

A Quick Path to Complex Short-Run Tooling

New computer-aided-manufacturing software helps this job shop build intricate forming tools in high quantities.

In high demand by customers of Tonnard Manufacturing, Corry, PA, are complex short-run form tools. To help fill these orders, the 50-employee job shop has contracted with Pathtrace Systems Inc., Southfield, MI, for EdgeCAM computer-aided-manufacturing (CAM) software. The new software has enabled Tonnard to reduce machine programming time by 90 percent and bring in new work from existing customers, according to Aaron Horwood, Tonnard programming manager.

"Before, when we didn't have the capabilities to execute the tool designs, we would have shied away," he says. "Some very good ideas died because no job shop could be found to do the work and bring the designs to life."

At Tonnard, short production runs, frequently for prototypes, predominate—a company specialty for decades.

"About 70 percent of our tool work involves design and manufacture of form tools such as draws, U-form or compound curves for stamping, and 30 percent for our press brakes," he says. "This is all short-run tooling. Some jobs run out in the shop in just a few hours, and nearly all tools run for less than one shift."

The average Tonnard stamping order numbers less than 1000 pieces, with very small orders—one to 10 parts—completed via laser cutting and bending with standard



press-brake tooling. Every short-run job seems to come down to the cost of tooling that will be used to make just a few hundred or a few thousand parts, according to company officials.

Besides bringing in the new CAM software, Tonnard has worked to improve changeover time by employing quick-change tooling methods.

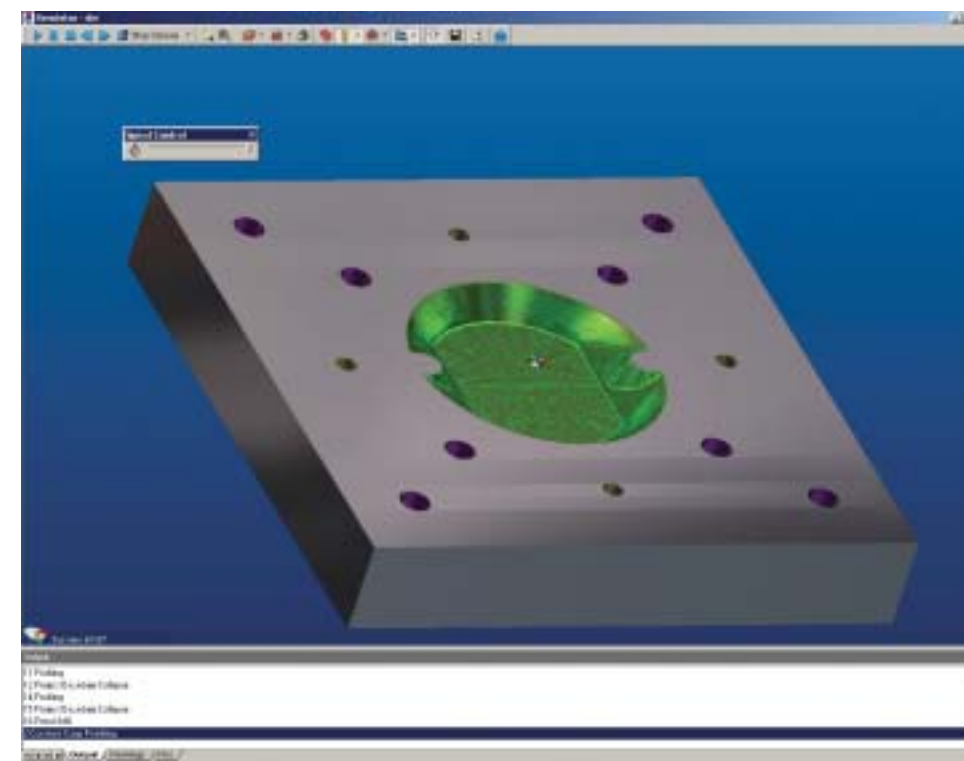
"An efficient toolroom is necessary to make these changes," Horwood says. "We must work fast and smart if we want to optimize our pressroom."

The pressroom consists of more than 100 hydraulic and mechanical presses in capacities from 10 to 400 tons as well as double-crank presses for producing larger blanks and perforations, all backed by hand, robot and servo material-feed capability. Material of choice is cold-rolled steel sheet and coil. The company keeps 800 tons of sheet steel on hand in thicknesses from 0.015 to 0.500 in., but the majority ranges from 0.030 to 0.25 in. Tonnard also produces parts from stainless steel, aluminum and other alloys.

To keep the pressroom busy cranking out brackets, latches, hinges and flat parts for automotive, motorcycle, construction and other industries, Tonnard buys some tooling from shops located between Pittsburgh, Cleveland and Erie, but increasingly relies on its inhouse toolroom.

"Our customers expect low-cost

Tonnard forms these die halves for a reproduction gear-case cover of an antique motorcycle. They were produced using new CAM software linked with CNC machinery. Addition of the new machining capability has allowed the job shop to produce complex short-run tooling 90 percent quicker than with previously used methods.



