surfcam

: waveform roughing

Consistent Material Engagement

Waveform roughing strategy is a high speed machining technique that maintains a constant tool cutting load by ensuring the tool engagement into the material is consistent. The toolpath moves in a smooth path to avoid sharp changes in direction which maintains the machine tool's velocity.

Waveform Roughing

Reduces cycle time

Improves tool life

Lengthens machine maintenance cycles

Keeps constant chip load

Cuts deeper and faster

Constant Engagement With Material

Although a spiral roughing path looks much simpler at first glance, the problem is that the tool "digs" into each corner. This can cause the tool to overload, leading to reduced tool life or breakage. To compensate, the machine tool operator may have to reduce the cycle's feed rate, increasing manufacturing time.

As Waveform maintains a constant material engagement, the feed rate can remain at the optimal value throughout the cycle. This will improve tool life and greatly reduce the risk of tool breakage.

The Waveform Pattern

To maintain a constant chip load, the cycle applies the concept of machining from "Stock to Part". This reduces the amount of intermittent cuts, particularly on external regions, which means the tool spends more time cutting material and less time in the air. In contrast, traditional cycles generally offset from the component until they meet the stock. This can lead to the generation of sharp corners, fragmented toolpaths, and longer cycle times.

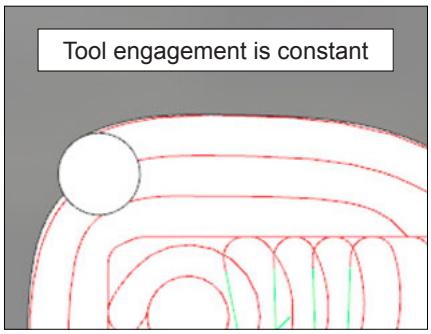
In pocket regions, the tool will make a helical plunge to depth at the center, then remove material with a continuous spiral cut until the edge of the pocket is reached. Any remaining corners are then removed.

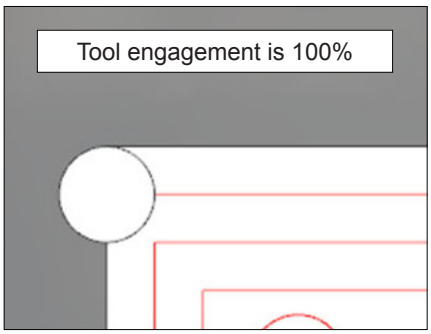
Automatic Adjustment for Tool Engagement

To maintain constant tool engagement and chip load, the toolpath is automatically adjusted to compensate for the part geometry.

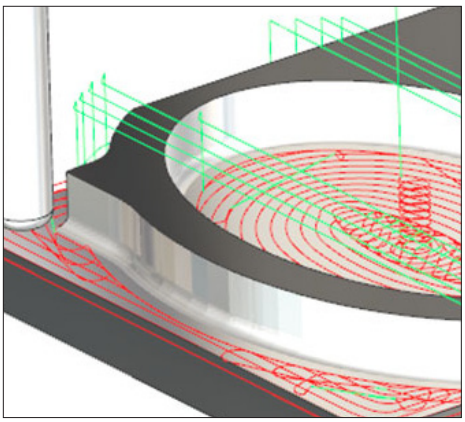
When cutting into a concave area, tool engagement is increased. The cycle adjusts the step over between the passes to compensate and maintain the desired engagement.

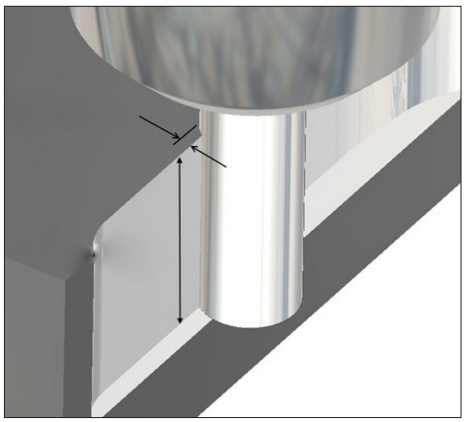
When cutting a convex area, the opposite effect occurs. As the material falls away, the toolpath step over is increased to maintain the desired engagement.

