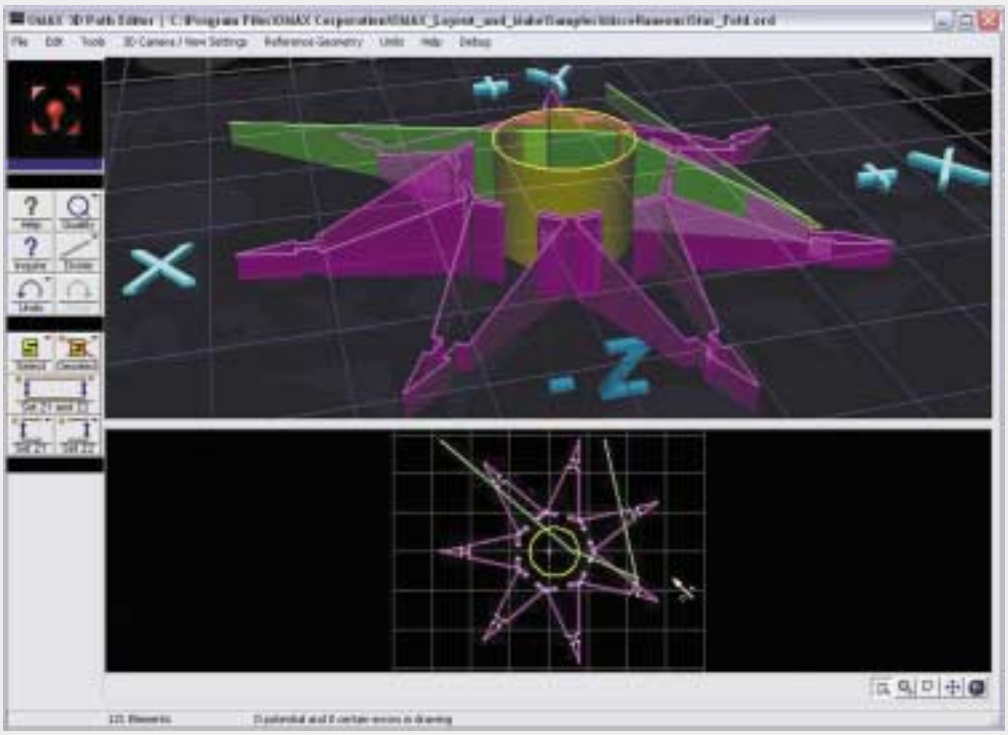

Software: How is it Contributing to Plasma and Waterjet Operations

Waterjet Software

As machine tools evolve, adding processes and creating more parts in complex shapes, the software becomes an increasingly important factor in not only the operation of a machine, but the purchase as well.

This is especially true with waterjet software that can change often, as new advancements in technology drive the systems toward new frontiers.

What makes the software for this type of machine important is the fact that the stream of water that does the cutting is not a rigid cutting tool that is simply guided along a path to make a part.

The stream of high-pressured water creates a tapered kerf as the stream bends back along the path, moves from side to side and also creates a wider kerf when moving slowly. As the stream moves through the material, the lower section of the water lags behind the upper section. In a straight cut, this does not present a problem, however, when machining corners, the jet must be slowed to control the amount of lag. If it is not, the part will be undercut or overcut.

It is this type of situation that waterjet software is designed to overcome.

"The old way to do an external corner," explained John Olsen, founder and chief technology officer of waterjet manufacturer, OMAX, "was to slow down for the corner, make the turn and then accelerate out. The purpose of the slowing was to let the jet at the bottom of the material catch up with the jet at the top so it didn't make a big error in geometry."

Now, advancements in software have allowed machines, like those made by OMAX, to corner with much more speed and accuracy.

"We've changed the software so that the jet moves at full speed past the corner far enough to ensure that the bottom of the jet has passed the corner. Then it stops, rapidly accelerates back to the corner and then slowly accelerates out from the corner," added Olsen.

This type of system can really cut part time significantly, he said. The amount that it goes past the corner is dependent on how thick the material is and what edge quality is needed. On thick material the jet may, in rare cases, travel past the corner as much as an inch so the software also ensures that the jet will not pass into a nested part.

Olsen added that this movement past the corner doesn't create significantly more scrap since it is usually occurring in a place that is scrap anyway.

Other Innovations

An example of recent software innovation that OMAX has introduced is the theory of 'minimum taper'.

Using the same model that predicts the nature of the taper, the minimum taper selection will choose the correct cutting

speed to minimize the taper.

"This means that if you have parts that have a few spots where taper would be unacceptable, you can choose those spots and cut with minimum taper," said Olsen. "But if you want to do a whole part with minimum taper quality, especially if it's a thin part, you may find that the cut time is five times longer or more."

Olsen also stressed that it was the software along with the addition of the Tilt-A-Jet tilting cutting head that was producing the best results as far as significantly reducing the taper and increasing cutting speed. In fact, OMAX has suggested that customers can realize an increase of up to 50 percent in average cutting speeds thanks to the latest generation of hardware and software.

Another benefit that OMAX software brings to the table is the fact that it is purchased for life. Once the machine and software is purchased, the original owner of the machine gets free software upgrades.

"We feel the reason that people are looking more and more at waterjets now is because of the software," added Olsen.

