It is important to note the following rules of good practice for thin-walled parts:

1. Reduce the tool nose radius while maintaining the largest radius for best tool life that does not cause distortion.
2. Reduce the lead angle so that the resultant force is directed into a strong or supported section of the part piece.
3. Reduce depth of cut.
4. Do not cause the tool to dwell excessively.
5. Reduce speed.
6. If necessary, change back to carbide for lower surface speed resulting in less deflection, less surface material distortion and less heat.

Rethink the process

Interrupted Cuts

WG-300 is inherently very strong and able to withstand interruptions provided the recommended speeds *(Figure 13)* are increased. Speed is all important in the successful cutting of parts with interruptions.

Do not give in to the temptation to reduce speed.

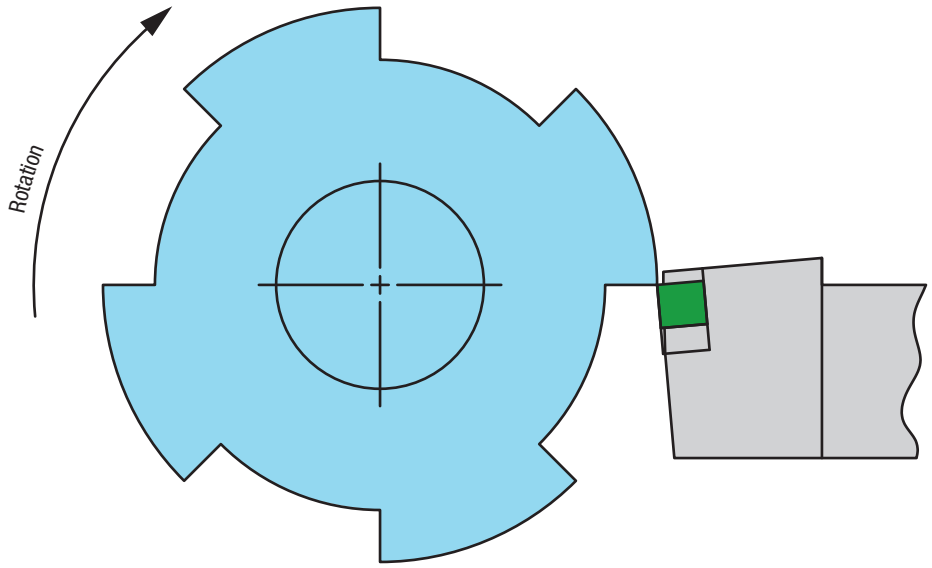
The amount of increase in the recommended speed for severely interrupted cuts can usually be calculated. It is necessary to increase the speed to get back into a temperature zone which the interruptions have lowered by virtue of the intermittent contact between tool and workpiece. First, calculate the circumference of the part and then subtract the sum total of the interruptions. This will give a smaller diameter value. Then increase the RPM so the smaller diameter value returns us to the originally recommended surface speed.

As a simple example *(Figure 63)*, if 50% of the material is taken away by voids or interruptions at the surface, 50% of the surface remains in contact with the tool compared to an uninterrupted part. In this case, double the surface speed to compensate.

A simple estimate will often suffice. Look at the part. Estimate the percentage of surface missing due to interruptions and then increase the speed by at least that amount.

Rethink the process

Figure 63 – Interrupted Cuts



Edge Preparations for Interrupted Cuts

It is advantageous in interrupted cutting to ensure that the feed rate is less than the width of the negative edge preparation on the insert. This assures that the insert cutting edge is in compression at all times and not in shear, as would be the case if the feed exceeds the width of the land. For this reason the T2A or T7A edge preparation should be used.

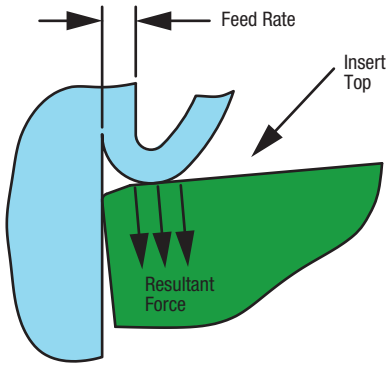
Feed rate must be reduced on severe interruptions to get more heat into a thinner chip. This will reduce the cutting pressures. If these rules are followed, few problems will be encountered on interrupted cuts. *(Figure 64)*

For interrupted cuts, the rules are:

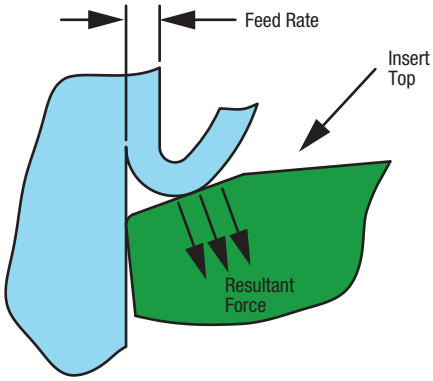
1. Select a larger edge preparation
2. Reduce feed rate
3. Increase recommended speed

Figure 64

Uninterrupted Cuts



Interrupted Cuts



Surface Hardening

Incorrect tooling practices, worn tools, tools with too much hone, etc., can cause excessive surface hardening effects during the machining of Nickel-based alloys, particularly in finishing.

It has been shown that cutting with the higher speeds, feeds and lower pressures possible with WG-300, will decrease (not eliminate) the work-hardening effect and will be an eventual factor in tool life due to notching of the tool at the depth-of-cut line.

If a tool is allowed to dwell without feed, the workpiece will be burnished or glazed and thereby work-hardened. Sharp tools are needed for light operations to avoid burnishing.

Greenleaf WG-300 has the advantage of being available without hones to accomplish finishing cuts and has the edge strength to make this possible.

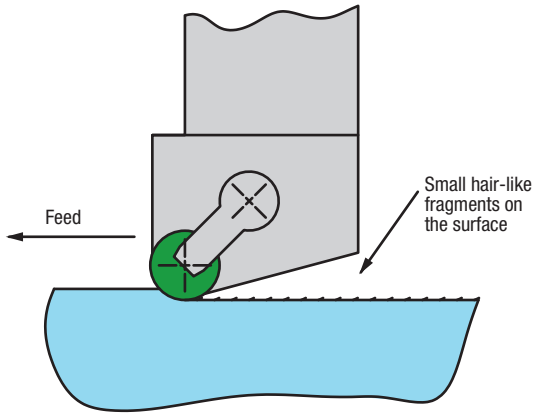
Smearing

Smearing can often be identified as small hair-like particles embedded into the finished surface. *(Figure 65)* This is caused by the Nickel, being very gummy in nature, which is built up on the flank of the tool and then swept past a worn, chipped, or honed area of the insert under great pressure and is embedded or pressure-welded in small fragments into the finished surface.

Greenleaf WG-300 is strong enough that inserts are recommended and produced as standard without a hone. A clean, sharp edge is then presented to the part piece, reducing stress and eliminating the tendency to smear the material in finishing cuts.

Smearing will occur even with WG-300 if the tool is allowed to wear excessively before indexing or if it chips or flakes due to side pressures caused by flank wear.

Figure 65 – Smearing



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