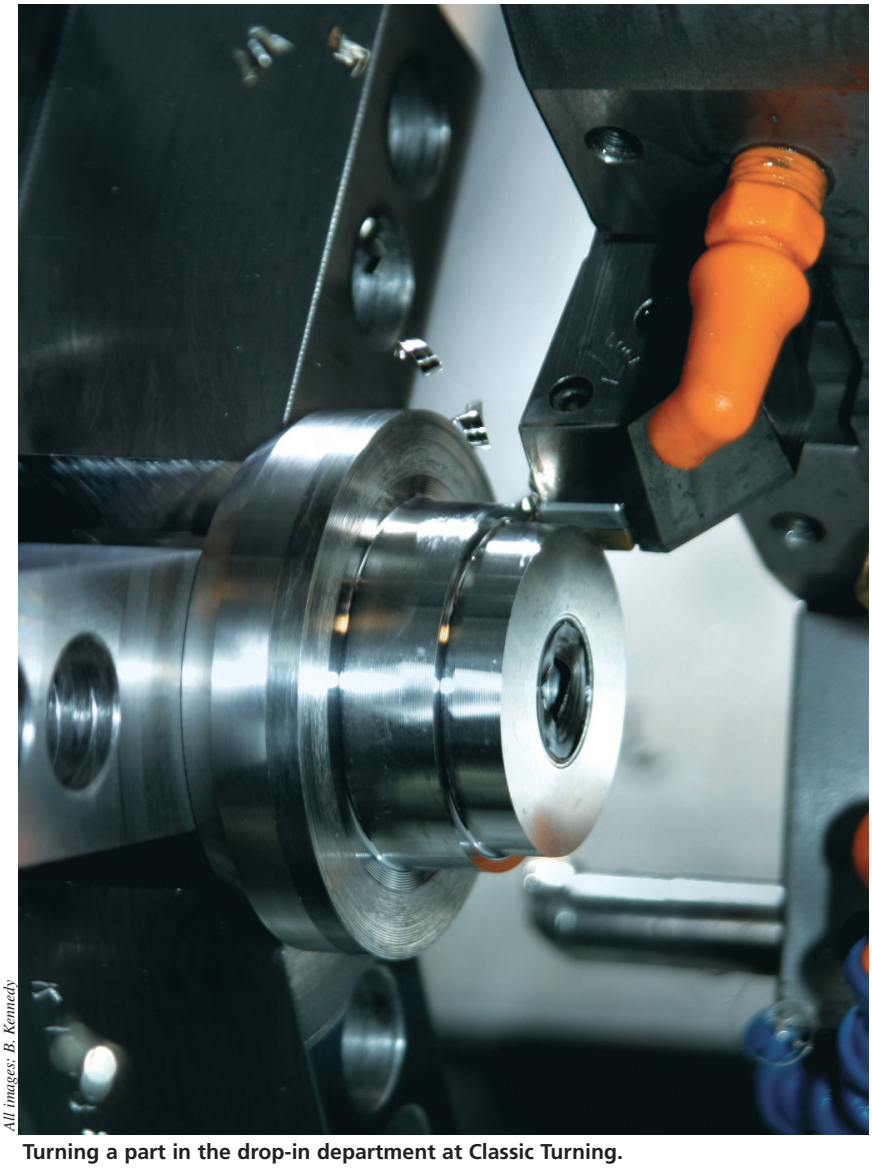
cover story

➤ BY BILL KENNEDY, CONTRIBUTING EDITOR

A 'Celling' Proposition



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Turning a part in the drop-in department at Classic Turning.

A machine shop has stayed competitive by incorporating cellular manufacturing methods.

To be truly competitive—beyond simply cutting prices—a shop has to offer something its competitors don't. To provide quick turnover of relatively small runs of parts, Classic Turning Inc. employs cellular manufacturing methods and frequently modifies the configurations of its cells in response to customer needs. The strategy has enabled the shop to grow and prosper.

Founded in 1986 in a 300-sq.-ft. building with half a dozen employees, Jackson, Mich.-based Classic Turning's name reflects its original focus on lathe work for aerospace, medical and automotive customers. Today, Classic turns and otherwise machines a variety of hydraulic-hose end fittings and fuel-handling couplings, as well as a range of other parts such as racing shock absorber components. In addition, the shop has expanded its milling capabilities and makes retrofit airframe components, various robot end effectors and other milled products. Typical workpiece materials are stainless steels, titanium and aluminum. Currently, the business occupies a 30,000-sq.-ft. facility, working two shifts a day

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and has 70 employees.

