

COMPETITIVE PRODUCTION

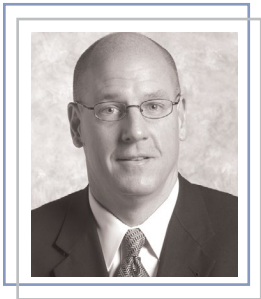
VOLUME 12.1



INSIDE FEATURES



OUT FRONT



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BECOMING NIMBLE, FLEXIBLE AND RESPONSIVE IN YOUR JOURNEY TO GROWTH

For high-precision contract machining organizations, the localized competitive business strategies of previous decades are no longer aggressive enough to succeed in a high-pressure global economy. It's not a simple matter of keeping up with what the shop around the corner is doing. Competitive organizations must think broader by focusing on leading global trends and technologies in order to drive out costs, boost throughput, increase efficiency and improve quality.

Building a competitive contract machining organization requires a machine supplier that supports your shop beyond just the sale and delivery of new equipment that meets your work-zone requirements. Your suppliers must be able to provide you with a deeper perspective of a technology's true value by addressing productivity, quality, tool life, automation, reliability and, most importantly, the bottom-line impact to your business. By focusing less on the specifications of a machine, and more on the impact that it can have on your business, Makino provides you with the support and consultation necessary to focus on what really matters to your customers—per-piece part cost.

To drive costs down and thrive in the global market, precision contract machine shops have to be nimble, flexible and responsive. Most commodity stand-alone machining centers are limited in their production capabilities, and identifying qualified operators who can develop creative solutions for working around these limitations is not an easy task. As such, overcoming these challenges requires new technologies and methodologies—from the adoption of high-performance horizontal machining centers and flexible automation systems to improved fixture and tool management systems and streamlined programming practices.

This issue of *Competitive Production* highlights the journeys of numerous contract machine shops from across the United States as they've deployed advanced machining technologies to drive costs out of their operations and better serve their customers. From high-performance vertical machining centers to highly flexible pallet-handling systems, these companies have rationalized and realized the true bottom-line impact of improved throughput, setup reduction, dynamic production scheduling, tool management, minimized work in process and reduced in-direct labor requirements. These companies exemplify the determination and clarity of vision necessary to overcome the toughest challenges facing North American contract machine shops today.

The next time you find yourself looking down the street, remember that your true competition isn't just around the corner, but far beyond the horizon.

CONTENT

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OUT FRONT

ON THE HORIZON

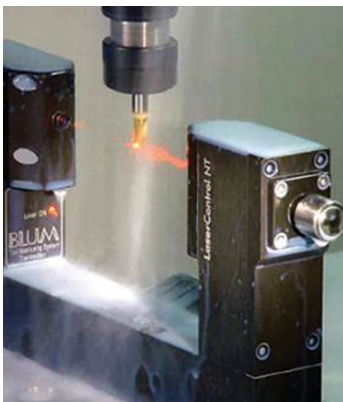
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MANAGING GROWTH

FEATURED STORIES

PROCESS INSIGHTS

ON THE HORIZON



JULY 16, 2015

Webinar: Broken-Tool Detection: Good, Better, Best

Broken-tool detection can be very beneficial—ensuring that the tool is functional—and preventing potentially dangerous, and costly, machine “accidents” part-quality issues and lost production. However, broken-tool detection—if not implemented correctly—could also increase part cycle times—escalating manufacturing costs. This webinar focuses on various methodologies, techniques, tools (i.e., “Good – Better – Best”) and the latest technology developments (including digital imaging) in broken-tool detection.

Register for this webinar at makino.com/webinar

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MANAGING GROWTH



IMPROVING EFFICIENCIES THROUGH AUTOMATED PALLET-HANDLING SYSTEMS

Whether running a large or small shop, you continuously look to improve efficiencies in order to compete—whether on the global stage or against the company down the street. One of the best ways to accomplish real business growth is through [automated pallet-handling systems](#), which enable improved flexibility and more cost-effective production of parts.

The biggest opportunity with an automated pallet-handling system is that it maximizes equipment utilization. In a traditional dedicated production cell, each machine is tied to a specific operation in the part cycle. With multiple load and unload processes, and varying cycle times between each operation, the machines are unable to realize full utilization. Additionally, when one machine goes down, the full cell goes down.

With an automated pallet-handling system, the need for dedicated production is eliminated. Any and all processes can be deployed across every machine with little operator intervention. This means that individual assets have no impact on one another, leading to maximum usage. One machine is not dependent on the output. Even if a machine goes down, 75 percent of full-production part flow is maintained because the automated rail can transport parts to be machined on other equipment.

Further, equipment utilization is maximized in an automated pallet-handling system by eliminating machine setup for non-cut time. Doing away with machine setup is accomplished through reducing time spent in repetitive steps, such as part loading and unloading, through faster part changeovers, improved workflow management, eliminating material shortages, managing economic order quantities, streamlining first-part checks, adjusting part mixes and eliminating human error and uncertainty. An additional bonus is that as shops increase productivity and decrease lead-time, work in process (WIP) and inventories are decreased, and hours of operation can be extended through unattended machining.

Automation can also allow for single-setup processing flexibility to decrease labor requirements that were spent on



redundant setups. It can also help reduce economic order quantities and minimize on-and-off inventories. Product life cycles are always unpredictable with fluctuations in capacity demands over time. Traditional manufacturing methods can easily create overutilization or underutilization of equipment. Automated pallet-handling systems offer flexibility with single-setup processing that allows for agile part production where capacity can be adjusted in increments as the market requirements change.

For those businesses looking to reduce cycle time and scrap rates, or take manufacturing lead-times from weeks to just hours, automated pallet-handling systems can have real impact. The best results are increased responsiveness to the market due to the flexibility that these systems allow. The infographic on the following pages illustrates the economic advantages and increased efficiencies that these automated pallet-handling systems can bring to your shop.

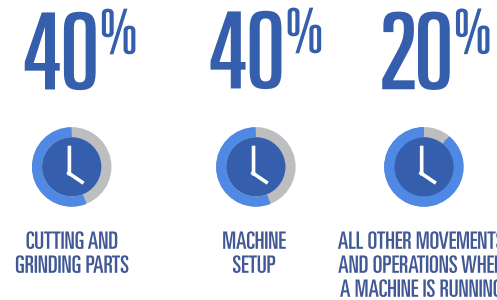
THE BUSINESS CASE FOR AUTOMATED PALLET-HANDLING SYSTEMS

YOUR ROUTE TO NEW BUSINESS

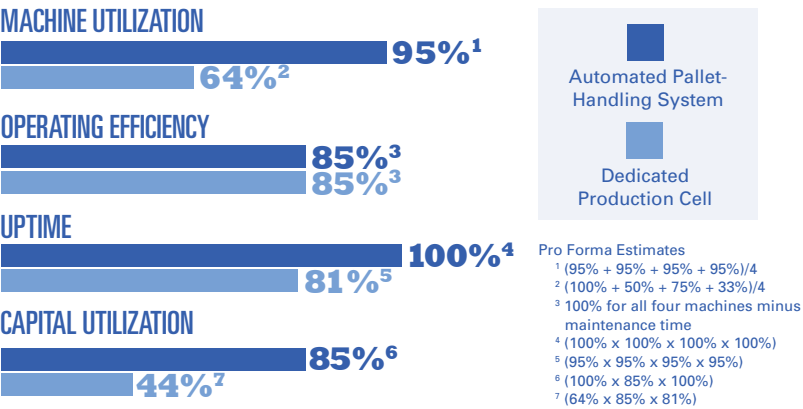
Adding automation systems to high-performance machining centers can enable businesses to produce better quality parts faster while reducing labor costs. It's the best way to make traditional machine shops more competitive.

CUT OUT UNPRODUCTIVE MACHINE TIME

Less than half of the hours available to an average machine shop in the United States are spent actually making chips:



BETTER UTILIZATION A shop operating four machining centers with automation can expect *significant* productivity and capacity gains compared to operating four machining centers manually:



SCORECARD: TRADITIONAL VS. AUTOMATED

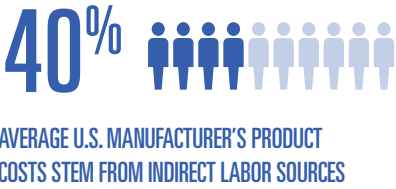
By eliminating setups and maximizing machine utilization, automation enables shops to obtain the greatest profitability from available production hours:

		DEDICATED PRODUCTION CELL	AUTOMATED PALLET-HANDLING SYSTEM
UTILIZATION		44%	85%
HOURS PER YEAR	1 SHIFT 2 SHIFTS 3 SHIFTS	2,520 7,040 10,560	6,800 13,600 20,400
BILLINGS PER YEAR @ \$50/HOUR	1 SHIFT 2 SHIFTS 3 SHIFTS	\$176,000 \$352,000 \$528,000	\$340,000 \$680,000 \$1,020,000

CONTROL LABOR AND OTHER COSTS

Automation enables machine shops to reduce or eliminate costs while mitigating the challenges of identifying skilled labor through technology:

