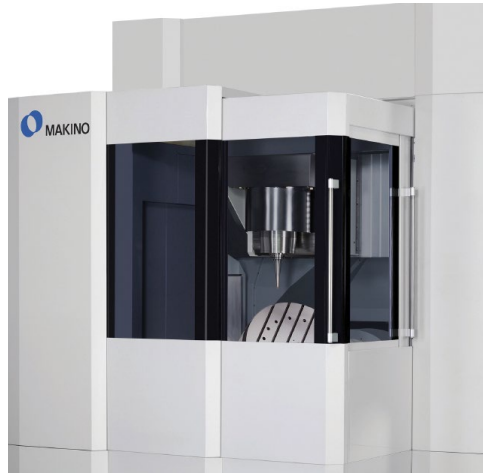


THE PUBLICATION FROM MAKINO THAT MOLDS MORE COMPETITIVE COMPANIES

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

VOL.20 / NO.1



## INSIDE FEATURES





## GROWTH IN THE DIE/MOLD INDUSTRY CONTINUES

The renaissance of the North American die/mold market continues in 2014 at all-time high levels. The Gardner moldmaking business index in May was at 56.0, which showed strong growth for the fifth straight month and the fastest rate of growth since August 2013. Overseas manufacturing investments in North America, led by the automotive industry giants, continues to fuel the die/mold market and its supply base.

[IMTS 2014](#) is right around the corner and opens its doors to the largest technical “candy store” in North America. On display will be the latest and greatest manufacturing tools, promising to improve efficiency, increase your bottom line and put your company ahead of the competition.

With three years of solid business as a foundation, many companies will be looking to the show to help them find the next piece of machinery to meet their business needs. Still, many of you will face the dilemma of trying to figure out what will fit your needs not only today but also three to five years from now. Should you purchase another vertical or maybe a horizontal machining center? Do you need more automation? Should you obtain 5-axis or will 3-axis be sufficient?

This edition of *Competitive Mold Maker* highlights two of our customers that have asked these very questions. One zeroed in on a horizontal machining center for their shop in order to improve efficiencies with multiple part setups. The pallet changer and highly reliable spindle technology combined with a thermally controlled stable machining structure helped the company to run a lights-out operation.

The second customer chose a Vi-Series vertical machining center that allowed for zero stock machining and eliminated polishing. These results were made possible through patented under-race spindle lubrication technology that eradicates thermal growth and leads to hours and days of unattended machining.

Both customers are unique in their organizational structure and business needs, as is your company. The common denominator is that they sought our consultation and dialogue in order to decide what made the most sense for their company needs.

We trust that if you have similar discussions within your organization that you would also seek our help—whether it is at IMTS 2014, at our North American Die/Mold Technical Center in Auburn Hills, Mich., or through your local Makino contacts. We look forward to speaking with you!

Sincerely,

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Shelley Frakes, marketing coordinator at Fallbrook, demonstrates the smooth ride and performance of the NuVinci bicycle transmission.



## MOLD-MAKING PERFORMANCE ENABLES INNOVATION AT **FALLBROOK TECHNOLOGIES**

If you visit [Fallbrook Technologies Inc.](#) in Cedar Park, Texas, and meet David Markley, the vice president of technology development, ask him if he can explain what his company does. You just might be surprised by his reply:

“Sure. Go ride this bike.”

That’s because it’s easier for Markley to let you experience Fallbrook’s revolutionary [NuVinci®](#) continuously variable planetary (CVP) than it is to try to explain it—it’s that far removed from anything riders would have previously experienced from the seat of a bicycle. Born from the mind of a man who was working to break the land-speed record for bicycles and who realized that traditional bicycle gearing was a significant limitation, the NuVinci N360™ hub replaces



The rigidity and stability of the V56i have provided Fallbrook with tool-life increases in excess of 300 percent in certain applications.

“We got incredibly creative in overcoming the machine limitations in order to meet the specifications that we needed to achieve, but we finally hit the wall. We had to be able to machine the hard materials to take the next step.”

the cogs of gears and derailleurs that have been standard issue on multi-speed bicycles for decades. Unlike conventional transmissions, the NuVinci hub enables riders to continuously, seamlessly and silently change the bike's drive ratio. Exclamations from those who experience it turn quickly to, “Wow, that's smooth!”

Fallbrook began commercializing this transmission in bicycles, and when the company first demonstrated it at the Interbike trade show in 2004, it

House, engineering manager for the prototype shop. “Before they ride it, people want to know things like ‘What's the efficiency?’ After they ride it, they want to know ‘How much is it?’ and ‘Where can I buy one?’”

But what's equally appealing as a ride on a NuVinci-equipped bike is the wide range of applications where the innovative transmission can be used. Everything from lawnmowers to heavy equipment, from automobiles to electric vehicles can use a version of this transmission. What's more, it

“With the accuracy of the V56i, we're actually able to machine in tiny defects just to test what the effects of looser tolerances or production variations might be.”

caused quite a stir. “Everyone thought that it was cool, but it was clear from talking to people in the booth that only 5 to 10 percent of people really understood what it meant for the industry,” explained Mark

can provide not only a continuously variable forward-ratio range but also reverse with an infinitely variable planetary configuration—all without using a single gear.



Fallbrook's V56i investment has enabled the company to bridge the gap between prototyping and production readiness, proving commercial viability of its innovations.

It was in working through the R&D required to develop solutions for these additional applications, as well as further innovation in the original design for bicycles, that Fallbrook found its prototype shop pushing the limits of its machine tools. Like many manufacturers, Fallbrook brought the designs coming out of its R&D department to life as prototype parts produced on commodity production vertical machining centers.

Since introducing the NuVinci CVP almost a decade ago, Fallbrook has been on the leading edge of mechanical power transmission, and the company is further pushing the envelope with its new designs. Over the years, Fallbrook relied on the creativity of its operators to overcome commodity machine limitations in order to produce prototype parts for testing. Some of Fallbrook's new designs and larger transmission sizes started exceeding its machining capabilities.

With the nature of the traction-drive principle used in the NuVinci CVP, surface finishes for its parts are vital and profile accuracy is required for proper operation. Further

complicating matters—because the transmission essentially also serves as a large bearing—it requires hardened materials, typically 52100 alloy steel hardened to HRC 62, making tool life a significant concern as well. This situation was untenable, since the company needed its R&D team to produce quality parts in order to prove that its newest design innovations were commercially viable for production. Fallbrook knew it had reached the limits of what creative processing could get from its commodity vertical machines and decided to seek other solutions.

Markley explained, “We were limited by the equipment we had, but we became masters of using it to get the parts that we needed.”

House said, “We got incredibly creative in overcoming the machine limitations in order to meet the specifications that we needed to achieve, but we finally hit the wall. We had to be able to machine the hard materials to take the next step.” Outsourcing was not the best option,

according to Markley. “We looked at outsourcing the work to a mold-making shop, but we would be coming in with such small numbers, one to 10 of something, that there was no way we would be able to get any attention or the quick turnarounds we need.”