Tonnard used CAM software to simplify machining of the gear-case cover and create this simulation of results from the proposed machining process.

tooling," says Horwood, "so we've had to develop inexpensive inhouse methods. Some of our toolmakers have been here for more than 30 years and our customers appreciate their techniques and skills in cutting costs."

CAM Fills the Bill

Until early 2003, Tonnard had virtually no CAM abilities to back employee skill and experience, with the only computerized production equipment a laser cutter, some press brakes and an electrical discharge machining (EDM) center.

That changed with the addition of an EdgeCAM seat (through software distributor Roney Software, East Springfield, PA) and two CNC machines: a Haas Automation CNC VF3 machining center with 40-pocket automatic tool changer and a Haas lathe. Soon after, Tonnard added a second EdgeCAM seat for milling and a third for the lathe and EDM center. The company also made room for CAD, as most form tools and every tool machined on the Haas machines are designed in the newly acquired CAD solid modeler Autodesk

Inventor. In fact, a big reason for Tonnard choosing EdgeCAM was its compatibility with Inventor, according to Horwood. Tonnard also uses AutoCAD for simple 2D work.

The CNC machines and software allow Tonnard to simplify design and build of short-run form tools, leading to production of complex tooling in a timely manner, according to Horwood.

Traditionally, such tooling includes a few pieces of carefully shaped steel, bolted or clamped together, with tooling components reused whenever possible. This requires highly skilled toolmakers and at Tonnard, these toolmakers traditionally have worked with manual machine tools.

"With the now obvious benefits of CAM and CNC, those days are numbered," says Horwood.

In the past, as Tonnard took on newer tools, machining forming tools proved to be the toughest challenge, "and we were falling behind even though the shop always had the know-how to design the tooling," Horwood says.

Computer design and manufactur-

ing software has sped the process of tool production through rapid machine programming of difficult jobs.

“The combination of EdgeCAM, Inventor and the Haas machines allow us to take on tougher jobs,” says Horwood. “One of the new, more complicated tools often replaces two or more simpler tools. This reduces hit counts in the shop, increasing productivity as each press hit requires a separate setup.

“We get into some very complicated part geometries with multiple and even reverse bends, common in the automotive market,” he continues. “In the past we would have had to build several tools to do these jobs. Now, with the new machines and software, we can do the same job with fewer hits and a lower tooling cost.”

On a piece-part basis, gains have been dramatic.

Programming Time Cut, Quality Improved

“CNC programming time has been sliced by 90 percent with EdgeCAM,” says Horwood. “We also have eliminated errors that are inevitable with manual coding, especially when working without good drawings.”

Horwood found the Tech Assist module within the EdgeCAM Tool Store component especially useful.

“Tech Assist lets us define cutters in terms of material and geometry,” he explains. “We enter the manufacturer’s recommended feeds and speeds for various materials. When we set up a job, the software lets us toggle between the feed and speed databases

and Tech Assist matches them up so that we get optimum performance.”

Horwood also likes the built-in tutorials that he says assist in reaching high CAM productivity quickly.

“They were helpful in learning the software,” he says, “and they make a great reference for toolpaths that are rarely used.”

The company receives software updates about every four months, and the latest release, EdgeCAM v. 8.5, has updated toolpath functions that Horwood says have brought better finishes in less time on tool-machining jobs, while reducing programming challenges.

“The toolpath simulation capabilities allow us to evaluate the time to machine,” Horwood says, “and we can quickly evaluate the optional tool paths for speed versus finish quality.”

Those tradeoffs are important, as Tonnard puts much faith in unattended machining—almost all the toolroom machines run unattended. “We can’t stand there and watch them run,” he says. “We have to know that the programs will work.”

Trade Speed for Complex Toolmaking

Interestingly, with the new technology, turnaround time for the average tool at Tonnard remains unchanged. On simple jobs, such as laser/press-brake work

not requiring hard tooling, turnaround is two weeks. More complicated work, such as single-hit blank and pierce tools with bending, requires four weeks, and the most complicated tools take six to eight weeks.

“We can do things faster,” Horwood says, “but speed trades off for time to make better tools and more difficult parts. EdgeCAM has brought us a lot more work from our existing customers, and more complex jobs. Tool-and-die shops can make this tooling, too, but far more expensively than we can and nowhere near as fast.”

That keeps the seven Tonnard toolroom employees busy.

“When orders are up we stay busy building new tools,” Horwood says. “When business drops, we optimize existing jobs.”

The company also works on optimizing its customer base.

“We are diversifying our business,” he explains. “In today’s business environment you must have a large customer base. Accounts with large customers are great, but you must have a strong list of small customers. Management wants the company to be less vulnerable to sudden changes at customers that comprise a big chunk of our revenue, and we enjoy working with smaller companies.”

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Information for this article was provided by Pathtrace Systems Inc., Southfield, MI; tel. 248/356-8800; www.edgcam.com.

With time saved in die production by shifting to CAM software and CNC machining equipment, Tonnard was able to concentrate on redesigning existing dies. This punch-die block originally was intended for a two-hit operation.

Tonnard tooling personnel redesigned the tooling so that the part could be produced in one hit.