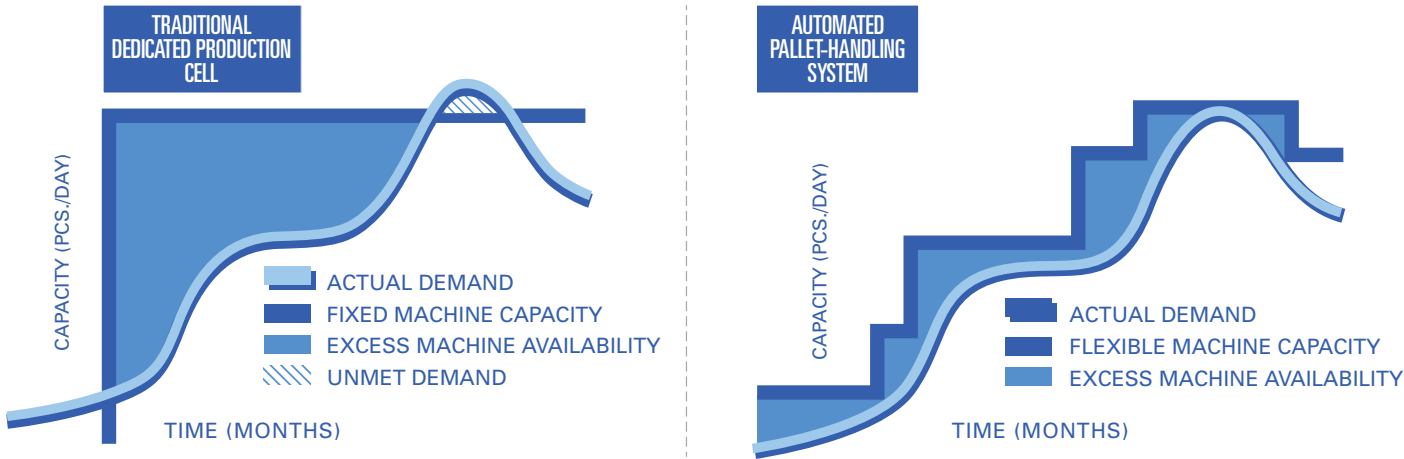
INDIRECT LABOR



AUTOMATED PALLET-HANDLING SYSTEMS provide shops with greater production, workflow and inventory flexibility than traditional dedicated production cells:

- Elimination of setups and indirect labor
- Dynamic scheduling for true pull-demand system
- Reduction of work in process and completed inventory
- Enhanced tool management and monitoring
- Rapid modular expansion for growing capacity demands

PRODUCTION DEMANDS OVER THE LIFE CYCLE OF A CONTRACT can be unpredictable. Automation provides the agility to reduce or eliminate capital waste with true pull demand:



MORE WAYS TO GROW YOUR BUSINESS

WHAT YOU'RE REALLY BUYING

Automation is more than just an investment in production capacity; it's an investment in your shop's efficiency and ability to meet customers' changing demands. With automation, machine shop owners are really investing in efficiency:

- Improved capital utilization
- On-demand production flexibility
- Consolidated floor-space consumption
- Reduced inventory and WIP
- Elimination of redundant setups
- Improved labor efficiency
- Shorter lead-times
- Improved part quality
- Enhanced measurement and reporting
- Rapid expansion for new revenue/growth

RUN UNATTENDED

Day or Night

Automation enables you to realize additional revenue through unattended processing and lights-out operation—add more shifts without the extra labor costs.

HIGH-PERFORMANCE PRODUCTION VERTICAL

HELPS ALL AXIS EXCEL IN PROTOTYPE ORDERS



Small-business owners like Tony Chastenay at All Axis Research & Development LLC know that acquiring new orders is crucial to growing the business. It is also part of building a better life for owners and for the employees who devote so much energy and passion to work on a daily basis.

"I know it's hard to have a career that is stable in this day and age," said Chastenay. "And I realize that there are also risks in working for a small business. I want to make sure that taking that risk is worthwhile. I want my employees to have a workplace where they feel secure, and that our customers can feel confident they are getting the quality products that they expect, delivered on time. That is what matters most."

Technology is the company's competitive weapon to achieving this goal, and Chastenay employs it to efficiently create prototype parts for clients in the electronics, aerospace, glass and industrial printing industries.

To handle the sheer diversity of materials and parts it works with, All Axis requires flexible and reliable

"We want to be the best, so we try to buy the best."

equipment, like its [Makino PS95 vertical machining center](#). This equipment has not only helped All Axis handle this kind of part variety, but it has also reduced cycle times by up to 50 percent over previous equipment, showing customers that the company is committed to completing jobs on time, on budget and with exacting tolerances.

"Making prototypes is not a cookie-cutter process. Each has its own challenges," said Chastenay. "To handle this kind of work, you can't just have talent. You need modern equipment, too. We want to be the best, so we try to buy the best."

HANDS-ON SUCCESS

Ever since high school, Chastenay has enjoyed machining and working jobs where he was able to use his hands. He has always been good at tinkering with cars, trucks and other heavy equipment. A trade class in high school piqued his interest early on and drove him to excel in this type of career.

After high school, Chastenay worked at a few local companies, including an aerospace manufacturer that handled many exotic metals. When a friend recommended an open development position at another company, Chastenay found himself eager for the challenge. He started working as an experimental machinist and gradually moved up to supervisor and then into a management position.

"I stayed for 14 years, and it was there that I learned a lot about engineering and design," he said. "I enjoyed handling the more challenging projects and overseeing the experimentation, test machining, data collection and feedback."

When the company decided to discontinue its experimental machine shop, Chastenay saw a new opportunity. There was continuing demand in the market for producing prototype products, and he already had a Bridgeport machine at home for performing side jobs. Chastenay decided to go into business for himself at All Axis. He had the blessing of and encouragement from his former employer, and he qualified Chastenay's business as a vendor before Chastenay even left the company.



Owner Tony Chastenay (center) with development machinists Kevin Aucoin (left) and Chad Summer (right).

"I had a great transition to business owner," he said. "Today I still work with my former company on new designs."

At All Axis, Chastenay handles engineering and proves out products. The company creates prototypes for some businesses and often manages bigger runs. The company also makes fixtures for the parts it is designing. The work at All Axis has continued to evolve as Chastenay and his colleagues learn more about the capabilities of their equipment.

As it worked on many prototype and small-batch jobs with quantities under 10, All Axis found itself performing a lot of setups and programming.

"We found that we needed more capacity and better performance from our equipment," said Chastenay. "We were already stretched thin on our schedules. In fact, we had three of our commodity vertical machining centers already scheduled out for the entire year."

Running its existing equipment nonstop meant that All Axis didn't have a

"We are finding that we can get the highest metal-removal rates on the PS95 compared to our other machines."

moment for downtime. The company was afraid that if it lost a machine, there would be no backup, it could lose a customer, or that the loss in profit would be more than the machine itself. Moreover, it was already experiencing some reliability issues with its previous equipment.

"We decided to invest in infrastructure," said Chastenay. "We needed equipment that would perform roughing on tough materials. To do that, we needed



something extremely rigid with fast spindle speeds. We wanted something that would work well for a lot longer than other machines and that would retain its value."

INVESTING IN TECHNOLOGY

Chastenay had some familiarity with the Makino name and the machine's Fanuc-based control. Then, at IMTS 2012, he

also saw a demonstration of the PS95 cutting steel.

"The machining demo was impressive," he said. "And I appreciated that Makino shared extensive details and specific metrics on the machine's rigidity and build, unlike the competitors who would not disclose to me how their machines are designed."

While All Axis had never worked with Makino distributor Able Machine

Tool Sales before, it had received good recommendations about them from other shops. Chastenay also saw the PS95 in action at one of these businesses.

"A key to producing quality products is machine reliability," said Chastenay. "We require equipment that will not break down. All of us liked the heavy-duty spindle on the PS95, and we knew the rapids and high feedrates would fit the bill for our requirements. We realized we couldn't afford not to invest in technology."

All Axis purchased the PS95 in December 2013. The machine has since exceeded the company's requirements for productivity, quality and efficiency.

"After installation, we found that all the details that Makino and Able Machine Tool Sales had provided us about the machine prior to installation were 100 percent accurate," Chastenay said. "I believe that you get what you pay for. The machine is very efficient and user-friendly."

"We have transitioned much of our heavy hogging and hard-material applications to the PS95, based on the rigidity, accuracy and overall efficiency of the machine. We machine a lot of 45 HRC parts and produce some that are 41/40 heat-treated. We are finding that we can get the highest metal-removal rates on the PS95 compared to our other machines."

All Axis appreciates the through-spindle coolant and the chip conveyor features that it didn't have on previous machines, all of which comes standard on the PS95 machine.

"We find it very efficient to not have to remove chips from the machine," said Chastenay. "We used to shovel enough to fill a 55-gallon drum on

each part. With the PS95, we are not shoveling chips. We are instead making chips. Features like the through-spindle coolant speeds up cycle times on milling, drilling and plunging. On pecking operations, we can now complete these features in one clean Z-axis plunge. The PS95 is the fastest machine in the shop. Machine utilization is up, and we're able to be more competitive.

"We transferred a part comprised of A2 tool steel from our previous machine to the PS95. Cycle time used to be 40 minutes per part, but on the PS95 it was cut in half—to 20 minutes. On other parts transferred to this machine, we have seen 20 percent cycle-time reductions without adjusting processes. We did not anticipate that much of a decrease. We knew the numbers would be better, but this was really eye-opening."

Another area where the company is saving time is by consolidating setups by using progressive fixturing. In addition, the larger work envelope and travel of the machine compared to the previous machine have enabled All Axis to take on larger part applications and to perform multiple operations in a single load for faster completion of parts. All Axis also appreciates that the PS95 follows the geometry it is programmed to, with less tool deflection and better blends.

"We get higher resolution and adjustability with the Makino controls compared to our other vertical machining centers," said Chastenay. "In fact, we get one full decimal point better."

The company is also now able to use more advanced tooling. "We can drill through six inches of aluminum with a quarter-inch drill in just seconds instead of minutes," said Chastenay. "With its

In parts transferred from previous equipment to the PS95, All Axis has seen cycle-time reductions from 20 to 50 percent.



speed, rigidity and through-spindle coolant, this machine just blasts chips out of the hole."

All Axis is also pleased with the quality coming off the PS95.

"We can handle tight-tolerance holes and slots at plus or minus 0.0002 inch with great repeatability," said Chastenay. "With the PS95 we don't have to spend valuable time making constant adjustments. With our other equipment we could get to this result, but it would take much longer, due to more machining passes and slower feedrates."

The results seen on the PS95 have brought in more orders. The machine has also made the company more competitive, which is reflected in its part costs.

Chastenay explained, "By reducing our cycle times and achieving better quality, we are able to pass along savings gained from those efficiencies to the customer. In fact, on parts transferred to the PS95, we have had a 10 percent decrease in cost. We are now bidding on jobs that we couldn't previously, and customers who once passed on our services are now coming back to us.

