

# DAY 1

MONDAY | SEPT 13, 2021

## FABTECH

NORTH AMERICA'S LARGEST METAL FORMING,  
FABRICATING, WELDING AND FINISHING EVENT



# SHOW DAILY

THE OFFICIAL FABTECH PUBLICATION

## TODAY'S EVENTS

### Keynote: FABx Tech Talks

8:30 – 9:30 AM  
Lakeside Center Ballroom

### Leadership Exchange: Explore the Future of Advanced Manufacturing

12:30 – 1:30 PM  
Lakeside Center Ballroom

### 3D/Additive Manufacturing Showcase

During Show Hours  
Booth A1220

### Careers in Welding Exhibit

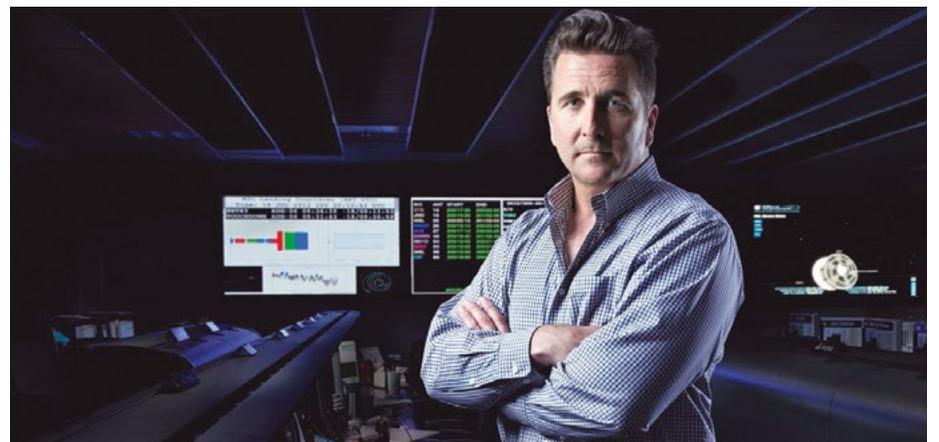
During Show Hours  
Booth B20084

## FABTECH Heads To Outer Space

Adam Steltzner, Leader & Chief Engineer for the NASA Mars 2020 Mission's Perseverance Rover project will deliver a highly anticipated keynote tomorrow "Into the Unknown: How Leadership, Ingenuity, and Perseverance Put a Rover on Mars."

Steltzner led the team that overcame immense challenges to land a rover on Mars, one that is now gathering research data and sending back spectacular video footage from the surface of the Red Planet. Together, his team struggled for almost a decade to overcome almost insurmountable design challenges and setbacks. His talk will answer questions such as:

- How did he keep the team focused and on task?
- What makes a team gel and enables truly innovative thinking?
- How do team dynamics drive forward or inhibit the process of innovation?



- And how can organizational culture create an environment for sustained performance?

The challenges he and the team faced, and the lessons learned from many trials and tribulations over the years will help you to better lead your teams, manage innovation, and drive towards excellence.

### Solving the Impossible

Steltzner works for the renowned Jet Propulsion Laboratory (JPL), an integral part of NASA operations. Prior to the Perseverance

Rover project, he worked on a long list of famous flight projects such as Galileo, Cassini, and Mars Pathfinder. He also led the team that developed the rover for the Curiosity mission. That vehicle successfully landed on Mars in 2012 and continues to operate on the surface to this day. The data from that project proved invaluable in the creation of the Perseverance Rover.

Any space flight or mission must negotiate countless obstacles. There is no room for mistakes or imprecision. But the Perseverance

continued on p. 8



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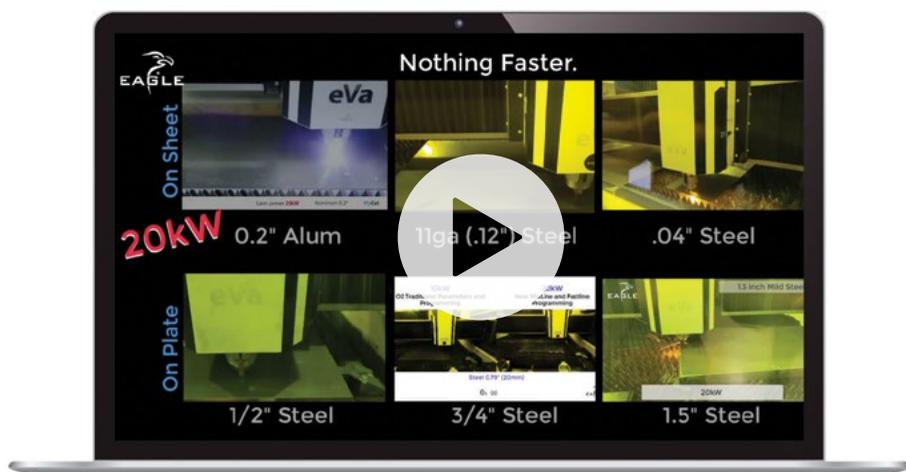
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# FMA's 500th Fundamentals of Metal Fabrication Certificate is Earned

The Fabricators & Manufacturers Association, International (FMA) is proud to announce that the 500th Fundamentals of Metal Fabrication Certificate has been earned. Congratulations to all the students who successfully completed the requirements to get it to this milestone achievement!

The certificate was developed by FMA with manufacturing instructors and faculty members to assess and validate a student's comprehension of core metal fabrication concepts. Schools can offer the program in tandem with their own sheet metal fabrication curriculums. After completing instructional coursework and passing the exam, participants obtain an industry-recognized certificate – strengthening their qualifications and resumes.

The Fundamentals of Metal Fabrication Certificate also helps bring recognition to Certified

Education Center (CEC) schools' manufacturing programs and gets more qualified candidates entering the manufacturing workforce.

A summer testing group at Harper College in Palatine, Illinois, pushed FMA over the 500-awards mark. Kurt Billsten, Harper's chair of manufacturing and construction had this to say of the program, "The FMA Fundamentals of Metal Fabrication Certificate is the capstone of our Basic Welding Certificate. The certificate provides proof of knowledge students are ready to enter the metal fabrication workforce and gives students an incentive for further achievement."

