

C O M P E T I T I V E MOLD MAKER

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AUTOMATING YOUR OPERATION GOES BEYOND THE EQUIPMENT

Across North America, manufacturers in the tool, die and mold industries are rapidly turning to automation to fuel competitiveness and grow their business in the face of global competition. Automation can be a powerful tool in achieving these goals; however, many manufacturers place too great an emphasis on the automated technologies themselves, particularly during the process of initial consideration. The key to establishing a complex, highly engineered automation system is the knowledge and expertise that go into designing, developing and integrating the technologies.

Many of our customers reach out to us with questions about automation in order to solve issues of skilled labor availability and to maximize machine investments through increased utilization rates. While all are valuable outcomes that manufacturers can expect from automation, we are quick to emphasize that successful implementation of automation begins with understanding the workflow and process requirements of the applications they produce. It's this level of consultation and dialogue around defining processes that truly makes automation effective.

Many suppliers are on the market that can simply sell and install a robot. Could this level of service improve current productivity and efficiency? Without a doubt. But when taking on a sizable investment that is meant to position a business for the future, achieving bare-minimum results is a disservice to long-term competitiveness and return on investment. It's also important to remember that successfully implementing automation does not end with equipment installation. Manufacturers should expect to work with their automation supplier to conduct post-process checks and ongoing process optimizations to ensure continuous improvements. A highly dynamic and intelligently applied automation system can provide nearly unlimited opportunities for process enhancements, including these capabilities:

- Reduce part and labor costs.
- Enhance throughput and overall capacity.
- Improve process consistency and quality.
- Increase production flexibility.

Customers have many options when it comes to machines and automation, but only one solution for total support and integration of processes and automation. With more than two dozen applications engineers focused on milling and EDM for tooling, Makino guides its customers through the automation process by deploying best-in-class techniques from concept to implementation, and from production to continuous improvement over the life of the equipment.

We all want to win new business. Achieving this goal takes not only the right automation investment but also excellent support.

Sincerely,
Andre Ey

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FOR ACCEDE,

THE PATH TO CONTINUOUS IMPROVEMENT BEGINS WITH VMCS



Accede Mold & Tool has a long history of producing complex, custom-designed plastic injection molds, from small single-cavity prototypes to 30,000-pound multi-shot molds. Key to the success of this full-service shop is the employees it considers as family; and unlocking the company's competitiveness requires providing the team with the tools it needs to get the job done efficiently, whether it's for the medical, consumer goods, packaging or automotive markets.

In 2007, shop-floor leaders decided that the company should expand capabilities to provide additional value to its customers. The opportunity was ripe for reliability and uptime improvements that would help the company grow. To increase its competitiveness, Accede needed to invest in new equipment.

The company looked for a machine-tool manufacturer that was as serious about complex mold-making as it was. And Accede found it in Makino. In 2008, Accede purchased an [F5 vertical machining center \(VMC\)](#) to replace two of its commodity machines. It quickly saw cycle times that were 30 percent faster, increasing the company's total volume each month, and putting Accede on a path to continuous improvement.

"The first Makino machine gave us confidence in the equipment," said

Brett Lindenmuth, vice president of operations at Accede. "Since then, each additional machine purchase has brought improvements in efficiency, reliability, cost and capability."

FAMILY MATTERS

Accede is a family-owned company founded in 1981 by Al Fox in Webster, N.Y. Today it is run by Al's son, Roger Fox, in nearby Rochester. A third generation of family has recently joined the company and includes Roger's daughter, son and nephew. It's evident that family is important here. The familial atmosphere extends not only to the company's 68 employees but also to its customers, whose needs are met through the company's wide range of in-house services that include engineering, design, fabrication,

"It was quickly apparent that Makino's focus on hard milling was different than other manufacturers."

sampling and testing. Accede wants to provide strong support for its customers, so the company is actively training a new generation of employees through a six-year apprenticeship program.

When it came to researching new equipment, the company invested

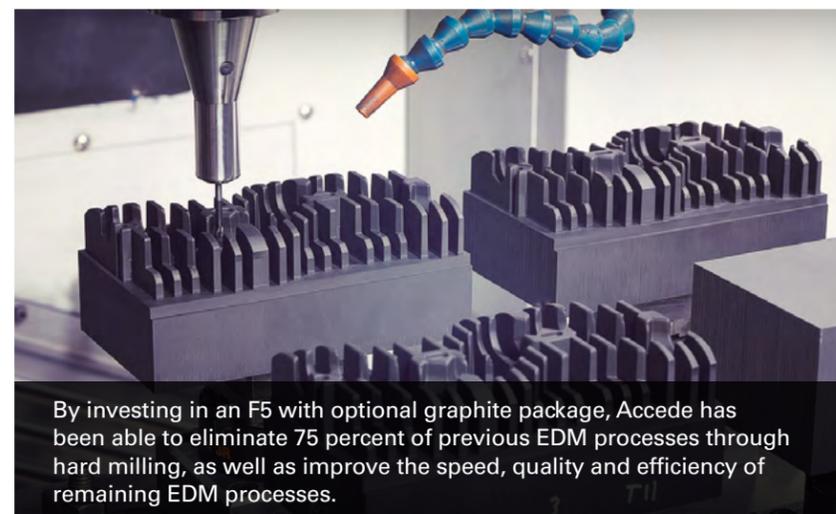
the same time and care into searching for a partner as it does in nurturing its employees. It wanted to find a partner experienced in producing highly complex molds. Representatives from Accede traveled to Japan to visit the Makino factory. They quickly found that the level of detail and care put into the design and construction of their machines was very different than most other machine builders on the market. [Makino's engineers](#) demonstrated pride in their jobs and enthusiastically shared the intricate design considerations that went into each machine.

"While many suppliers could rattle off machine techs and specs, few could convey what that meant to our mold-building operation," said Tom Flaherty, CNC manager at Accede. "It was

quickly apparent that Makino's focus on hard milling was different than other manufacturers. It wasn't just about having a fast machine but also about having dedicated engineering support. We were very comfortable with their commitment to their customers. We knew that if we needed someone on the phone to help us problem-solve, they would be there."

