Rigid rotary tables are well known for their ability to reduce cost and increase accuracy. When added to a three-axis machining center, rotary tables add a fourth or fifth axis, making the machine an affordable alternative to a full five-axis machining center. Of course, while adding axes may improve productivity, use of less rigid rotary tables can hinder speed and accuracy. Obviously, the key to fast and accurate machining with a rotary table is holding a part rigid to the table. Without rigidity, vibration is introduced to harmonic levels, creating chatter and reducing the quality of surface finishes.

Fluke Metal Products Inc. (Bothell, WA) had experienced rigidity issues with its rotary tables and replaced them with more rigid Nikken rotary tables. Fluke, founded in 1957, employs a staff of 50 at its 15,000 ft² (1393-m²) facility. The shop manufactures precision-machined parts for the medical device and implant, electromechanical, and aerospace industries.

Fluke produces precision workpieces from a single prototype part to quantities of 10,000 parts per job.

“In our industry, it all comes down to how rigid the hold is when you’re in the cut,” explains Larry Fluke, president, Fluke Metal Products. Not every rotary table is of equal rigidity. In fact, rigidity issues with the company’s last rotary tables prompted Fluke to switch to the Nikken brand. All of Fluke’s four- and five-axis Kitamura CNC milling machines are installed with Nikken rotary tables, which replaced less rigid existing rotary tables. The more rigid Nikken rotary tables enabled Fluke to achieve greater machining accuracies and speeds in producing its parts.

Recently, Fluke was approached by RJC Enterprises LLC (Bothell, WA) to produce a medical device quickly and affordably. An OEM supplier of fiber optic sensors and systems for medical applications, RJC components were being produced in a shop that did not have five-axis milling capability.

“It was definitely a matter of response time. Fluke builds parts sooner and less expensively due to its rotary tables,” explains Jim Hartl, manager of product development, RJC Enterprises.

Specifically, RJC required the milling of a fiber optics pressure assembly, or optic block, used in an intra-aortic balloon catheter. This device consists of various components that are installed in relation to one another to assist with the flow of blood in patients with weak hearts. The portion of the assembly manufactured by Fluke consists of a
two-piece base and cover. Machined from 6061-T6 aluminum, the final part dimensions are approximately 1.28 × 1.3 × 0.66" (32 × 33 × 16.7 mm). General dimensions are ±0.003" (0.08 mm) with critical features ranging from 0.0002 to 0.0005" (0.005-0.013 mm) total tolerances.

“We machine RJC’s part complete--five sides with one operation--for reduced costs, while holding the integrity of the dimensions,” continues Fluke. “Nikken rotary tables hold 0.0002" [0.005-mm] profiles, and that is impressive.”

“In our industry, it all comes down to how rigid the hold is when you’re in the cut.”

For four-axis machining, Fluke uses the Nikken CNC180-FA rotary table. This compact model features a faceplate diameter of 180 mm and rotation speeds of 44.4 rpm. It is suitable for a wide range of applications from a small drilling
Nikken's single-axis back-side motor mounted 5AX130-FA rotary table is used for five-axis machining at Fluke. While this model also features a faceplate diameter of 180 mm and rotation speeds of 44.4 rpm, it is designed for machine tools with limited space in the Y-axis and is suitable for indexing and rotational milling. “Rigidity, accuracy, and speed of rotation are the top three things we look for in a rotary table, and Nikken fits them all,” states Fluke.

Quality casting material in combination with a patented ground carbide wormscrew mechanism provides a balanced environment for rigid machining. The carbide worm system in the rotary table uses a carbide wormscrew and ion-nitrided worm wheel, rather than a conventional bronze or bronze-alloy actuation mechanism. These result in a reduction of friction and wear by up to eight times. The wormscrew consists of a less brittle V-grade form of carbide, while the wormgear is ion-nitrided to a depth of 0.1 mm and an external surface hardness of Rc 68. These properties, as well as a steel way hardened to Rc 58-60, all work to enhance system rigidity and longevity.

Nikken rotary tables are also highly effective in machining increasingly popular 6AL-4V titanium. Stronger than steel, yet lighter than aluminum, this titanium requires a true rigid set to achieve desirable finishes. ME
Shop Bets on New Technology

Sometimes in the life of a metalworking shop, a single machine purchase will make a huge positive difference. If it’s the right machine, that is. Identifying that right machine and integrating it into your business is generally not a simple process. Typically, it requires experience, expertise, and just a touch of boldness. A recent collaboration between Unique Tool and Manufacturing Co. Inc. (Randleman, NC) and machine tool distributor Morris South (Charlotte, NC) underscores that point. Unique Tool worked with Morris South to identify new technology for its production and new business needs.

Unique Tool specializes in manufacturing complex parts that are shipped to customers throughout North America, including Mexico, and Europe using the latest technology available.

Founded in 1986 by father and son Jimmy Scott and Vincent Scott, Unique Tool is a 21st century machine shop...
that specializes in the manufacture of complex parts that are shipped to customers throughout North America and destinations in Europe and Mexico. Along with milling, turning, grinding, jig grinding, jig boring, EDM, and other equipment, Unique Tool owns several advanced machines including four and five-axis machines with automatic head changers, pallet changers, and tool changers. The company is also capable of engineering, building, and running-off entire automated systems for their customers.