He added, “Had we not been able to do things on our own schedule—often under tight timeframes—in order to make it to all the different industry shows and events we have done, we wouldn’t be here today. There’s simply no way we could outsource it.”

**LOOKING TO MOLD-MAKING TECHNOLOGIES**

It’s that kind of productivity on short lead-times that has fostered in Fallbrook’s leadership a significant respect for the value that the R&D

shop provides to the company. House summed it up: “We have incredibly creative people working here, and the ability to quickly take the engineers’ imaginative solutions and develop a part to put on a bike and ride in the parking lot is the value our R&D department provides. With our machining talent, we can evaluate the benefits and drawbacks of a design in real-world terms almost immediately.”

Based on specifications for one of its most challenging parts and desired cycle times, House conducted extensive research into machine technologies that could handle Fallbrook’s requirements with ease. Typical of the out-of-the-box thinking at Fallbrook, the search was not limited to the usual production machines.

“The V56i allows the tools to perform at their upper limit and we can barely hear the machine running. That’s all rigidity.”

“The cost of the tools is about four times as expensive, but with the extreme gains we’ve seen in tool life and overall throughput, it’s still worth the investment.”

House added, “Focus remained largely on prototyping, but we needed to demonstrate quality typical of production solutions. In keeping the complicated simple, we realized that processes previously tried had potential if they were refined and utilized on capable equipment.

“We needed a path to production in the tens of thousands. Our R&D team could make tens of things or handle any one-off designs, but we needed to move into what we called medium-volume production. Higher volumes also demand cost reduction, increased surface finish and repeatable accuracy. We needed something more than our current prototype practices provided. We made the most of hard milling and hard turning, but this is where we hit the limitations of the machines in

terms of tool life, surface finish and ultimately part cost.”

And with that in mind, the investigation led him into the world of mold making. While they’re not making molds, these machines are specifically designed to deliver the high speeds and feeds in the hardest materials—exactly what Fallbrook needed to achieve the levels of accuracy and finish required for its unique products.

**FROM PROBLEM PARTS TO NO PROBLEM**

Fallbrook reached out to several machine suppliers, requesting sample part runs for one of its more difficult parts, giving them very aggressive cycle-time targets to try to push throughput as far as possible, along

with improving part quality. Makino was the first company to meet the part requirements and deliver a sample part, using its [V56i vertical machining center](#).

As a part of his pre-purchase research, House visited Makino and was taken to see a mold-making customer that operates a V56i for hardened materials. Upon taking a tour, House noticed something odd. “I realized that they didn’t have any metrology equipment in the shop,” he said. When he asked about it, he was informed that the shop was so confident in the Makino’s ability to hold two-tenths tolerance that it didn’t need to do metrology. He was told that when there is a dispute, which doesn’t happen often, the shop’s policy is to go to a qualified third party to perform the measurement testing and resolve the issue.

After Fallbrook’s research was completed and the results from the test-part runs were in, it was time to prove the ROI. “We did a cost benefit analysis of the V56i over replacing



The V56i has enabled Fallbrook to easily hold profile tolerances and achieve finishes of 0.2 micron Ra or less.



Left to right: Jason Schafer, Keith Knippa, Kris Gonzales and Mark House stand next to Fallbrook’s V56i.

with an existing brand, looking at what could be kept in-house versus what would need to be outsourced. Through this calculation, we saw a full repayment period of two to three years,” said Markley. With leadership convinced, Fallbrook purchased a Makino V56i from its local [SST representative in Texas](#).

In order to get the most out of the V56i and the R&D department as a whole, all operators in the R&D department were trained on the machine, and Fallbrook got to work.

#### PEDAL TO THE METAL

Partnering with SST and Makino, House and his team immediately began to test the machine’s capabilities by filling customer orders. Similar to the change in thinking it took for Fallbrook to look to mold-making technology for its prototyping

needs, it realized a new perspective on the entire machining process. “We no longer have that wall—that equipment limitation which previously stopped us dead in our tracks,” House explained. “Now we have fun. For example, rather than turning on one part, we chose to helical interpolate a traction surface on a large ring and held 2 microns circularity.”

Due to the rigidity of the V56i, Fallbrook was able to increase speeds and feedrates by 35 to 65 percent on typical applications, and operators believe those numbers can eventually grow much larger with additional process optimization. “It’s the rigidity of the machine, the core cooling and the control with its ability to look ahead that’s allowing us to run at those speed ranges,” said House. “We’re still learning how to look at this as a mold maker might. As we

“We’re not just here to make a profit. We want to make a positive impact on the world around us, producing lasting experiences that people can’t experience anywhere else.”

get more familiar with the high-speed machining (HSM), we expect to see our productivity on many types of parts continue to increase. These run rates and the overall machine performance brought a huge boost in morale to our engineering machinists, Kris, Jason and Keith.”

Despite employing significantly more aggressive cutting strategies, the V56i has enabled Fallbrook to use more advanced tooling. Where previous machines would cause the floor to shake with certain tools, the V56i processes parts without any struggle—as quietly as a NuVinci N360 operates. “On the old machines, when we tried to move into more expensive tools, we would get vibration due to the lower rigidity, and as a result, we didn’t get good enough tool life to justify the investment in high-performance tools,” said House. “The V56i allows the tools to perform at their upper limit, and we can barely hear the machine running. That’s all rigidity.”

And while the tools cost more than previous tooling, the rigidity and stability of the V56i have led to tool-



“Not only did we reduce cycle time on critical cam features, but parts per finish tool increased four times, conservatively. Now cutting bearing-grade steels that are heat-treated to HRC 62, or any other hard steel, is no problem.”

life increases in excess of 300 percent in certain applications. House pointed out: “The cost of the tools is about four times as expensive, but with the extreme gains we’ve seen in tool life and overall throughput, it’s still worth the investment.”

Previous concerns surrounding accuracy and finish were eliminated with the V56i, which has enabled Fallbrook to easily hold profile tolerances. House explained, “This machine is supposed to be able to cut within a 5-micron band and we have confirmed that.” Thus, an additional way in which the prototype shop expects to benefit from the precision of the Makino is in reducing production part costs. “With the accuracy of the V56i, we’re actually able to machine in tiny defects just to test what the effects of looser tolerances or production variations might be. We have confidence in the accuracy, so we can put in defects artificially to test what we may be able to do to open up our part tolerances without affecting performance, thus possibly reducing part cost.”

The company also has experienced improvements in cycle time. In one

component transferred to the V56i from previous equipment, cycle times dropped from approximately eight hours to just two hours.