It also didn't hurt that the company already had two LeBlond Makino machines on its shop floor that were still running without issues even after more than 25 years. Accede knew that it had a supplier capable of providing the reliability it was seeking.

"When your job is to produce quality, it's easy to recognize quality in other products," said Flaherty. "Makino puts the same level of care and pride into their work as we do our own."



By investing in an F5 with optional graphite package, Accede has been able to eliminate 75 percent of previous EDM processes through hard milling, as well as improve the speed, quality and efficiency of remaining EDM processes.

ACHIEVING FLEXIBLE EFFICIENCIES

The F5 proved to be a highly efficient solution for precision hard-milling applications, as well as complex electrode production, thanks to Accede's investment in the optional graphite package.

"With the F5 machine's hard-milling capabilities, we were able to reduce 75 percent of our previous EDM processes, while simultaneously improving the speed, quality and efficiency of all remaining EDM processes through enhanced graphite processing," said Flaherty.

"One customer couldn't believe that we could mill their exotic materials, such as cindered carbide, instead of using EDM. We were hard milling with better results, especially on extremely tight tolerances," Flaherty added.

With the F5, Accede is cutting 48-58 HRC steels with tolerances of plus 0.000 inch and minus 0.0003 inch. The machine consistently produces tight blends and matches on 3-D contours, allowing for perfect part interchangeability.

"We have eliminated jig grinding with the F5, and in some cases handwork has been reduced from six hours to two hours or less," said Flaherty.

Operators are able to easily navigate the Makino Professional 5 control, which has a Microsoft Windows CE operating system graphical user interface and touch-screen selection. In addition to being comfortable with the laser, spindle and probe, Accede personnel were able to leave the machine unattended for start-to-finish machining, something they weren't able to do with the company's older equipment.

"Our lead-time delivery is now four times faster with the F5, enabling us to better predict workflow and prepare our next jobs—something we couldn't do before," said Flaherty.



Success with the F5 led to Accede purchasing a [V33 vertical machining center](#) to replace two older machines and focus on high-speed precision machining. The company also purchased a [PS95 vertical machining center](#) for production machining. The 40-taper spindle can handle a wide range of its tough machining operations.

"The PS95 quickly became our workhorse to hog material and to do some of our finishing," said Flaherty. "It truly expanded our general-purpose machining."

Accede followed up those purchases with a second F5 and a [V56i vertical machining center](#). On the milling machines, Accede uses magnetic pallet tables as its form of automation, allowing standardized work holding with no engineering needed.

"We just find the real estate we need on the table, and turn on the magnet," said Flaherty. "We don't need to add holes or worry about the techniques of different operators."

CUTTING OUT COSTS AND LEAD-TIMES

With its new equipment, Accede achieved the improved uptime that it originally sought and is now producing more parts than ever before, all while giving its customers more lead-time. It has seen improvement in not only speed and efficiency but also in quality and tool life.

ACCEDE BY THE NUMBERS

68 PERSON SHOP

35 YEARS IN BUSINESS

6 NEW MAKINO MACHINES

30% CYCLE-TIME REDUCTION

4X FASTER MACHINES

66% REDUCTION IN HANDWORK

100% REDUCTION IN JIG GRINDING

FEATURE ACCURACY OF PLUS 0.0000 INCH AND MINUS 0.0003 INCH

With these high-performance machines, Accede is using brand-new, sophisticated tooling technologies that it couldn't use before.

"With the first F5, our tool life was extended four times that of our previous machines," said Flaherty. "When we added the V33, tool life doubled again. The V56i improved tool life even more."

Accede is so confident in the quality and performance of the Makino machines that jobs are frequently run fully unattended, and only one cavity is verified before assembly. In fact, first-trial shots are frequently performed with the customer present.

"Doing first runs in the presence of the customer can be intimidating," said Flaherty, "but we are now more confident than ever in the consistency of what we're producing. We know we will hit all requirements on the first try, and every time after."

While the growth spurt at Accede started well before it purchased its VMCs, these machines certainly helped the company control its higher volumes of work while enjoying shorter lead-times.

"What used to be a 20-week build now takes 12 to 14 weeks," said Flaherty. "This has opened up the capability for us to take on jobs that we may have previously passed on."

Lindenmuth agreed. "We believe that you get what you pay for in terms of machine quality, sales and service. We are a small company, and what Makino can offer above and beyond the machine in terms of technical support has proven to be very valuable. We see them as an extension of our resources. We've had great experience with them in all aspects of performance; if we ever do have a problem, we know they will be there when we need them." When it comes to what matters most to Accede, in addition to supporting

JUST IN TIME FOR THE HOLIDAYS

In December 2015, Accede had the opportunity to bid on a new job. The trouble was, the company didn't have the equipment it needed to meet the delivery schedule of these two 30,000-pound stack molds, and the opportunity came just prior to the holiday shutdown. In a bold move, Accede decided to go for it anyway. On a Friday morning, owner Roger Fox contacted local Makino distributor Meagley Machinery; within hours, Meagley had located a V56i vertical machining center. The order was quickly placed, and by Thursday of the following week, the machine was delivered. On that Friday—a week after Accede first inquired about the machine—the Makino technician was setting up the V56i. Accede immediately began the job. The part ran for 96 hours straight on its first run, and proceeded to run orders continuously throughout the Christmas and New Year's holidays, with Accede technicians popping in to check on progress. During each visit, company personnel saw that everything was running reliably with pristine quality.

"Due to the flawless performance of the V56i, the job schedule was pulled in by a month and delivered to the customer a week early," said Flaherty. "We shocked the customer with our quality and output. Deciding to purchase that machine so quickly was one of our boldest moves—our owner went above and beyond to take a chance on getting this work, and we saw a great team effort. We not only won the order, but this machine has allowed us to continue to take on jobs we couldn't have possibly considered before."