Lot sizes vary. "Typically, they're in the neighborhood of 25 pieces. I would consider 1,000 pieces a big run," said Scott Brockie, president. "Especially in the aerospace business, our customers regularly ask for onesies and twosies." Small lots have been Classic's niche since Brockie began to manage operations in 1992, when the shop had four turret lathes, three secondary lathes, two CNC lathes and two Bridgeport mills. At that time, Brockie said, "my specialty was drop-ins. A three-piece job—we'll have it done tomorrow."

Then, in the mid-1990s, the competitive landscape began to change. Last-minute small jobs alone were not enough to support growth, and Classic's shop practices prevented it from effectively competing for 100- to 500-piece production jobs and long-term supply agreements that would provide consistency. The shop attempted to stick to its tried-and-true methods, but pressure from a major customer as well as local competitive forces prompted a move to cellular manufacturing in 1997.

Close-up of parts produced in the drop-in department.

"We were losing business to the competition because our biggest customer started giving out long-term agreements to shops that were putting processes in place to reduce costs and lead time," Brockie said. The large customer, in fact, called its local suppliers together to urge them to adopt lean manufacturing methods. At that time, Classic had 24 employees and 13 CNC machines. "I went to all my employees and said, 'We are going to work together and not get rid of anybody, because if we do it right we can grow,'" Brockie said.

Making the Move

The basis of Brockie's lean manufacturing strategy and cellular machining tactics is one-piece flow: do a part from start to finish in one cell. The layout of Classic's first few cells was based on the nature of the parts the shop was making. "Nearly everything we did involved turning two ends on a part, then putting a hole in it, or a hex, or something like that, with a mill," Brockie said. At that time, the shop had two mills and 11 lathes, so the first two cells consisted of two lathes and a mill. One operator ran each cell, and produced a part from start to finish.

The transition wasn't easy. "When we first went to cellular machining, we had

a couple of guys quit," said Mark Epperly, contract production department supervisor. "They said, 'One guy running two machines? I ain't doing that.'"

But the cellular methods proved to be much more efficient, and produced more versatile operators. "We used to have lathe operators and mill operators," Epperly said. "Now I'm giving them the chance to learn more, earn more money and be better. They are pretty proud of the fact that they can set up two lathes and a mill in a couple of hours."

As its cellular focus evolved, Classic bought more equipment. The shop now has 54 CNC machines, including more than 30 Mazak turning centers and 13 Haas mills. Brockie said he has a goal of buying two pieces of equipment a year to take advantage of the speed and reliability newer equipment provides. Surprising evidence of the shop's continual growth is that Brockie just now "is getting to that point where I have to start thinking about getting rid of older equipment because it is starting to wear out. Up until now, I never had any machines that wore out and had to go. We take very good care of them." Brockie said he buys equipment based on similarity of use, which permits quicker cross-training of operators.

During the implementation of cellular manufacturing, Brockie arranged the shop into four departments: drop-in, which handles short-deadline work; contract production, dedicated to longer and standard lead-time repeat runs; forging, which machines fittings from forged blanks; and milling, where parts requiring extensive milling are machined.

Customer requirements determine which department processes a part. Classic's standard lead time is 2 weeks. Parts needing quicker service are evaluated to see if capacity exists to make them in the contract production department. If not, the job goes to the drop-in department, which currently is made up of five cells. "Ninety-nine percent of the time we can produce the complete part in a drop-in cell and are able to ship the next day," Brockie said, adding that 25 to 35 percent of Classic's business is dependent on drop-in work. He noted that about half of the drop-in jobs are short-deadline repeat business.

Contract production at Classic consists of runs from 25 to 200 parts. Epperly said the drop-in department, supervised by Steve Carpenter, handles the single-digit part runs, but "sometimes when he gets busy they throw some of them my way. We're versatile."

Classic presently has six cells in

President Scott Brockie (left) in the contract production department with machinist David Brooks.

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its contract production department, four cells in the forging area and five in milling. Cell configuration varies depending on part requirements. Four cells in the drop-in department have two lathes and a mill, and one contains two lathes. In the contract production area, five cells are set up with two lathes and a mill, and a new cell has two twin-spindle turning centers with Y-axis capability. Three of the four cells in the forging department have two lathes and a mill, while the fourth forging cell has three lathes, permitting the manufacture of T-fittings (with three turned ends) in a one-piece flow. The milling department is set up with two mills per cell.