"The results seen on the PS95 have brought in more orders."

"We have learned that if you don't invest, you will lose bid after bid on jobs you quote. With the new efficiencies gained from the PS95, we know that All Axis as a whole will be stronger."

EXCELLING BEYOND EXPECTATION

All Axis sees high-performance technology as the future of the company and has plans to continue



Standard features of PS95, like the through-spindle coolant and high-pressure coolant, help speed up cycle times in milling, drilling and plunging operations.

to replace older equipment with another PS95. It is also considering an expansion of its capabilities with the addition of a 4th- or 5th-axis table.

"We all know that there are no guarantees in life. That is why I typically set goals beyond my reach. It allows me to excel in what I do so that I can exceed the expectations of my family and customers. This high-performance equipment helps All Axis to achieve that."

CLICK TO VIEW THESE WEBINARS:

YDC PRECISION MACHINE ADVANCES IN INDUSTRY WITH HIGH-PERFORMANCE VERTICAL MACHINING CENTER

Few things in life transport one back to the days of youth; but Yvan Cote relives the excitement each and every day at work, as he fosters a passion for machining that began following high school.

"I remember the satisfaction of being able to create something from nothing, and that feeling still motivates me all these years later," Yvan said. The president and CEO of YDC Precision Machine Inc. in Franklin, N.H., has invested this enthusiasm and pride into creating a family business that still drives him, even after three decades. "The best part of my job is creating something from nothing," said Yvan. "It never gets old for me."

His infectious excitement for the trade is something that he shares with his son, Kelly. "I had initially started my career studying to become a mechanical engineer," said Kelly, "but I quickly learned that I would rather be creating than designing something. I joined the family business and found that I truly enjoy coming to work. One of the best things about working at YDC is that we are not making the same part every day. Each and every job is different, and I really appreciate that. My passion for this industry motivates me to always do my best."

YDC creates a variety of parts used in the communications and commercial-equipment industry. The company's workload had increased so much that its existing vertical machining centers could no longer maintain the kind of quality and precision required. It needed capacity and capability.

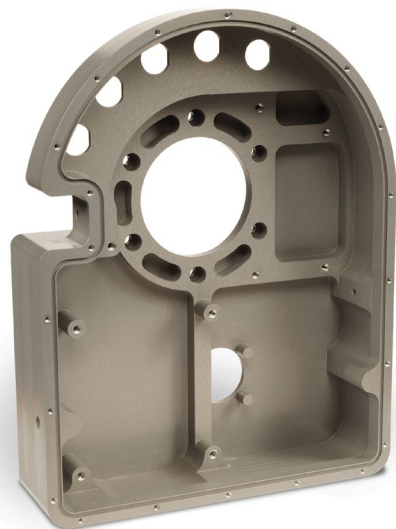
"As a job shop, we never know where our next project will come from," said

Kelly. "We require the latest technology to stay ahead of the game, and we got exactly that in the [Makino PS95 vertical machining center](#). It helped our company cut cycle times in half, producing three parts in the time it used to take to create two."

GROWING A ONE-MAN SHOP

The seeds of the business began for Yvan right after high school, when he worked part time in a job shop and later for an original equipment manufacturer (OEM). "I kind of fell into this line of work," said Yvan. "I was running a mill and then just continued with it. Working in this industry was not anything that I had planned to do—certainly not for 36 years! But I've loved almost every minute of it."

But after a few years of working for others, Yvan quickly decided that he wanted to plant his own roots and went out on his own. "I wanted the chance to build my own relationships with



customers and provide services that constantly challenged me to accomplish more, better, faster,” he said.

Yvan started YDC in 1983, as a one-man shop located in a 600-square-foot garage, where it remained for many years. In 1998, the company expanded to a 3,700-square-foot facility, until it maxed out the electrical capabilities; then it moved to the 7,200-square-foot space, where it remains today, performing work for production OEMs in the semiconductor and communications industry, as well as the commercial-equipment industry.

“These features should be standard on every machine, because that’s the level of quality and machinability that is needed for small job shops to compete.”

required more machining time than planned.”

In search of new equipment, Yvan conducted research online and also sought many personal recommendations from colleagues. The company’s Makino distributor,

Yvan agreed. “We realized that Makino machines would last nearly 20 years before we’d have to replace them, rather than the five to 10 years we were accustomed to in our other machines. It would be a good investment, especially because we knew we didn’t want to fight tolerances all day long. By purchasing a Makino, we knew that we could be assured that we would consistently hold tenths. The higher speeds and feeds proved that the PS95 really fit our needs.”

After seeing other local users experience favorable results, YDC decided that it was worth the investment and, in early 2014, purchased the Makino PS95 vertical machining center.

FEEDING THE MACHINE

The company’s first part run on the PS95 included the ground-unit components that led Yvan and Kelly to seek new equipment in the first place. “Right away, we improved our throughput by 50 percent,” said Kelly. “And that extra part per hour had the potential to generate a lot of extra revenue. In some of our components, we were able to nearly double our feedrates compared to our previous vertical machining centers, further proving out an average decrease in cycle time of 50 percent. We have found that this machine is the fastest in its class; and for a small job shop like us, every second counts.”

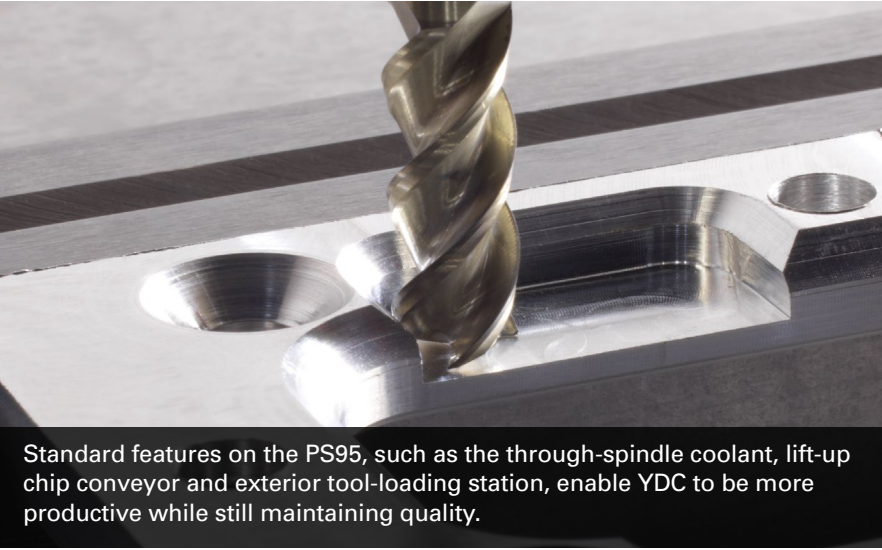
The fast tool changes also helped contribute to these results, reducing out-of-cut time. With the PS95, YDC is



In 2014, workload had increased so much that YDC’s current vertical machining centers could not maintain quality and precision while still keeping pace, leading to an investment in a Makino PS95.

The company was producing ground units for satellites and received an urgent order to complete the aluminum components for an assembly. YDC needed to produce 300 pieces in one week; and it knew that its commodity machining centers would not handle these types of quantities in time while still meeting the precision requirements. “Quality was our primary concern on this part,” said Yvan. “Our current machines were unable to repeat required tolerances and finishes. This meant that we were left to inspect frequently, adjust machine offsets throughout the day, and the parts often

Able Machine Tool Sales, suggested that YDC look at Makino machines. “We had thought that Makino, being a premium machine, would be unobtainable on our job-shop budget,” said Kelly. “But when we weighed in other factors, such as machine options—many of which the other suppliers counted as add-ons, like the through-spindle coolant, chip conveyor and high-speed spindle—then the gap lessened. In reality, these features should be standard on every machine, because that’s the level of quality and machinability that is needed for small job shops to compete.”



Standard features on the PS95, such as the through-spindle coolant, lift-up chip conveyor and exterior tool-loading station, enable YDC to be more productive while still maintaining quality.

also able to take on more aggressive cutting approaches. The company used to worry about recutting chips; but the standard options like the through-spindle coolant, spiral chip conveyor and lift-up chip conveyor have helped improve efficiency in roughing and drilling operations. YDC’s operators appreciate the rigid tapping that the machine allows—especially since the company can’t justify purchasing an expensive tapping head, when it does not make many of those types of holes very often. The machine’s rigid tapping capabilities fulfill exactly what the company needs it to do. The PS95 also glides through a variety of materials and has more memory for loading additional programs.

“I can bring the PS95 to the point where I’m roughing from 275 to 300 ipm [inches per minute], with a three-quarter endmill in aluminum,” said Kelly. “With our other vertical machining centers, we have to cut this speed in half to complete these processes. You can tell that quality was built into the machine and not patched in through software.

“The enhanced design features of the machine also became evident when roughing the pocket of another

component. The PS95 transitions through corners, where our previous machines would pause. The machine’s control is always looking ahead in the process, anticipating what is next. This really helps us to be precise, especially when the slot we are machining is 0.060-inch wide, requiring a plus or minus 0.0005-inch tolerance. Previously, we would slow down the rpm and feedrate to achieve the accuracy we required. The PS95 just handles it, without our having to adjust speeds and feeds. This is especially helpful if it’s a

“We realized that Makino machines would last nearly 20 years before we’d have to replace them, rather than the five to 10 years we were accustomed to in our other machines.”

complicated part. We couldn’t do that on our commodity machining centers.”

Surface quality has improved on primary machining passes. On its previous equipment, YDC would have to take two cleanup passes to address deflection. This step is not necessary

on the PS95, eliminating unnecessary programming, tool degradation and labor time for shorter cycle times and greater profitability. This type of performance is especially helpful in a small shop like YDC, where workers are operating multiple machines at a time.

“Not only has the initial performance been solid, but it’s been repeatable. We can run a part through the machine all day long, and it will come out of the machine with the same accuracy as the first part,” said Kelly. “This level of repeatable quality is exactly what our customers have come to expect from us; only now, we don’t have to worry about babysitting a machine and checking parts frequently.”

