The Way to the Future

Connectivity, data management define the future of process improvement

BY LINCOLN BRUNNER

In years past, job shop owners looking for better machine tools might have focused their scouting efforts on faster cutting speeds or perhaps a slicker nesting package.

That was yesterday. Cutting processes (notably oxyfuel and plasma) are reaching their speed limits. Process control software is becoming far more holistic, extending beyond nesting. With those advances, machine tool manufacturers and customers increasingly are looking to more sophisticated control software and systems that connect multiple machines (or even factories) for productivity gains.

TRANSFERRABLE DATA

Beginning at the basic cutting level, machines like OMAX abrasive waterjets don't need to have an operator create a proprietary program to cut a sheet of steel. They now can take a CAD drawing, reproduce the shape of the drawing and then plot the sequence of the cut needed to create it. At the controller, the operator tells the machine what material is being used, tool offsets, diameter of the jet and away he goes.

But what if machine A goes down and you want to cut those parts on machine B now? Some systems force you to tweak the program in the CAD/CAM software. Not OMAX's software–it can transfer files via a common server with no downtime.

"You can take the exact same path that you programmed, walk over to a totally different machine, and start cutting with that same program," says Carl Olsen, director of software products at OMAX, Kent, WA. "You don't have to reprogram anything at all."

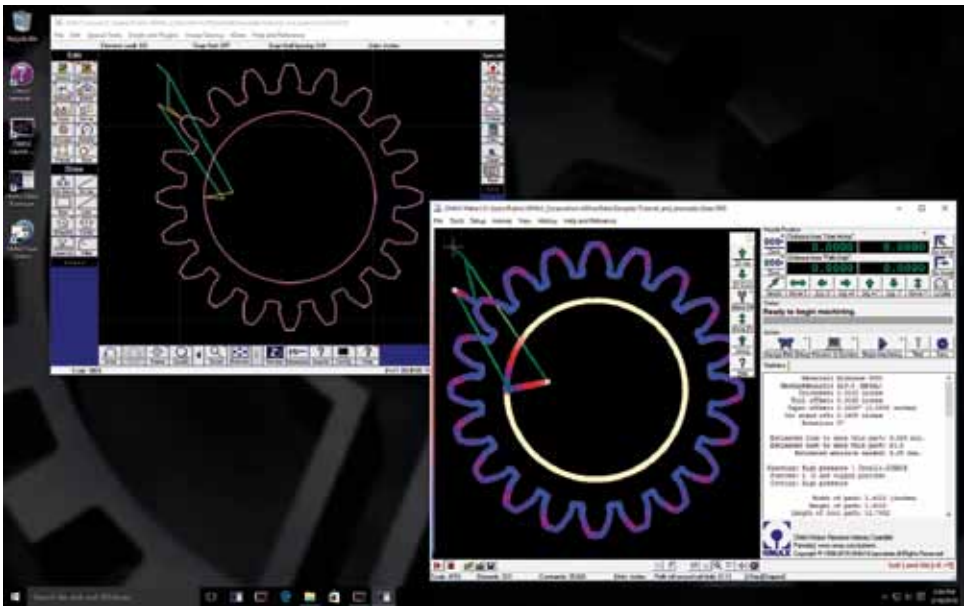
AUTOMATION FOR THE MASSES

What OMAX is doing for waterjet cutting—taking the control system beyond mere CAD/CAM and nesting—Hypertherm's Robotmaster is doing for robots that accomplish all kinds of tasks. It takes a 3D model (say, from SolidWorks) and then programs a path automatically for a robot arm to take while it's cutting, welding or spraying. It then automates that path for the end user, plotting out the robot's postures and then optimizing the robotic arm's movements.

"The way robots have been programmed is through the teach pendant—you drag the robot to every point," says Garen

Cakmak, engineering and sales leader for Robotmaster. "What we're utilizing is a mature CAD/CAM technology where we really extract the features. For instance, the information from the cutting is all extracted from the CAD model. Your path is generated from that point on."

Despite the complexity created by a robot's range of capabilities, Robotmaster users don't need robotic expertise. "The person, once we output the program, never has to touch it," Cakmak says. "They can take that program that's generated and send it to the robot. And then the robot can execute it."



Users of OMAX's abrasive waterjet machines don't need an operator to create a proprietary program to cut a sheet of metal. And, if machine A goes down and you need to cut on machine B, OMAX's software transfers files via a common server.