Overhead view of the contract production department. In the foreground is a two-machine cell recently set up to machine a family of titanium nuts.

The configuration of the Classic shop is fluid, to say the least. Brockie is currently acquiring equipment to build two drop-in cells comprised of two lathes and two mills. "We are starting to get into more complex work, where the part needs to be milled into a shape first, and we need two mills to do that, followed by two lathes," he said. Other complicated parts require two lathes for initial work, followed by processing with two mills. The new cell will eliminate the need to mill a batch of parts in the milling department and then move them across the shop for turning, or vice versa.

Cellular machining also helps Classic optimize finished-part inventory and scrap. Previously, an operator would complete a lot of parts before passing them on to the next machine in the process. "That normally meant that I had a lot of product partially done, sitting, waiting for the next operation to work on it," Brockie said.

The method also required running extra pieces as setup parts for the next operator, and to replace the part or two that might be scrapped in subsequent operations. On a 10-piece order of an expensive titanium part, for example, two extras would be machined out of titanium, as well as two out of aluminum for setup. If parts were scrapped during the process, Brockie said, "at the end, I hoped to God I had the 10 pieces." Or perhaps all 12 would survive, and unsold parts would sit on the shelf. With one-piece flow, he said, "if we scrap one, we make one more and we're done, and we don't have any extra parts. We're utilizing material a whole lot better, and not carrying any 'dead inventory,' as I call it."

Cell Schedules

The machines are just one portion of the strategy. Scheduling the work among them is crucial. Even before the move to cellular machining, scheduling was a challenge. "I had a full-time job just trying to keep the schedule balanced so that each operator standing in front of a machine had something to do to keep them productive," Brockie said. "I spent a lot of time making lists on paper for everybody."

Now, Brockie said, "we have 54 CNCs and 70 employees doing four to five times the work we were doing before we changed. I still do all of the scheduling and spend less than half the time I did back then."

How? One part of the answer is job-scheduling software. Classic uses Job-

Molding machinists

In these times of Playstation and MTV, it's hard to get young people interested in actually making things in a machine shop. Classic Turning works closely with Jackson, Mich., community organizations in encouraging careers and training in manufacturing.

Scott Brockie, president of Classic, is involved in an apprenticeship program just introduced by the Jackson Area Manufacturing Association. He's also been on the advisory board of the Jackson Area Career Center, the school district's vocational-training department, for 8 years. Classic has set up an arrangement with two local high schools and the career center to provide $2,000 in scholarships each year to students pursuing manufacturing careers. Minimum requirements include working at Classic in a co-op arrangement. Brockie said the programs have been influential in developing new manufacturing talent.

Steve Carpenter (left), drop-in department production supervisor, discusses part details with Eric Coolbaugh, an apprentice machinist.

Regarding retention of skilled and valuable workers, Classic plays to its employees' "inner racer," among other things. "I have a lot of employees who are into car racing and I like to let them do different things," Brockie said. He permits employees to use company machines during off-hours to make their own parts. "It encourages learning," he said. "When somebody is making their own part, they learn about being careful with the material, getting the first one right and managing their time."

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Boss from Exact Software North America. "The way we used to do it, I knew what was due today, and I knew what was due tomorrow, and as I quoted stuff for next week I just hoped I didn't overbook," Brockie said.

Now, he can check the status of current jobs and schedule new ones with the software, and can also call up a graphic representation of the shop floor on a computer screen and see the jobs currently being machined. "A lot of our cells are set up similarly, so if one is booked, we are able to move the job to a different cell," he said.

Another scheduling tool is a Classic Turning-developed, computerized version of the traditionally wall-mounted "whiteboard" found in many shops. Epperly said he uses the foreman's report from JobBoss and the whiteboard to balance jobs among the cells. "The software tells me my load," he said. "I use it to grab a job, open it up, see what it is, if it's going to oursourcing or not, what kind of material it uses, and how many hours it is scheduled for." He can then name the day and time a job should start, and, often, if it can be paired with other jobs. "Sometimes, if I get a little bit ahead, I see two jobs that match up and I can save myself an hour on the setup time by running them in the same cell and keeping the same size stock and same tools," he said.

