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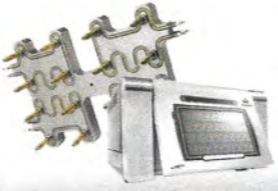


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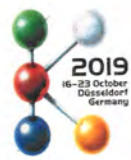
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Bringing Topology Optimization to Injection Molds PG 21.

Policies Needed to Maintain a Skilled Workforce PG 34.

Putting 3D Printing to Work in Mold Manufacturing PG 40.

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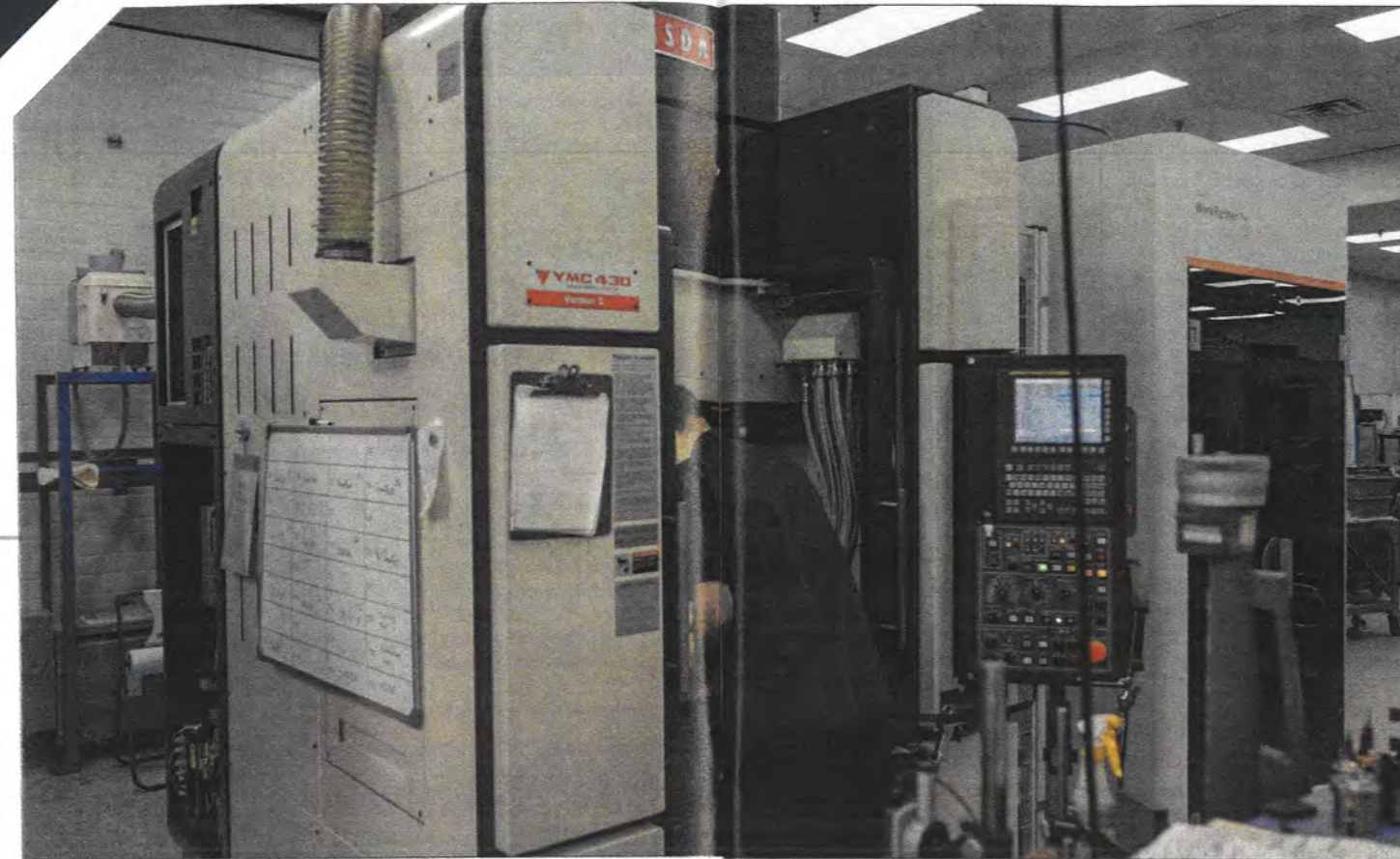
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X-Cell Tool and Mold Inc. – The Continuous Drive for Perfection

Continued investment in new technologies and automation has enabled this moldmaker to maintain shorter lead times no matter how large or complex the mold build.