Yvan agreed. “It used to shock me that machining on the PS95 takes less time, but yields better quality; but I love it. At YDC, we know that to achieve these kinds of results, you must stay up on technology. I wish that I had three of these machines right now, rather than our three other vertical machining centers.”

To keep up with the productivity of the PS95, YDC recently invested in new fixtures to accommodate additional

parts for each setup. This has helped eliminate spindle downtime between part loads while limiting the amount of labor time, to allow operators to focus on maintaining the other machines’ performance. Additional features of the PS95 that operators have appreciated

A man in a blue polo shirt and khaki pants stands next to a large industrial machine. He is holding a black laptop. The machine is white and grey with the logo 'a61hx' on its side. In the foreground, there are two large, complex metal castings. The background is a light blue gradient with faint, repeating text: 'G0 G90 G54 X0 Y-47.498 N140 S2500 M3 N150 2.5. M7 N160 Z-23.5 N'.

Every company has its reasons for choosing Makino.

AXXIS CORPORATION DELIVERS CUSTOMERS IMPROVED PART COSTS WITH FLEXIBLE MANUFACTURING SYSTEM

Densely populated Southern California is a highly competitive region for small machine shops. When bidding for new work, these businesses know that the competition is likely to be stiff. Always keeping an eye on the bottom line, many shops carefully consider any big equipment investments because they count on every dollar to compete with the guy down the street.

At the same time, a challenge for many shops is being more efficient by reducing part setups in order to achieve faster turnaround and ultimately lower part costs, especially on repeat jobs. Axxis Corporation of Perris, Calif., was no stranger to this situation, but set its sights on improving flexibility and labor efficiencies to drive down part costs for its customers. This goal set Axxis on a journey to identify new solutions that could reduce setup hours, particularly in short cycle-time applications. Axxis found its answer in 2014 with the purchase of a [Makino a61nx horizontal machining center](#) with a 12-pallet [MMC2 automated machining cell](#).

“The competitiveness of today’s market requires a steadfast determination to constant improvement,” said Brandy Tidball, CEO of Axxis. “Our investment in the a61nx flexible manufacturing system has proven to our customers that Axxis Corporation is never satisfied with the status quo. We now have the flexibility to offer smaller economic order quantities at a lower cost, while achieving four times the production speed and three times the tool life of previous processing methods. It’s this level of performance that enables us to provide outstanding quality and service to current customers while taking on a more cost-competitive positioning in winning additional work.”

A NEW WAY OF OPERATING

Axxis Corporation was established in 2007, after Tidball acquired an existing job shop that produced parts for the automotive aftermarket and energy, aerospace and medical-device markets. Tidball and his leadership team observed several opportunities for improvement within the shop that could drive down customer prices. After reorganizing the company and pursuing new business opportunities, Axxis Corporation knew it was time to focus on investing in new equipment in order to lower costs and improve service.

“We thought that obtaining new high-performance equipment could



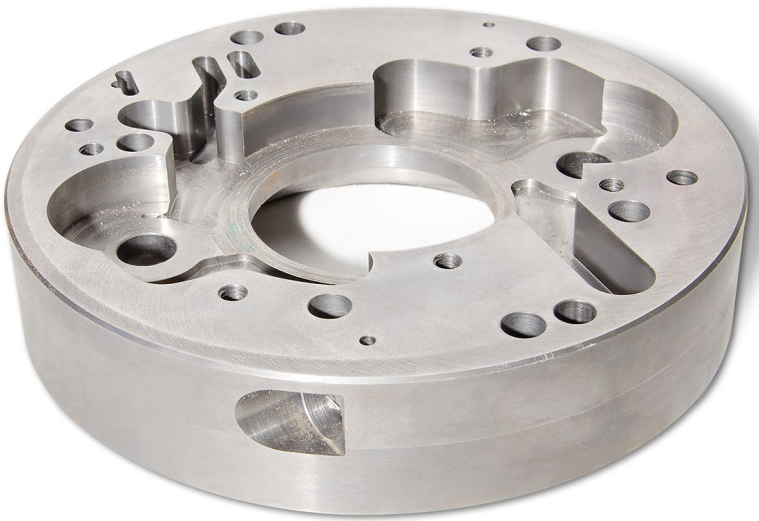
improve efficiencies,” said David Butler, operations manager at Axxis.

Axxis saw the opportunity to improve flexibility and grow the business by more efficiently managing a wide variety of part quantities and materials, including aluminum, stainless steel, carbon steel, plastics, high-temperature alloys and magnesium.

Axxis personnel initially looked for a high-performance, stand-alone horizontal machine with an envelope that would fit the company’s current parts. The goal was to consolidate operations, increase utilization rates and boost reliability. Axxis personnel were thorough in their research, talking to several distributors about HMC technologies and visiting many online forums to see which companies were being discussed. One of those distributors was [Single Source Technologies \(SST\)](#), a national distributor of machine tools, related consumables, tooling and EDM supplies.

Colony introduced Axxis to another company using the same equipment. This customer had a horizontal machining center with an MMC2 automated pallet-handling system. While familiar with these flexible systems, the staff at Axxis had never seen one at work.

parts with long setup times and short cycle times that would be ideal for this type of operation. That’s when we decided that it was the right time to look beyond a stand-alone horizontal machine.”



With the a61nx, Axxis is capable of holding tolerances of plus or minus 0.0005 inch repeatedly while extending tool life threefold.

The system has given the company the flexibility to manage part quantities while achieving four times the production speed and three times the tool life of its previous equipment.

“We showed everyone our components and products, and all agreed that the horizontal machine was the best approach for our parts,” said Butler. “But we were also looking for a vendor that could offer us great support. Our SST salesman, Wes Colony, immediately responded to our RFQ [request for quote] and was quick to respond in great detail.”

“We had not initially considered such an automated system, but when we talked to this user, they raved about how it had completely eliminated repeat setups,” said David McClure, production lead at Axxis. “Hearing this made us wonder what improvements and innovations our experienced staff could accomplish with this level of technology. We knew we had lots of

Axxis began exploring the potential of an automated horizontal machining cell with pallet system.

“The efficiencies it could provide were really key,” said Butler. “We realized it could not only help us reduce setups but also combine operations, track tooling and improve scheduling. To actually see and touch it and have someone demonstrate how it works was compelling. When we left that shop, we knew it was time to make the move to automation to improve flexibility for improved delivery and more cost-effective production of smaller part quantities.”

The company’s next objective was identifying the best supplier to help Axxis meet its goals. SST brought in

specialists from Makino’s facility in Mason, Ohio, along with representatives from other vendors who would be supplying equipment. Together, they helped to answer the company’s questions and to discuss its needs.

“SST made sure every question we had was answered, and not everyone did that,” said Butler. “They [SST] didn’t just say, ‘It will work’—they showed us how. They proved it. They rationalized how this equipment was not only affordable, but would support us in our mission to drive down costs for our customers. They also brought in representatives for tooling, probing and other kinds of equipment to answer questions and validate the capabilities of the equipment.

“We realized that the cell controller would require some adjustment and training to use effectively right out of the box. While many other companies were fine taking four, five or even six months to become accustomed to their new equipment, we wanted our customers to see immediate improvements with a smooth transition. When it came down to it, we wanted the provider that could help us get up and running immediately after installation. SST was, hands down, the supplier we felt most confident with.”

EFFICIENTLY UP AND RUNNING

Axxis purchased a Makino a61nx with 12-pallet MMC2 system in 2014. Prior to the cell’s installation, Axxis personnel attended training at Makino’s facility in Mason to learn how to optimize the cell’s machine and controls.

“We thought we would be in a class with other companies, but were pleasantly surprised to learn that the training was tailored to our needs. We worked on a system that was identical to the one we had purchased, and

“With the cell, we are able to push things harder. We have seen a 50 percent reduction in cycle times, thanks to the improved speeds, feedrates and reduction in operations.”

Makino customized the software and taught us about the specific features we should be using. It made us feel completely comfortable with the cell’s [MAS-A5 control system](#) to use it on our own,” said Butler.

During installation, SST was the single point of contact on all equipment, and Colony also coordinated ordering and setting all of the tombstones and vises.

“The process was very streamlined,” said Butler. “We picked a configuration

and they made it work. We had lots of people coming in and out, and SST took the brunt of the scheduling—communicating between all parties. There was great communication between those handling tasks such as the machine setup, tooling and probing. The project was achieved exactly how they [SST] explained it.

“The crew that installed the system was very thorough. I mentioned that we might add another machine in the future, and when they were leveling



According to Axxis, installation of the MMC2 and a61nx was extremely thorough and prepared the company for quick and easy modular expansion in the future.

the floors, they were forward-thinking enough to level additional flooring for that future machine. It was all very thoughtful and precise.”

Once everything was installed, Axxis began running parts without delay. And already, after just a couple of months of using the system, Axxis is loading its catalog of parts into the system and seeing positive results. The MMC2 has given the company the additional throughput it needed, along with workflow optimization.

“With the cell, we are able to push things harder,” said McClure. “We have seen a 50 percent reduction in cycle times, thanks to the improved speeds, feedrates and reduction in operations. On one of our engine-mount parts, we went from 25 minutes to 13 minutes, or two-and-a-half parts per hour, to four

“Our work in process went from an eight-week lead-time to having the ability to provide delivery in four weeks.”

parts per hour. This is a commentary on the speed of the machine, and is definitely over and above what I would have achieved in a commodity horizontal machine.”

A significant portion of this timesaving is because the machining processes are no longer coupled to setup operations, so the spindle has virtually no downtime.

“The control system allows us to store programs and fixture data for repeat orders, eliminating requirements for extended setup times,” said McClure. “With the increased spindle utilization, we achieve more parts and make our customers happy. Altogether, we are getting four times the overall

productivity and four times the ROI compared to our previous equipment.