The Accede Mold & Tool team is gathered around their recently acquired Makino vertical machining centers.

its employees and customers for generations to come, a stable business environment is important.

"We want to grow and support our customers," said Flaherty. "In the last eight years, we've made significant investments to increase our capacities. As the company grows, we will continue to invest in new equipment. Makino will be at the top of our list during the machine selection process."

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High-Precision Die-Cast Mold Machining on Makino V56i

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IN DIE/MOLD, IT'S
THE DETAILS THAT
MATTER MOST.



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MAKINO.COM/DIEMOLD

WHEN YOU MAKE WHAT MATTERS





HIGH-PERFORMANCE VMCs DELIVER PRECISION,

RELIABILITY FOR GROWING FRANCHINO MOLD

In central Michigan, leaders of Franchino Mold and Engineering bet big on a strategy to grow their business by investing in their people, improving processes and obtaining the best technology available.

Beginning in 2012, Franchino began a \$5 million shop expansion, which doubled their number of employees to 91 and expanded their machining—including the purchase of six Makino [F5 vertical machining centers \(VMCs\)](#).

Four years later, Franchino is expanding its position as a leading maker of die-cast and plastic injection molds—some as big as 420,000 pounds.

The company, founded in 1955, specializes in molds for automotive, construction equipment, appliance and consumer products manufacturers. Franchino also provides contract machining, and has long relied on Makino machines for their performance, reliability and durability. With three locations and more than 100 machines to create dies and molds for customers, the company is always looking to stay current with machinery.

When it was time to expand their small vertical mill area, Makino was at the top of their list. Little did they know that at the end of their purchase cycle of six F5 machines they would see improvements across the board: cycle time decreased by 30 percent, tool life improved by 25 percent and maintenance costs lowered by 20 percent.

CONSISTENTLY CUTTING TO NET SHAPE
Franchino had a lineup of older mills from various suppliers that were aging and beginning to experience chronic maintenance issues. As they looked to upgrade, there was one area of particular importance: the ability to accurately cut to net shape. When working with the large molds they were becoming known for, tolerances had to be minimal, since in large molds with multiple parts any tolerance error quickly adds up. The company determined that the ability to accurately and reliably cut to net shape would significantly reduce bench time

“We improved surface finish by changing how our programs cut based on what their [Makino’s] engineers taught us.”

for hand finishing mold components, resulting in quicker turnaround time and cost efficiencies for both the company and their customers.

At the outset of their purchase research, Mike Hetherington, vice president of operations, and company president Robert Franchino spent 18 months studying new machining technologies. During that research, they worked closely with [Single Source Technologies \(SST\)](#), which provides machine tools, engineering

services, tooling, supplies, application support and customer service to local manufacturers. Hetherington even traveled with SST representatives to Makino’s assembly plant in Japan to learn firsthand about how the machines are built and to better understand their capabilities.

The Franchino team later challenged SST with test cuts on complex workpieces that had to be held to tolerances of plus or minus 0.0002 inch. Not only did SST and Makino engineers successfully produce the parts on an F5, but they also offered recommendations for

process improvements. These process improvements were possible because the F5 is designed to provide stiffness and rigidity for chatter-free cutting, as well as agility and accuracies for tight-tolerance blends and matches needed for complex, 3-D contoured geometry.

Franchino purchased two F5 machines, and quickly realized the improvement of the Makinos over their older machines.

“The components come right off the machines and fit right into a pocket. We don’t have to fit them. They will go in the first time,” said Scott Pollok, a CNC programmer and team leader in Franchino’s F5 area.

Soon after the initial purchase, Franchino then bought a second set of F5 machines—and then a third set months after that, bringing its total to six F5 machines. As Franchino purchased each pair of F5s, the company’s operators attended a week-long training program at Makino’s Die/Mold Technologies Center in Auburn Hills, Mich. They learned to operate the new machines and also discovered best practices for programming.



Service and support from Makino and SST have enabled Franchino to improve all aspects of their processes from tooling and programming to work-holding and cutting strategies.



With the F5 machines, Franchino is able to consistently hold tolerances of plus or minus 0.0003 inch with surface finishes of Ra40, reducing polishing times by up to 40 percent.

“We got a different perspective on what we had been doing for years,” Pollok said. “We improved surface finish by changing how our programs cut based on what their [Makino’s] engineers taught us.”

REPEATABLE TOLERANCES, SURFACE FINISH—ALL WITH THE LIGHTS OUT

One of Franchino’s goals in upgrading their small vertical mills was to improve the reliability of unattended and lights-out machining, especially during its second shift. Previous machines weren’t able to consistently hold tolerances without an operator continuously monitoring the program, and often required additional benchwork and hand polishing to meet requirements. The F5s changed all that.

Hetherington estimates that with the F5s in place, downtime for repairs or maintenance has been improved by 100 percent. As a result, jobs can be set up and run unattended for six hours or

longer during the second shift with only one operator on duty. The reliability of the equipment has also given Franchino the confidence to run some mold components over the weekend with no one in the shop.

“One of the biggest things we have now with the Makinos that we didn’t have before is the ability to trust that they’re actually going to do what we tell them to do,” Hetherington said. “We don’t worry about the machines going down or not making it through the programs that we run. We are able right now to send a program to the machine and go home for the weekend, and rely on the fact that the machine is going to be running when we come back in on Monday.”

Each F5 is equipped with the Makino Professional 5 control, which comes with an easy-to-use touch-screen interface and provides operators with convenient access to the tools and information necessary to program and process cavity components quickly and efficiently. The 30 percent cycle-time improvement Franchino has realized is due in no small part to how well the control assists the operators, Hetherington said.

One of the key process improvements SST and [Makino engineers](#) recommended was a standardization of the machines’ tool changers. Each F5 has an automatic tool changer (ATC) loaded with the same first 15 tools. Additional tools fill out the 30-tool magazines as needed, simplify programming and enable Franchino to define and standardize processes. Franchino also has cut in half the amount of time required for polishing and other benchwork because the rigid F5s cut accurately and consistently. A program can be set up and tuned in on one machine, and then transferred to some or all of the other F5s. No matter how busy the shop is, or which operator is scheduled, Franchino can easily accommodate engineering modifications and production schedule changes without affecting quality.

