANGLE                             <ul style="list-style-type: none"> <li>• REDUCE FEED RATE</li> <li>• REDUCE DEPTH OF CUT</li> </ul> </li> </ul>
<u><b>WORKPIECE INACCURACY</b></u>	<ul style="list-style-type: none"> <li>• LOOSE/WORN TOOLHOLDER</li> <li>• POOR TOOLHOLDER RIGIDITY</li> <li>• POOR SPINDLE RIGIDITY</li> <li>• INSUFFICIENT NUMBER OF FLUTES                             <ul style="list-style-type: none"> <li>• TOOL DEFLECTION</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• REPAIR OR REPLACE</li> <li>• REPLACE WITH SHORTER/MORE RIGID TOOLHOLDER</li> <li>• USE LARGER SPINDLE OR DIFFERENT MACHINE TOOL</li> <li>• USE TOOL WITH HIGHER FLUTE QUANTITY</li> <li>• SHORTEN LOC, PLACE SHANK FURTHER UP HOLDER</li> </ul>