“Another reason that we are experiencing far less downtime is simply because we don’t have to manually change out tools. Additionally, the machine’s rigidity gives us tighter tolerances and better tool life. In fact, we’ve seen up to three times the tool life compared to our prior technologies, further reducing cost per part.”

Holding those tighter tolerances means accuracy has been improved. For example, one part used to require several mill operations and lathe operations. Now all operations are done on one machine in a single setup, reducing variation and holding necessary tolerances. In addition, parts can be checked and deburred while the machine is running.

“As far as accuracy, we have a part where we need to hold tolerances of plus or minus 0.0005 inch. Our previous machines required four endmills per job to hold this tolerance. But we just completed the entire job with only one endmill on the a61nx due to the machine’s rigidity and through-spindle coolant, which flushes chips out of the part. These features allow us to achieve more high-speed cutting paths, really lowering our cost per part for customers,” McClure said.

As it improved accuracy, the company also began to enhance processes with weekly management meetings to discuss its work in process. In addition, Axxis started using the system to collect data in order to improve any bottlenecks and increase throughput.

“We were able to cut our work in process in half. We now have better visibility and flexibility in our production schedules, based on data collected by the MMC2 cell,” said McClure.



The cell has especially been a perfect solution for short-run, high-mix applications.

“The automated cell has certainly helped with our repeat jobs,” said Butler. “We can eliminate setups and provide quicker turnaround and better pricing. And today, if a customer’s job sits for a week while they approve a prototype part, we can run a variety of other orders without concern for when we’ll need to get the order back into production. We can also easily produce a one-off part if a customer asks for something extra that was not in the original order. This kind of flexibility means that we try to push every job through our cell, because once it’s in there, we can always pull the program and go.”

With this flexibility, Axxis has seen organic growth in its current customer base and has also gained new customers as it looks to expand into the medical market.

“Our shop motto is to look at the big picture so that we can continue to grow, and this equipment fits right in with that,” said Butler.

TAKING CUSTOMER SERVICE TO THE NEXT LEVEL

Having achieved its goals for improving customer part costs and flexible delivery, Axxis is looking forward to eliminating overrun and reducing standing inventory as it continues to establish additional jobs in its cell.

“What matters most to Axxis is providing outstanding customer service,” said Butler. “We want our clients to be satisfied because we have supplied them with a quality part on time and in a cost-effective way. This is our niche.”

To achieve its goals, Axxis plans to further expand its cell with 24 pallets and a second a61nx. It hopes to further improve its process by running parts overnight, doubling the business.

“We want to be the number one machine shop, growing to the point where our name is widely known throughout the market as doing whatever it takes for our customers,” said Butler. “We know that by achieving our goal of making our production even more efficient has given us a newfound flexibility to help our customers achieve their goals.”

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Dear Reader: This is the story of how two brothers featured in this issue made their way into the contract machining world, and how family continues to influence their respective businesses to this day.

TWO COMPANIES ONE DNA

Working in the machining industry is a family affair for Larry and Jay Campbell. The two middle sons of seven children joined their father Joseph's side business as teenagers, hoping to earn extra money.

"Dad worked as a production manager in the electronics industry, which led him to a connection for contract projects from an injection molding company," said Jay. "He would bring bags of molded parts home, and we would all join him around the kitchen table each night, removing the flash."

Soon, this side business grew and Joseph Campbell left his full-time job to form his own company, AFAB Precision Machining, where the boys worked with him each day after coming home from high school.

"AFAB stood for 'Anything for a Buck,'" said Larry. "And true to the company's name, we took on all sorts of random projects in those early days. It wasn't long before Dad obtained a Bridgeport machine and used it to grow the business beyond our initial deburring operation. Jay and I jumped right in to the machining environment."

The company expanded, producing fixtures for a few local medical companies, and as AFAB grew comfortable in this niche, the company



Larry and Jay Campbell

made more of a presence in the machining industry.

Following high school, Jay attended Long Beach State, earning a degree in manufacturing technology. Here, internships exposed him to the manual lathe and milling machine. In 1989 he brought this knowledge back to AFAB, when he again joined the company.

Like Jay, Larry had briefly branched out early in his career. He worked as a production manager at a medical company before returning to the family business in 1987. By then, expansion was happening quickly at AFAB, and Joseph began buying a new machine each year to accommodate growth. Input from Jay and Larry led to Joseph purchasing AFAB's first CNC machine.

"AFAB had really begun to take off by then, and the three of us grew the

business together for 10 years," said Larry. "We were so busy we often slept in the office."

In 1998, wanting to reduce his lengthy commute and be nearer to his own family, Jay left AFAB to start his own company, Campbell Engineering.

"My first projects came from a neighbor creating car parts for a limited-edition Shelby Mustang," said Jay. "I helped with prototype parts for the drivetrain and brake calipers. Another friend connected me with work in the medical industry. The business took off, and we began obtaining more machines and larger shop space. Dad retired from AFAB in 2008, and, under Larry's leadership, the company grew through the implementation of lean principles and automation."

Today the brothers are running separate businesses, but they still enjoy sharing their success by consulting each other on ways they can improve their respective companies.

"My decision to go with Makino machines to expand Campbell Engineering's capacity was wholly due to Larry's success with them," said Jay. "As we both continue to expand into contract machining, we know that this kind of technology will be what separates us from our competitors."



AFAB PRECISION EMPLOYS FLEXIBLE MANUFACTURING SYSTEM TO DRIVE CUSTOMER SUCCESS

For AFAB Precision Machining of Lake Forest, Calif., the foundation for success is built on a service-oriented philosophy that steers their long-term commitment to exceed client expectations. They firmly believe that a customer's success is their own success.

In order to achieve mutual benefit, AFAB knows they must drive internal innovation. They recently did so with the purchase of a [Makino a51nx horizontal machining center](#) with a 12-pallet [MMC2](#) system that has cut cycle times in half. AFAB knows that having an operator stand in

front of each machine is no longer a competitive way of doing business. For AFAB, the journey to innovation and success lies in automation.

"We have always believed in a customer-centric philosophy, following our four C's methodology: Customer Service, Confidence, Capability and Commitment. The Makino system has added a fifth C through increased Capacity," said Larry Campbell, president of AFAB. "The Makino provides the flexibility and competitive production-run pricing our customers deserve."

A VISION FOR AUTOMATION
AFAB was founded in 1971 by Larry's father, Joseph Campbell. Larry grew up working in the business with his dad, getting his start helping to deburr injection-molded parts. He came up through the ranks as a machinist, before taking over the business in 2008, when Joseph retired. Back in their early days, the company used conventional machines. But by 1987 they had purchased their first CNC machining center and have continued strategically adding to that technology. As president, Larry developed a vision for the company that would incorporate

lean principles and automation, helping AFAB to continue to grow and remain competitive.

Today AFAB specializes in precision, CNC turning and milling of plastic, aluminum and stainless steel parts across a variety of sizes, applications and industries. Their dedicated and highly skilled engineering and manufacturing team strives to apply innovative solutions to each of their projects, “doing it right the first time, and on time.” With a customer base that is primarily in the medical industry, accuracy, quality and finish are always top of mind.

“With our flexible manufacturing cell, we have been able to achieve 100 percent utilization rates or 22-plus hours of production each day.”

quickly respond to customers, whether they required five parts or 10,000 parts.

AFAB began implementing automation with the supplier of their existing horizontal machining center, but the situation of dealing with multiple vendors soon became overwhelming, creating confusion,

coordinate all elements of design and installation.”

That information, combined with financing from Makino’s Capital Services group, helped AFAB better visualize the return on investment. They purchased the a51nx and 12-pallet MMC2 system.

NEWFOUND FLEXIBILITY

Prior to installation, several AFAB personnel went to Makino’s Mason, Ohio, facility for training. They learned not only how their new system operated but also advanced machining features such as managing tool life.

“In the past, other manufacturers trained us on clamping parts and programming when we purchased their equipment,” said Chad Jackson, production manager at AFAB. “But Makino taught us so much more—and this was all done on the same machine that we had purchased. We felt that it was an exceptional introduction.”

Not long after the system was up and running, a Makino representative visited AFAB for post-production support, where he provided additional training and consulting. He printed a report listing 25 personalized recommendations to further improve the machining system.

“He went over the software and remote monitoring—analyzing and optimizing what we were already doing,” said Jackson. “It was like buying a high-end car and having them come to your house to consult on vehicle operation.



“That medical lamp base previously took 17 minutes to complete the first operation. We can now finish that operation in just eight minutes,” said Jackson. “We estimate that we are saving at least \$100,000 per year with the cell by eliminating these repeat setups. And best of all, the system has the precise machining capability to help us achieve better performance. We used to have to rely on the operator loading parts correctly to achieve required tolerances, and we would triple-check before hitting the ‘start’ button. But the nature of this palletized system allows us to relax, knowing it is correct. We appreciate how everything runs so consistently.”

Jackson credits most of this to the quality, construction and features of the a51nx. AFAB was impressed by the stepped-axis design, roller-type linear

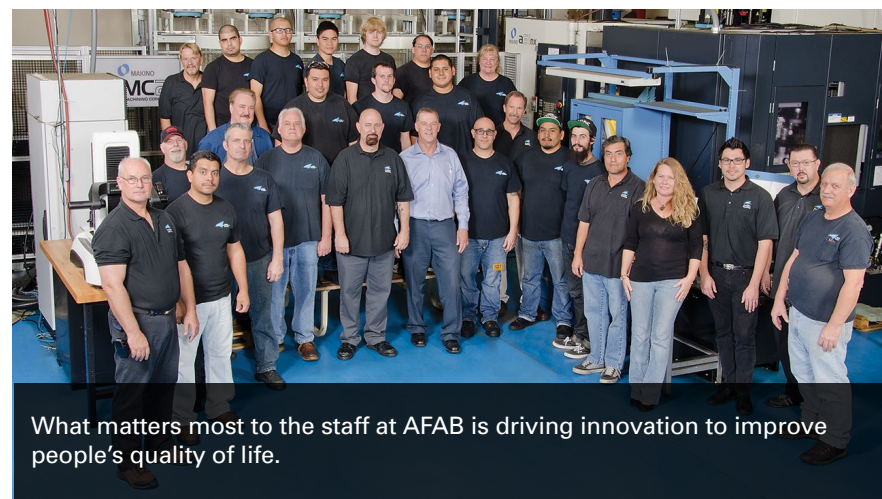
It was amazing how much information we were given. And today, should we call with a question, they are always responsive and helpful. It has been everything you’d expect from a top-tier supplier. Our impression of Makino was first and foremost based on the equipment, but we were also impressed by the people we’ve been involved with. Everything has exceeded our expectations.”