X-Cell Tool and Mold Inc. made investments in newer technologies and robotics a key aspect of its fundamental growth strategy, and it has paid off. The company has seen a significant boost in shop-floor efficiencies and an increase in the number of molds built annually. In addition, those molds have also grown in cavitation and complexity—but they are delivered in the same timeframe as smaller, less complex molds they build. These achievements and more helped X-Cell Tool and Mold earn Leadtime Leader honors for 2019.

X-Cell Tool and Mold makes its home in Fairview, Pennsylvania. The company had its beginnings with current owner Ron Novel and his partner in a small, 800-square-foot rented space in Erie, Pennsylvania, in 1996. “We decided to

strike out on our own by starting a tool shop and making injection mold components and, eventually, complete molds,” Novel says. It wasn’t long before the company outgrew that space and moved into a larger facility in Erie where the X-Cell team worked hard to achieve customer satisfaction. Soon after, they rented a second facility, and in 2002, the decision was made to buy a building large enough to bring both operations together under one roof. Things went along well for a short time until the industry went into a tailspin due to a bad economy. Like so many other mold manufacturers, X-Cell struggled to stay in business and had to lay off some employees. Novel bought out his partner and began to focus on ways to rebuild by making new connections and marketing the company’s capabilities.



Ron and Pam Novel are the proud owners of X-Cell Tool and Mold Inc. in Fairview, Pennsylvania. X-Cell has been named *MoldMaking Technology Magazine’s* 2019 Leadtime Leader and will be honored at Amerimold and throughout the coming year. X-Cell embodies the drive to continuously improve, to use advanced technologies and equipment and to build and maintain a team that works cohesively for the greater good and the future of the organization.

“Work started to pick up again and one customer awarded X-Cell a job to design and build a five-mold package,” Novel says. “The economy was improving, business was on the incline, and the employees were called back one by one. We hired a sales representative in November 2005, and new customer relationships were being formed and more work was flowing through the shop’s doors.” Novel says the company purchased and moved into its current facility in Fairview in June 2014. In 2018, X-Cell began adding an additional 20,000 square feet to the original 25,000-square-foot building to house mold-sampling equipment and additional equipment for moldmaking to take on larger, turnkey programs. The expansion will be completed this year. “Business continues to thrive, and expan-

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For X-Cell, purchasing this Yasda YMC-430 RT10 five-axis vertical Micro Center with System 3R WorkPartner 1+ robot has been the biggest game changer technologically because of the opportunity it brings to grow its hard-milling capabilities and optimize its finish machining operations. The investment was so significant, the company just took delivery of a new Yasda YMC-650 Micro Center, which will form a five-axis machining cell with the 430 and System 3R robot.

2019 Leadtime Leader Award: Winner

COMPANY:

X-Cell Tool and Mold Inc.

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Email: rnovel@xctam.com
Web: xctam.com

Leadership

Ron Novel, *President*
Pam Novel, *Managing Director*
Jim Cummings, *General Manager*
Brian Dippel, *Operations Manager*

Jerry Przybylski, *Engineering Manager*
Aaron Bentley, *Molding Manager*
Rachel Ellis, *Office Manager*
Jack Jaeger, *Program Manager*

Metrics

- Annual sales: In excess of \$10 million
- No. of employees: 50 plus sales team
- Main facility: 45,000 square feet
- Average on-time delivery: 94.7 percent
- Lead time: 14 - 16 weeks
- No. of molds/year: Capable of building 50-60 molds per year with a mix of cavitation from 1-96.
- Associations: National Tooling and Machining Association (NTMA)

End Markets

- Automotive/Transportation
- Consumer packaging
- Electronics/Computer
- Food and Beverage
- Medical Products

Capabilities, Products and Services

X-Cell Tool and Mold specializes in manufacturing high precision plastic injection molds and mold components, including capabilities for product and mold design.