FMA is committed to the industry and working with schools to connect students to meaningful jobs. The Fundamentals of Metal Fabrication Certificate is a great example of FMA's rewarding partnerships with CECs. The exam showcases a student's

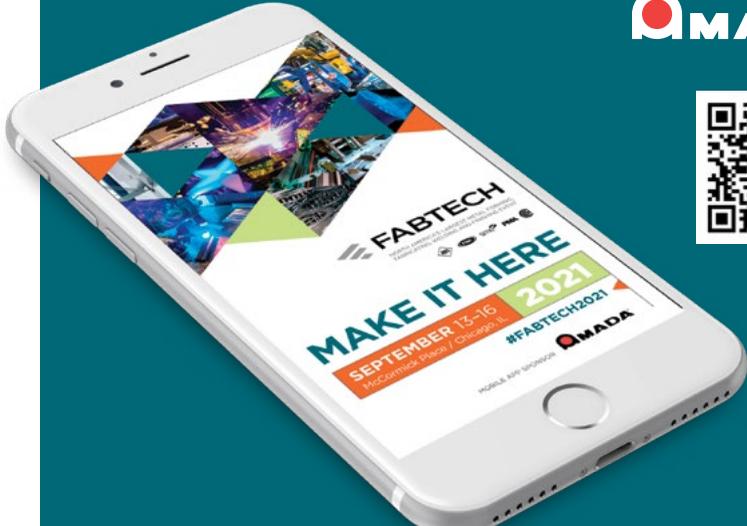
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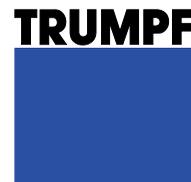


dedication in the classroom and enables them to confidently pursue a prosperous career in manufacturing. ■

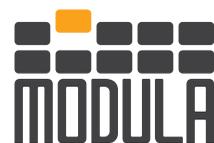
Learn more about FMA at [fmamfg.com](http://fmamfg.com) and visit Booth A3654.

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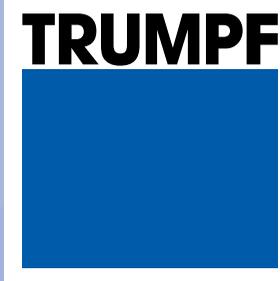
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September 13-16, 2021 / Booths A2904, B18005, B16004



# Your challenges, our solutions.



## Visit TRUMPF at FABTECH

Fabricators today are facing more challenges than ever. Lower order quantities, shorter lead times, higher material costs and a shortage of skilled labor combine to make your challenges seem overwhelming. TRUMPF understands those challenges and provides innovative and productive solutions for the entire spectrum of sheet metal fabricators. Whether your needs are stand-alone machines or smart factory solutions of any scale, TRUMPF has the machines, software, experience and manpower to determine, produce and support the best solution to fit your needs. We invite you to visit our FABTECH booths to see a sampling of our products, speak with our experts and develop a roadmap to solving your challenges today.

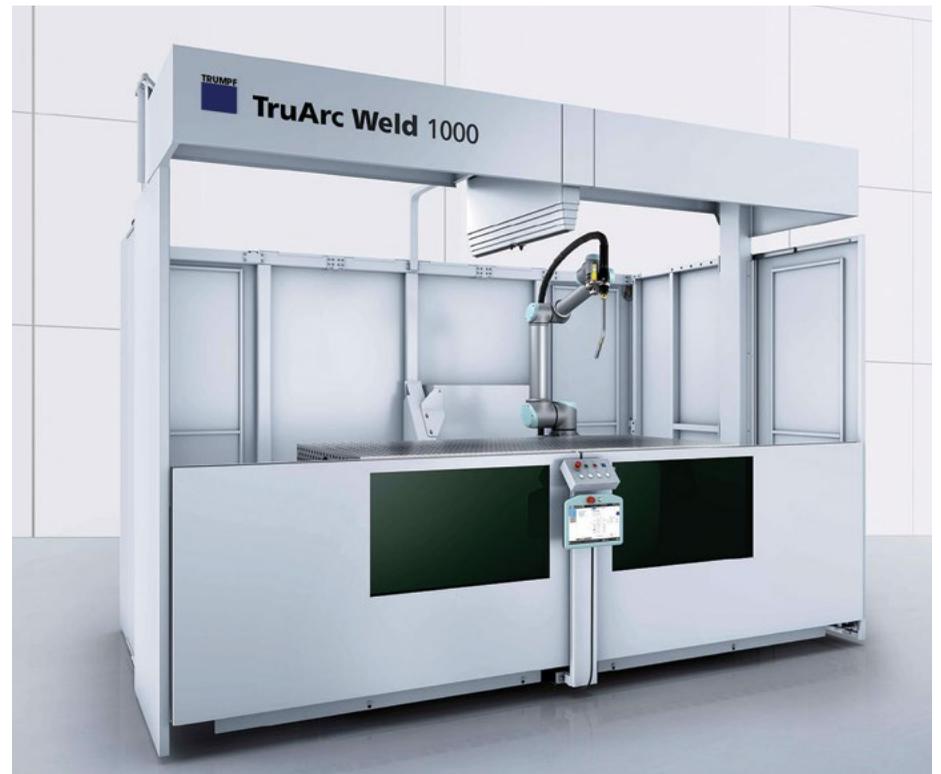
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## TRUMPF Introduces Easy Robotic Welding

TRUMPF has released its first automated arc welding system that makes adopting automated welding easier than ever. The TruArc Weld 1000 comes with a collaborative robot known as a “cobot” that assists in the creation of the program, rather than relying on values from an offline source or entering positioning data into a control. After the operator manually guides the cobot over a part, it automatically creates the weld program. The remarkably easy programming enables fabricators to utilize robotic welding, even with a lot size of one.

### Faster and easier programming

Unlike conventional industrial robots, operators can interact with the cobot, guiding it over the part manually. A built-in sensor ensures a smooth response from the cobot. The cobot allows users to store the weld path’s start and end points as well as intermediate points in order to create the program. Furthermore, the cobot control system includes templates for welding programs and parameters that cover scenarios such as different sheet thicknesses. Combined with the operating unit on the welding torch, this simplifies the task of programming the cobot. It also enables efficient and



fast programming and welding with the TruArc Weld 1000.

### Small batches, great results

The TruArc Weld 1000 offers an automated alternative for many parts that users would normally weld manually and produces a high-quality weld seam. Thanks to the rapid programming, fabricators have an affordable means of tackling short production runs and single part runs even if the parts only require a short weld seam.

### Simultaneous setup and welding

Inside the TruArc Weld 1000 is a partition that can be moved up and down. This allows users to divide up the working area and choose between welding one large part (single-station operation) or several smaller ones (two-station operation). In single-station operation, the cobot can weld parts measuring up to 80 x 24 x 24 inches. Other ratios of width to length are also possible depending on part dimensions. In two-station operation, the TruArc Weld 1000 can process smaller parts measuring up to 24 x 24 x 24 inches. To ensure it can easily reach both stations, the cobot travels between two sta-

tions along a linear axis. While the cobot is performing welding on one side, the operator can use the time to set up a part on the other side. The cobot program can also be transferred automatically from one station to the other.