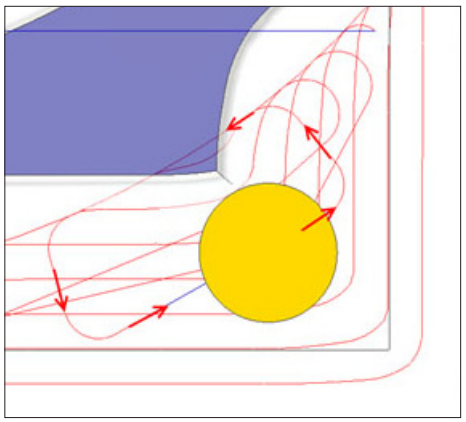




Waveform machining is standard with Surfcam. No additional purchase necessary







Smooth Toolpath

By ensuring a smooth tangent toolpath, the velocity of the machine can be maintained and the desired feed rates achieved. An additional benefit is less vibrational forces are transmitted into the machine and component, due to continuous tool motion.

Linking the Toolpath

The links within the cycle take account of the rapid and high feed rate settings for the machine tool. When moving to the next cut, the cycle will automatically choose the fastest method to get to that point. In localized areas the tool will stay at depth, but on longer moves the tool retracts and rapids to position.

Stay at Depth

When the tool remains at depth, the path will automatically move around the stock when required. The moves at depth can be at high feed rate, and allow the user to program a small retract move to stop the tool from rubbing on the floor of the part.

Simple Interface

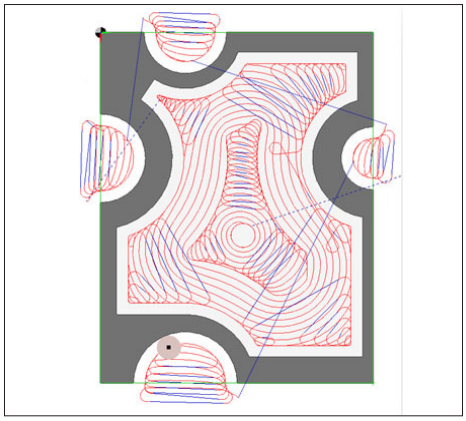
The cycle uses the information in the part and code generator, where possible, and requires only 3 additional modifiers. This ensures the cycle is easy to apply and is integrated into the main roughing cycle menu.

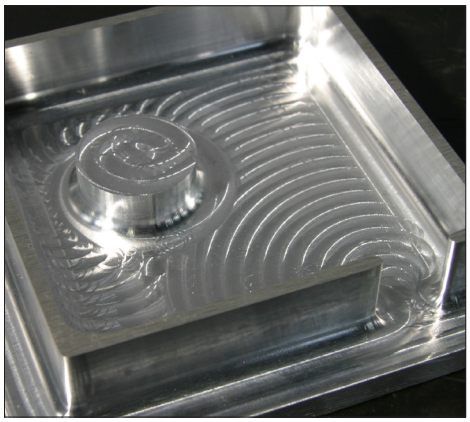
Full Cut Depth Machining (High Speed Machining)

Waveform Roughing greatly improves on standard roughing by ensuring a constant volume of material is removed. In addition, this opens up the way for use of high speed machining, particularly for harder materials.

Using as much of the flute length as possible distributes wear evenly along the entire cutting length, rather than just the tip. The radial cut depth is reduced to ensure consistent cutting force, allowing cut material to escape from the flutes. Tool life is extended, as most of the heat is removed in the chip.

An example of the feed rate and depth of cut that can be achieved in hard materials, both in metric and inch measurements, are shown below.





Material	SS1650 carbon Steel	6AL4V Titanium
Tool	10 mm endmill	1/2 inch endmill
Depth of Cut	20mm	3/4 inch
Stepover	10%	10%
Feed Rate	5700mm/min	50 in/min
Speed	9500 rpm	3128 rpm