Equipment (highlights):

- CNC Mills:**
- Yasda-YMC-430 RT10 five-axis vertical Micro Center with System 3R WorkPartner 1+ robot and YMC-650 five-axis vertical Micro Center
 - Matsuura-MX-520 five-axis VMC
 - Sodick-HS650L, MC640L and MC430L high-speed milling machines
 - Mori-Seiki-SV 403 vertical mill
 - Doosan/Daewoo-OMV 3016L VMC

- EDMs:**
- Sodick-AG40L (2), AG60L Sinker EDMs, each with System 3R Workmaster robots; AQ327L Wire, ALN 400G Wire
 - Seibu-M35B Wire, M50B Wire
 - FANUC-Robocut Wire a-01A
 - Charmilles-35P Roboform Sinker
 - Handsvedt-Workman/201 Ram Sinker

- Surface Grinding:**
- Amada-MS-VS High-Precision CNC Surface Grinder with FANUC 320i-B Control
 - Harig-612 (2) Grinder
 - Mitsui-High-Tee (8) Grinders
 - Okamoto-ACC 12x24DX and ACC 16x32 Grinders

- Related Equipment:**
- Lathes-Mori-Seiki NLX2500-SY, LB3000 EX-11/950-MY three-axis, LB3000 EX11/500 two-axis, Colchester manual
 - FOBA M3000-P Laser Marking Workstation
 - KASTOWiNA 3.3 CNC Band Saw

- Special Equipment (highlights):**
- Quality-Renishaw AI MS Revolution CMM, OGP Smartscope Flash 200 (2), OGP Optical Comparator

- Molding Presses:**
- Toshiba-EC200SX 200-ton horizontal press and EC390SX 390-ton horizontal press, each with three-axis servo robot
 - Nissei-HM7 horizontal, 77-ton vertical, 122-ton horizontal, 80-ton horizontal
 - Arburg-88-ton horizontal



Phil Mendes, moldmaker, is working to set up one of the company's EDM cells so that it will run over the next couple of days. This cell comprises two Sodick AG40L sinkers with a carousel and System 3R Workmaster robot that feeds the two machines. Using automation has helped to significantly advance X-Cell's operations while also reducing costs and optimizing lead times.

sion became inevitable," Novel says. "The addition doubles the manufacturing space of the building. The plan is to hire additional employees and purchase new equipment to increase our capabilities and address the needs of our customers."

As it was when X-Cell was founded, so it continues today. X-Cell operates by the old-fashioned work ethics that Novel believes in, including treating employees and customers with respect, showing a positive attitude and providing timely delivery of a quality product. He applies these ethics to advanced manufacturing processes to drive continued success. Industries served include medical, electronics, automotive/ transportation, packaging, consumer products and more.

Delivering on Lead Time and Complexity

X-Cell Tool's lead times average about 14 to 16 weeks. The company credits its decision five years ago to invest in newer technology and automation as a key factor in maintaining that timeframe.

Jim Cummings, general manager, says, "Any lead time improvements have been offset by the amount of work needed to build the higher cavitation, higher complexity tools and/or the number of tools being built." In other words, if X-Cell's average delivery times ranged between 14 and 16 weeks five years ago, today the company maintains that same lead time range but is building more 32- and 64-cavity molds. "It is interesting because at first look, we did not see any real difference in the delivery timing, yet our mindset was registering that efficiencies were improving.

"Upon taking a deeper look and discussing the work, we



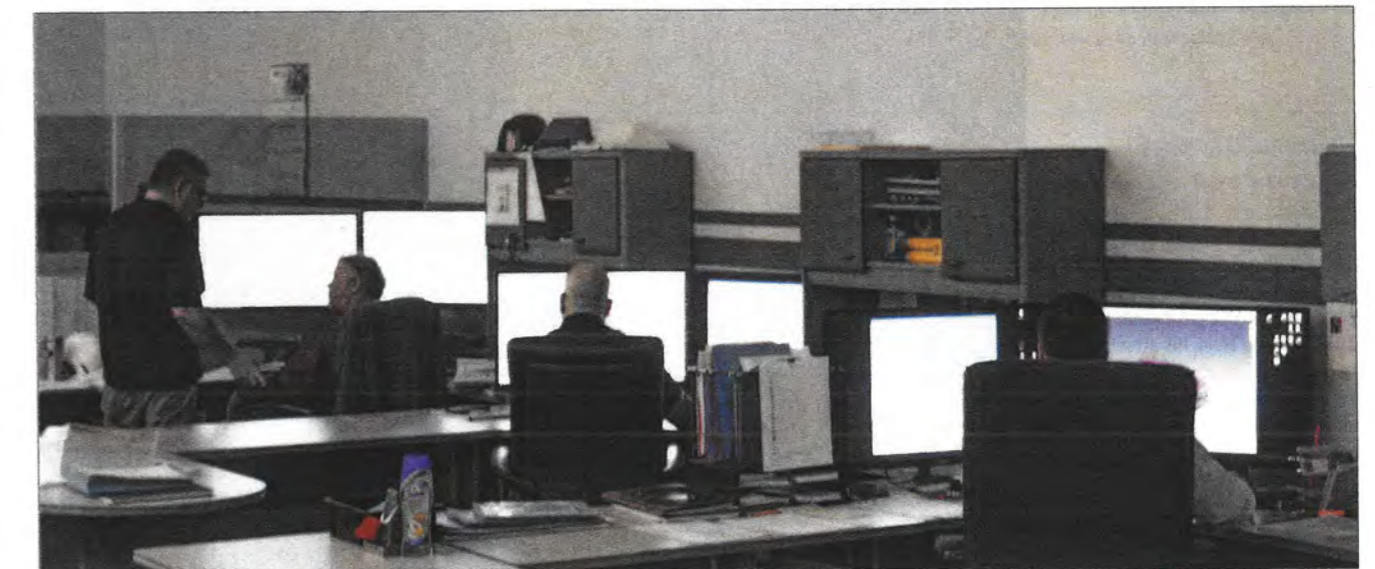
Continuous improvement is a fundamental goal at X-Cell Tool and Mold. Here, Owner Ron Novel (left), General Manager Jim Cummings, Engineering Manager Jerry Przybylski and other members of the management team conduct a weekly meeting to discuss work in progress, any challenges and expectations.