### Ready to go with no training required

No previous experience is required to operate this system. Customers can carry out commissioning of TruArc Weld 1000 themselves within a few hours using dedicated video tutorials that contain all the information required to quickly learn how to operate and program the machine outside of a classroom. From the wire coil to the welding parameters, the system comes with everything you need to get started with the welding process. **Be sure to visit TRUMPF at FABTECH Booths A2904, B16004 and B18005.** ■

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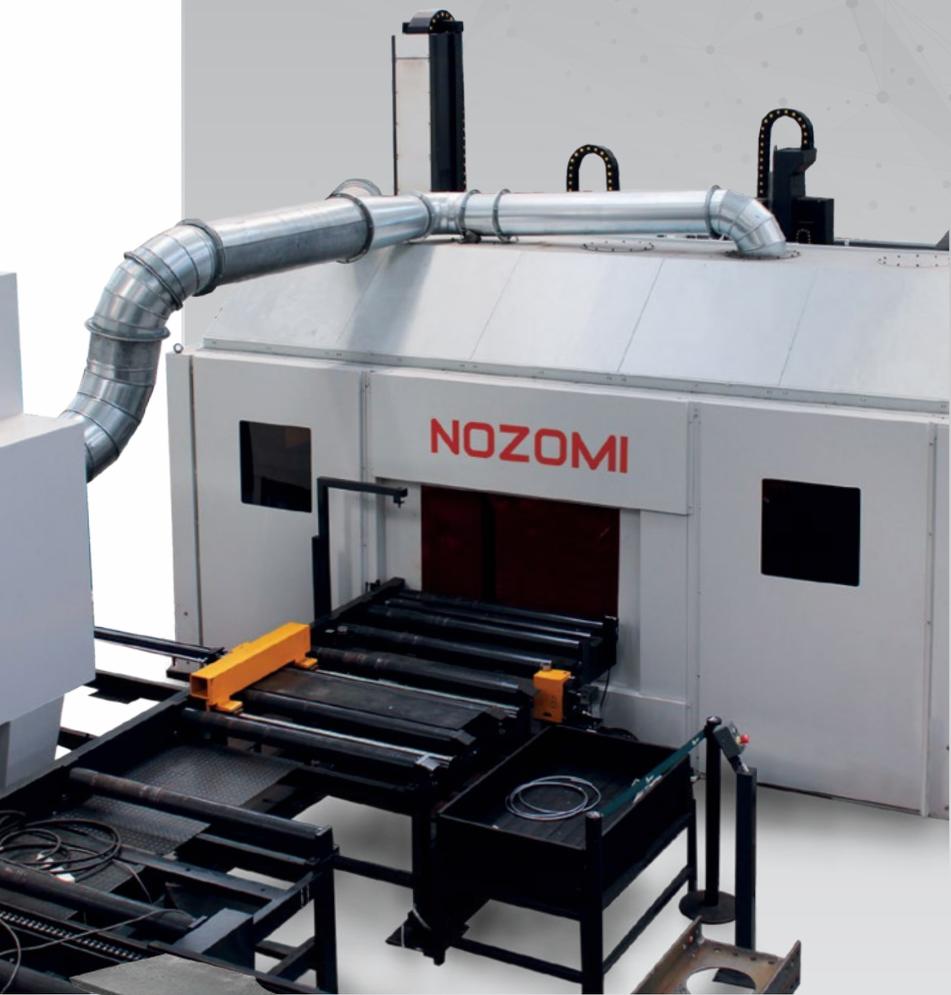
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# FABTECH Heads To Outer Space

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Rover took things to a whole new level. Our neighboring planet can be anywhere from around 34 million to 250 million miles away from Earth, depending on their relative positions. Yet traversing such vast distances could be looked upon as the easy part compared to being able to land a rover on the ground within a Martian crater.

During the Tuesday morning keynote, Steltzner will explain the intricacy of the technology the team evolved to accomplish this momentous feat. Here are a few of the jaw-dropping highlights:

It takes only seven minutes from the point where the spacecraft enters the Martian atmosphere until it reaches the surface. That journey would be difficult enough even with real-time communication and control. But due to the distances involved, it takes 14 minutes for a signal from the spacecraft to travel from

Mars to Earth. In other words, the team can do nothing to alter events once the rover enters the atmosphere. They either have designed, tested, and implemented everything perfectly or the vehicle is going to crash into the ground. It is up to the onboard computer to execute all aspects of the descent and all phases of the landing with no help from the ground crew.

"If any one thing doesn't work just right, it's game over," said Steltzner.

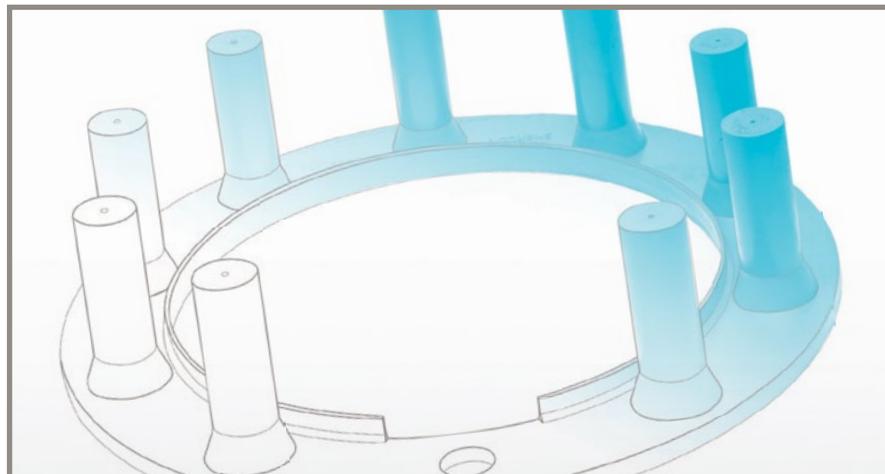
But the challenges don't stop there. The craft enters the atmosphere at 13,000 mph. There is so much aerodynamic drag that the heat shield reaches temperatures as high as 2,500 degrees Fahrenheit. Despite the speed of entry, the heat, and the inability to communicate, the vehicle had to be directed to a specific area of the surface. Not only that, it had to be done in an atmosphere that is 100 times thinner than on Earth.



- Propulsive flight
- Touchdown system

Entry into the atmosphere gradually slows the spacecraft down from 13,000 mph to around 1,000 mph. But at those supersonic speeds, the craft would be ground to dust as it collided with the ground. The team devised a customized and highly sophisticated parachute that had to cope with 9Gs of force upon opening in order to slow the ship down further. The rover was equipped with the largest and strongest supersonic parachute ever made, which was used to slow the ship down to 200 mph. Simultaneously, the heat shield had to be discarded to reduce overall mass.

