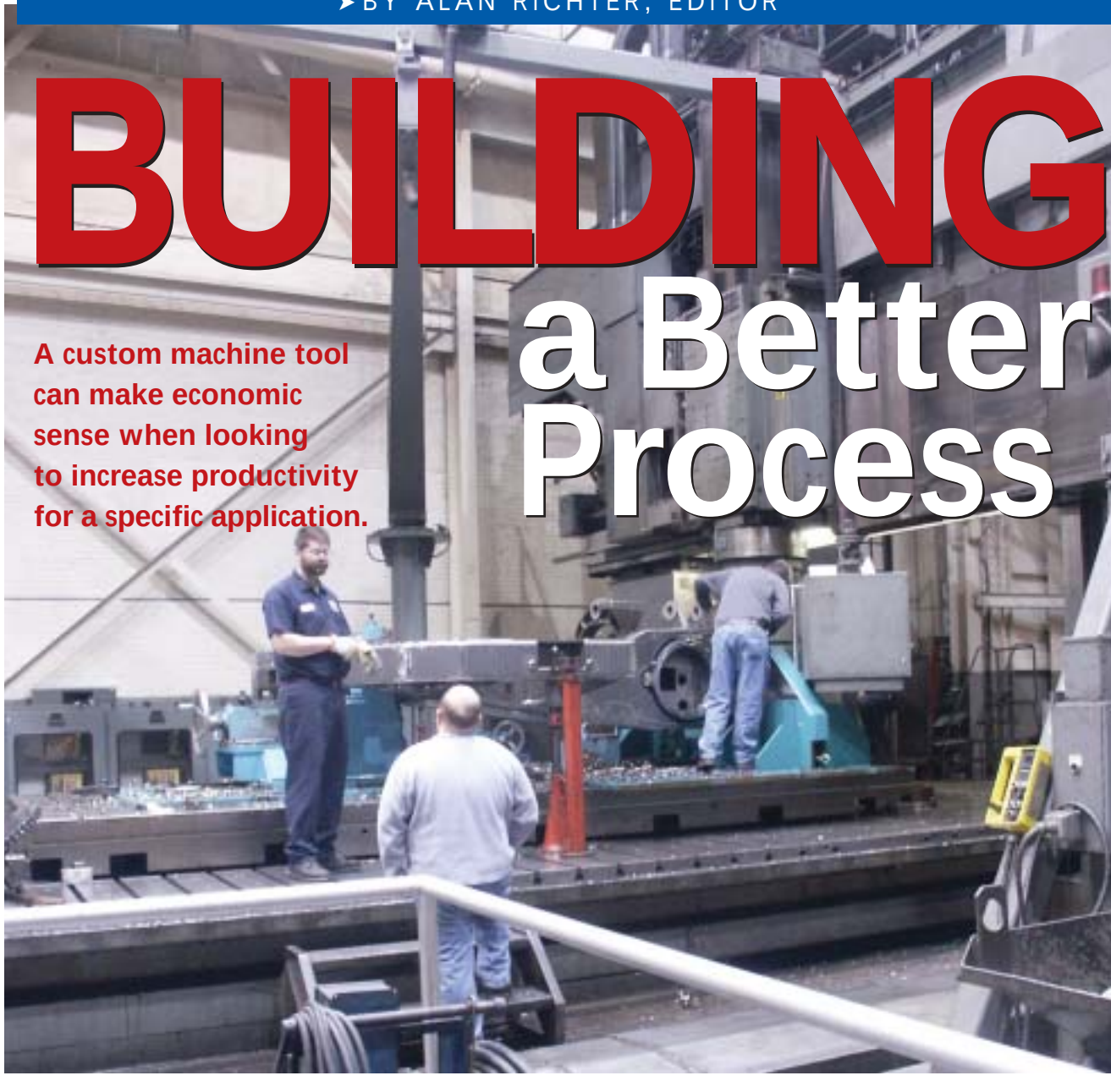
➤BY ALAN RICHTER, EDITOR

BUILDING a Better Process

A custom machine tool can make economic sense when looking to increase productivity for a specific application.



A. Richter

Standard CNC machine tools are ideal for job shops producing whatever-comes-through-the-door parts. But when boosting productivity for a specific application is the goal, purchasing a custom piece of machinery engineered from the ground up might be a better choice.

"Basically, the customer has two choices: He either buys something out of a catalog or he buys equipment specifically for making his part," said Tom Van Horne, product manager for CNC turning at Bardons & Oliver Inc., a Solon, Ohio-based builder of standard and custom lathes and turning machines. "The catalog sellers say, 'OK, here is the machine we are selling today. Do you think you can get your part on it?' Our customers come to us and say, 'Here is the part or here is the process we are trying to achieve. Quote us the machine.'"