X-Cell Tool develops user-friendly designs with parting-line accessibility, face-mounted components for in-press access—as standard. Mold longevity through user-friendly designs that result in an overall lower cost of ownership is the company's end goal. Here, members of the company's engineering team, led by Jerry Przybylski, works to develop designs that leave no stone unturned for the customer.

realized in that same time frame we are delivering much more complex and higher cavitation tools," Cummings continues. "We are also getting more work accomplished per machine hour; we are getting more machine hours; and we are getting more unattended machine hours. All in all, we are producing more product in the same delivery time frame."

Designing in Innovation

Continuous improvement is a fundamental goal, Brian Dippel, operations manager, says. "The mentality that you either take a step forward or backwards is alive and well here. Complacency



is not accepted due to our 'Nothing is ever fast enough or good enough' company culture." As an example, Dippel refers to X-Cell's "No snowflakes" mantra and explains that the company prides itself on designing and building Class 101 molds featuring componentry that is completely interchangeable as

The mentality that you either take a step forward or backwards is alive and well here. Complacency is not accepted due to our 'Nothing is ever fast enough or good enough' company culture.

manufactured. "This statement is reiterated time and time again during conversations within X-Cell and with our customers to preach X-Cell's unwavering commitment to quality," he says. "The quality of our work is supported by the quality of X-Cell's designs.

Our components are drawn and toleranced to fit together. For example, we design all corners with fit radii. This enables the components to be machined complete and once finished, they need no hand fitting to mate with other components. When customers order spares from X-Cell, these components will fit into the tool and work properly. We develop user-friendly designs with parting-line accessibility, face-mounted components for in-press access. It's our standard. Mold longevity through user-friendly designs that result in an overall lower cost of ownership is our end goal."