AFAB says that system deployment happened at breakneck speed. They have become very comfortable with their new FMS, and have been able to use it to improve their quality, reduce labor costs, and achieve the flexibility to supply customers with just-in-time delivery of their varied part requirements.

“With our flexible manufacturing cell, we have been able to achieve 100 percent utilization rates or 22-plus hours of production each day,” said Jackson. “And across many different parts, we have easily experienced cycle-time reductions between 25 and 50 percent, while repeatedly achieving tolerances of 0.0002 inch, which is critical to our medical part requirements.”

On one particular part, AFAB’s customer first looked at sending that part to be cast. However, they weren’t sure the tolerance requirements could be met. On the Makino FMS, the quality of that part has been proven.

“To be competitive, job shops must add better machining centers, better software, cutting tools and insert technology. We have that with our FMS.”



What matters most to the staff at AFAB is driving innovation to improve people’s quality of life.

AFAB had already realized the benefit of setup reduction that comes with using multi-axis horizontal machining centers, but knew they had to further increase capacity and invest in just-in-time production capabilities to meet the volume requirements and price pressures of their customers. One of AFAB’s customers shared with Larry that their number one supplier had employed a flexible manufacturing system (FMS) to remain competitive. Happy with their latest 5-axis HMC investment, AFAB began investigating opportunities to tie that machine to an FMS in order to further reduce costs and setups. They wanted the ability to

conflicts and uneasiness. AFAB pulled out of the commitment. [Single Source Technologies \(SST\)](#), a national distributor of machine tools, related consumables, tooling and EDM supplies, approached AFAB and recommended a Makino a51nx horizontal machining center and MMC2 material-handling system.

“We were impressed by the knowledge that SST demonstrated and felt comfortable working with them, based on the sales representatives’ knowledge of the industry,” said Larry. “More importantly, they offered a turnkey solution for their FMS system and would

guides and robust single-base casting design, all of which offer extra rigidity. They are confident that these features have contributed to part quality, as has the chip removal. AFAB appreciates that the system helps them better track tool life.

“The FMS shows the operator how much a tool has been run, so we are managing that much better and are really getting a handle on our consumable costs,” said Jackson.

Managing their catalog of parts through the flexible system has also become much easier. If a customer phases out a part but then comes back months

later asking for it, the cell can call it up and run the part without delays. The FMS has also enabled AFAB to reallocate their labor, making them more competitive.

“We feel that the technology hasn’t eliminated jobs but instead has changed them,” said Jackson. “We don’t necessarily work harder, but work smarter, as operators spend time programming machines instead of using their hands like they did in the past. With this comes a demand for the technology to stay cutting-edge. To be competitive, job shops must add better machining centers, better software,

cutting tools and insert technology. We have that with our FMS.

“I’ve used equipment from other manufacturers, and this is the first time I’ve had a brand-new machine with so few problems. I’m very impressed. The quality is outstanding. I’m really happy with the system, and we’ve been running the heck out of it.”

AFAB is currently looking to employ key learnings from the automated cell into other areas of the business in order to improve workflow and inventory across all areas of the shop floor.

HIGH-PERFORMANCE EQUIPMENT ADDS CAPACITY, BRINGS FAMILY SUCCESS TO CAMPBELL ENGINEERING

Many draw upon the support of and commitment to family as motivation to succeed. James “Jay” Campbell is no different. Family has motivated him for nearly 30 years in the industry—beginning early in his career when he joined his dad and brother to build the family business, and later working with his own children as owner and CEO of Campbell Engineering Inc. in Lake Forest, Calif.

Jay had no idea that when he and his brother Larry were paid pennies per unit to help their dad deburr injection-molded parts each evening during their high school years, the experience would shape the future. It first led to a position at the family company, where Jay worked for over 10 years alongside Larry and their dad. Then Jay left to start his own company. After 19 years of running Campbell Engineering, Jay

still considers himself more machinist than CEO, and continues to value ties to the family business. He consults Larry for advice and is thrilled that his own daughters and son-in-law now work with him at Campbell Engineering.

Over the years, the company has found its niche milling highly complex, low-volume components—primarily aluminum parts for medical laser instruments. It has developed a reputation for having high standards of quality and customer service while delivering parts on time. Recently, Campbell Engineering has been evolving from a job shop into more of a contract manufacturer, as current clients ramp up part quantities. It has been able to expand its capacity as it shifts its business model, thanks to its [Makino PS95 vertical machining center](#) and [a51 horizontal machining center](#).

“Both the PS95 and a51 have enabled us to accomplish our goal of expanding capacity beyond what was capable from previous conventional vertical machining centers,” said Jay. “In fact, both machines are cutting 60 to 70 percent more aggressively than the other machines on our shop floor.”

MANAGING GROWTH

Prior to acquiring its new machines, Campbell Engineering had used conventional vertical machining centers (VMCs) for its operation. While that equipment had fulfilled Jay’s dream of starting his own shop and had served the company well for many years, he knew that adding newer technology would help the company better accommodate its growth.



Campbell’s recent investments in Makino PS95 and a51 machining centers have helped the company expand capacity in order to meet growing customer demand.

“We didn’t seek new equipment because we were having problems,” said Jay. “We just needed to better manage our expansion. There were new opportunities we did not want to pass up. Customer needs have changed in the last five to 10 years, and we are going from prototypes to production. To meet this new business opportunity, we wanted to increase capacity, and that required a new strategy that would enable our business to thrive without adding additional labor.”

The company had already grown from a one-man shop to a two-shift operation, and had expanded from an 800-square-foot to 11,500-square-foot building. Recognizing similar growing pains as those his father’s business had once experienced, Jay spoke to Larry about the Makino machining solutions they had put in place during their growth spurt.

“Larry told me that he was extremely impressed by the quality, service and productive performance of the Makino machines they had acquired,” said Jay. “So our Campbell Engineering team scheduled a meeting with [SST](#), our local Makino distributor, to learn more. Our SST representative responded immediately to all of our inquiries and

“Not only have cycle times been reduced, the equipment is much more repeatable and accuracy has improved.”

did a great job explaining what the machines could do. In fact, he was unlike any other sales representative we had encountered before. He provided an exorbitant amount of detail about the machines available and analyzed our company’s goals and current position, to advise on which

would be the most cost-effective and efficient solution. We really felt that he understood our business. This helped us make the right selections to steer us toward future opportunity. He acted more as a partner than a salesman. He wasn’t just out to put another machine on our shop floor.”

In addition to consulting his SST sales representative, Jay attended trade shows to see various machines in use and researched horizontal machining centers (HMCs) online to learn more.

“I noticed that every time I did a search, Makino was in peoples’ top three for

horizontal machining centers,” he said. “The more I read the threads and blogs, I saw very favorable comments about Makino from other machinists and owners all over the world. This gave me a lot of confidence in the brand.”

Despite all the research into HMCs, Campbell Engineering first purchased a PS95 vertical machining center (VMC) in December 2013.

“I was still hesitant to take a chance with a horizontal machining center, so I decided that my first Makino purchase would be a VMC,” said Jay. “I knew we couldn’t go wrong due to the production capability, product quality and pricing, which were all the main factors in my decision. SST had the machine installed and running at the shop within 48 hours of delivery and also brought in a Makino engineer for on-site training with three of the company’s operators.”

A few months later, Jay invested in a Makino a51 horizontal machining center.

“The HMC would help us combine operations and improve quality, since the products we are making require five to eight operations and a true position of 0.001 inch,” he said.

“Makino service personnel were everything you would expect from a premium machine manufacturer.”

SST served as a single source not only for both machine installations but also all related fixturing and consumable needs, even suggesting that Campbell add a Techni-Grip™ work-holding system to the a51.



The PS95 with pallet changer has become Campbell’s workhorse for all larger applications with limited operations that require high metal-removal rates.

“We appreciated all of SST’s guidance,” said Jay. “The company responded to all of our questions and stayed with us until we were completely up and running. The Makino service personnel were everything you would expect from a premium machine manufacturer. We received progress updates from their technicians throughout the day during the installation process. It could not have gone better.”

Following installation, four days of training took place on site at Campbell. Even though the machine had more

features than the company was used to with its previous machines, there were no issues with training.

“The learning curve for high-speed horizontal machining went very

smoothly, and it did not take long at all for us to catch on,” said Steve Butner, machinist supervisor at Campbell Engineering. “The representatives from Makino were a step above the rest, and everything lived up to expectations.”

A WINNING COMBINATION

Only eight months into operating its new machines, Campbell Engineering is already seeing big improvements as it expands its capacity.

“Our cutting performance has improved significantly,” said Butner. “On both machines, we have increased spindle speeds and feedrates by 50 to 70 percent.”

The PS95 became the company’s number one workhorse for larger applications with limited operations that require high metal-removal rates (MRR) and precise true positioning.

“The PS95 is pretty impressive compared to our previous machines,” said Butner. “We like the speed of the tool changes and the machine rigidity. We feel like it has the performance

“We feel like it [the PS95] has the performance equivalent of two to three other machines in the shop.”

equivalent of two to three other machines in the shop. We used to run our commodity machine at 800 rpm while feeding it at eight inches per minute [ipm]. We run the spindle on the PS95 at 3,200 rpm and feed it at 30 to 35 ipm. What a difference!