Sometimes, a customer doesn't have a choice. "Standard equipment in a lot of cases won't do the job," noted David Duquette, president of New Century Cos. Inc., a Santa Fe Springs, Calif., builder of application-specific and standard CNC vertical and horizontal turning centers. When it comes to producing large and awkward parts, his sentiment is usually true. Duquette recalled one customer's application that involved drilling 140 holes around the outside of a ring that measured more than 100" in diameter.

"When they looked into bridge mills, the size of machine was astronomical and the price was astronomical," he said, "and, generally, there was only one ram, or one head, to do the drilling. So we constructed a machine from scratch in which we put a rotary table under a partial gantry and they were able to drill

two holes simultaneously and increase productivity about 900 percent."

In other cases, standard machines can do the job, but "sometimes you'd have to buy three standard machines, which would be more expensive than the one custom machine," Duquette said. "For example, we build a machine to slot six 30' shafts simultaneously while a standard mill machines only one at a time."

For whatever reason it is needed, a custom machine is typically not the lowest initial-cost option. But a custom machine's ability to advance throughput enables an end user to achieve a faster return on investment. "Our customers look for a payback in 2 years or less," said Rick Moscarino, Bardons & Oliver's vice president of engineering. "I see some trying to do it in a 12-month period—that's a hell of a challenge."

The Building Process

Although Moscarino noted that the applications for custom machines and, therefore, the variety of custom machines is "all over the map," the need to have a tight collaboration between the builder and the customer when designing the machine and specifying the tooling is fairly constant. "We do have customers who are pretty adept at their machinery and can come in and tell us exactly what they want us to do," he said. "But, typically, it's a collaboration between us, the builder, and the customer to review the application and optimize the equipment to suit his needs."

When designing and building a custom CNC turning machine, Moscarino said B&O starts with a base machine of a certain size and a selection of spin-

Standardized customization

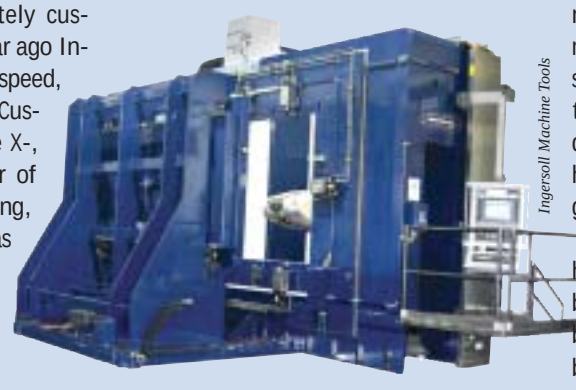
Historically, Ingersoll Machine Tools Inc. has been known for its "white-paper engineering," meaning a machine tool is designed from scratch. Although Mike Reese, Ingersoll's director of sales, indicated that a strong demand still exists for completely customized machines, about a year ago Ingersoll launched a line of high-speed, profile-type milling machines. Customers are able to specify the X-, Y- and Z-axis strokes, number of tool-magazine modules, fixturing, and spindle speed and power, as well as choose from an array of parts-handling systems.

"It's a standard machine with a wide range of choices, but the performance of it is not of a standard machine," Reese said.

What's unique for Ingersoll is offering a machine that can be built and delivered in 6 months without a customer in mind. "We actually have one of these vertical family machines assembled that doesn't have a customer," Reese said. "We did the same thing last year with a horizontal machine (4m × 1.8m) that we ended up selling. The machine was practically complete and all we needed to change was the spindle and pallet system. We were able to deliver a relatively large machine to the customer in less than 5 months ARO."

What's familiar to Ingersoll is the size of the machine. The smallest machine in the profile milling series has a 1-cu.-meter work zone, Reese noted. In addition, a 32,000-rpm, 134-hp spindle is available.

"We supply special solutions using standard machines—not special machines," said Dr. Tino Oldani, Ingersoll Machine Tools' president and CEO, when describing the new line.



Ingersoll Machine Tools

When selecting a machine from Ingersoll's line of profile-type milling machines, customers are able to specify the X-, Y- and Z-axis strokes, number of tool-magazine modules, fixturing, and spindle speed and power, as well as choose from an array of parts-handling systems.

Oldani added that the new line enables customers to wait until the last minute to buy a machine for a specific application and begin production quickly. He said the time to market for Ingersoll's customers has quickened in the last 3 years, which has shortened the planning time for their capital investments. "Now everyone wants faster and better for less price."

One customized aspect of the company's profile milling series is the high level of technical support provided. Reese pointed out that this helps big companies that have downsized and whose remaining employees are wearing multiple hats and relying on outside sources to fill in the gaps.

"It's getting lean," he said. "In the past, where they had equipment engineers and facility engineers, it wasn't much of a stretch for customers to install a machine and do all the necessary things to launch the machine into production. Now, a lot of customers don't have the internal resources to do a good job installing a big machine tool."