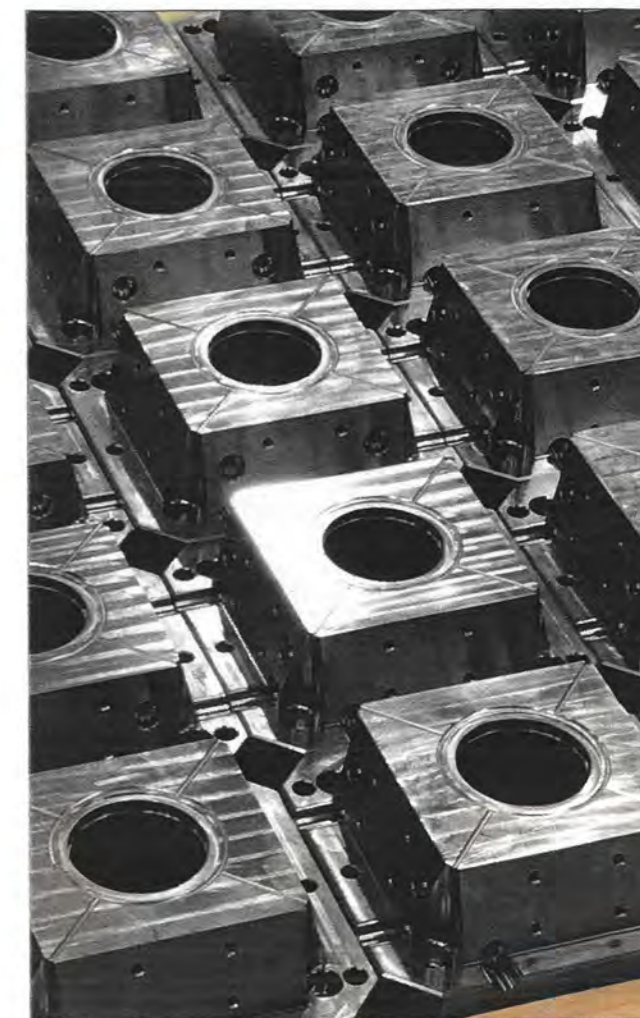
Jerry Przybylski, engineering manager, says he meets weekly with the design team to assess workloads and address challenges and questions. "To eliminate confusion, our engineering team provides every customer with an assembly and disassembly book, fully detailed prints for every mold component and a breakdown of each component so they are easier to find versus having a complex and busy 2D assembly drawing," he says. "We feel that these items help to break the language barrier because we are helping the customers to help themselves." He notes that customers also receive complete design data, which many shops do not provide. All data related to a mold, such as 3D Solidworks, 2D PDFs, steel certificates, engineering book, assembly book, steel inspection reports, all scientific injection molding (SIM) reports, Design of Experiments (DoE) and validation data is stored on the mold cycle counter or a flash drive so it travels with the mold. "We are confident enough that we can provide these things and our customers will continue to work with us on future mold builds."

Novel acknowledges that X-Cell's price is often comparable to or higher than some of the premier mold shops in the U.S., but the company often stands its ground. "An X-Cell mold may have a higher cost related to a specific quoted design intent that offers longevity, user-friendliness, or features to improve production performance. With other shops these more expensive features may not be included to keep costs down, but X-Cell will always quote the best design to minimize the mold's 'total cost of ownership' over the life of the mold."

Ken Thrasher, shown here measuring and assembling mold plates, is a master moldmaker at X-Cell Tool and Mold. His attention to detail is imperative to X-Cell's mission to deliver a top-quality mold on time, and it supports the company's "no snowflakes" mantra. X-Cell enjoys a first-pass quality rate (meaning no rework required) of 99.7% and has an on-time delivery rate average of 94.7%.



X-Cell Owner Ron Novel (left) and Operations Manager Brian Dippel are actively engaged with the company's more than 50 employees at all levels of production within the 45,000-square-foot facility. The company is committed to investing in measures to grow the company, including plans to establish additional locations in the U.S. and possibly Mexico.



These parts are fresh out of X-Cell Tool's Matsuura MX-520 five-axis vertical machining center and ready for heat treating. The Matsuura is considered to be one of the company's primary work horses, using advanced tooling like through-coolant drills and high-pressure chip blasters to feed workpieces as fast as 10 inches per minute, according to Jim Cummings, general manager. X-Cell also uses the Matsuura to threadmill holes versus tapping them.

Upping its Technology Game

Dippel says that to support its lead-time strategy and sustain its notable quality and customer service ratings, which are supported by annual online surveys, X-Cell continually innovates, or modernizes, its processes and equipment.

The recent purchase of a Yasda YMC-430 RT10 five-axis Micro Center for hard milling has been an exciting addition for X-Cell, according to Novel, because of the opportunity it brings to grow its hard-milling capabilities and optimize its finish machining operations—more continuous improvement. "This machine was purchased with a System 3R WorkPartner 1+ robot from GF Machining Solutions, which has opened a whole new realm of hard machining possibilities." He explains that while the advantages of a five-axis CNC include fewer

setups and more capability to reduce ram EDM time and the need to make electrodes, "the robot allows for more unattended time and utilization of nighttime hours, which is always a plus, and the improved finishes and quality means less time must be spent polishing molding areas or performing other hand work on complex geometries for both molding surfaces and shutoff surfaces."

"The Yasda is one of the most advanced machines I've come across in my 40-year career," Jim Cummings adds. "It is capable of holding 0.0001-inch tolerance day in, day out, and it will manufacture components exactly the same. It is a very high-end machine with a 42,000-rpm spindle. We also invested in CG CAM-TOOL software (by CGS North America Inc.) for the Yasda to be able to run the tool paths that can create

Surveying for Service

"Customer satisfaction is very critical to X-Cell Tool and Mold. Period," Brian Dippel, operations manager, says. "What defines a customer relationship is not what happens when times are great, and everything is going well because that is a given. The relationship is built and defined when times are not so great, and things are not going well. The choices you make during the tougher times will make or break your relationship with your customer."