As mind boggling as those steps might be, if the design made it this far, it faced what many considered the scariest part. Booster rockets were used as brakes to take the speed steadily down from 200 mph to near zero. Those same rockets were then used to move the craft to the designated landing spot. But this posed a huge problem: once those boosters approach



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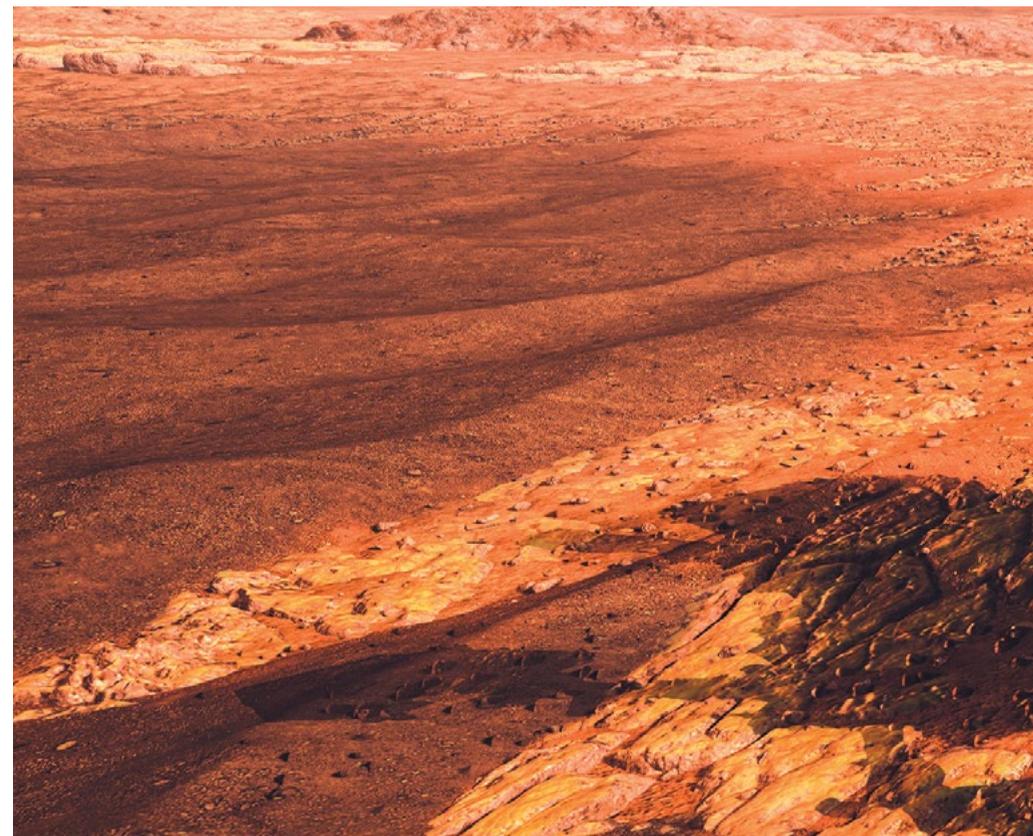
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the surface, they would kick up so much dust that it would be impossible for onboard cameras and sensors to know altitude precisely or where to land. In addition, that dust could damage various mechanisms and instruments, rendering the rover useless.

The solution? The team invented the Skycrane, a concept that was initially considered crazy within NASA itself. This component took a vast amount of technology, testing, and retesting to get everything right. During the descent, the Skycrane kicked in about 20 meters above the surface and lowered the rover on a 21-foot long tether until it reached the surface slowly. It then carefully deposited the machine on Mars. As soon as the Rover landed, the Skycrane flew away.

“The central challenge we faced was balancing design performance with the complexity within the system that emerged from those design choices,” said Steltzner. “We created from our minds something that had never existed.”

As a project manager, he likes to combine elegance and simplicity in what he calls, a “Wu Wei” approach i.e., devising solutions that naturally work. Derived from Taoist philosophy, it refers to the cultivation of a state of being in which actions effortlessly respond in an ideal way to whatever situations arise.

“As aerospace engineers building the first nuclear-powered Mars mega-rover and its landing system, it was easy to keep everyone motivat-

ed, but we wanted more,” said Steltzner. “To keep them on fire, we needed to create a culture in which everyone felt they could bring the most of themselves to the team’s tasks.”

During his talk, he will detail what it takes to make a team gel and enable truly innovative thinking.

“When team members feel comfortable to explore the edge of their individual understanding, when they are really stretched, that is the place where innovation happens,” said Steltzner. “Mutual respect and appreciation are really the most powerful forces in pushing the team forward. Without it you are lost.”

### Lesson Learned from Mars

Steltzner and his team worked closely together for many years to solve the many riddles inherent in this challenging project. He learned a great many lessons. One concerned time. Under the gun of project deadlines, and having to deal with countless setbacks and occasional failures, it is easy for desperation to set in. It can seem like time is slipping away. Steltzner said this project taught him that this is often not the case.

“There is usually enough time to implement changes to make your product better,” he said. “You always seem to have a bit more time than you think you need but never as much as you would like.”

But the vital necessity of teamwork was perhaps the biggest lesson learned. He enjoyed the company of some of the brightest minds in the world. Each one brought their own individual talents to the project. But in isolation, their efforts would never have borne fruit. It is the interaction of these minds and mutual problem solving that occasioned success. One engineer, a giant in his or her own field, may wrestle with a challenge for months. Yet a short period of interactions with a couple of colleagues in disrelated fields may provide the input that solves it.

“Whether one is building mega-rovers, light switches, or the next iPhone app, it is all about your team being on fire, burning with a passion to contribute and feeling welcomed in a culture of collaboration,” said Steltzner. “It is all about people.”

With the Mars Rover behind him, Steltzner is far from finished. He is already envisioning many years of further space innovation.

“I’d love to put a lander on Europa, the ice moon of Jupiter,” he said. “That is the place most likely to have life in our solar system today.” ■

**Hear more from Adam Steltzner tomorrow at 8:30 AM in the Lakeside Center Ballroom.**



## Gain an Inside Look at the Future of 3D/Additive Manufacturing

Additive Manufacturing (AM), also known as 3D printing, has proven to be a formidable addition to the manufacturing sector. At FABTECH the 3D/Additive Manufacturing Showcase in the 3D/Additive Manufacturing Pavilion provides an inside look at this fast-growing technology.

A group of industry-leading companies will share 20-minute presentations on the latest technologies and applications in the AM community. Formlabs, for example, is a 3D printing company on a mission to expand access to digital fabrication to enable anyone to make anything. Its product line has been designed to make 3D printing more accessible, reliable, and versatile.

Katherine Brown, Formlabs Associate Events Marketing Manager, said the company's three printer lines are easy to use. Formlabs is constantly expanding the number of applications supported as well as investing in material innovation to provide users with unique properties that open up new ways to harness this technology.

"Formlabs engineers are committed to developing 3D printable materials that enable our customers to create the products and prints they need," said Brown.