“We now can take details off one machine and put them on any one of our six Makinos and be confident that it’s going to run exactly the same on any of our machines,” Hetherington said.

SECONDARY FINISHING CUT 30 TO 40 PERCENT

Blending issues are a common problem for manufacturers when they have to use two or more cutters of different sizes. With the Makino F5s, Franchino no longer has to worry about those issues; the repeatable accuracy of the F5s has eliminated that problem, because the rigid design of the machines reduces chatter. Core-cooled spindles, thermal-controlled spindle jackets and high-pressure through-spindle coolant also ensure long hours of rigid, stable cutting. In addition, the Professional 5 control quickly manages more tool points, and an automated tool-length monitor ensures tool integrity. The cutting feedrate reaches 787 inches per minute.

“The F5s’ capabilities are just amazing,” said Jim Walter, Franchino Mold’s CNC supervisor. “They process programs so fast. The feedrates and chip loads are high. They’re in the cut all the time.”

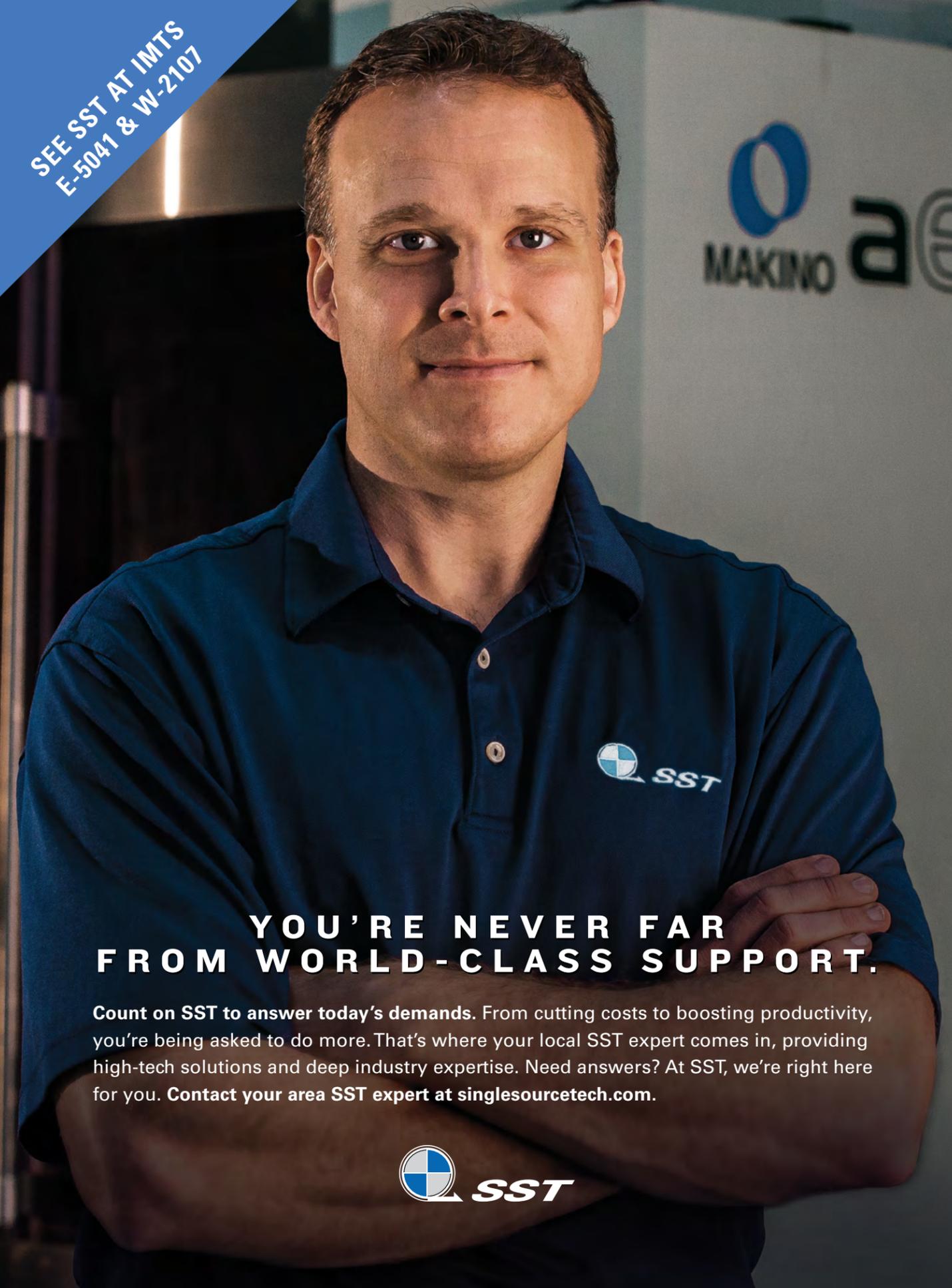
MORE THAN MACHINES: ENGINEERING AND PROCESS ADVICE

[Process engineering](#) support from SST and Makino contributed to Franchino Mold achieving its business goals. Franchino’s leaders set out to purchase vertical machining centers, but they also received detailed advice on how to incorporate the new machines’ abilities into their processes; and they plan to incorporate new programming techniques and workflow.

[Training during implementation](#) of the F5s helped the Franchino team to take an advanced engineering perspective of their processes, giving them accurate information to calculate feeds, speeds, depths of cut and chip loads. A routine to drill a hole and complete details around a hole now is saved in the Professional 5

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INNOVATION MOLD ACCELERATES GROWTH WITH RAPID INVESTMENTS IN PRECISION MACHINERY

We often read and hear that to compete, manufacturers must become more agile, efficient and faster to market. Never mind what the business experts and gurus write and say. Just take a look at what Innovation Mold & Design is accomplishing.