Customer satisfaction is measured through annual online surveys that X-Cell sends via email inviting customers to link to and answer the survey questions. The purpose is to receive comments back with scores based on the questions asked regarding X-Cell Tool and Mold's performance in different areas, and how X-Cell has addressed their specific needs. Additionally, pertinent information regarding customer perception is discussed during management review meetings, and X-Cell's president, project managers, general manager and operations manager each continually assess customer satisfaction through daily interactions with customers. Other methods of measuring customer satisfaction are used, including monitoring the number of customer complaints and corrective actions, and by gauging any increase or decrease in the amount of new business each customer awards the company.



Led by Aaron Bentley (left), molding manager, X-Cell Tool provides mold sampling and validation services for its customers, including Scientific Injection Molding (SIM) to develop a centerline process, Design of Experiments (DoE), first article inspections (FAI), IQ/OQ/PO process validations as well as sampling and short production runs. X-Cell has two ISO Class 7 soft-side clean rooms for sampling or production and is ISO 13485 certified for molding medical device components. Here, Bentley works with Carlos Cazares, engineer and program manager for X-Cell in Mexico and South America.

Partnering to Innovate

For X-Cell Tool and Mold, finding ways to innovate does not stop with home-grown design and craftsmanship. About six years ago, X-Cell formed a strategic partnership with France-based JP Grosfilley SAS (JPG) to expand its offering of innovative design and molding solutions to its customers, President Ron Novel says. Called Injection Molding with Index Technology, or IMIT for short, customers can access Bi- and Tri-rotating element indexing systems, which were showcased at NPE 2018 in Orlando, Florida. X-Cell and JPG introduced this technology in the Milacron booth. Novel says this technology has become a core competency for X-Cell.

IMIT works like a family mold except that on one side of the mold, the platen indexes in order to mold multiple parts of the assembly, and then a robot puts them together and performs a secondary operation like fusing the parts together, inside the mold. "It is more efficient, because you are eliminating the secondary steps and labor to do them, but more than that, you are saving a lot of space by having one mold, one press, and the finished part that comes off the conveyor into a box and it's done," he says. The indexing systems have advanced so much just since last year, he adds, that they can enable the molder to shoot up to six different colors and plastics in one mold. "If you do high-volume molding of multi-component products, this technology will pay for itself quickly, plus it saves money because there is less scrap (no runners) and no need for auxiliary equipment like sonic welders or fixtures to do the assembly."

the finishes we require. Advanced machining requires advanced software. The Yasda has been the biggest game changer for us in terms of technology investments." Due to the performance gains X-Cell has accepted delivery of a second, larger five-axis machine, a Yasda YMC 650 Micro Center, to integrate with the existing automated Yasda machining cell, he says. This addition will complete this automated cell with two five-axis Yasda machining centers for hard milling a wider range of component sizes.

Asked about the company's Matsuura MX-520 five-axis vertical machining center, Cummings says he considers that machine to be one of the workhorses in the X-Cell shop. "We set the Matsuura up to get parts to heat treat, meaning we put the advanced tooling in there, our through-coolant drills and high-pressure chip blaster," he says. "Most of our drills will feed at 10 inches per minute. We threadmill; we don't tap holes around here anymore, so that Matsuura is a workhorse." Cummings adds that the company has also recently invested in an Amada CNC grinder that has increased its surface-grinding capabilities. "The grinder has proved that it can run most of the day by itself and we have seen a dramatic increase in unattended grinding. Because of this, X-Cell is looking to purchase another larger CNC grinder later this year."

In addition, Cummings calls out the company's CNC lathes, which feature a fourth, Y-axis that gives X-Cell the ability to offset a tool and mill flats, pockets, drill/tap holes off center and



Last year, X-Cell hosted Faisal Aqlan, Ph.D., of Penn State University Behrend and this group of science, technology, engineering and math (STEM) high school teachers who participated in the Manufacturing Simulation and Automation course at PSU's Behrend Campus. The course is part of the National Science Foundation's Research Experience for Teachers program. By touring X-Cell the teachers saw firsthand how an injection mold is designed in 3D, how components of a mold are milled, heat treated, ground, etc., and the technologies used in advanced manufacturing like robotics, CAD/CAM, inspections and so on.

other milling operations whereas before, they could only turn round items. "When it comes to round work, it is so much faster and easier now," he says.