Early this year, the company released Fuse 1, the world's first benchtop industrial selective laser sintering (SLS) 3D printer. This machine helps engineers, designers, and manufacturers at all levels to rethink product development, hybrid manufacturing, and end-use production. It uses a laser to precisely fuse nylon powder into lightweight, robust parts. Unlike traditional 3D printed plastic, nylon bends and returns to its original form with ease, making it the perfect material for structural, load-bearing, or mechanical parts.

### Fuse 1 features include:

- A modular build chamber that enables continuous printing and reduces downtime.
- Surface Armor technology that creates a semi-sintered shell to protect the surface of the part as it prints.



The Essentium 280i HT 3D printer.

- The capability to print with up to 70 percent recycled powder.
- A material refresh rate (the minimum ratio of fresh powder required to print) of 30 percent to reduce material waste.

"This new addition gives users cost-effective, high-quality options for taking manufacturing and prototyping in-house," said Brown.

She firmly believes 3D printing adds real value. "Fabricators and manufacturers directly benefit from the versatility of 3D printing materials and technology due to their affordability, sustainability, and inherent ability to create personalized products and parts," said Brown. "From accelerating prototyping to reducing lead times and costs of outsourced tooling, the opportunities to enhance manufacturing processes through 3D printing are plentiful."

### High-Speed Extrusion Printer

Essentium will host another not-to-be-missed presentation in the 3D/AM Showcase. It provides industrial 3D printing solutions that disrupt traditional processes by bringing product strength and production speed together, at scale, with a no-compromise engineering material set. Its High-Speed Extrusion (HSE) 280i HT 3D printer aims to transform factory production speeds and boost build volume for industries like aerospace, electronics, automotive, contract manufacturing and consumer goods. It features X- and Y-axis extruders that can work independently to enable parts to be printed simultaneously. A non-slip, high torque extrusion system with

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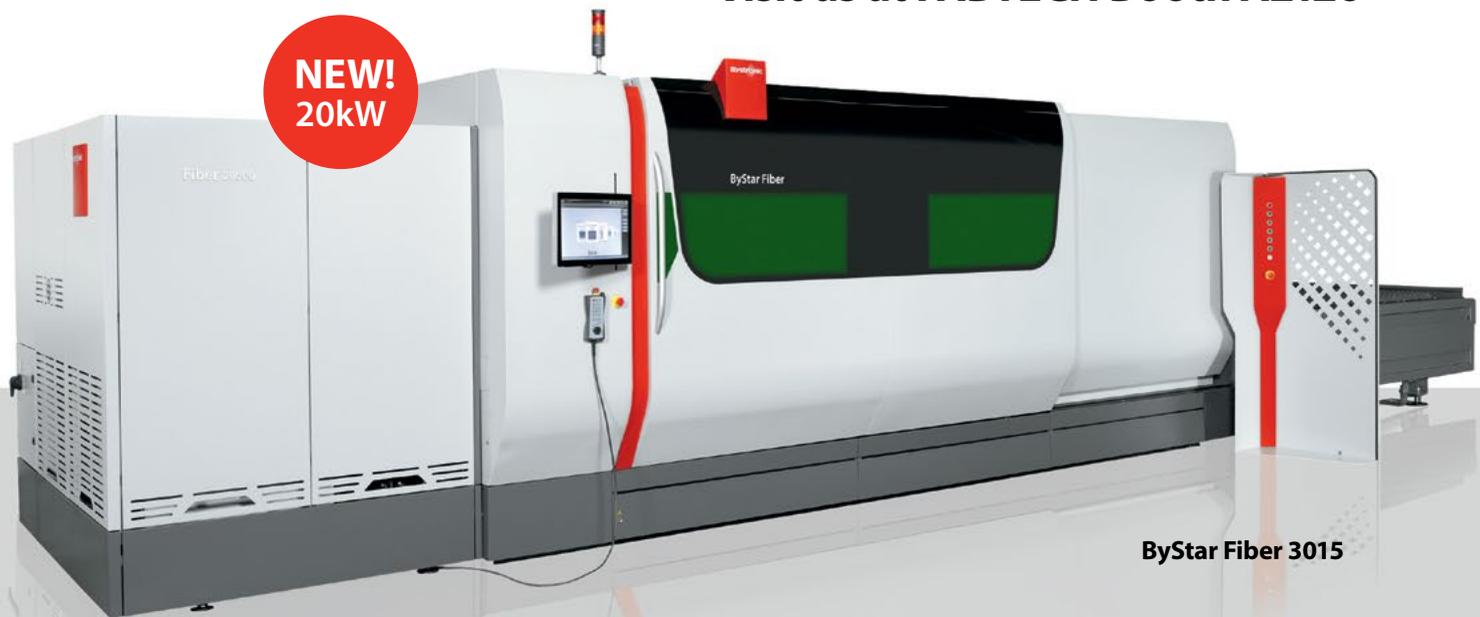
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## American Welding Society Launches “Take the Torch” Initiative to Attract Younger Audience

Millennials represent more than a quarter of the world’s population. To help foster the next generation of young professionals in the weld-

ing industry, the American Welding Society is proud to announce a new membership initiative – Take the Torch.

The goal of this initiative is to speak to the overall age gap in welding and to encourage the younger generation to step up and



make an impact. With an aim at Millennials and Generation Z, the Take the Torch initiative reinforces that when you join AWS, you’re joining something bigger – not only for your personal benefit but for the greater good of the industry and the welding community.

“With Millennials driving growth in the workforce, we are prioritizing efforts to attract younger members. An AWS membership is an investment that has many financial and non-monetary perks in the professional and personal lives of the next generation,” said Cassie Burrell, Senior VP, Marketing & Membership Development.

“Millennials are a natural fit for membership organizations, and we’re excited to engage the industry’s future workforce through social and professional networking and personal growth opportunities obtained as part of an AWS membership.”

The Take the Torch initiative highlights how an AWS membership can pay for itself each year with the benefits and discounts available to members. From resources like certification, education, and online peer communities to lesser-known benefits, like savings on technology, business book summaries, and office supplies, Take the Torch breaks down the overall value of an AWS membership and solidifies AWS’s influence in the industry. ■

**For more information about the Take the Torch membership initiative, visit [aws.org/takethetorch](https://aws.org/takethetorch).**



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## LAKESIDE BISTRO

The Lakeside Bistro is a convenient place for exhibitors and attendees to eat, meet and network. Located in the Lakeside Center Ballroom, the Lakeside Bistro will be open on event days from 11AM-2PM and feature a buffet menu that will change daily. Reservations are not required and credit cards are accepted.