“One part that we produce is a beam splitter for the medical market. This detailed part requires tight tolerances. We used to run it on our commodity VMCs, but after putting it on the PS95, the cycle times dropped from 42 minutes to 25 minutes—with improved repeatability. The horsepower and torque on this machine allow us to be 60 to 70 percent more aggressive in our cut, even using smaller tools.”

Campbell Engineering also uses the PS95 to perform high-performance roughing operations and establish datum points on the first operation.

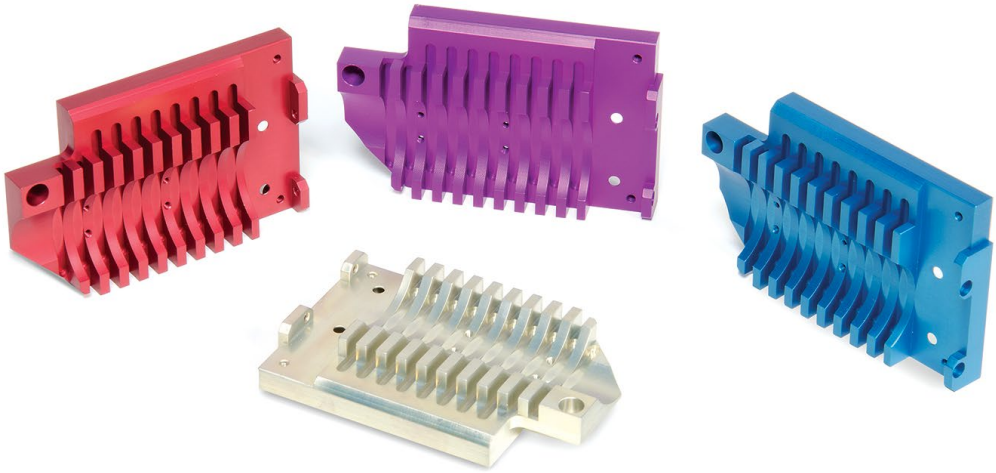
“We try to nail the first position perfectly, because all subsequent operations come off of it,” said Butner. “This strategy has enabled us to use the PS95’s strongest advantages across the widest number of applications.”

Similar to the PS95, the a51 has seen positive results. When Campbell Engineering encounters applications requiring three or more operations, the a51 is its go-to solution to machine the part complete.

“With the added benefit of the B-axis table, we are able to access more part features, consolidate operations, reduce setups and use fewer tools—all of which maximize spindle utilization,”

said Butner. “We came up with 50 percent faster cycle times without much effort.”

One of Campbell Engineering’s a51 operators describes the machine as “a beast that is always hungry.”



“We continue to keep pushing the machine’s cutting parameters further and further, and it just keeps taking on more and more,” said Butner. “We can’t get parts programmed fast enough to run through the machine. With the 14,000-rpm spindle, we feel like the sky’s the limit on the feedrates. You can be as aggressive as you want when programming it. You just need the proper tools. And even with the increased machining speed, we do not see an increase in tool wear. We attribute this to both the rigidity of our Makino mills and our quality tool holders.”

“Six months after the a51 was up and running and training was complete, we

knew that we made the right choice,” said Jay. “Any worries about ROI went away as soon as we fired it up and saw what it could do. The machine has proved to be what we’ve hoped for, and more. Not only have cycle times been reduced, the equipment is much more repeatable and accuracy has improved. This means that we spend less time struggling with setups and first articles, saving time and money in our quality department.”

The machine enables the company to take existing jobs and complete them using more efficient solutions.

“It’s fun to find new ways of doing things,” said Jay. “That kind of creativity makes this job fun. I want to do things faster and more accurately than the competition. And the speed and rigidity of both of the machines allow us to accomplish that.”

Campbell Engineering operates each machine with its individual strengths in mind, maximizing value. Between the two, the company tries to run as many jobs as it can.

“Since we have been using Makino machines, we have not only seen a significant reduction in cycle times, but we have also been able to run additional volumes of certain parts,”

“At Campbell, everything that each of us accomplishes is driven by our desire to provide for our families, and our machining technology is one way for us to accomplish that.”

said Butner. “Moreover, from a programming standpoint, we are much more aggressive in the way we approach cutting material.”

And even being more aggressive in the cut, Campbell’s throughput and profitability are improved.

“We feel that this equipment is far superior compared to our previous equipment,” said Butner. “At Campbell, we hold tight tolerances. In fact, plus or minus 0.0005 inch is not uncommon. We have already observed a decrease in setup time and in holding positional tolerances. We used to spend time trying to locate the sweet spot for the part. But the PS95 and a51 are so repeatable. This saves a lot of time, maintains quality and eliminates scrap. We can produce high-quality parts in a fraction of the time than we did with our previous equipment.”

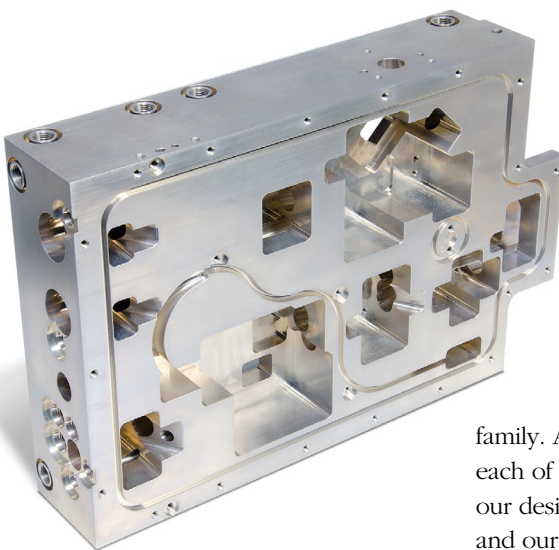
PURPOSEFUL EXPANSION

As the company continues to expand with more high-mix, low-volume work, it has already purchased another Makino HMC, the a51nx, as well as a Makino U6 wire EDM, to give the company even more control over quality and scheduling.

“We currently outsource \$8,000 to \$10,000 per month in wire EDM work,” said Jay. “And based on the user-friendly design of [Makino’s U6](#), we

believe we can quickly eliminate those expenses while obtaining additional flexibility for the future.”

Campbell Engineering knows that acquiring new technology can help it maintain its competitive edge.



Campbell’s investments in Makino equipment have opened up capacity to run additional volumes of parts, providing for efficient transitions from prototype to production.

cutting-edge tools out there. We enjoy showing them off when someone visits our shop. It makes them feel confident knowing that we have the capacity to handle their needs. We believe that quality breeds quality, and we look forward to growing our business as we acquire more Makino machines.”

As it expands, Campbell Engineering is currently working toward Stage 2 ISO certification after Larry challenged Jay to complete it.

“We enjoy pushing each other toward success,” said Jay. “Especially because what matters most to our business is

family. At Campbell, everything that each of us accomplishes is driven by our desire to provide for our families, and our machining technology is one way for us to accomplish that. It’s fun, challenging and ever-changing, and it brings purpose.”



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YDC PRECISION MACHINE

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are the user-friendly control and maintenance reminders. “On other machines we’ve used, we have to track the maintenance ourselves,” said Kelly. “But the PS95 tells us when service is required. This is helpful because we are constantly in motion around the shop floor, trying to push as much productivity as possible. We don’t have the luxury of having one person devoted only to maintenance, so automated reminders have been a huge asset in keeping things running at peak performance.”

BEATING THE COMPETITION

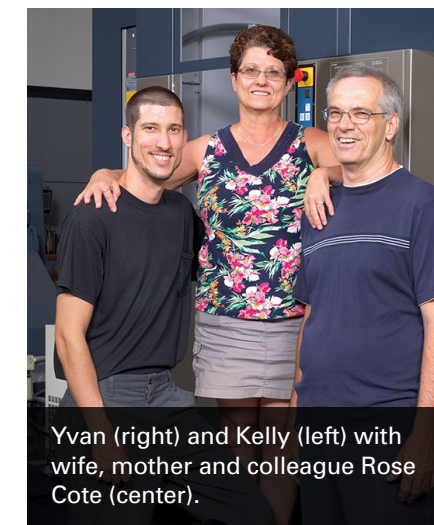
With its new machine, YDC can now accept work that it used to pass on before, growing its business. “That [accepting new work] is the biggest benefit,” said Yvan. “This technology has taken us to a higher level, where we can meet very tight quality standards. We can now hold tolerances to the tenths, which gives us new opportunities.”

The company knows that the way it can continue to beat the competition is by always meeting part requirements and by doing so at a competitive price. “When you are a small job shop like we are, it takes more than being able to do the job to remain competitive,” said Yvan. “You must provide the best value; and that means offering a superior product with the lowest cost per part. We’ve learned when searching for a quality machine that to achieve this, lower initial investment costs don’t necessarily equate to long-term ROI [return on investment], competitiveness or profitability. It all comes down to performance.

“The PS95 keeps us ahead of the game. We can produce parts that the bigger companies can make, but with a lot

“We can run a part through the machine all day long, and it will come out of the machine with the same accuracy as the first part.”

less overhead. That is a big positive for us. While doing so, we can also be confident in our work. The PS95 opens the door for us, because of the reputation for precision.”



Yvan (right) and Kelly (left) with wife, mother and colleague Rose Cote (center).

GROWING THE INDUSTRY

Since getting a taste for the bigger jobs, YDC plans to continue producing high-end products as it grows. “We hope to someday find a niche in meeting tight tolerances,” said Kelly. “And as we continue to expand, we will need additional machines to meet that growth. When this happens, we will definitely invest in another PS95 or even a Makino horizontal machining center.”

Yvan agrees. “Once you get equipment that does what it is supposed to do, and it does it well, you don’t want anything else. I would definitely buy a Makino again, because I know this machine will still hold accuracies in another 10 years.”

For YDC, what happens in that next decade is always on its mind, especially as the machinists of today begin to retire. That is why advancing the industry is what matters most to the company. “Over the last 10 years, people went into other industries, as not enough emphasis has been put on the trades,” said Kelly. “It is my hope that schools start to promote jobs where people can work with their hands.”