Cummings notes how automation has also benefited the company's EDM operations. "Our EDM department is very advanced," he says. "X-Cell's EDM cells are fully robotic, with a carousel and System 3R Workmaster robot that feeds two machines, and our larger EDM has a bookshelf carousel and robot on it, so palletized workpieces are being fed in and out of the machines automatically, along with the tooling. We run 24/7 unattended with those robots."

Bottom line, X-Cell believes that five-axis and mill-turn machining equipment are the way to the future. "If you have not already invested in this type of equipment or you are not investigating it, you are on the verge of becoming obsolete and therefore not competitive," Cummings says. "The same thing can be said about robotics; driving labor out of the final product is an absolute must going forward."

Dippel adds, "Once the mold is complete, the validation process is the next area X-Cell can help to reduce mold delivery times. X-Cell has invested in the personnel and equipment necessary to sample the molds we build." For example, X-Cell has hired Penn State plastics program graduate Aaron Bentley to manage its growing molding department. Aaron is

RJG - Master Molder 1 and 2 certified. "By having the ability to sample, develop a centerline process, perform a first article inspection of the parts, and groom a mold at our facility, it ultimately reduces the mold delivery time," he says. X-Cell has its own validation protocol but can tailor the details of the process to accommodate customers' specific needs. Services provided include Scientific Injection Molding (SIM) to develop a centerline process, Design of Experiments (DoE), first article inspections (FAI), IQ/OQ/PQ process validations as well as sampling and short production runs. X-Cell has two ISO Class 7 soft-side clean rooms for sampling or production and is ISO 13485 certified for molding medical device components. The ability to sample and validate tools completes the full-service capabilities X-Cell needs to service its customers' needs.

Taking Quality Seriously

Dippel notes that X-Cell enjoys a first-pass quality rate (meaning no rework required) of 99.7% and has an on-time delivery rate average of 94.7%. About quality, Ron Novel's nephew, Mike Novel, is currently an intern but is quickly establishing himself as one of the next generation leaders within the X-Cell team. He oversees the company's business management systems, which include managing the ISO 9001:2015 and ISO 13485:2016 certifications. "A lot of people look at ISO 9001 as a

Image courtesy of Penn State and the National Science Foundation.



Attention to detail and quality-mindedness can be seen throughout X-Cell's facility, including, of course, in the polishing department where Brian Morgan and others apply well-honed skills. X-Cell is ISO 9001:2015 and ISO 13485:2016 certified.

quality management system. I see it as a business management system, because to achieve the level of work that we do here, you have to put into place certain processes and procedures to obtain repeatability and consistency," Novel says. Using router sheets that travel with the workpieces X-Cell requires complete accountability for each step of the manufacturing process to ensure in-process measurements are performed and verified. Before a workpiece can move to the next station, employees must inspect, verify and sign off on it.

Housed in the company's quality lab are additional pieces of inspection equipment, including a AIMS Revolution coordinate measuring machine (CMM) with a Renishaw MCU lite-2 PH20 head, an OGP SmartScope Flash 200 non-contact, dimensional measuring machine, an OGP optical comparator and several other metrology instruments that provide X-Cell customers with exacting first-article inspection reports, capability studies and gauge repeatability and reproducibility (R&R) studies. While Mike Novel says the ISO 9001 certification, which X-Cell has had since 2008, supports the company's "bread and butter" core competencies building molds, ISO 13485 represents the opportunity to build on its molding capabilities. X-Cell is also working to expand its service offerings by adding the aerospace market to its customer lineup.

"We are looking to see if we can make a difference in that market," he says. "We want to provide certain aerospace and International Traffic in Arms Regulations (ITAR)-registered companies with our services, and we are working with a third-party registrar to achieve AS9100D and a government consultant to help meet strict ITAR requirements. X-Cell also has

a dedicated IT manager, Eric Slaughter, whom Novel works closely with to help prepare the company by implementing critical cybersecurity programs and processes. "A lot of the cybersecurity measures factor into the back end of these certifications. Eric works to ensure the correct firewalls are in place for certain programs, including accessibility, restrictions and so on, to meet the requirements of the standards and registrations. He's doing an amazing job, and we are approaching this very diligently to avoid making any mistakes."