#### PROVING COMMERCIAL VIABILITY FOR NEW INNOVATIONS

Innovative is a word that has been used so much in business that it’s almost lost all meaning. But purely mechanical breakthroughs, truly new ideas not dependent on computers or software, are becoming more and more rare. Fallbrook Technologies was founded on a product that is unlike anything in its space and that has uses in innumerable applications. This company is the very embodiment of innovation.

For a company that’s turning power transmission on its head, it’s not enough to have designs that are good in theory. They have to be commercially viable at a cost that the market can bear. Such a company cannot deliver its products without equipment that removes the limitations on what can be produced, equipment that frees its engineers to develop anything they can imagine. The Makino V56i has made the impossible possible for Fallbrook,

bridging the gap between prototyping and production readiness and proving that its innovations aren’t ahead of their time.

“Bringing innovations to market is what matters most to all of us at Fallbrook,” said House. “We’re not just here to make a profit. We want to make a positive impact on the world around us, producing lasting experiences that people can’t experience anywhere else.”



With the nature of the traction-drive principle used in the NuVinci CVP, surface finishes for its parts are vital and profile accuracy is required for proper operation.

“PERFORMANCE,” “PRODUCTIVITY,”  
“PROFITABILITY.”



Watch a free webinar to see more real-world examples of Makino technology in action.

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MOLD BUILDER OF THE YEAR:

## CS TOOL ENGINEERING PERFECTS THE MOLD-MAKING PROCESS

“WE ALL KNOW THAT YOUNG PEOPLE ARE GOOD AT VIDEO GAMES. WELL, I SAY LET’S TAKE THAT PASSION A STEP FURTHER. TOOLPATHING A MOLD CAVITY IS VERY SIMILAR TO PLAYING ONE OF THESE GAMES. THE BLOCK OF STEEL IS THE ENEMY, AND YOUR WEAPON IS YOUR CAD SYSTEM AND THE MULTI-AXIS MACHINE TOOL. LET’S MAKE SOME CHIPS!”

That’s the perspective of Don Snow, operations manager at [CS Tool Engineering](#), who was honored as the 2014 AMBA Mold Builder of the Year for his efforts in bringing youth to the tool and die trade. Snow knows that since the economic recovery, things have changed. There’s a demand for both the people and technologies that can make this work more efficient. Being able to combine the two is key to success in this new machining world.

Snow makes a point to stay up on high-performance machining technology, such as the company’s new [Makino a82 horizontal machining center](#), which has expanded its capabilities and reduced cycle times by one-third while cutting setup times in half. But, like many businesses, CS Tool also needs qualified people.

“We want to encourage students who are interested in working with their hands and their brains to learn this kind of equipment,” said Snow, who has been with CS Tool for 35 years. “For a 10-year stretch, the mold machining industry didn’t bring anyone into the trade because it was simply surviving. It has now come out of that survival mode and has gone into replenishing mode. Mold shops need high-tech equipment and also need people to run it.”

### YEARS OF PERFECTING THE PROCESS

CS Tool is known for its work as a Tier 2 supplier to the automotive industry. The company, located in Cedar Springs, Mich., got its start in 1967, founded by brothers Tom and Don Mabie. In early years, it made molds for smaller automotive parts, like hood ornaments, garnish trim and lamp bezels, and it was soon also producing the molds for “Star Wars” characters for Kenner Toys.

By 1981, CS Tool began a relationship with a major Tier 1 automotive supplier that still endures to this day. This work really helped it gain a foothold in the automotive industry via making molds for auto interiors and overhead consoles. Today producing plastic injection and compression molds for automotive interiors remains the company’s specialty for its Tier 1 customers, but it also continues to produce molds for various consumer products.

Over the years, the company has always updated technology to change with the times. In 1980, it purchased its first duplicator for electronic tracing, and then in 1982 obtained its first CNC equipment. The equipment upgrades continued until, like many businesses, the company went through the economic downturn that began in 2007. CS Tool managed to



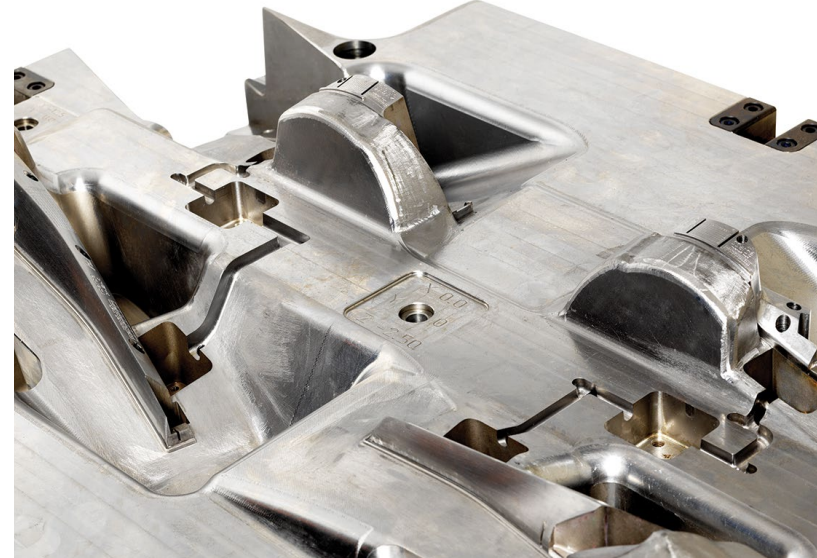
survive because it was not overextended in terms of credit, had loyal customers, and had a fast and precise machine to handle the P20 steel and Mold Max® alloy it works with.

CS Tool had purchased a [Makino MCC2013 horizontal machining center](#) back in 2003 in order to efficiently handle a large workload of injection-molded door panels and a floor console package. This machine made the company more competitive in its ability to handle large dies and molds—creating parts faster, reducing benching times dramatically and giving it the ability to promise better lead-times. CS Tool was pleased with the machine's 4th-axis table that could handle large pockets and varying angles from the face, achieving fine finishes on tight corners and walls and reducing handwork. It helped the company meet its immediate and ongoing capacity demands while improving agility. In fact, on one mold in particular, its cycle time was cut in half with the MCC2013.

So it was no surprise that by 2011, when business was ramping back up and it was time to upgrade equipment, that obtaining another MCC2013 was top of mind for Snow. When he and his colleagues approached their contacts at SST, their local Makino distributor, the people at SST asked to come out and tour the CS Tool plant to determine requirements. What did surprise Snow, however, was that the SST representatives thought that Makino's a-Series horizontal machines would be a better choice for CS Tool's current and expanding needs.

**“... with the combination of the a82 and FCS, we were eliminating setup time, improving utilization, reducing time required for pickups and were achieving access to multiple sides of the part. In short, we were performing single-setup workpiece processing.”**

By integrating an FCS modular clamping system into its setup processes, CS Tool has been able to reduce setup times and improve workpiece positioning repeatability.