OMAX's software, Intelli-MAX, has been designed to produce higher cutting speeds and greater precision along the path. Advancements that have been built into the software include a 3D editor that lets users add a third dimension to the tool path, by adjusting the height of the nozzle and also a nesting feature that is designed to increase material savings.

Cutting Speeds

According to Joe Cisar, senior applications trainer with Bystronic, another way that software helps with this technology is in controlling cutting speeds.

Cutting a straight path is far simpler and much faster than cutting a path with sharp corners or with tight turns. It is because of these turns and corners that controlling the water pressure and abrasive mix in relation to speed is critical.

"If you accelerate too quickly or if you are too slow, you are going to wash into the corners and you are not going to have a true, good quality edge," he said. "You must be able to control the speed, the nozzle height, the stream pressure and the amount of abrasive that is entering the stream."

All of this being said, these machines are generally viewed as being simple to set-up and very easy to use. According to Cisar, anybody can be trained to run a waterjet, however, the real challenge is trying to hold tight tolerances so the more CNC parameters can be precisely controlled, the better end product will be produced.

Cisar is also predicting that more automation will become involved in the waterjet cutting process as they move into higher volume applications.

"I think waterjet is going to be a great lights-out machine," he said. "It keeps an eye on itself, thanks to the new controllers we have, and it's great if you want to do high output on thick plate materials or materials that you can't cut with any other machining process."

With built-in material databases and systems that can accept DXF and DWG files and also create their own by drawing an image on screen, the software is one of the main reasons that these machines are easy to set up and run.

"You basically load the parameter and the program," said Cisar, "press start and let the machine run."

Dynamic Cutting

Michael Ruppenthal, director of marketing for waterjet manufacturer Flow International, also sees the advancements in software and hardware driving the increasing popularity of waterjet as a cutting process.

"Software is extremely important because what you are doing is modeling a dynamic process," he explained. "The waterjet is a dynamic cutting tool unlike a mill or a lathe or even a laser to some extent. The jet of water is live and what you are trying to do is model how it is going to behave at different speeds in different thicknesses and different materials."

Because of the intelligence that is built into the software controller you are able to get accurate, repeatable parts.

FlowMaster is Flow's PC-based software that was developed specifically for abrasive waterjet cutting. Flow, who also produces a tilting cutting head, is using this combination to address the issue of taper minimization to let people cut faster and more accurately.

The secret of the Dynamic Waterjet® is the software and the models built into software. In the next six to 12 months, Ruppenthal expects the software to be able to produce even better cutting models, better cornering than is currently available and more accessories to become available for these machines.

Plasma Cutting Software

Software and controls are helping to advance plasma cutting systems to ensure that this process keeps pace with other cutting options. These advancements are critical in order to change set-up time into production time and one way that this is being done is by the addition of PC-based, CNC controls to the machines.

As the industry evolves and flexibility becomes increasingly important, a machine's software, interface and operator must

combine to get the most productivity out of a machine tool in the shortest amount of time.

Now in plasma cutting, the software and CNC controller automatically takes the material type, thickness and plasma process into consideration in order to adjust gas mixtures, feed rate, pierce delay and pierce height.

The operator needs to simply load the material and then select the appropriate choices from a list. The controller then automatically configures the machine and the plasma unit.

Users are constantly looking to incorporate complex plasma cut parts that could actually replace more costly parts previously made through other, labor-intensive processes. The result is more accurate production at a lower cost with higher volumes being produced.

One way that plasma software is changing the process for the better is in the area of advanced nesting.

According to Ron Schneider, marketing manager for Messer MG Systems, nesting software packages, which are not unique to plasma, but also used for laser, waterjet and other processes, are really enabling users to get the most out of the plasma machine while at the same time, using as much of the material as possible.

"As a machine supplier, in many cases we get more involved or are closer to end user applications than even the plasma supplier," he said. "This means that we are able to learn more tricks of the trade and programming techniques. Then we can take that information, and because the power of CNC today, we can imbed that into our CNC control for the machine. This in turn enables the end user to get even faster, better and more productive cuts in plasma."

Another benefit, when it comes to modern controls, is onboard databases that have many plasma parameters pre-loaded into the system in order to minimize operator learning curve.

Messer MG's product manager for plasma and CNC controls, Mark Ringgenberg, cited another benefit when it comes to modern CNC controls.

"The control's onboard imbedded database allows plasma parameters to be pre-loaded into the system in order to minimize operator learning curve and increase his immediate productivity. Even inexperienced operators can produce high volumes of good parts without a lot of training."

Another way that software is helping produce higher quality parts in less time is through the adoption of automatic lead-ins. When making a cut you have to pierce or burn through the metal and go toward the line you are cutting. It's this entry point that's called the lead-in.

"In the old days, the operator or programmer would have to define the lead-ins. Now, most software automatically selects the best path for the lead-in. The user can then accept the lead or alter it if desired," said Tim Walsh, president of Plasma Automation.

"Another one of the biggest progressions recently is the nesting process," added Walsh. "The software will also nest or position the pieces on the material to achieve the best utilization of the material. The Vicon PC Controller enables shop personnel to see on the screen exact what will be cut."

This will not only increase productivity but save time and material as well.

For more information, visit www.bystronic.com, www.flowcorp.com, www.omax.com, www.messer-mg.com or www.plasmaautomation.com.■

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