Yvan agrees that what matters most is keeping industry top of mind, especially for young people. “Every advancement in the world relies on this industry,” he said. “The technology for the future is being created in machine shops. Whether it includes aircraft parts or the molds and tooling that make nearly everything, it all originally came from a machine shop. That is something that keeps me excited about this industry. But in order to create the products being introduced to the world, you need the technology and employees to make it all happen.”



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7 CRITICAL VMC FEATURES FOR IMPROVING PRODUCTIVITY



By: William Howard,
Vertical Product Line Manager,
Makino Inc.

There are tens of thousands of machine shops located across North America, and each year, on average, these companies purchase upwards of 6,500 vertical machining centers from more than 260 different machine builders. With this volume of

purchasing and variety of machine options, it's critical for machine shops to understand and carefully assess machine features that possess the greatest impact on productivity and profitability. Highlighted below are seven recommended features to evaluate in a production vertical machining center:



1 METAL-CUTTING CAPABILITY

The core competencies of any machine tool are its ability to cut metal, meet customer expectations and produce revenue. Therefore, one of the most important features to evaluate on any vertical machining center is the spindle. A productive vertical machining center should have a robust spindle design with wide-ranging characteristics, including exceptional horsepower, superior torque and wide-ranging spindle speed. This level of spindle capability can enable companies to cut a wide variety of materials, reduce cycle times, lower production expense, shrink delivery times and increase profitability through lower part costs.



2 TOOLING SUPPORT AND CAPACITY

A typical job-shop vertical machining center is required to produce a variety of parts, perform quick part change-over and check tool quality frequently. Unfortunately, not all vertical machining centers are designed with these considerations in mind, resulting in short but frequent periods of machine downtime that can quickly add up to higher part costs, extended delivery times and significant losses in profitability. Manufacturers looking to avoid these issues should seek a vertical machining center that offers generous tooling capacity, easy access to the tool magazine—while keeping the spindle cutting—and a design built to accommodate a wide variety of tool sizes and weight.



3 CHIP AND COOLANT MANAGEMENT

With enhanced productivity also comes greater demand for chip and coolant removal. Additional production time generated from enhanced cutting capabilities can be diminished if the machine needs to be stopped frequently to clear chips from the work zone in order to continue production. Oftentimes, these issues stem from insufficient chip and coolant tank size, lack of coolant flow and inadequate coolant system delivery technologies (e.g., flood, part wash, through spindle). As such, manufacturers should seek features that help improve chip and coolant removal, such as wide machine casting openings, robust coolant systems with appropriate volume and pressure, chip conveyors to remove materials from the work zone and external lift-up chip conveyors to evacuate materials from the machine.



4 CONTROL SOFTWARE

The control software of a vertical machining center has the ability to facilitate or limit the flexibility of the machine in terms of data storage, coordinate systems, probing and networking. An effective machine control should offer the capabilities to fully support production and enhance ease of use for the operator. Ideal features and capabilities include ample part program storage, diverse program registry, numerous tool offset pairing, extensive work-coordinate systems, tool length measurement and spindle probe capability as well as Ethernet, DNC, PCMCIA, USB drive and RS-232C features.



5 FIXTURING AND 4TH-AXIS POTENTIAL

The ability to apply unique fixturing and multi-axis tables to a vertical machining center can have a critical impact on setups and workflow. With flexible table space and work-holding opportunities, companies can run multiple setups on the same base plate, providing quick and direct transfer of parts. Similarly, the addition of a 4th-axis table can enable greater machining surface area and access to five-part faces, minimizing fixturing and handling for the highest level of machine utilization and overall productivity.



6 AUTOMATION INTEGRATION

The most efficient means for boosting the productivity of a vertical machining center is decoupling setup procedures from the machining process through automation. Decoupling requires a machine that is built to accommodate automated technologies and unattended processing as outlined by the other features mentioned earlier. In most machine shops, setup is the leading contributor to spindle non-cutting time. By introducing automation, such as pallet changers or robotic part-handling systems, companies can de-couple setup time, build a work queue in front of the spindle, and dramatically increase spindle utilization, providing more productive hours and reduced costs.



7 OPERATOR-FRIENDLY ERGONOMICS

The final key component to vertical machining center productivity is the machine operator and how he or she interacts with the machine. No matter how extensive the capabilities of a machine, if the operator is experiencing fatigue or discomfort in working with the machine, overall productivity is limited. An ideal vertical machining center provides operators comfortable ergonomics, including easy access to the machine worktable, exterior tool magazine and overhead crane access. Automation can also improve operator ergonomics through additional time and space to set up workpieces.

Learn about the new standard in production vertical machining centers, the Makino PS-Series.



IDENTIFYING SOLUTIONS THROUGH REAL-TIME PRODUCTION MONITORING

Thanks to the advent of many types of production software and hardware technology, along with the accessibility of telecommunications technology and the Internet, getting the most out of a shop-floor environment is just a mouse-click away. When multiple machines are connected to a single network to a centralized computer, data-monitoring software can enable a manufacturer to retrieve, store and analyze high volumes of actionable machine data in real time, eliminating the need for manual data collection.

This data can provide detail about part counts, cycle time and tool life. In addition, production and status data can be collected directly from the machines. Such information enables shop personnel to react quickly when bottlenecks occur, ultimately preventing downtime and yielding more parts per machine.

Data monitoring is employed in many manufacturing environments—from very low-mix automated environments to high-mix automation or stand-alone machines—and should no longer be considered exclusive to large companies. Data can potentially be accessed from anywhere in the world to improve productivity and help a company reap the most from its machine investment.

Those shops wanting to implement a monitoring solution must first decide what data is most important to record and retrieve. Some of this information includes machine utilization data to help calculate ROI, and spindle load monitoring to enable manufacturers to optimize spindle speeds, feedrates and cutter engagement for maximum

it to the staff, and determining how to handle all of the stored data.

When choosing the right monitoring solution, it is critical to have the support of a provider that offers tight integration between the software and the machines. Companies should also be ready and willing to adapt to change

Standard actionable data that can be tracked:

- Multiple machine status
- Machine utilization
- Power monitor
- Camera monitoring
- E-mail notifications

Advanced monitoring features offered by select vendors:

- Probe data analysis
- Tool management
- Work scheduling
- Spindle monitoring

metal removal. Data monitoring software has a wide range of standard and advanced features.

The open-architecture machine communications protocol called MTConnect gives manufacturers the ability to connect their software packages to all types of machines. This software is becoming more widely available in newer machines, but it can be retrofitted into older machining systems as well. Implementing the data-monitoring software requires several preparations including Ethernet and wiring, training, backup, introducing

to help perfect the processes to achieve optimum workflow efficiency. With data-monitoring software, manufacturers can have more confidence in the operation than anytime before. The actionable data can maximize efficiency and minimize downtime.



To read the full white paper, "Measure to Improve: Identifying Solutions Through Real-Time Production Monitoring," visit makino.com/whitepapers/rtpm



The cutting performance and flexibility of AFAB's a51nx cell have provided the capabilities to reduce cycle times by 25 to 50 percent over previous equipment.

AFAB PRECISION continued from page 30

AFAB is also in the process of implementing additional tool-life monitoring and broken-tool-sensor management functions to enhance lights-out production.

DRIVING INNOVATION

AFAB personnel continue to add applications into the cell's [MAS-A5 control system](#) in order to expand automation. Company personnel have no doubts that this flexible technology has the potential to quadruple business.

"As we expand into new markets, we hope to increase our investment and add 5-axis capability and an additional FMS," said Larry. "We want the capability to grow and to service additional customers. We feel that this will allow us to not only machine more complex parts more efficiently but also improve our competitive advantage.

The Makino system differentiates us and gives us the freedom to try new things and achieve continuous improvement."

This continuous improvement ties directly to the company's mission. What matters most to AFAB is their commitment to customer success.


"We take pride in producing the highest quality parts with the fastest turnaround at a cost-effective rate in order to facilitate customer innovation," said Larry. "We are able to achieve this through high-performance technology. It allows us to grow and innovate and to find new ways to service our customers."

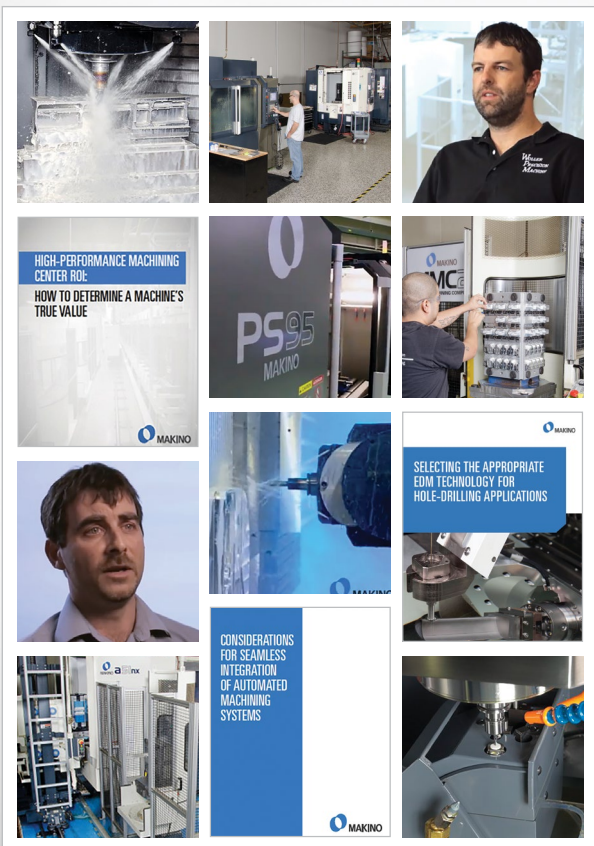
AFAB wants to be known for their quality, customer service and innovation.

"We make parts that save lives," said

Larry. "If they are not done right, there are consequences, so our machinists take their jobs seriously. You can certainly make things quickly, but if you don't have quality, you are wasting your time. With Makino, quality is not an issue.

"As a company, we aren't happy standing still. We want to work with companies driving innovation to improve people's quality of life."

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