The Germantown, Wis., mold shop has transformed into a successful model of how to embrace advanced technology, hire more skilled machinists, diversify its customer base and enhance its machining capabilities. As a result, Innovation improved its mold build times, enhanced workpiece quality and significantly grew its bottom line.

What matters most to company president Alex Hermann is that Innovation expands with precision, high-performance technology. The company's investment in six Makino machining centers and accompanying changes to programming and processes enable Innovation to achieve the aggressive goals set by Hermann.

Here's what they've achieved:

- Sales increased from \$2 million in 2012 to \$6.5 million projected for 2016. This resulted from increased throughput and also the new capability to produce lens molds for automotive and other applications (traffic controls, commercial lighting), plus aerospace and medical parts.
- Skilled operators, programmers and engineers have been added, more than tripling the workforce to 29 while adopting an open-shift approach in which employees have flexible weekday schedules, and can program

as well as monitor machine operations remotely with their smartphones and laptops. Lights-out machining occurs on weeknights and over the weekend.

- Nearly all secondary machining, benchwork and fitting have been brought in-house, turning what had been a source of added expenses and extended lead-times into a new profit center and a competitive advantage. In 2015, 30 percent of all molds had some processes that required outsourcing. In 2016, that number has been lowered to 9 percent. Time required for secondary operations has been reduced by days—and by a week or more on some projects.
- Milling tool and EDM consumable costs have been significantly reduced, from 5 percent of gross sales to 2.5 percent.

"In the last decade we've heard a lot about survival. That was never a part of any discussion I've had with Innovation.

They always talk about growth. They always talk about the next project. It's obvious from the minute you meet him [company president Alex Hermann] that he's all about growth, performance and perfection," said Lynn Bachman, sales engineer at [SST](#).

SPENDING SPREE TO GROW THE BUSINESS

Established in 1979, Innovation Mold & Design was a mature, profitable supplier of tooling and die/mold components, primarily to regional manufacturers of plastic injection-molded consumer products. The company had eight to 10 customers; one customer represented about 60 percent of revenue.

Hermann, a 23-year employee, purchased the company in 2012 and quickly refocused Innovation to add the capabilities needed to win new business from a wider variety of customers, especially those in the automotive, aerospace and medical industries with demanding requirements for tolerances



The automatic pallet changer on the [a81nx](#) has helped Innovation increase machine utilization by as much as 20 percent compared to previous commodity machines.

and surface finish. Today, Innovation has 43 customers, with most concentrated in those three new industries.

The company initially considered buying a horizontal machining center—a rarity in die/mold shops—in order to bring mold cavity applications in-house that had historically been outsourced. Innovation sought out SST, which distributes [Makino machines](#) and sells tooling and consumables to shops in North America, because he knew about Makino's reputation for precision and high performance.

Their conversations, however, soon turned from horizontal machining solutions to wire EDM. Innovation's leaders were frustrated with a commodity wire machine they had recently purchased

“SST showed us that there was a large difference between the original purchase price and total cost over the life of the machine.”

that experienced repeated mechanical issues and failed to run unattended as Innovation planned. A purchase order for a second commodity EDM was canceled due to nagging problems with wire threading on the first machine.

Innovation then purchased two U6 wire EDMs from SST, installing them in June 2015. The impact was immediate.

Innovation now produces more mold components with less wire. Consumable costs are down 1.5 percent of total sales compared to the commodity EDM machine previously used.

Innovation didn't forget about adding horizontal machining. In July, the company purchased an [a81nx](#), along with two vertical machines: a [Makino F5 and PS95](#). A second PS95 was purchased in October, completing the whirlwind expansion cycle.

How the company selected the a81nx illustrates the relationship and partnership that developed between Innovation's team and SST. Engineers from SST took Hermann and his leadership team to other shops nearby to see horizontal machines in action. SST worked with Innovation to

define the purchase decision not around the machine price but how closely the machine matched Innovation's application and process requirements and the total cost of ownership.

“We quickly realized the commodity machine we were about to buy would have been too small for us,” Hermann said. “SST showed us that there was a

small difference between the original purchase price and the total cost of ownership. We chose to invest more upfront, but gained capabilities that enable us to win jobs that we could not win before and that we could make more components with lower costs for tooling and consumables and maintenance.”

SST's recommendation combined the a81nx with tooling, work holding and programming that better matched the cavity components Innovation sought to bring in-house. The a81nx has a dual pallet changer that makes setup and loading efficient. The bottom-line impact from 2015 to 2016: Expenses for outsourcing are down 60 percent.

CUTTING MORE ACCURATELY THAN TESTING EQUIPMENT MEASURED

The dependability and predictability of the Makino machining centers are most important to Innovation's production managers and operators. The company runs the machines unattended over nights and weekends whenever possible.

As a result, some mold builds that had been scheduled for eight weeks using the company's previous commodity machines are now produced in four weeks.

The time needed for hand polishing has been cut by 30 percent because the four CNC machines hold tight tolerances. The F5 and a81nx cut feature tolerances repeatable to 0.0001 inch. In several applications, the PS95s produce perfectly even tool blends across nearly half a dozen cutters, eliminating nearly all hand fitting of shutoffs and parting lines.

The U6 wire EDMs yielded surprising early results, said Innovation Operations Manager Mark Shaw. In one of the first jobs Innovation produced on the new machines, the company's quality lab reported components out of tolerance by as much as 0.0005 inch. Operators and production managers checked and rechecked the U6 setup and program.

They called SST, which dispatched its engineers, who confirmed during an on-site visit what Innovation's team had already determined. The programming was correct, and the U6 machines produced the components properly.

“The U6 machines were cutting to within 0.0002 inch. We discovered that our vision-based coordinate-measure machine [CMM] was not as precise as the Makino wire machines. We were getting the parts we need from the wire EDMs from the first shot,” Shaw said.

Innovation tracks machine uptime, which has improved by as much as 20 percent because the Makino machines operate reliably, compared to the company's commodity VMC machines.