The accuracy of the machine, along with the precision work holding of FCS, has driven down costs and lead-times at CS Tool by reducing spotting and benching operations

**“What used to take four setups to get the slide component machined can be done all in one setup, since five sides of the block can be machined and rotated at different angles—one pickup, one setup—cut and done!”**

#### ADOPTING A PRODUCTION MIND-SET

SST suggested that CS Tool purchase the Makino a82 horizontal machining center. This machine, for all intents and purposes, is a production machine tool most commonly used in automotive engine block production.

“I thought it was a bit strange that SST was recommending an a82 because we are a mold operation, not a production machining environment,” said Snow. “It wasn't until I saw this type of machine in action in other mold shops, and talked with other owners, that I began to see the benefits.”

Snow was able to see that mold components can be machined with the same mentality as used in production machining, even when building custom components where only two pieces are alike.

“SST and these other mold makers were able to show me that the benefit comes from having the agility to switch jobs quickly—being able to spin the workpiece around, get it cutting and then getting to the

next job,” said Snow. “This was a mind change.”

While investigating viability of the a82 at other mold shops, Snow also noticed a new modular clamping system being used at each of these facilities.

“This FCS clamping system caught my eye the first time, but after seeing it again and again, I had to ask SST about this system that everyone seemed to be using.”

Designed to provide quick, custom setup options for unrestricted access to five workpiece surfaces, the [FCS clamping system \(Breyll\)](#) enables mold makers to spend less time on setups and more time on machining. Its flexible and repeatable fixturing options are ideal for any type of workpiece, and it is advertised as turning hours of setup into minutes. FCS has an H-7 class fit with micro-level repeatability. The clamping body and workpiece are connected by a single rod. Where the rod interfaces with the workpiece, there are standard metric threads, typically M12 by 1.75 or M16 by 2.0. On the opposite end of

the rod, a serrated feature fits into the clamping unit to fasten the workpiece securely to the base gage plate. When the final assembly is tightened, the tapers on the rings are guided into precise location.

“At first, this system looked very appealing, but we were not sure it was worth the extra investment,” said Snow. “We decided at the time to hold off, but in hindsight we should have just gone for it. We didn't realize then just how powerful this would be for our operation when combined with the a82 machine.”

#### A KNOCKOUT COMBINATION

After visiting the other mold shops, CS Tool purchased the a82 in the summer of 2011. Snow hoped that it would help the company satisfy market demands, enhance customer service and become more efficient in the processing of small and large mold applications.

Having a machine with the appropriately sized work zone has brought CS Tool high efficiency in its goal to produce small molds as well as larger components.



Purchased in 2003 as CS Tool's first HMC, the MCC2013 is still as accurate today as when it was first delivered.

CS Tool appreciated the pallet changer on the a-Series machine so that the company would no longer lose time during work setup. The pallet changer lets operators load and unload work while another job is cutting. These capabilities also helped improve the company's agility, enabling it to pause and switch jobs quickly. With the full 360-degree B-axis, CS Tool was now able to machine all five sides and angled holes efficiently.

"The two-pallet system has helped our company improve utilization rates of the machines while also helping us become more agile in producing quick turnaround orders, such as engineering changes to previously produced molds," said Snow.

For example, CS Tool may be cutting a block with a long run time. Then, an engineering change comes in. The operator is able to load that block while the machine still cuts. Operators can pick a point to stop, or pause the long-run-time application mid-process. They can then switch out the job and do the short-run order, before swapping the original long-running job back in.

This pallet-changing capability certainly saves a lot of time. But Snow had seen that even more potential was available.

"I kept going back to how well the FCS worked for other mold shops, when combined with the capabilities of a production-oriented machine," said Snow. "So we purchased the FCS. Suddenly, with the combination of the a82 and FCS, we were minimizing setup time, improving utilization, reducing time required for pickups and were achieving access to multiple

**"Recently, we were able to spot a complex mold in two days, down from five days in our previous processes."**

sides of the part. In short, we were performing single-setup workpiece processing."

The FCS minimized setup even further because CS Tool no longer has to pick up and indicate the workpiece. The holes always are located in the block of steel to serve as permanent reference points to enable easy removal and reassembly of the workpiece on the pallet or base gages to keep the zero reference point locked in. This design facilitates engineering changes or part repair, and the original mounting holes enable quick re-clamping at the same point.

Snow says that while CS Tool operators must take the initial time to drill and tap a hole and qualify the counterbore, once that hole is made, the FCS follows jobs through engineering changes, production and repairs.

"In a matter of minutes, you can have the block, insert and slide mounted in the machine and be ready to make the cut for the new tool or repair," he said. "It leaves no room for errors from pickup holes being wrong. The FCS has enhanced our capabilities even further. It brings value and accuracy to setups and reduces machining time, allowing the spindle to be in contact with the work even more."

What CS Tool has found is that it has reduced its setup time considerably and is more accurate in the tools it cuts. In addition, the company is able to produce custom FCS designs and fixtures in-house, using the accuracies of the machine. It is able to maintain precision hole location on the plates and build the FCS fixtures to match the pallets' center of gravity. By producing custom FCS designs and fixtures in-house, CS Tool not only saves money but also gets the size that works best for its applications.

"The combination of FCS and the 4-axis a82 horizontal machining center

**"Our MCC2013 is 11 years old and is still as highly accurate as day one. Day after day, we go out there and run the machines without issues."**

has allowed us to decrease cycle times by 33 percent and reduce setups by 50 percent," said Snow. "What used to take four setups to get the slide component machined can be done all in two setups, since five sides of the block can be machined and rotated at different angles—one pickup, one setup—cut and done!"

The combination also helps with CS Tool's lean efforts. Because the FCS and pallet changer yield more spindle time, operators can now run two to four machines each.

"This is a powerful saving, since we can do multiple workpiece setup and run lights out," said Snow.

### INCREASED ACCURACY DRIVES DOWN COSTS

The accuracy of the machine, along with the precision work holding of FCS, has driven down costs and lead-times at CS Tool by reducing spotting and benching operations.

"Recently, we have been challenged with not doing hand spotting of the tools after they are machined," said Snow. "We are no longer leaving plus stock on a parting line. In fact, these days it's all about machining the parting line to a minus stock. With that comes the challenge of accuracy in the cut. This starts with the machine tool and tooling and setups."

For example, CS Tool needs to cut a highly contoured parting line with three- to five-degree shutoffs to a minus thickness. Additionally, the tool must sit together but seal out without

flash. This means CS Tool needs its machine tools, processes, cutting tools and tool holders to give the required accuracy.

"Ultimately, we need a precise and rigid machine tool to do this," said Snow. "And recently, we were able to spot a complex mold in two days, down from five days in our previous processes. This is because the machine's speed provides a finer finish cut and less benching without an additional finish pass. Previously, that finer finish would cost us more machine time. The a82 helps us work faster and more accurately and produce our mold components."