NECESSITY OF SOFTWARE IMPROVEMENTS

But automation is only the beginning. Connecting different functions of a business and the software that runs them to push productivity gains is the next step.

Why emphasize software connectivity? Because process improvements are getting harder to extract from other areas of fabrication operations.

For example, every cutting technology has its physical limit—the point at which viable cuts simply cannot be made any faster. Purveyors of most major cutting techniques— sawing, waterjet, oxyfuel, plasma, laser—are nearing or have met those limits.

"You cannot just cut faster anymore," says Holger Hahn, global product marketing manager application software for ESAB in Germany. "You cannot be a lot more precise than you are currently with the [oxyfuel and plasma] processes. The only thing you can improve on is a complete process, including the planning side and the material handling side and data collection. You cannot cut faster."

The answer for achieving productivity gains for ESAB is a software system like Data Leap. The Data Leap package connects a shop's enterprise resource planning (ERP) system with current production data that it can monitor and store in a shop's own secure, private data cloud. That data gets collected and paired with plant data that allows a shop to view that data different ways, allowing it to:

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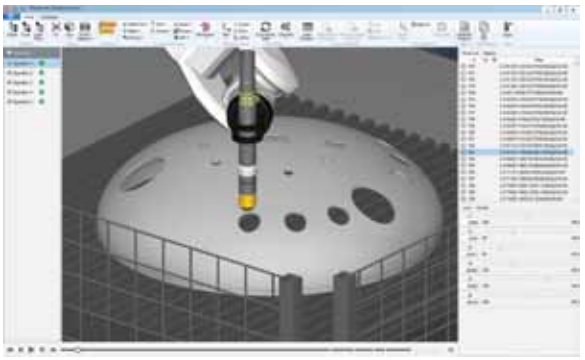

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- Make business decisions.
- Make technical decisions.
- Improve workflow.
- Improve material handling systems.

As opposed to years past, when a simple part inquiry often set off a flurry of phone calls and paper shuffling, "with these modern systems, you just type in the part number or the order number, and then you see what data was collected for this part," Hahn says. "You see it was nested by John Doe on Wednesday. On Thursday morning it was cut. It was cleaned three hours later, and then it was shipped."

That data extends beyond order fulfillment into machine maintenance and productivity analysis.

"If you want to make a decision, you need some data to base it on. You can look inside the database and see, 'OK, we had a breakdown here, some problems there.' That's data.

"Or, you can ask the shop floor manager, 'OK, what is your workload?' Maybe you have one machine that can do some more, balance the workload better. You need data for this."

TYING EVERYTHING TOGETHER

As with any revolutionary technology, it's actually been a series of evolutionary steps that have moved manufacturing toward the fourth Industrial Revolution, or Industry 4.0. In a nutshell, Industry 4.0 is a concerted effort by businesses, industries and even countries to connect manufacturers and their industrial processes in a self-responsive system through the Internet.

One industry-wide effort that pushed the connectivity of manufacturing forward was MTConnect, first introduced as a concept at the 2006 AMT annual meeting. Just five years later, the German government unveiled Industry 4.0. Combined with connectivity efforts like MTConnect and the exploding possibilities of the Industrial Internet of Things (IIoT), Industry 4.0 is rapidly making science fiction into predictable reality: machines talking to machines over vast distances at light speed. In the not-so-distant future, machines will tell each other to order raw material for cutting or a new bottle of assist gas for a welding torch—and fill those orders with no human intervention.

"You can imagine shops where there are no people in them," OMAX's Olsen says. "Orders come in and parts come out, and they're shipped off by drones directly to the end customers."

But people shouldn't be afraid of the future, says ESAB's Hahn. It's easy for even the smallest shop to take steps toward letting their once-separate systems communicate so the shop becomes more efficient. "The whole 4.0 concept is that the things talk to each other," Hahn says. "So the machine tells the business system, 'I did something.' Or the business system tells the nesting system, 'Hey, there's some work for you—go nest it.' How many times is order data inputted in many companies? Maybe in three, maybe in five different systems. It's a waste of time.

"The cutting process will not cut faster tomorrow. It won't in a week, in a year. What you can do is reduce the handling time, the time from taking the order to the time the machine starts cutting. It's amazing. And it's the only way today, and I think in the next few years, we can improve productivity for our customers." SMT

ESAB's Data Leap package connects a shop's ERP system with current production data that it monitor sand store in a shop's own secure, private data cloud.

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