The performance measurement that matters more to the company's leaders, however, is how much the Makino machines enable lead-times to be reduced. Capacity is more important to Innovation than machine utilization, which is currently at about 60 percent, providing the company with capacity to add new business.

It used to take up to 10 days for some lens mold components featuring complex bezel geometries using the company's previous commodity machines. Today that run time is as low as two hours. Innovation combines runs on a PS95 for roughing cavities and the F5 for precise component details. The speed and accuracy of these machines, in conjunction with new programming and processes designed (with support from SST) to run in coordinated ways, make such a huge improvement possible.

‘PUT IN A POSITION TO SUCCEED’

Central to Innovation's growth strategy is making sure the machining centers are optimized with the right combinations of cutters, shrink-fit tool holding, work holding, programs and processes. SST proved to be the perfect partner to

accomplish all of this, said Jim Paulsen, Innovation's vice president.

“They really know my business, and SST with Makino has the full package of machine and tooling. They also provide ideas about our [processes and programs](#). They really put you in a position to succeed,” Paulsen said.

SST and Makino engineers recommended tooling and work-holding solutions customized for Innovation's specific applications that yielded significant increases in efficiency, accuracy and contribute to longer tool life. By collaborating with SST, Innovation was able to calculate its ROI not just on the purchase price of the six machines but also on overall reductions in costs for consumables, tooling and maintenance plus improved machine efficiency and quality.

Innovation's tooling costs have dropped from 5 percent of sales to about 2.5 percent in the past year. The company has brought all roughing and nearly all other outsourced work in-house, eliminating

significant expense. Moreover, because of the machines' accuracy, hand polishing has been reduced by more than 30 percent.

“I tell everyone who asks, and they do ask us now, I've never seen anything like these Makinos,” Paulsen said. “Every machine tool supplier will say their machines can do this or they can do that. And then we buy them and start using them and learn they really can't do what we need without a lot of tinkering. These machines do exactly what Makino promised us they could do. They're accurate, fast, and they cut consistently across the table. They are deadly.”

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WORK WITH AN EXPERT PARTNER

SST engineers began working with Innovation Mold by determining the customer's need. What mold components do they machine? What processes and equipment did they previously use? What are the new requirements?

SST next worked through the total cost of ownership. Most shop owners associate that number with the sticker price, but the total cost of ownership far exceeds the initial price of the equipment, said Bachman. Cost calculations must include expenses for tooling, consumables and the time it takes to complete a job.

For example, Makino builds machines with a spindle so well balanced that the cost of perishable tooling is decreased dramatically. Additional saving is realized in the number of hours it takes to produce a job, because the time needed for tool changes is reduced or eliminated.

“If they're going through three or four cutters on a cavity with other equipment, with a Makino spindle they'll go through none or one cutter. They don't have slowdown or the inaccuracy in the cutting process from dull tools. So it's not just about the initial cost of that cutter. It's the investment in that cutter over the cost of the job,” Bachman said.



ADOPTING A PRODUCTION MINDSET TO MOLD-MAKING BRINGS GLOBAL ADVANTAGE

By Darrell Johnson, Consumables Product Group Manager, SST

Today's die and mold shops are experiencing many demands. Not only is every job different, but molds are also increasing in complexity when it comes to geometric designs and how they are processed. Customer requirements are continually changing as well, requiring shorter lead-times, greater repeatability and improved quality. Added to this is the growing pressure for lower-cost tools, especially with competition from a global marketplace.

Internally, there are other challenges. Complex workpieces require more frequent changeovers between machines, affecting timing and repeatability. Operator skill sets vary, too, with some personnel having one year on the job and

others bringing 30 years of experience or more. This disparity can affect speed, efficiency, consistency and, ultimately, quality.

To successfully overcome these growing challenges and meet customer demands, shop owners must think about mold manufacturing in a new way by "productionizing" their mold manufacturing processes. What this entails is the transitioning of a product or process from one-off fabrication to a series of common procedures that can increase productivity and efficiency, and reduce the probability of errors that cause delays and scrap. These common procedures can be realized throughout the mold manufacturing

process, including using CAM toolpath templates to standardize many of the cutting parameters, standardized tooling and assemblies, and the adoption of new, modular work holding.

Taking on a production mindset is imperative in order to succeed. Streamlining the mold-making process can help companies achieve the following six goals:

- Shorten lead-times
- Reduce setup times
- Improve machine utilization rates
- Cut machine cycle times
- Decrease spotting times
- Address human factors, such as operator skill sets

ADDRESSING SETUP INEFFICIENCIES

One of the primary sources of inefficiency in today's mold shops is setup procedures. Mold manufacturers have grown accustomed to numerous part setups. From the initial squaring up of parts, to roughing, heat-treating, finishing and EDMing, manufacturers oftentimes run through more setups than they care to count. Moreover, these setups frequently entail changeover between multiple machine platforms. Substantial labor time results, hindering manufacturers' ability to reduce lead-times. In addition, it increases the risk of errors due to being unable to locate the workpiece.

Setup issues become even more troubling as design complexity increases with multi-face machining requirements. If a

This is where new modular work-holding solutions, such as the FCS clamping system, have the greatest impact.

manufacturer is operating traditional 3-axis machining centers, an application calling for machined features on two or more sides of a workpiece could entail multiple sequential setups on multiple machines. Mold shops that try to improve workpiece accessibility through custom setups have their own unique challenges, including positioning inaccuracies and demand for an incredibly experienced operator skill set. This is where new modular work-holding solutions, such as the [FCS clamping system](#), have the greatest impact.

Designed to provide quick, custom setup options for unrestricted access to five workpiece surfaces, the FCS system enables mold makers to spend less time on setups and more time on machining. The system creates a three-dimensional grid in every machine installation that maintains positioning repeatability within 6 µm (0.0002 inch) on every setup.

The base gage features a grid of threaded holes and precision counterbores spaced evenly apart by 50 mm to within 5 microns, allowing for quick and precise modular setup adjustments that are safeguarded from human error.