As far as the investment in the a82 and FCS system, CS Tool has found its ROI to be in the accuracy and uptime of the machine. It is seen in products such as the complex tooling the company does for its rearview mirror molds.

"We respect the quality of the Makino machines," said Snow. "Our MCC2013 is 11 years old and is still highly accurate as day one. Day after day, we go out there and run the machines without issues. We can't afford downtime costs.

"Everyone strives to be better in this trade. Starting out, you purchase what you can afford. Then, you keep pushing the envelope as you grow—looking for ways to eliminate problems. Inexpensive machines don't hold their accuracy. So as you grow, you try to move up with better quality. You need excellent machine



CS Tool's investment in an a82 horizontal machining center helped the company employ production machining practices in its own mold-making processes to improve workflow flexibility and throughput.

tools in the shop in order to build a quality mold.”

AN AWARD-WINNING FORMULA MATTERS

Snow’s service on advisory committees for career tech centers and work with local colleges to bring up that next generation of workers into the tool and die trade helped bring him to the AMBA’s attention for the Mold Builder of the Year award.

CS Tool is part of the Whitehall Township Tooling Coalition, which is an alliance of eight companies in Western Michigan. All companies in the coalition have the common need for attracting people into the trade and work together to do so. Snow also hosts an in-house apprenticeship program at CS Tool.

“As we attract folks into the trade, we also need to mentor them in the trends and future initiatives,” said Snow. “This is a changing industry, and to keep up, you must know what your peers in the industry are doing. There is a demand for it.”

Part of CS Tool investing in its young workforce includes making the technology available that can take them through the future.

“What matters most to us is treating people how we would want to be treated,” said Snow. “And that means providing our employees with the best equipment we can.”

This philosophy of treating people well carries over to the company’s relationships with peers.

“I’ve seen that in the last 10 to 15 years of being in the trade, the relationships with peers and competitors has also helped us grow, like when we searched for our own machining solution and visited our competitors to see what machines they were employing,” said Snow. “Even though those companies competed with us, they opened up and showed us what they do. That really means a lot.”

Relationships with customers are also crucial. Just as CS Tool’s peers

shared its technology, the company has also shared its best practices with customers. In fact, one of the Tier 1 suppliers that CS Tool works with purchased an a82 machine after seeing CS Tool’s success with it. Employees at CS Tool also work as a team to provide excellent service to customers, especially as customer requirements change.


“We pride ourselves in our relationships,” said Snow. “We want to provide the best service on all the tools we build, ultimately taking care of our customers. This includes doing service work on the tools we make. It matters a great deal to us, and is what separates us from competitors. We have the equipment to do the best job possible, and Makino has helped us in that area. We are thankful to SST for changing our mind-set on how to achieve our goals.”

This capability, along with a passion for customers and building the tool and die trade, has brought award-winning results to CS Tool.

Thanks to Don Snow and other leaders at CS Tool, the company has become recognized and respected in the industry for its efforts in improving youth education in the field of manufacturing.

“What matters most to us is treating people how we want to be treated. And that means providing our employees with the best equipment we can.”

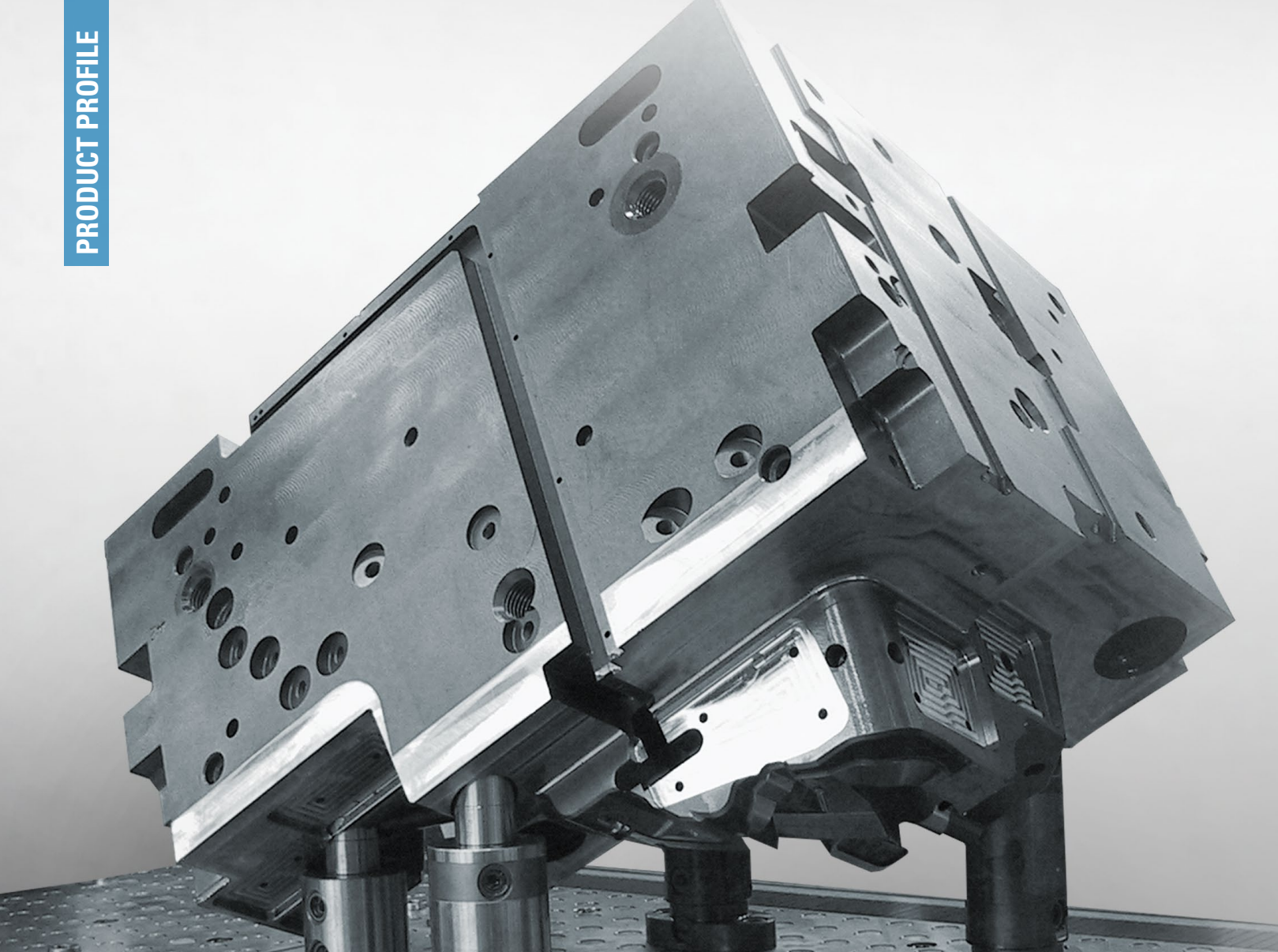
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## REDUCING SETUP TIME & INCREASING MACHINE UTILIZATION WITH FCS MODULAR CLAMPING SYSTEM

The competitiveness of today's mold-making market demands the highest degree of precision and efficiency from companies' setup procedures. Designed to provide quick, custom setup options for unrestricted access to five workpiece surfaces, the [FCS modular clamping system \(Brey\)](#) enables mold makers to spend less time on setups and more time on machining. Its flexible and repeatable fixturing options are ideal for the machining of large mold workpieces that are commonly tough to set up.