There are several examples of progress made so far, including a recent investment in Solidworks Inspection first-article and in-process inspection software to automate creation of inspection drawings and inspection reports. "Our next challenge is to automate data collection from the actual dimensional observations made during inspection processes. This will eliminate the potential for clerical errors from human data entry during the measurement process," Dippel says.

In addition to inspection software, X-Cell continually updates the libraries within its project data management (PDM) software to maintain seamless integration with Solidworks. "Our latest efforts included the addition of our own custom mold frames, PCS frames and DME Express frames, which saves a tremendous amount of time because PDM works parametrically, so when a dimension value is changed in the design, the entire frame changes," Dippel says. "Having these frames accessible within the PDM system is much more convenient."

Sharing and Supporting to Grow

X-Cell is committed to investing in its own future by grow-

ing the company and adding facilities in the Southern United States and possibly Mexico. Beyond that, the company also invests in the future of this trade and the economic health of the United States in general, Ron Novel says. That includes giving back and supporting the community. From sponsoring softball teams and charity golf outings to sponsoring and placing ads in a flier for an event in Erie, Pennsylvania, called Roar on the Shore, the X-Cell brand is well known locally.

In trade-related circles, Dippel says X-Cell represents the plastics industry by serving on the Industrial Advisory Board (IAB) of Penn State University's (PSU) Behrend Campus in Erie. This board of 50 plastics industry professionals from the tristate area helps to guide PSU faculty in developing and maintaining the institution's curricula used to train the next generations of professionals for the plastics industry. X-Cell hires students from the PSU Behrend Plastics Program as interns each summer. Students help during mold sampling at X-Cell and are exposed to the elements of developing center-

Our next challenge is to automate data collection from the actual dimensional observations made during inspection processes.

line processes and validating tools.

Additionally, X-Cell is currently working with the National Tooling and Machining Association (NTMA) to have its revamped apprentice training program, which was

written by Jim Cummings, sponsored by the Pennsylvania Apprenticeship and Training Counsel. This will enable apprentices, successfully trained under the new four-year, 8,000-hour program, to receive a journeyman's card issued by the state of Pennsylvania. "In my opinion, the training program was outdated," Cummings says. "I was motivated to write a new curriculum because the young people don't want to get into the trades—they have been told horror stories that we know are unfounded. I felt that if I could redesign the curriculum and show them the long-term career opportunities that are available in advanced manufacturing, they will understand and reap the benefits of it. NTMA is helping X-Cell to develop a new curriculum, so when one of our apprentices graduates in four years, he will be trained in the five-axis machines, wire EDM and other state-of-the-art technologies versus Bridgeports and engine lathes," Cummings says. "I wanted to write an apprenticeship program that fits our shop, and it is currently being reviewed by the State of Pennsylvania."

X-Cell Tool exhibits at the biannual career fair for senior students held at PSU's Behrend Campus. That is where X-Cell met Faisal Aqlan, Ph.D., the PI & Director of the National Science Foundation's Research Experiences for Teachers (RET)

in Engineering and Computer Science program. According to Dippel, the program grants funding for teachers and students from tri-state STEM high-schools and community colleges in the Greater Erie Area (covering counties in Pennsylvania, New York and Ohio) to collaborate and attend a six-week program that offers authentic summer research experiences related to engineering and/or computer science. "Part of the program provides teachers with the opportunity to tour local manufacturing companies to see manufacturing best practices. They can then take what they learned back to their classrooms and share it with their students," he says. Future and current research programs include manufacturing simulations (both computer and physical), integrating virtual reality with manufacturing simulations, Manufacturing Ergonomics (using Digital Human Modeling), Robotics, automation, 3D printing and Internet of Things (IoT) Industry 4.0, Manufacturing processes, Data Analytics for manufacturing and Product Design.

"X-Cell was founded on a philosophy that the company's success is governed by the quality of its product and the desire to help and to service our customers," Dippel says. "That statement speaks directly about the caliber of people needed to deliver on those company goals. Not only do you need to recruit these higher caliber persons, you must retain them for the long term." **MMT**

VIDEO:

Video: 2019 Leadtime Leader X-Cell Tool and Mold

X-Cell Tool and Mold embodies what every progressive mold manufacturing company should: the drive to continuously improve, to use advanced technologies and equipment and to build and maintain a team that works cohesively for the greater good and the future of the organization. View the video and get to know X-Cell better: short.moldmakingtechnology.com/2019LLA

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