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# Gain an Inside Look at the Future of 3D/Additive Manufacturing

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all linear servo motors offers print speeds above 500 millimeters. As well as speed, the machine provides strength and the ability to scale up production of parts. Unlike fused filament fabrication (FFF) processes that depend on a heated build chamber, the HSE 280i HT 3D printer does not need to wait for its chamber to warm.

On the material side, Essentium partnered with LEHVOSS Group to develop a new PP-CF filament reinforced with polypropylene that is made with LUVOCOM 3F resin. This new material is easy to 3D print, chemically resistant, and has low surface energy. It is suitable for silicone and urethane molding applications. The resulting parts are stronger and stiffer than those made with unreinforced polyolefins.

The build volume of the HSE 280i HT is 695 x 495 x 600mm with a throughput of up to 220g per hour for single head printing. Nozzle temperatures can go as high as 550°C and build chamber temperatures up to 200°C. Warm-up



The EnvisionTEC Viridis3D 3D printer has a print head attached to a robot arm. It uses binder jetting technology to print sand molds and cores for the foundry industry. Courtesy of EnvisionTEC

times for the machine range from 15 minutes to 120 minutes.

## Robotic Additive Manufacturing

Formlabs and Essentium are joined in the 3D/AM Showcase by EnvisionTEC, a wholly owned subsidiary of Desktop Metal. EnvisionTEC is a global provider of volume production photopolymer 3D printing solutions for end-use parts. It is the original inventor of digital light processing (DLP) 3D printing technology and has almost 200 materials qualified for its platforms.

EnvisionTEC boasts more than 40 3D printers across six lines that build objects from digital de-

sign files. The new Envision One and Xtreme 8K printing platforms, for example, are designed to deliver high-speed and economic end-use parts production with accuracy and properties meeting or exceeding thermoplastics. In addition, EnvisionTEC's robotic additive manufacturing (RAM) digital casting capabilities take advantage of Single Pass Jetting technology to drive productivity enhancements and improve part economics.

The EnvisionTEC Viridis3D RAM 123 is one example. This robotic 3D sand printer can use the data from a CAD file to print a mold and core, resulting in a casting within a few hours. Designed with the foundry in mind, the RAM 123 is the fastest, most flexible robotic 3D printing platform in the industry.

"As we move toward more on-demand production and mass customization, the future of manufacturing will hinge on the ability to rapidly produce and tailor the products consumers want, when they want them, while maximizing margins," said Formlabs' Brown. "To do this, the factories must be-

come more streamlined and agile, and take over some previously outsourced processes that elongate timelines. With the adoption of technologies like 3D printing, manufacturing professionals will be empowered to work smarter, not harder."

These are just a few of the innovators to be featured in the 3D Printing/AM Showcase. Further market leaders attending the Showcase include 3D Systems, EOS, HP, Interfacial Materialise, RENA, Renishaw, and TRUMPF. ■

**Stop by the 3D/Additive Manufacturing Showcase in Booth A1220 to catch a presentation and learn more.**

## 3D/ADDITIVE MANUFACTURING SHOWCASE

3D/Additive Manufacturing has proven to be a formidable technology in the manufacturing industry. This year, FABTECH features a presentation showcase in the 3D/Additive Manufacturing Pavilion, **Booth A1220** to provide access to information on this fast-growing technology.

The showcase features industry-leading companies sharing 20-minute presentations on the latest in the Additive Manufacturing community.



## Caplugs Works to Help Manufacturers Streamline Finishing Processes Amid Labor Crunch

With manufacturers struggling to fill and maintain staffing levels to keep up with the pace of product demand, Caplugs is working to help businesses work smarter with custom solutions to streamline finishing operations and deliver greater consistency.

Caplugs' team of engineers has been helping customers improve their existing processes through custom masking design and manufacturing. Starting with an on-site masking efficiency analysis – when possible, depending on the COVID health and safety restrictions in place in different regions and organizations – the Caplugs team can evaluate existing masking operations, looking to identify failures in current processes, opportunities to use a more appropriate part or masking shape and how part failures could be prevented using a purpose-built solution. This analysis may also identify ways a custom part could provide greater ergonomics or improve safety and working conditions versus hand-cut tapes or imperfect off-the-shelf options.

“You’ve always heard you should use the right tool for the job, but when there’s not a right tool, developing a custom solution can make the job easier,” said Vimal Venugopalan, Director of Industrial Business Development at Caplugs. “Custom masking ensures a correct fit and is tailor made for the part being masked, improving speed, accuracy and consistency.”

In addition to saving manufacturers the time to complete and remove masking, using custom-designed solutions can also drive down failure rates. With hand-cut masking or imperfect parts, the potential for bleed or masking failure increases. Custom parts and die-cuts can dramatically diminish these errors, reducing time and cost to rework a product or a complete product loss for uncorrectable errors.

“Custom masking parts or tapes are often seen as a premium product and an increased cost,” added Venugopalan. “However, the truth is that while the cost for masking

material may rise, the substantial savings in reduced labor cost and failure rate quickly overcome the increase, leading to a net positive investment for most customers in

a matter of months – even weeks, for high-volume manufacturers.”

To help illustrate the value of  
continued on p. 20



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# Advances in Automotive-Stamping Technology

By Peter Ulintz

*Technical Director, Precision Metalforming Association and regular columnist to MetalForming magazine*

Technologies in metal stamping continue to advance and mature — as they always have done — but today this occurs more rapidly than in the past, and with technologies profoundly more complex.

## Hot Forming — Amazing but Complex

Hot forming provides a good example. In common practice today: forming automotive components from boron-steel sheet metal at very high temperatures (approximately 900°C) in a die that simultaneously quenches the stamping—essentially heat treating the formed part in the die.

Hot forming differs greatly from a traditional deep drawing process. Hot forming employs no blankholder; instead, special clamping units hold the part material in position and prevent the formation of wrinkles. And, the process often requires cooling lines located close to the die surface to facilitate the quenching process, which requires special die steels with high strength and heat-transfer rates. Strong ejector systems also must be designed and built to facilitate part removal. These represent only a few critical features that must be addressed when de-

signing and building hot forming dies, which makes hot forming an amazing accomplishment considering that most die engineers and toolmakers never were trained in this technology.

## Big Gains on the Materials End

Material evolution represents another example of complex technology. Advancements in steel technology has led to a new class of high-tensile-strength materials called advanced high-strength steel (AHSS). Except for the boron-based hot forming grades, these materials are designed to be cold formed in traditional stamping dies and press lines at room temperature. These materials may exhibit two to three times the tensile strength of traditional high-strength low-alloy steels, placing unprecedented demands on new tooling and older press lines.

A third generation of AHSS materials features tensile strengths approaching those of hot formed stampings but with enough ductility to be cold formed at room temperature. These ultra-high-tensile-strength materials surely will push existing press lines beyond their designed-for capacity limits.