The precision of FCS is upheld by the design of the system's base gage plate mounted on the machine

worktable. Featuring a grid of threaded holes spaced evenly apart by 50 mm to within 5 microns, this base gage plate allows for quick and precise modular setup adjustments that are safeguarded from human error.

Positioning accuracy is further enhanced by the system's TiN-coated steel rings. These rings are installed between the workpiece and a cylindrical clamping body, held tightly in place by mating surfaces on one and precision ground tapers on the other. The result is an H7-class fit with micron-level repeatability.



The clamping body and workpiece are connected by a single rod. Where the rod interfaces with the workpiece, there are standard metric threads, typically M12 by 1.75 or M16 by 2.0. On the opposite end of the rod, a serrated feature fits into the clamping unit to fasten the workpiece securely to the base gage plate. When the final assembly is tightened, the tapers on the rings are guided into precise location.

FCS 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.

Companies using FCS systems have reported an average 88 percent increase in production time, which translates to higher machine utilization and lower costs. Additionally, faster equipment and pallet changes mean a more standardized work process for improved workpiece quality and consistency.

Advanced users of FCS can also take advantage of the optional Guideline software, developed by BKC of Italy. This virtual design software enables users to design FCS workholding systems based on the CAD model of a workpiece. Guideline software projects the FCS grid onto the workpiece to calculate the most efficient workpiece positioning for machining and chip evacuation. After checking for possible interferences

with other holes, it automatically arranges the fixing seats based on the dimensions of the workpiece and combination of pallets and clamping available.

FCS is available through [SST \(Single Source Technologies\)](#) and can be purchased in a variety of package offerings, including a basic package that features a base gage plate and clamping components, which are available in lengths of 40, 80 and 120 mm. SST also offers services to help FCS users develop the most effective fixturing.

*For more information on FCS modular clamping system, or to place an order, visit [singlesourcetech.com/FCS](http://singlesourcetech.com/FCS) or contact SST directly at 1-877-228-2884.*

*Further enhance the die and mold processing capabilities of FCS by also checking out SST's new line of NS Tool carbide endmills. For details,*



# 10 TIPS

## FOR BUILDING AND OPTIMIZING YOUR COMPANY WEBSITE

At least 60 percent of the sales process happens prior to a sales engagement.<sup>1</sup> This means your website is likely to be the first place visitors encounter your brand when they are searching for a product or service. Not only does a good website build credibility, but it also gets a company noticed. To put your business in the best light, whether creating a new website or optimizing an existing site, here are 10 tips to keep in mind:

**1** Ensure that your site is easily navigable. Page navigation is critical to the user experience, so the layout of your site should enable visitors to quickly and easily locate the information they care most about. Nomenclature and being intuitive to use are important, too. Use names that clearly describe specific areas of your website, and provide global navigation to facilitate exploration.

**2** Provide visitors with a simple and appealing design. Have a straightforward layout with plenty

of white space and no clutter. Include easy-to-find contact information. This seems like a no-brainer, but often companies miss the mark here. Use professional photos and easy-to-read fonts. Be bold and concise with headlines.

**3** Develop unique and engaging content. Provide content that demonstrates how your company's capabilities and successes stand out from the crowd. Identify the primary key messages that you want visitors to take away about your business. Share your company's personal story or background, along with what makes it unique. Offer customer case studies and testimonials that effectively demonstrate your value proposition.

**4** Build your site for multi-device compatibility. Responsive website design can help ensure compatibility across all devices and the most commonly used browsers, automatically adapting

layout to fit a variety of screen sizes and user interface devices. With over 114 million smartphone users in the United States, it is important to think mobile, ensuring that the site works well with both smartphones and tablets.

**5** Structure your website for search engine optimization. Develop a short list of keywords most relevant to your business, industry and location, integrating them within prominent locations of your website. Remember that search engines crawl a page from top to bottom, so to optimize your site, make sure that the URL, page title, header tags and body copy contain the ideal keywords for that content. Ensure that metadata for all pages within your site is unique and pertinent to the content on that page.

**6** Use video to enhance the user experience. If a website relies too heavily on text to convey all of its messages, visitors can quickly

become overwhelmed with information. Photos and videos offer an alternative means for providing information in a simple and easily digestible format. Make sure that video is suitable quality, and do not overuse it to the point that it becomes a distraction to other information that you want visitors to see. Resize and reformat this media to ensure fast page-load times.

**7** Tell audiences what you want or need them to do. Ensure that a call to action is clearly visible on each page. The "contact us" button should be included within the global navigation so that it's accessible from any page.

**8** Get social. If your company has a presence in social media, be sure to inform your website visitors by prominently displaying social media icons within the global navigation.

**9** Internal Linking. Internal links are links that go from one page

on a domain to a different page on the same domain. These types of links are useful because they allow users to easily navigate a website, preventing them from getting stuck on a particular page without options for additional navigation. Internal links also help establish information hierarchy, and they help spread ranking power around websites.

**10** Test and update! During and after website development and implementation, it is critical to test all pages and functionality thoroughly, using multiple browsers and devices to effectively identify any errors prior to launch. Also remember that a company website is never "done"—it should grow and change as technology and user behaviors change.

When designed and programmed well, a website can help you grow leads and develop new business opportunities. Whether designing the website yourself or seeking third-party

support, following these tips can help you make the most of this important business tool.

*Mark Rentschler is the marketing manager at Makino, Inc. He has served within the manufacturing industry for more than 30 years, and has been with Makino since 1995. Mark has been recognized as a Top 25 Digital Marketer twice in the last three years by BtoB Magazine. He is passionate about helping manufacturers succeed in all aspects of their business, from highly competitive manufacturing processes to effective marketing practices.*

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Source:  
<sup>1</sup> 2011 Study from Google and CEB titled "The Digital Evolution in B2B Marketing"



# NEW ENDMILLS FROM NS TOOL PROVIDE HIGH-PERFORMANCE HARD MILLING



Today's mold-making processes require innovative cutting-tool technologies that are capable of delivering the highest degree of precision, flexibility and efficiency. With its latest line of endmills, [NS Tool](#) equips manufacturers with capabilities for boosting productivity and maximizing output in high-performance hard milling.

