JUST THE FACTS

FROM THE EXPERTS

KYOCERA SGS Precision Tools' R&D Engineer Jake Rutherford explains why traditional tool paths should not be overlooked.

The CNC machining world has been divided for years into two camps: those who support traditional tool paths, and those who support trochoidal paths, oftentimes referred to as dynamic milling. There are significant benefits associated with both approaches, and the decision is largely driven by what the customer values the most. Is increasing tool life and reducing tool change costs important? Is a reduced cycle time the central focus? Moreover, the workpiece material, component geometry and machine type are of paramount importance in choosing a toolpath.

Recent years have seen traditional tool paths make way for dynamic milling for a variety of reasons: Utilizing a finisher to perform a roughing operation while achieving a smooth, spec-compliant surface finish. With dynamic milling, it is possible to reduce the chip load per tooth and thin the chips. In many cases, lowering cycle times. It is important to note that these are all desirable results in machining, but many people can be seduced by these flashy improvements and believe they are the only solution. This leads to people overlooking or ignoring the benefits of traditional tool paths. Here are just a few reasons why traditional tool paths remain relevant in modern machining environments.

Let's look first at one of the main arguments against this machining style. A variable radial engagement angle means the width of the cut can vary depending on the point in the toolpath the tool is in. In corners or stepover areas, this variability results in inconsistent loads and forces being applied to the tool. It has been a common place in the past for tools to break or for the tool to deflect so greatly, that the part could potentially be out of specification if the tool survives the cut. Either scenario costs the user resources they cannot afford to waste. Modern technology provides answers to all of these questions. The CAM software takes this issue into consideration and adjusts the rate based on the tool's radial engagement. Thus, as the engagement angle is heavier, the software will reduce the chip load, which will reduce the tool load and increase tool life, as well as provide a part that meets specs. As machines have played a major role in avoiding this style, there is much less "slop" in the axes of the machines than in the past. Getting around this, or to make tight tolerance parts possible, requires a lot of experience and expertise. Machines today though, can hold much tighter tolerances with the use of ball bearings and the advancements in the pre-loading of those bearings have greatly improved and have eliminated nearly all slop.

Is this form of machining still a viable alternative in today's market, with technological developments easing these issues? In other words, can this approach be more productive than the newer, flashier, trochoidal style paths? Yes, to put it succinctly. Engineers are seeing wins in the field with this form of machining on a regular basis and attempts to educate end users on when to adopt which strategy. There are many elements to consider (material, part, fixturing, machine, CAM capability, etc.) as with any application, but when these factors can be taken advantage of, it can truly pay off to just hog material out. Compared to trochoidal toolpaths, this approach spends less time out of the cut (no "cutting air"), uses a less expensive tool (fewer flutes), and excels in shallower features. Finally, just because something is old doesn't imply it's no longer useful