Positioning accuracy is further enhanced by the modular clamping system's TiN-coated hardened steel rings. These rings are installed between the workpiece and a cylindrical clamping body, held tightly in place by an H7-class precision counterbore in the workpiece or base gage and precision ground tapers on the other. The result is a secure fit with micron-level repeatability. The rigidity of the system is developed by serrations in the clamping mechanism with matching serrations in the rod. As the clamping

mechanism tightens on the rod, the serrations pull on the rod's matching serrations, delivering precise tension on the rod, the seat and the ring to secure the workpiece.

Advanced users of the FCS system can also take advantage of the optional Guideline software, developed by BCK of Italy. This virtual-design software enables users to design FCS work-holding systems based on the CAD model of a workpiece. Guideline software projects the FCS grid onto the workpiece model to identify the most efficient workpiece positioning for machining and chip evacuation. After checking for possible interferences with other holes, it automatically arranges the FCS features (drilled and taped hole and H7 Class counterbore) based on the dimensions of the workpiece and combination of pallets and clamping available.

CREATING A GLOBAL ADVANTAGE

The competitiveness of today's mold-making market demands the highest degree of precision and efficiency from companies' setup procedures. Applying a production mindset to mold manufacturing can be the edge that a shop owner needs to gain an advantage globally.

Several of North America's leading mold shops are already successfully applying modular work-holding solutions to drive down costs and improve responsiveness to customer needs. The FCS system, in particular, has enabled shops to reduce setup times of complex applications from hours to as little as 15 minutes. The system's innate positioning accuracy and repeatability are transferred throughout the mold manufacturing process, from machine to machine, leading to reductions and even elimination of spotting and manual finishing operations. Additionally, the use of Guideline software lets fixturing locations be completed during the CAD/CAM phase so that manufacturers can further "productionize" their processes with preplanned tool paths and work holding.

The FCS system is incredibly simple to deploy, even for novice operators, despite the complexity behind the system's design. With the prevalence of skilled-labor shortages and growing demands to reduce scrap and unproductive time, this clamping system enables mold makers to simplify manual-labor activities and eliminate setup error while operating more efficiently and profitably.

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GO BIG OR GO HOME: FAST, ACCURATE SINKER EDM FOR HUGE WORKPIECES

The dilemma that shop owners have always seemed to face is how to produce large parts not only quickly but also precisely. With commodity machines, the choice has always been made for owners: Production of large parts is either quick or precise, but rarely both.

UNTIL NOW.

Makino introduced its [EDNC-Series sinker electrical discharge machines \(EDM\)](#) to ensure an ideal blend of speed, surface finish and reduced electrode wear. It's a tough combination to beat for jobs in large work envelopes that also require delicate, fine features with high accuracy.

"Large commodity sinker EDMs experience significant performance drop-off in accuracy, surface finish and machine speed compared to standard-size sinker EDM machines," said Brian Pfluger,

Makino's EDM product line manager. "The Makino EDNC-Series machines overcome these challenges with key technologies that achieve small sinker EDM performance on machines designed to handle large workpieces."

ADVANCED TECHNOLOGIES POWER SINKER EDM QUALITY

All Makino EDM machines include the revolutionary Hyper-i control interface for user-friendly operation. The control intelligently streamlines the touch-screen

interface to enable operators of all skill levels to achieve the most efficient and accurate results.

The EDNC-Series combines the Hyper-i control with HyperCut machining technology to boost productivity. HyperCut is a new generator technology that improves roughing speeds by up to 30 percent without affecting workpiece accuracy or surface quality by increasing power levels without requiring additional reduction on the electrode.

The technology also minimizes electrode wear while providing the fastest possible machining speed. The EDNC-Series of sinker EDM machines are equipped with Makino technologies that maximize machine power and quality.

SuperSpark IV is an advanced adaptive control that optimizes the machining discharge power and electrode jump motions during roughing and finishing operations. This technology is especially effective on rib or drafted electrodes and, when combined with HyperCut settings, can reduce total machining time by up to 50 percent.

Likewise, all EDNC-Series sinker EDMs can be equipped with Makino's proprietary High-Quality Surface Finish™ (HQSF). The technology yields achievable surface-finish capabilities 50 percent better than conventional surface finishes using graphite electrodes, regardless of discharge surface area. A big benefit: HQSF can extend tool life through improved surface integrity, and it can also reduce cycle time even when fine surface finishes are not required.

PRODUCE BIG WORKPIECES WITH SMALL DETAILS

The EDNC-Series offers similar performance, capability and user friendliness as the Makino EDAF-Series of sinker EDM machines, but in a larger machine platform.

EDNC machines are capable of high-speed jump Z-axis motions up to 20 meters per minute with a 1.5G acceleration rate using the optional HS-Rib Z-axis, making them just as productive and accurate as smaller machines. The [EDNC6](#) and [EDNC8](#) use a programmable three-sided drop work tank to improve

EDNC SINKER EDM FAMILY



TABLE SIZE	31.5" X 21.7"
X	25.6"
Y	17.7"
Z	19.7"
TANK SIZE	43.3" X 29.5" X 17.7"
MAX WORKPIECE WEIGHT	3,307 LBS



TABLE SIZE	43.3" X 27.6"
X	31.5"
Y	19.7"
Z	19.7"
TANK SIZE	55.1" X 35.4" X 19.7"
MAX WORKPIECE WEIGHT	6,614 LBS



TABLE SIZE	51.1" X 37.4"
X	39.4"
Y	23.6"
Z	19.7"
TANK SIZE	59.0" X 43.3" X 19.7"
MAX WORKPIECE WEIGHT	6,614 LBS



TABLE SIZE	78.7" X 39.4"
X	59.0"
Y	27.6"
Z	31.5"
TANK SIZE	98.4" X 55.1" X 31.5"
MAX WORKPIECE WEIGHT	22,046 LBS



TABLE SIZE	98.4" X 51.2"
X	78.7"
Y	27.6"
Z	31.5"
TANK SIZE	110.2" X 70.9" X 41.3"
MAX WORKPIECE WEIGHT	22,046 LBS



TABLE SIZE	110.2" X 63.0"
X	78.7"
Y	59.1"
Z	31.5"
TANK SIZE	129.9" X 78.7" X 47.2"
MAX WORKPIECE WEIGHT	22,046 LBS

Some EDNC-Series models are available with optional extended stroke and extended work tank configurations.