“We take every opportunity to capitalize on our strengths in precision machining and engineering in order to boost our competitive position,” says Vincent Scott, CEO of Unique Tool. “That includes being alert to ways that new technology can boost our efficiency and profitability,” he adds.

That’s exactly the approach taken by Unique Tool in the case of a family of large diameter milling cutters that Unique Tool was producing for one of its key clients. These milling cutters are part of a high-precision tool-change system with a unique design that offers time savings on tool change in comparison with conventional systems. The milling cutters feature a polygonal interface that permits the transfer of higher cutting forces.

“It came to a point where we felt we had to do something. That’s when we called Morris South.”

Unique Tool had been machining the milling cutters along with similar large diameter parts, such as large cams and various tooling and fixturing, on a horizontal lathe. The parts met their customer’s stringent requirements for precision, but increasingly Scott and his father James, co-owner of the company, felt they could do better. Specifically, they were looking for greater productivity and increased automation.

“We were pushing the capacity of the older machine, leaving us very little room to expand our work with large diameter parts,” recalls Vincent Scott. “It came to a
point where we felt we had to do something. That's when we called Morris South.” Morris South, a division of Morris Group Inc., is a leading machine tool distributor, which serves as the exclusive regional distributor of Okuma, Tsugami, Hardinge, Bridgeport, and other prominent brand machine tools. “Besides the machine tools, we provide the in-house applications engineering expertise,” says Morris South president Jerry Rex. “We don’t just pass on a standard piece of equipment from our builder partner, or rely on them for our engineering services. We take the time to understand the customer’s specific requirements before recommending a solution,” Rex explains.

It's an approach that worked for Unique Tool in the past. Three years ago, after working with Jerry Rex and his team to identify and analyze specific needs and possible solutions, Unique Tool purchased an Okuma Multus B300-W turning center with five-axis milling capability from Morris South. The results were dramatic. “Many of the parts that we switched to the Multus had been taking us 20 to 30 minutes to run,” says Vincent Scott. “With the Multus, we typically machine them in nine to 10 minutes now.”

“The Multus turned out to be the most advanced machine on our floor,” Vincent notes.

“Helping the client get the most effective manufacturing technology for his needs, budget, and timeframe is what it’s all about,” says Rex, looking back on the collaborative effort that led to Unique Tool’s selection of the Multus.

Given this history, it was logical for Unique Tool to turn again to Morris South. The Scotts studied a number of CNC lathes and turning centers in the desired capacity range. The Okuma V80R vertical lathe stood out as their first choice. It features open access to speed loading and unloading, quick tool change, fast turret indexing to minimize noncutting time, an optional driven tool system, and easy integration with a number of automated systems, thanks, in part, to the machine’s advanced THINC-OSP control.

THINC uses the power of the Microsoft Windows operating system to combine Okuma’s OSP control with an open architecture, PC-based operating platform. As a result, THINC can access almost any application or peripheral, including factory management systems. It can interface with bar coders, feeders, robots, probes, and tool setters to help streamline production. Okuma’s THINC-OSP control features standard Ethernet capabilities that enable immediate access to online documentation applications or selected internet resources. Communication with established business and production systems is thus immediately available on the factory floor.

Reading about the machine’s impressive capabilities was one thing, seeing it perform was quite another. The Scotts wanted to see the V80R perform, not in a showroom demonstration but on the factory floor. Jerry Rex was able to arrange it, and he and Vincent Scott traveled to a user’s facility to watch the V80R being put through its paces live and unrehearsed, so to speak.

Designed to serve as an efficient means of machining larger diameter workpieces, the V80R boasts a 12-station turret that minimizes adjacent tool interference, offering a variety of options for tool layout. The turret, plus open access, makes tooling changeover easy. The Scotts were impressed by the way the rapid turret indexing minimized non-cutting time, a key concern of theirs. Its 630 ipm (16 m/min) rapid-traverse rate was another positive.

“The Scott's are very thorough and savvy buyers,” notes Rex. “They know you can’t always just spreadsheet machines; it’s not that simple. You’ve got to factor in things like support and reliability, and have a clear focus on what features are most important to you.”

Vincent Scott liked what he saw, and subsequently the V80R was up and running at Unique Tool. The results have been dramatic.

“We've cut cycle times thanks to the higher torque, greater horsepower and rapid traverse rate of the new machine,” says

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Vincent Scott. “We’re able to take heavier chip load and much deeper cuts on these parts than we could in the past, all the while maintaining amazing accuracy,” he adds.

For Unique Tool, another prime selling point of the V80R had been its vertical configuration, making it easier to load and unload parts—particularly heavy parts—than the horizontal lathe they had previously used. The new machine cuts down on load/unload times—in some cases by as much as half—and makes life easier for Unique Tool’s machinists, but as Vincent Scott notes, “It also opens up new business for us.”