NS Tool specializes in very high-precision, small-diameter tools. Their intense focus on the tiniest detail in creating their product translates into products that preform consistently superior to most of their competitors. The fine details of quality are so precise that one must magnify the cutting edge thousands of times to see how flawless each cutting surface is.

Endmills from NS Tool feature a variety of coatings and flute designs, offering a solution for any modern mold-making challenge. Many of them have NS Tool's patented MUGEN premium coating, which features a hardness of 3,600 HV for longer and more stable tool life in the machining of hardened steel (48 to 65 HRC) applications. MUGEN premium coating is widely known for its excellent heat resistance, making it ideal for dry, high-speed-cutting operations. Although originally designed to cut hardened steels, MUGEN premium coating has proven to provide excellent wear resistance to machine steels in the lower hardness range. Tools with this coating are designed to deliver superior levels of accuracy and finish.

Combining NS Tool's exceptional attention to quality with advanced coating technology equips the MUGEN premium coating with outstanding characteristics. These high-precision, small-diameter tools can consistently create the tiniest details for excellent finishing capability.

## MSBH230

The MSBH230 ball endmill features a two-flute, 30-degree helix design with MUGEN premium coating. This tool is capable of producing superior surface finishes in hardened materials ranging from 48 to 65 HRC. Its unique cutting-edge design reduces chatter and increases strength to eliminate possibility of chipping.

## MRBH230

The MRBH230 long-neck ball endmill also has MUGEN premium coating, and it is ideal for machining rib features in hardened materials ranging from 48 to 65 HRC. Similar to the MSBH230, this model features a unique two-flute, 30-degree helix design that reduces chatter and increase cutting-edge strength to eliminate possibility of chipping.

## MSB345H

The MSB345H is a three-flute ball-nose endmill. Its spiral shape, coupled with unequal flute spacing, reduces chatter and yields stable cutting at increased feed rates. The additional flute enables increased productivity without sacrificing finish. MUGEN premium coating provides the wear resistance and toughness to machine steels and other materials with hardness up to 65 HRC.

## MRBTNH345

The MRBTNH345 is a three-flute, long-neck ball-nose endmill. The additional flute enables increased productivity without sacrificing finish. With unequal flute spacing and spiral design, chatter is greatly reduced while stable cutting at increased feedrates is achieved. MUGEN premium coating supplies the wear resistance and toughness to machine steels and other materials with hardness up to 65 HRC.

## MSXH440R

The variable helix angles and pitched flute design of the MSXH440R micro-

grain solid-carbide corner radius endmill has the ability to suppress chatter for stable milling conditions in a variety of applications. The 40- and 42-degree helix angles of this MUGEN-coated tool deliver excellent performance in alloy steels, stainless steels, titanium and other heat-resistant materials.

## MSZ345

The MSZ345 is a MUGEN-coated square endmill with Z-axis plunging capability. Its ability to center cut, drill and side mill in the same tool makes the MSZ345 an ideal solution for opening up pockets. The tool has a three-flute, 45-degree helix design with chip-breaker in the end that provides efficient cutting in steels, stainless steels and pre-hardened steels.

These endmills yield superior performance, excellent finishing capability, durability, longevity and high performance in hard-milling applications.

NS Tool endmills are available at Single Source Technologies (SST) throughout North America.

*For more information, contact:*  
*Darrell Johnson*  
*(248) 232-6277*  
[darrell.johnson@singlesourcetechnology.com](mailto:darrell.johnson@singlesourcetechnology.com)  
[www.singlesourcetechnology.com](http://www.singlesourcetechnology.com)



**"OUR TOOL LIFE'S BEEN EXTENDED  
UP TO 23 PERCENT, WHICH HAS LOWERED  
TOOL COSTS BY ROUGHLY 15 PERCENT.  
AND OUR PRODUCTIVITY HAS  
INCREASED AROUND 25 PERCENT."**

**"WE'VE SEEN NOTICEABLE  
DIFFERENCES IN TOOL LIFE AND  
LOWER TOOLING COSTS."**

**"EXTENDED TOOL LIFE AND  
REDUCED TOOL BREAKAGE HAVE  
DECREASED OUR OVERALL TOOL  
COSTS BY 30 PERCENT."**

For people who make what matters, tool life is critical. Which is why these companies chose Makino. They appreciate how Makino's comprehensive approach to machine design extends their tool life. But mostly, they're thrilled with how Makino has helped their cost per part and improved their efficiency and profitability.

Read their stories and watch their videos and cutting demonstrations at [makino.com/tool-life](https://makino.com/tool-life).



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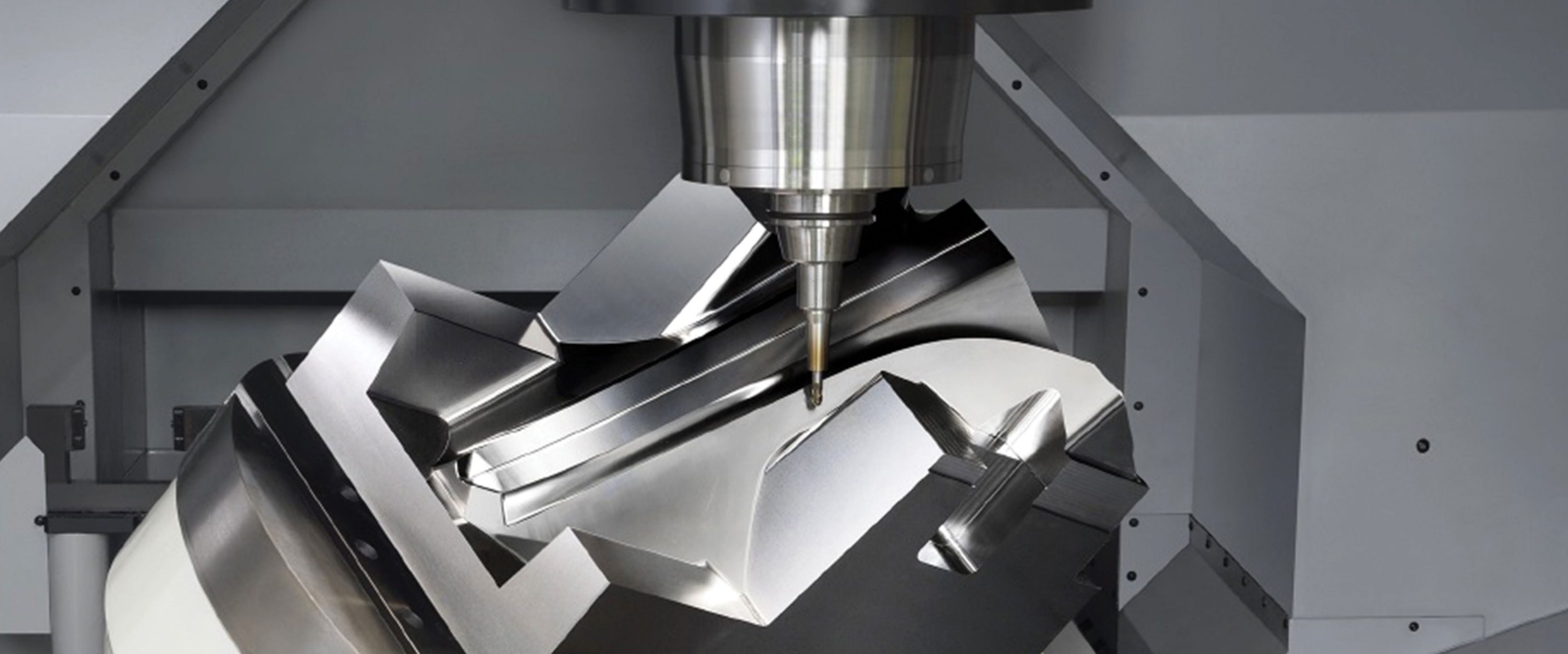
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# MAKINO'S NEW D800Z 5-AXIS MACHINING CENTER BRINGS SUSTAINED ACCURACY TO LARGE-PART PRODUCTION