Epperly emphasized the benefits of shop-wide access to the whiteboard. "By consulting the whiteboard, the material-supply guy can learn when a job will run and, therefore, when to get the stock to the cell," he said. "The toolcrib guys go by the whiteboard, put the tools in the cart and roll the cart to the job. We don't want operators to have to be looking for things."

For each new job, Classic develops a tool sheet that helps speed setup when the job repeats. To issue the tooling, the shop has a vending machine that facilitates tool inventory management.

The scheduling system enables Classic to balance its workload in innovative ways. It has long-term production agreements with one of its largest customers for more than 600 part numbers. A Classic employee can access the customer's computer system and determine lot requirements and delivery dates for any of the parts. The information is entered into the shop's internal KanBan card replenishment system, which is designed to take advantage of open machine time to produce the parts in advance. The result is 1-day lead time for parts requested under the agreements, and more balanced utilization of Classic's machining capacity.

Shop-Floor Programming

In another distinctive approach, all of Classic's programming is done at the cells by the operators. Because first-time parts often come to Classic through the drop-in department, operators there write new programs on a daily basis. Brockie said Classic has about a dozen people trained to do it all: program, determine tooling, set up and run the part. "That's our niche," he said. "I never have a bottleneck anywhere. It costs me a little more, but it

gives me a quicker turnaround by having more people trained."

The programs are saved to a file server, which is backed up daily. Subsequently, the majority of the parts made in the contract production area are machined with proven programs. "About 60 percent of the work we do repeats sometime or another," Brockie said. The programs are transferred via wireless laptop computers from the machines to a server. There they are stored in Camlink storage software from Griffo Brothers, which is designed for use with the Mazatrol programming system that dominates in the shop.

In the contract production department, a cell comprised of three lathes produces T-fittings from titanium forgings (inset).

In the pursuit of better responsiveness and efficiency, Classic continually examines and modifies its procedures. Sometimes the examination results aren't great. For example, an attempt to dedicate cells in the contract production department to specific workpiece materials didn't work. "The jobs never came in the right order," Brockie said.

What did work was designating two cells in that area for larger parts, and two for smaller parts. Machines set up for the bigger parts can also handle smaller ones, increasing flexibility.

And when customer demands call, Classic answers. Brockie uses the new cell with two twin-spindle turning centers with Y-axis capability for machining titanium nuts. The nuts constitute a large family of parts whose similarity results in reduced setup time, enabling Brockie to aggressively price the job for his customer. One operator runs both Mazak Super Quick Turn machining centers, turning out a different nut on each machine during the day. The machines also run unattended for 4 hours each night. The family of parts was moved to the new cell from a three-machine cell in the contract production area.

John Greenman, toolcrib manager, loads a tool cart with tooling and accessories designated for use in a specific machining cell.

"The goal was getting 60 percent of the output of the three-machine cell on each machine," Brockie said, "but we get 90 percent of the output of the three-machine cell on each new machine, plus 4 hours of unattended operation each night."

Considering the short-run volume and configuration of the parts made at Classic, optimizing cutting speeds, feeds and tool life is important, but not always critical. "Even the best tool grade to use varies, depending on how we are holding the part and if time is worth more than the tool life," Brockie said. The ability to group similar parts in a cell helps by enabling Classic to use one tool on many jobs instead of changing tools with every job change. Brockie noted that Classic generally doesn't employ quick-change tooling systems; three to four positions in the machines' eight-position turrets feature standardized holders so operations can be changed by simply swapping inserts.

Despite unimpressive earlier attempts to standardize production cells by materials, Classic is working on developing specialized tooling and cutting parameters for the titanium nut cell. "With parts being so similar and material being the same, we bought special coated drills for making holes in the side of the nuts," Brockie said. Classic is also doing time studies on tool life in order to expand the cell's capacity for unattended machining.

Classic offers responsiveness that most competition—no matter where it is located—can't provide. "We haven't seen overseas competition affect us at all," Brockie said. "We have found that with the small-quantity orders and the short lead time, it would be very hard for their product to ship in the time that we can make it and deliver it."

Brockie lists his biggest challenges as finding and training good employees (see sidebar, page 32) and rising costs. And as commodity costs rise, customers request price reductions. "We have no choice but to continually look for better ways of doing things," he said. "We feel we stay competitive by constantly trying to improve the processes that we do. We listen to our customers' needs and are continually trying to adapt to them."

For more information about Classic Turning Inc., call (517) 764-1335 or visit www.classicturning.com. △