TECHNOLOGY SPOTLIGHT

operator access. The machines can be integrated with automation to increase productivity and maximize unattended operation.

To accommodate massive, heavy workpieces that require producing fine features, Makino has extended its sinker EDM line to include the EDNC10, EDNC15, EDNC20 and EDNC21. These machines handle workloads from 6,614 pounds to 22,047 pounds.

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The design of the EDNC-Series features:

- **High-mass castings** to ensure mechanical and thermal stability
- A **stationary table** for accurate positioning regardless of workpiece size or weight
- A space-saving **integrated reservoir** in the base casting to reduce machine footprint size and improve machine thermal stability
- **Dual-anchored direct-drive ball screws** that maintain precision long term
- Programmable **rise-and-fall work tank** design allows friendly ergonomic access to the work zone for loading/unloading of large workpieces
- Standard safety equipment (flame sensor and fire extinguisher) for secure, unattended machine operation

TECHNOLOGY SPOTLIGHT

TURN PARTS INTO PROFITS FASTER WITH NEW MAKINO Pro6 CONTROL



When it comes to complex, high-precision mold-making, it is critical to provide machine operators with the tools and technologies that enable them to move fluidly through machine setups, easily access machine process data and conduct daily routines with safety and confidence. The new Makino Professional 6 (Pro6) control fulfills these needs and accelerates productivity for machine shops and tool, die and mold makers through streamlined touch-screen layouts, operator guidance and the latest machine functions.

Despite its new human-machine interface (HMI), the Pro6 incorporates several familiar functionalities from the previous Pro5 control. Its advanced touch-screen layout also offers many new productivity tools, including screen customization, code and parameter search, guidance functions and other machine information—all at the operator's fingertips.

"The Professional 6 control gets you from parts to profits with enhanced functionality by making the point where the operator meets the machine a seamless transition," said Jim Brown, systems and control engineering manager at Makino. "Cycle-time savings and dynamic-control capabilities have been added to the new control's Geometric Intelligence functions to help lower costs per part."

The number of physical buttons on the control has been reduced and replaced with touch-screen commands that mimic

how modern Web browsers operate. The new "My Panel" feature enables operators to store their frequently used functions, macros or switches for quick access. Other new features include a QWERTY keyboard, a larger 15-inch display and an interactive status bar at the top of the screen. Touch a warning, alarm or indicator status icon and the operator can see detailed information about the issue.

FAMILIAR INTERFACE; ADVANCED FUNCTIONALITY

The Pro6 adds on-screen programming guidance for drilling canned cycles, probing, automatic tool length measurement (ATLM) and tilted working plane. The operator follows prompts and selects "input" to automatically insert lines of code into a program.

Pro6 has a converter to find parameter numbers based on the Pro5 number from its predecessor control, and automatically converts measurements from inches to millimeters.

Enhancements include Geometric Intelligence (GI) that provides 2-D corner control and optimized canned cycle indexing. Pro6 also has simultaneous program editing, MDI recall of the past 20 inputs and 3 GB of memory for program and subprogram storage, with an option to expand to 20 GB. When combined with the control's ease of use for operators of all skill levels, the new Pro6 raises the standard for machine control.

ASSISTANCE AND SAFETY AT YOUR FINGERTIPS

The Pro6 comes with cutting-edge technology that perfectly blends the proven stability of FANUC hardware and Microsoft Windows Embedded Standard 7 OS. In addition, the new control features:

- Operator assistance — Code and manual search functions along with guidance functions and parameters on screen when and where they're needed.
- Streamlined operation — The touch-screen's layout matches the operator's process flow from setup to production.
- Safety enhancements — Pro6 includes a dual door check, maintenance screens, easy access to machine information and a 3-D graphic viewer.

Operators using the Pro6 will move fluidly through machine setup, with the control empowering them with easily accessible information. The Pro6 is designed to protect operators and the parts they make.

The new Pro6 control is available only on select models. Contact Makino to inquire about specific availability on different machine models or on new machine factory orders.

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control, where it can be called up and quickly modified for new uses on subsequent jobs, saving significant time.

The common set of tooling, tool holding and work holding for each machine recommended by SST and Makino also met Franchino's goal of standardizing operations. Engineers from SST and Makino have remained available ever since to answer any questions Franchino Mold has in preparing new routines that have reduced cycle times and improved component quality. Franchino estimates the F5s have helped cut bench time by 30 percent and spotting time by 20 percent as a result.

"They [SST and Makino] helped set up processes that made the most of those machines," Pollok said. "We use what we learned every day, and we're seeing significant increases in efficiency because of it."

ACCOMPLISHING WHAT MATTERS

What matters most to Franchino is producing better products for its die-cast die and plastic injection mold customers with faster lead-times.

When other manufacturers retrenched because of a slow economic recovery, Franchino's leaders chose to boldly move forward by committing to three key areas: people, process and technology. They accomplished their business goals by adding skilled machinists and enhancing their employees' skills with advanced training, standardizing processes and investing in the best technology available.

"Our commitment to customers means that we have to provide durable, quality product that is reliable and maintainable. We need good people, efficient processes and outstanding technology. If one of those isn't up to par, our process falls apart," Hetherington said.

Makino helped the company with all three: training their employees, providing process improvements based on the F5s' advanced technology. "We knew about the quality of Makino machines, but the Makino equipment with the support from SST has enabled us to improve all aspects of processes, resulting in a highly reliable system that enhances our products, services and overall competitiveness. Makino and SST added to the value of our investment tremendously and help us to continuously improve our return on investment," Hetherington said.

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