The [D800Z](#) is the newest addition to Makino's family of 5-axis vertical machining centers. Joining the Makino D-Series (D300 and D500), the D800Z is designed for high-performance job shops, precision parts machining, die/mold and aerospace applications.

Like the other two D-Series machines, the D800Z offers easy access to the spindle and table, a highly rigid structure for responsive

cutting, outstanding surface finishes and optional automation devices. Workpieces of up to 1,000 mm in diameter and 1,200 kg in weight can be machined in five axes, with great efficiency and fewer operations for reduced production time.

Large-part 5-axis machining can present numerous challenges, due to the size, weight and range of features found on large components;



however, the D800Z 5-axis machine provides new levels of sustained dynamic accuracy, achieved through technologies that are very productive, yet which minimize thermal influences and maximize volumetric accuracy.

The 5-axis capability of the D800Z can be used in five-face milling mode to minimize setup, maximizing access to complex, multisided parts and reducing cycle times, or to address the demanding angular, blending, matching, fine-surface finishes and 3-D accuracy requirements of die and mold components.

**OUTSTANDING PRECISION**

The integral, direct-drive motor design of the fourth and fifth axes and the highly rigid supporting machine structure deliver productive speed and smooth motion, and ensure outstanding accuracy—even with large workpieces and payloads up to 1,200 kg. In addition, core-cooled ballscrews, temperature control of the direct-drive motors and massive machine structure deliver renowned thermal stability that guarantees sustained accuracy over time. The uniquely designed “Z” shape of the tilt-trunnion table ensures that the

center of gravity of the table and work are always captured within the center of rotation of the B- and C-axes. Large-diameter bearings minimize table deflection and offer outstanding stiffness and rigidity, regardless of the angular and rotary position of the work. The direct-drive motor design provides the speed for productivity and precision for tight-tolerance work.

**RIGID SPINDLE AND ACCURATE CONTROL**

The D800Z can be configured with two different spindle combinations: D800Z (#40) and D800Z (#50). The

D800Z (#40) offers a standard Cat #40 (or optional HSK-A63) 14,000-rpm spindle. As an option, the D800Z (#40) can also be configured with a 20,000-rpm HSK-A63 spindle. The D800Z (#40) incorporates a 40-tool magazine. The D800Z (#50) offers a standard Cat #50 (or optional HSK-A100) 12,000-rpm spindle. As an option, the D800Z (#50) can also be configured with an 18,000-rpm HSK-A100 spindle. The D800Z (#50) incorporates a 48-tool magazine. The range of spindle offerings gives the ability to customize the machine to suit a wide variety of machining applications. Feedrates of 36,000 mm/min. on the X-, Y- and Z-axes, and 18,000 deg/min. (50 rpm) on the B- and X-axes ensure productivity.

Also featured on the D800Z is Makino’s proprietary, next-generation Super Geometric Intelligence (SGI.4) software—developed specifically for high-feedrate, tight-tolerance machining of complex 3-D, contoured shapes involving continuous tiny blocks of NC data, which ensures production rates faster than standard CNC systems while maintaining high accuracy. SGI.4 has the lowest cycle times and costs achievable by reducing machining cycle times on dies, complex cavities and cores, and aerospace parts by as much as 40 percent, when compared to most other control technologies.

**CONVENIENT AND ECONOMICAL**

The D800Z is equipped with a number of 5-axis features, including Tool Center Point (TCP) control, which permits programming based on the tool tip, so that tool compensation features can be applied. Further TCP developments improve the cutter path to achieve greater surface quality. Dedicated user-friendly screens are developed to simplify the overall application of 5-axis machining.

Table Size	31.5" ø
X	47.24"
Y	43.30"
Z	25.59"
B-axis	180° (-180° to 0°)
C-axis	360°
Spindle RPM	14,000 (20,000 - option)
Rapid Traverse	1,417 ipm
Cutting Feedrate	1,417 ipm
Maximum Workpiece	39.4" ø x 27.18" (with limitations)
Maximum Payload	2,646 lbs
ATC Capacity	40 (80 - option)
Tool to Tool	3 sec
Chip to Chip	9 sec
Maximum Tool Length	13.8"
Maximum Tool Diameter	5.5" with limitations
Maximum Tool Weight	17.6 lbs

Easy-to-apply functions are included to prevent interference between the spindle and trunnion during automatic operation, eliminating collisions.

This machine comes with a two-sided front-door design, for easy access to the spindle and table for setup purposes, and a large window for enhanced visibility. The machine’s compact size of 3,200 mm x 5,070 mm x 3,600 mm requires less floor space, and its intelligent design facilitates maintenance activities.

The D800Z has also been designed to lower a shop’s operating costs through reduced energy consumption. To save energy costs, the D800Z features an eco mode, which turns off peripheral devices when they are not needed. The energy-saving coolant system comes with an inverter-driven coolant pump that supplies precisely the required flow rate and timing for

each function. The hydraulic unit, with its accumulator, ensures zero power consumption when the pump is idle.

“PERFORMANCE,” “PRODUCTIVITY,”  
“PROFITABILITY.”



Watch a free webinar to see more real-world examples of Makino technology in action.

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# SURFACE FINISH IS HUGE.

[ Especially at tolerances this small. ]

When you're machining to less than 100 microns, you need to be prepared to deliver an unsurpassed level of surface finish in hardened steels with every job. With its patented MUGEN premium coating tools, NS Tool gives you exactly what you need to deliver the small-feature accuracy, consistency and durability the industry demands.

**To learn more about the NS Tool offering,  
talk to SST at 877-228-2884.**

**Or visit [SingleSourceTech.com/NSTool](http://SingleSourceTech.com/NSTool).**

