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### Leaving the nest



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*Fabricating software grows up*

by Jim Barnes

Nesting software is a marvel of mathematics, calculating the most efficient layout of large numbers of complex shapes on a sheet or plate almost instantaneously. As important as that is, though, you have to look beyond the nest for true fabricating efficiency.

Powerful CNC controls have made calculating a nest extremely fast. "Today's sophisticated nesting software takes fuller advantage of hardware capabilities. This provides unparalleled processing speed to determine optimum part layout and cutting paths... New mathematical heuristics are also providing new levels of sophistication. Experience-based techniques for problem solving are employed to speed the nesting process," notes Pierre Slabber, vice president, Research & Development, SigmaTEK Systems LLC, in Cincinnati, OH.

And as the controls have evolved, new capabilities have emerged.

"Now, the focus is extending beyond reducing material wastage to making the whole cutting operation more productive," says Derek Weston, product marketing manager—CAM Solutions, Hypertherm, Inc., Lockport, NY

"Nesting software NC output files have become more complex as CNC controls grow in sophistication."

#### Complex files

It's not all about the number of parts you can get from a plate, any more. "There are many, many parameters that need to be evaluated," says Weston.

There is a wide range of choice. "I have counted at least 200 nesting systems around the world, including the ones the manufacturers supply with their machines. There is nothing wrong with them—they all do basically the same thing," says Dr. Matthew Fagan, president, FastCAM Pty. Ltd., headquartered in Australia with North American offices in Chicago.

Slabber says that of the many suppliers currently in the market, about 15 are serious players. "Some of the others are here today, gone tomorrow," he notes.

Nesting files themselves are getting more complex as suppliers develop some of the technology's potential. "The NC output file from the nesting software now provides additional, detailed job setup and process optimization instructions," says Weston. "We call this Part Program Support. Essentially, those instructions are providing guidance to the machine components, which is passed through the CNC for job setup and other process optimization instructions."

Settings like gas pressures, gas type and amperage and others that once had to be established manually can now be set automatically. "It saves time and eliminates the error factor. It reduces the need for highly skilled operators," says Weston.

Reducing piercing to the minimum makes cutting operations more efficient. "Eliminating pierces will produce a time saving. It can take more than 80 per cent of the time out of the job in oxy cutting, plus savings in consumables and machine and torch wear," says Fagan. FastCAM's EdgeSmart software makes continuous cuts to reduce piercing. As the torch approaches another part in the nest, it cuts a small keyhole. Then, when it is time to cut that part, it goes back to the keyhole, eliminating the need for the pierce, notes Fagan.



#### Integration

Integration is another important factor. "You should not look at nesting software as a silo.

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You have to look at it as an integral part of the customer's fabricating process, whether it's a small owner-operator business or a huge multi-facility corporation," says Weston.

Major vendors have widened their applications to a larger number of machine types and integrated them with other cutting software.

Slabber cites one owner who had been using separate packages to program each machine. This required multiple software licenses and demanded additional resources in programming and support. Once the firm consolidated its nesting into a single package, it achieved efficiency, speed, and savings with a single, scalable solution, he says.

Fagan compares nesting software to word processing software, which is more useful when it is part of a software suite that includes spreadsheets and graphics. FastCAM's products are modular; they can be used alone or integrated to handle all aspects of fabrication from design to final assembly.

Enterprise-level integration is also advancing rapidly. "The nesting software can be integrated with the customer's MRP and ERP systems," notes Weston. Work-order integration gives the nesting programmer visibility on what jobs are coming in next. There might be another job with matching material and grade type in the pipeline that could merged with the current one. The nesting programmer can now cut the parts in parallel—consuming more full plates—instead of cutting one job, taking the remnant off and storing it, and then putting it back on the machine afterwards for the next job.

"He can sort through those jobs by customer type, delivery date, material type or material grade, for example," says Weston.

CAD is another factor in improving fabricating efficiency and the ability to import nesting data directly from a solid CAD system without any conversion steps in between is crucial. "If you don't connect the two programs, you typically end up using a DXF conversion process to get the 3D model into a 2D format. You then run into situations

where someone updates the 3D file and forgets to update the 2D file," says Weston. Integration between the systems eliminates these headaches.

#### Added value

Fagan cites weld preparation as an example of how new directions in nesting can bring benefits to the fabrication shop.

"After cutting a piece of steel, the next thing you usually do is edge-prepare it manually so you can weld it," he points out. The more work you can do on a part while it is on the table, the more efficient your process is. A bevel head, a new plasma torch and a new controller can turn an ordinary cutting machine into an automated weld-preparation machine.

FastCAM software allows access to American Welding Society standards related to edge preparation, and incorporates them right in the cutting program, according to Fagan. The system can handle complex edge preparation. "We are doing precision double-V preparations, quickly and automatically during nesting, at the same time as other kinds of beveling," he says.

Software can also help you cut machine costs.

Hypertherm uses what it calls a nest configuration archive, a setup file that is customized to an individual machine. The software aids with dynamic sensing of consumable life optimization—the ability to sense arc voltage on an ongoing basis throughout the job and make adjustments as required to maintain a straight edge on a part and get the maximum consumable life, explains Weston.

"It helps you get the most out of the life of the consumables. It is not uncommon for a consumable to be removed before its optimal life expectancy has been reached. That cuts into a fabricator's profitability," adds Weston.

"The built-in process knowledge in the system is part of the software set-up. All relevant parameters are established during installation, according to the specified machine and job type," says Weston. For example, you can create NC files for several different types of cutting process – plasma, laser, waterjet, oxyfuel or combination punch.

Two things distinguish nesting packages. One, of course, is the specific software feature set. But as important as that "is the support the company can provide. The misconception is that you can get something off the Internet and think you are done. You have to look at the support level and what is behind the software," says Slabber.

*Jim Barnes is a Toronto-based journalist with more than 30 years of experience in writing about manufacturing and technology.*

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