“With these heavier parts, we’ve decreased cycle times by as much as 50% and boosted productivity by 40–50%. Plus, we’re able to handle new part configurations that couldn’t be accommodated by the old machine.”

“In the 15 months since we installed it, the V80R has been running as hard and as fast as possible. When we started looking at adding new equipment, we wanted to improve how we handled existing business and open up new work, too.

Now that we’ve got it, we’re definitely considering adding more machines like it in the future.” ME

For more information on Morris Group Inc. Go to www.morrisgroupinc.com, or telephone 860-687-3475.

Technology Proves Indispensable

While older machinery may be adequate to get the job done, at some point the advantages of the latest technology can’t be ignored. This was the case for Monks Manufacturing Co. Inc. (Wilmington, MA), when the company recently recognized it hadn’t purchased new milling equipment in about ten years. Although the company wasn’t encountering a specific problem per se with its existing machines, management suspected that newer technology could improve productivity.

Monks Manufacturing, a contract manufacturer employing 20 people, does about 80–90% of its work in aluminum and a portion in stainless steel. Aluminum parts may include anything from ruggedized enclosures for computers on drilling rigs to sound-system assemblies. Stainless workpieces are used primarily for manufacturing medical parts. Examples include 316 stainless disks with cutouts, small holes, and patterns.

Lee Monks, president of Monks Manufacturing explains: “We felt we were starting to fall behind the technology curve and sought new equipment so we could begin the process of

One of two Feeler HV-1000 VMCs chosen by Monks Manufacturing (Wilmington, MA) that feature the faster spindle speeds, improved CNC control, and engineering available from Methods Machine Tools, it’s go-to machine-tool supplier.
overhauling our technology base.” Monks Manufacturing’s primary goals were to increase spindle speed and have a controller which would handle the new feed rates it planned to use. Even though much of its older technology was still performing as good as the day it was installed, some of the machines were operating at 6000 rpm, a rate too slow for today’s applications and turning times.

“We wanted to cut parts faster and needed a machine that offered faster spindle speeds and improved control to handle the cutting tools we wanted to use. Also, our customers require us to decipher information from 3-D models of large components and parts. Providing this information and programming the most optimal toolpaths require state-of-the-art controls and software which are critical to successfully compete today,” Monks explains.

Monks Manufacturing looked to its long-standing machine tool provider, Methods Machine Tools Inc. (Sudbury, MA), to help revamp its technology. Methods’ machines already accounted for the majority of machining equipment at Monks Manufacturing, including eight Matsuura three-axis VMCs and two FANUC RoboDrill machining centers. “Given our relationship with Methods and their solid service history, it was easy to feel comfortable consulting with their application engineers,” says Monks. “Also, we knew our biggest challenge would likely be the learning curve required to take advantage of all a new controller and machine could offer. We needed a technology partner we could rely on and Methods is our go-to source.”

“We felt we were starting to fall behind the technology curve and sought new equipment so we could begin the process of overhauling our technology base.”

Methods’ engineers evaluated the requirements at Monks Manufacturing and presented the contract manufacturer...
with some options available in the new Feeler HV-Series High Performance VMC line, which features design and engineering from Methods. Monks Manufacturing was both comfortable with Methods’ expertise and impressed with the capabilities and price of the Feeler VMC line. Two Feeler HV-1000s were chosen. The HV-1000s feature a FANUC 18i-MB controller with fourth-axis prep and 150-line look-ahead combined with a 15,000-rpm spindle. The Feeler systems also feature 1 g X-axis acceleration and a 1.9-sec tool change time in either an 800-mm X-axis travel or in a 1000-mm option which Monks Manufacturing chose. A 30-hp (22.4-kW) direct-drive, 40-taper spindle, and 30-tool ATC are standard.

In addition, Monks took advantage of the Methods’ financing program to make the Feeler purchase. “The financing they offered was very competitive and was in line with our expectations. The purchasing process was straightforward and efficient, made even more comfortable since we were working with Methods,” says Monks.

Methods provided training to help shorten the learning curve to utilize the faster spindle speeds, as well as the more advanced tooling and toolholders used on the new systems. Monks Manufacturing also regularly updates its CAD/CAM software to maximize the benefits of using the new machining technology. Since the Feeler purchase, Monks Manufacturing has achieved a more competitive edge. A good example is a job where they make 60–72 parts in aluminum out of 6061 aluminum billets that are 1 1/8” (28.5-mm) thick. On this job, Monks was able to reduce a 2-hr cycle time on a 12,000-rpm machine, down to 1 hr and 15 min by incorporating advances from the radial chip thinning capability provided by the high efficiency 15,000-rpm Feeler machine.

“45 min per part in quantities of 60 pieces, a savings of 45 hr is realized on this one job. Multiply this by whatever your shop rate is and it’s easy to see how this machine can pay for itself within a year,” says Monks.

Monks has been so successful in implementing the technology improvements that the company is already assessing other areas of the shop floor that can be upgraded. “I am confident that in the not-too-distant future we will be exploring even greater spindle speeds in order to make more gains on our competition,” Monks concludes. ME

For more information on Methods Machine Tools Inc., go to www.methodsmachine.com, or telephone 978-443-5388.