Therefore, Reese said, Ingersoll has had to expand its expertise beyond building machines. "We're building buildings for the customer, we're building foundations, we're installing the equipment turnkey, and we're supplying all the toolpaths via CAM, fixturing and cutters. We launch the machines into production, train the operators and then turn over the keys."

And the value-added services don't necessarily stop once the machine is installed and running and training is completed, because not only is the equipment guaranteed, but so are the cycle times, tool costs and surface finishes. At one plant, Ingersoll needed to oversee production, because the customer wasn't sufficiently staffed to achieve the production requirements, Oldani said. "We had their managers step aside and we ran the shop, supplying operators to run three shifts, seven days a week," he said. "They're happy now."

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dle and chuck sizes and customizes the equipment based on the application requirements. Most of its machines have large through-holes, from 3" to 12".

Some of the equipment added to make the base machine a special includes a loading/unloading mechanism, high-pressure coolant system, special drilling package and inspection gear. "A lot of it is modular, but what we do is application driven, so we design what we have to to make it work," said Jim Dalton, B&O's vice president.

He added that the company's custom machines combine operations by adding workstations to increase productivity and reduce handling. "The customer is getting closer to raw material in and finished part out the opposite end."

"A lot of times the parts are big and bulky and heavy, so the more we can do on one spindle, so to speak, the better off the customer is," noted Dalton. In addition, "the parts can get marked up between handlings on different machines and a lot of people can't stand, for appearance sake, marks or nicks or scratches. If we can do it in one operation, it saves them from having rejects or polishing parts."

Although a machine tool customized for a particular application can improve productivity by more than 200 percent, Mike Reese, director of sales for Rockford, Ill.-based Ingersoll Machine Tools Inc., indicated that the additional cost for the customization is generally minimal.

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A custom machine from Ingersoll reduced the machining time for this aluminum vacuum chamber for the semiconductor industry from 800 hours to about 92 hours.

Dying Hard

One of the differences between standard commodity machines and custom ones is their life cycle. "For some of the catalog machines, customers think they're doing great if they get 5 years out of them before they throw them out," said B&O's Van Horne. "We build everything with the mindset that it is going to run 20 years."

Reese concurred: "We're not going to try to design a machine with a life cycle of 5 years. When people buy an Ingersoll machine, they're looking for a machine that's going to go 20 years. There are machines older than I am—and I'm 38—that are still out there pumping away and making parts."

Longevity, however, presents the prospect of technological obsolescence. "The structure of the machines and the way systems are something we don't normally have to deal with," Reese said. "Normally, it's the control, and customers want a little bit more spindle speed than what they bought, say, 15 years ago."

B&O's Moscarino added that "that's why you see smaller, commodity machines being discarded after 5 or 6 years of usage. It doesn't pay to update the controls or go through a complete refurbishment."

Also, as products are introduced into—and removed from—the marketplace more quickly than in the past, a machine built for a specific application needs to be spec'd so that it can adapt to those changes.

"You need to buy a machine with a work envelope big enough to accommodate future projects and applications," instructed Dr. Tino Oldani, Ingersoll's president and CEO.

It helps that the end users buying custom machines are generally Tier 1, and other large, manufacturers that know they're going to be in business for at least 20 more years, making relatively the same kind of parts.

"Some of these systems were designed to make parts according to very specific requirements," said Van Horne. As an example, he cited jet engine components where the names and numbers might change for the family of parts but the basic part premise doesn't. "That machine would be viable as long as they're making that style of part."

Special Considerations

Although builders of standard machine tools often have some experience

Bardons & Oliver

Bardons & Oliver starts with a base machine of a certain size and a selection of spindle and chuck sizes and customizes the equipment based on the application requirements.

The following companies contributed to this report:

Bardons & Oliver Inc.
(440) 498-5800
www.bardonsoliver.com

Ingersoll Machine Tools Inc.
(815) 987-6000
www.ingersoll.com

New Century Cos. Inc.
(562) 906-8455
www.newcenturyinc.com

with customization, they're probably not the best bet when shopping for a large, application-specific custom machine, say custom builders.

"You would never want to go to a company whose core business is selling commodity machines and buy a special machine," Reese said. "Most of the time, they're smart enough to realize that the requirements fall outside their expertise, and they will tell the customer 'buy our standard offering' or they will pass on the project. Once in a while, a commodity manufacturer is lured into [thinking] that they can build a custom machine. Those projects usually don't turn out well. If you're going to buy a custom machine, go to a company that builds custom machines."

When buying a custom machine, in addition to due diligence, a customer needs to have an entrepreneurial spirit. "If there is no risk, you won't go anywhere," Oldani emphasized. "You need to have the guts to make investment decisions to get better and keep your customers and your employees."

According to New Century's Duquette, more manufacturers are willing to invest in custom machines. "Our quotation level has been very active lately. I think 2005 is going to be a banner year." △