SOFTWARE

Refined Toolpaths cut Cycle Times, Extend Tool Life

PASSWORD

Glenn Coleman is chief product officer for Celeritive Technologies Inc. (Cave Creek, AZ), a developer of toolpath engine technology.

Manufacturing Engineering: What can a toolpath engine like VoluMill do for CAM users?

Glenn Coleman: VoluMill toolpaths increase the productivity of the users of any CAM system, and they do so for any two or three-axis roughmilling application, from prismatic parts for machinery components to molds for complex consumer products. Customers have reported that VoluMill toolpaths significantly reduce programming time and effort, and most importantly for most, they dramatically reduce shop-floor cycle times while simultaneously extending cutting tool life. This results in increased profitability through both reduced actual costs and increased asset utilization. In short, VoluMill can increase the power and flexibility of the CAM system that a given shop is currently using, and improve their shop-floor productivity.

ME: How does the toolpath engine improve shop productivity?

Coleman: The quick answer is the reduced cycle times, as shorter cycle times mean the ability to produce more parts per hour, and extended cutting-tool life, which reduces the per-part cost of cutting tools. But the real answer is much deeper than that. Good toolpaths can get the maximum utilization efficiency from machine tools, cutting tools, toolholders, workholding components, and so on, while poor toolpaths severely limit their performance. Why is this true? Well, if you think about the milling process for a moment, the cutting tools shape the material into its final form, but they can't do this without the machine tool revolving them and guiding them through the material. The machine tool does absolutely nothing without a set of instructions, and the instructions come from toolpaths—and it will execute poor instructions just as blindly as it does good instructions.

Poor toolpaths force a machine tool to drive a cutting tool along a path that repeatedly varies the material removal rate, contains numerous requirements to start and stop, and includes sharp directional changes. Machining loads become extremely high in such instances, which are commonplace yet invariably make up a relatively small percentage of the overall toolpath length. But since the milling parameters, chiefly the spindle speed, feed rate, cut depth, and cut width, must be set conservatively enough to allow the tool to survive these moments of brief but intense tool load, these parameters are woefully inefficient for machining the rest of the part, resulting in unnecessarily long machining times. It is the classic case of the tail wagging the dog, akin to holding a NASCAR race in a residential neighborhood rather than on a high-speed oval. It makes no sense at all, but it really is the history of numerically controlled milling in a nutshell, and it continues today. And this is why

"Customers have reported that VoluMill toolpaths **significantly reduce programming time and effort.**

Glenn Coleman

it is estimated that, while actually executing a part program, the typical machine tool operates at less than 50% of its true productivity potential.

On the other hand, VoluMill toolpaths instruct machine tools to drive cutting tools along a completely different path, one that contains no variations in tool load, no sharp corners, no sharp directional changes, and no repeated stopping and starting; they enable machine tools and cutting tools to operate as they are engineered to operate, allowing them to run consistently in their sweet zones. It is amazing how well machining hardware can perform when given the opportunity.

ME: Why do CAD/CAM users need a toolpath engine?

Coleman: All CAM systems have toolpath engines, so let me address why end users might need a third-party toolpath engine like VoluMill. CAM systems are complex products. They have to deal with file management, data translation, solid modeling, geometry creation and editing, graphics display, postprocessing, etc. Generating toolpaths is but one of hundreds of tasks they perform. We, on the other hand, get to focus completely on the toolpath. And because our technology is CAM system-neutral, it can blend into any machining environment.

"The machine tool will execute poor instructions just as blindly as it does good instructions."

ME: Can this toolpath engine replace CAM systems?

Coleman: No. Continuing with the theme of your last question, our desire is to enhance the capabilities of any CAM system. We focus on providing the easiest to use, best-performing, rough-milling toolpaths available. Because about 99% of the material removed in machining a typical part occurs while roughing, it is extremely important, and offers the potential for huge productivity gains. But producing a part requires more than roughing. VoluMill won't drill

or tap any holes, nor will it chamfer any edges, etc., so while we believe that any shop can benefit from adding VoluMill to its toolbox, they will still very much need their CAM system.

ME: You recently introduced a new standalone VoluMill; what's different about it?

Coleman: VoluMill currently runs directly inside some of the industry's leading CAM systems. VoluMill Universal is a standalone version of VoluMill that is intended for shops that use a CAM system for which there is not a direct add-in. VoluMill Universal accepts data in the popular neutral file formats, generates VoluMill toolpaths that are identical to those generated in our integrated versions, and outputs the toolpaths in G-code or CL-data format. This product is what allows us to say that VoluMill is CAM neutral, that it can work with any CAM system.■

Low-Cost Testing

Test system developer **Sciemetric Instruments** (Ottawa, Ontario, Canada) has released its new low-cost two-channel process monitor, the sigPOD 1302, which includes user-configurable software.

Sciemetric's platform includes templates for common test applications such as press, torque, and noise, vibration and harshness (NVH) with software that can quickly and easily be configured to support many monitoring applications including weld, crimp, dispense, profiling, and functional testing.

The system offers a robust, flexible platform designed for live production environments. The package for monitoring test and assembly processes is designed to integrate seamlessly into production lines, delivering commonality across the line, and providing immediate pass-fail status on the production floor. It includes signature-analysis technology, determining in real-time any deviation from the manufacturing process's correct waveform, thereby detecting defects as they occur. This process-signature verification facilitates detailed insight into process behavior by measuring and analyzing the physical characteristics of processes applied during manufacturing using a