Beyond steel, automotive and transportation applications of sheet aluminum alloys have increased greatly within the last decade. Pro-

cessing aluminum stampings can be challenging, especially when working with new or unfamiliar alloys. Producers have developed new alloys for ultra-high-strength hot forming applications, with other existing alloys successfully warm formed and a few others super-plastically deformed. In addition, refinement of more-common alloys has delivered better cold forming properties. The best opportunity for success demands that the process engineer and die designer understand the differences and limitations between the various aluminum alloys and their tempers.

## Lube and Tool Advances Abound

Advances in forming lubricants, application methods and thickness-measurement technologies have become increasingly more important and prevalent, especially considering the arrival of third-generation AHSS materials and the potential elimination of some types of chlorinated paraffin.

Modern stamping dies must withstand an ever-increasing array of stresses, temperatures, chemical attack, shock and vibrations. So—no surprise here—that metal stamping dies are prone to all kinds of in-process failures. Constantly improving tool-steel composition, heat treating methods and engineered surface coatings seek to meet the increasing demands placed on stamping dies.

Tool designers and builders often choose carbide materials for stamping operations requiring long production runs. These materials exhibit high compressive strength, resist deflection and retain their hardness values at high temperatures—a physical property especially useful in high-speed cutting, punching and forming applications. Some processes, such as perforating small-diameter holes in hard, tough materials, may only be possible using tungsten carbide punches.

Also emerging: process developments such as double-sided incremental sheet metal forming. This novel manufacturing process utilizes two generic tools to manipulate sheet metal to produce free-form parts without the need for dies. The process potentially achieves a design-to-product cycle time of only a few hours or days as compared to the typical period of weeks or months required for conventional sheet metal forming processes.

## Digital Evolution Lends a Big Hand

The digital world also works hard to keep pace with advancing stamping technology by delivering more accurate sheet metal formability analysis; improving spring-back prediction and responding to variations in the stamping process; and simulating programmable servo-press slides in combination with programmable servo-transfer systems to optimize strokes per minute. The digital evolution also includes optical scanning technology (white light and/or blue light scanners) to capture and digitize dies and parts produced off of dies in order to assess and appropriately modify the tooling; and morphing solutions that enable rapid and repeatable development of compensated die surfaces.

## Are We Ready for This?

These and other recent advancements in automotive-stamping technology, and the impressive speed of change, prove fascinating. But what about the workforce? Are young workers equally fascinated with the rapid changes in manufacturing, and do employers' training programs keep pace with this speed of change? MF ■



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# MONDAY, SEPTEMBER 13

# SCHEDULE-AT-A-GLANCE

TECHNOLOGY	8:00 AM – 9:30 AM	10:30 AM – 12:00 PM	1:00 PM – 2:30 PM	3:30 PM – 5:00 PM
3D/ADDITIVE MANUFACTURING	■ <b>F10:</b> Fundamentals of AM (7 Processes, Hybrid, AM Enabled) <b>Room S405B</b>	<b>NEW!</b> ■ <b>F11:</b> The Hidden Challenges: Is Additive Manufacturing for You? <b>Room S405B</b>	<b>NEW!</b> ■ <b>F12:</b> Managing the AM Supply Chain <b>Room S405B</b>	<b>NEW!</b> ■ <b>F13:</b> Ask the Panel of Additive Manufacturing Experts ( <b>BONUS SESSION</b> ) <b>Room S405B</b>
AUTOMATION/ROBOTICS	<b>NEW!</b> ■ <b>F20:</b> Automation Adoption: What You Need to Know & Why <b>Room S405A</b>	<b>NEW!</b> ■ <b>F21:</b> Five Steps to Creating Operational Excellence in Robotic Joining <b>Room S405A</b>	■ <b>WS3:</b> Getting Started with Robotics: A Journey to the World of Robotics & Autonomous Systems Workshop (1:00 PM - 4:00 PM) <b>Room S405A</b>	
CUTTING			<b>NEW!</b> ■ <b>F32:</b> The Most Versatile Machine Tool & 7 Habits of Highly-Effective Nesting Software <b>Room S401D</b>	■ <b>F33:</b> Comparative Cutting <b>Room S401D</b>
FINISHING			■ <b>C12:</b> I Want to Ecoat, Now What? <b>Room E353A</b>	
			■ <b>C22:</b> Powder Coating Basics - A Fundamental Understanding of a Powder Coating System <b>Room E353B</b>	
			<b>NEW!</b> ■ <b>C32:</b> An Architectural Update: Liquid and Powder Coatings <b>Room E353C</b>	
	<b>NEW!</b> ■ <b>C100:</b> Industrial Finishing Safety Workshop - Day 1 (9:00 AM - 4:00 PM) <b>Room E271B</b>			
FORMING & FABRICATING	■ <b>F40:</b> Press Brake for Engineers <b>Room S403B</b>	■ <b>F41:</b> Tube Bending: Best Practices <b>Room S403B</b>	■ <b>F42:</b> Coil Processing: Blanking, Leveling, and Deburring <b>Room S403B</b>	■ <b>F43:</b> Roll Forming Basics <b>Room S403B</b>
JOB SHOP	<b>NEW!</b> ■ <b>WS7:</b> Business Owners Guide to Protect, Value and Plan for the Future Workshop (8:00 AM - 12:15 PM) <b>Room S403A</b>		<b>NEW!</b> ■ <b>F72:</b> Industrial Ventilation & Air Filtration: Understanding Options in System Design <b>Room S403A</b>	■ <b>F73:</b> Estimating Software to Manage the Job Shop <b>Room S403A</b>
LASER		<b>NEW!</b> ■ <b>F31:</b> How Much Laser Power Is Right for Your Business? <b>Room S401D</b>		
LEAN	<b>NEW!</b> ■ <b>F50:</b> Lean Principle: Blue-Collar Kaizen: Leading Lean & Lean Teams <b>Room S402A</b>	■ <b>F51:</b> Lean Principle: Getting Started with Your Lean Journey <b>Room S402A</b>		<b>NEW!</b> ■ <b>F53:</b> Lean Tools: Production Floor Communication to Strengthen Employee Engagement & Standard Work <b>Room S402A</b>
MANAGEMENT	■ <b>F60:</b> Breaking Boundaries for Operational Excellence <b>Room S404BC</b>	■ <b>F61:</b> Business Builders: Make Business Development a Competitive Advantage <b>Room S404BC</b>	<b>NEW!</b> ■ <b>F62:</b> Creating and Sustaining Cultures of Innovation in Manufacturing <b>Room S404BC</b>	■ <b>F63:</b> Strategies for Leading & Managing a Change Initiative <b>Room S404BC</b>
MARKETING & SALES	<b>NEW!</b> ■ <b>WS8:</b> Market and Build Your Fabrication Story Workshop (8:00 AM - 12:00 PM) <b>Room S402B</b>		<b>NEW!</b> ■ <b>F82:</b> From Funnel to Flywheel: How to Maximize Your Marketing for Sales <b>Room S402B</b>	<b>NEW!</b> ■ <b>F83:</b> Learn How to Optimize Your Sales Team's Funnel & Obtain Visibility into Your Sales Forecast <b>Room S402B</b>
SMART MANUFACTURING	<b>NEW!</b> ■ <b>F90:</b> Meeting Changing Buyer Expectations Through Digital Transformation <b>Room S404D</b>	<b>NEW!</b> ■ <b>F91:</b> IIoT to Improve Manufacturing Process <b>Room S404D</b>	<b>NEW!</b> ■ <b>F92:</b> Digital Tools & Technology to Mitigate Project Risk <b>Room S404D</b>	■ <b>F93:</b> Leveraging A.I. In Industrial Manufacturing <b>Room S404D</b>
STAMPING	■ <b>S10:</b> What's Holding You Back? How to Optimize Your Press Line <b>Room S404A</b>	■ <b>S11:</b> Understanding Servo Metal Stamping Presses, Proper Usage, Troubleshooting and Maintenance <b>Room S404A</b>	<b>NEW!</b> ■ <b>S12:</b> Heat Treating Fundamentals, Vacuum Heat Treating and Applications <b>Room S404A</b>	<b>NEW!</b> ■ <b>S13:</b> 5 Steps to Creating Operational Excellence in the Press Shop <b>Room S401BC</b>
WORKFORCE DEVELOPMENT	<b>NEW!</b> ■ <b>F110:</b> Winning the Workplace Challenge: Getting Along and Getting Things Done <b>Room S401BC</b>	<b>NEW!</b> ■ <b>F111:</b> Tutorial on How to Develop or Enhance Virtual Presentation & Internships <b>Room S401BC</b>	<b>NEW!</b> ■ <b>F112:</b> Three Key Areas that are Essential to Become a Better Leader <b>Room S401BC</b>	■ <b>F113:</b> Read (Hidden) Emotions - Know What Others are Thinking and Feeling <b>Room S401BC</b>
WELDING	■ <b>W1:</b> How to Create and Write a Quality Manual for the ATF Program - <b>Room N230AB</b>			1:00 PM - 5:00 PM
	■ <b>W2:</b> Overview of Welding Inspection - <b>Room N231</b>			1:00 PM - 5:00 PM

Schedule subject to change. Detailed Conference Program session descriptions, speakers, pricing, room locations and more can be found at [fabtechexpo.com/conference](http://fabtechexpo.com/conference).

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## Visit AMADA AMERICA in Booth A2104

Please join the world's leading innovator of sheet metal fabrication equipment, AMADA AMERICA, INC, in Booth A2104 at FABTECH Chicago.

Do not miss the North American debut of the BREVIS 3015 AJ, AMADA's newest compact 3kW fiber laser. It features reliable, high-speed laser cutting, easy material loading, and a rotary index option to process tube or pipe, making it the ideal solution for high-volume, short-run production.

For the first time live at FABTECH, AMADA will exhibit the FLW ENSIS fiber laser welder. The FLW ENSIS achieves a high-speed, high-quality weld not possible with a conventional laser welder. This cutting-edge technology is a complete welding solution equipped with automatic beam focus, a patented rotating lens, and a Teaching Assist System that utilizes a camera to prevent deviation from the targeted welding path.

Booth A2104 will include the VENTIS 3015 AJ which features AMA-

DA's patented Locus Beam Control technology. Locus Beam Control achieves infinite locus patterns to ensure each cutting application produces the best results. By utilizing specific cutting patterns, VENTIS maintains optimal beam quality to ensure smooth, high-quality cutting, especially on stainless steel and aluminum.

To showcase 24/7 production, AMADA will display the 12kW ENSIS 3015 AJ fiber laser paired with AMS 3015 CL automation. The ENSIS fiber lasers are manufactured in Brea, CA to provide quick delivery and customer access to engineering support. ENSIS technology provides continuous processing of thin materials and thick plate without a cutting lens change or manual setup. AMS 3015 CL is a modular system that allows you to easily expand your automation capabilities as future demands evolve and is manufactured in AMADA's Brea, CA and High Point, NC facilities.

AMADA's latest HRB Series press brakes are also featured

in the booth. Manufactured in High Point, NC, the HRB press brakes leverage AMADA's latest bending technology and a variety of production-enhancing features to provide an outstanding price/performance ratio. This latest advancement in press brake technology also features the HRB 1003ATC. Combined with AMADA's patented Auto-matic Tool Changer (ATC), fabricators can perform even the most complex tool setups in less than four minutes. This innovative press brake series provides unprecedented flexibility to produce high-quality parts on demand.

Additionally, AMADA will demonstrate an EG 4010 press brake. This compact press brake provides the ideal solution for producing small sheet metal components that demand a high degree of precision. The EG Series has key features such as a high-speed Dual Servo Power Drive System, two AC-servo motors, and a thickness detection system.

Lastly, Booth A2104 features a live feed demonstration from AMADA's Schaumburg Solution Center of

the EML 2515 AJ fiber laser punch combo with Punch & Die Changer. This machine is equipped with a multi-purpose turret and 3kW fiber laser to enable accurate, high-speed operation. The EML AJ provides fabricators the flexibility to work with customers to create more efficient part designs. Visit AMADA AMERICA's booth and learn more about how our state-of-the-art manufacturing solutions will help your business grow. ■

## Caplugs Works to Help Manufacturers Streamline Finishing Processes Amid Labor Crunch

continued from p. 15

custom masking, Caplugs has launched a new custom masking calculator. Using the tool, users can enter their labor cost and hours, masking material costs and volume of parts produced to calculate a rough estimate of their savings on an annual basis. This allows manufacturers to perform a self-assessment of their operation and determine whether changing their existing masking process could provide a savings benefit before contacting Caplugs to start designing a custom solution.

Engineers and sales staff at Caplugs work with customers from prototyping and initial development through final production, ensuring an accurate fit and design at every step in the process. The company also offers six manufacturing processes that offer varying levels of production capacity to meet a manufacturer's needed volume, as well as a range of materials, including vinyl, plastics and rubber to meet performance requirements. ■

Visit [SmarterMasking.com](http://SmarterMasking.com) to try the masking calculator or stop by and speak with a member of the Caplugs team at Booth D45634.



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# The Multigenerational Workforce: Working Together Effectively

Today's workforce encompasses four different generations, with each one working differently and having unique thoughts on what makes a good employee and leader. It's also the first time in more than three decades that the workforce is younger rather than older, challenging the traditions of older generations. Toss in rapid change with technology advancements and a global pandemic, and organizations have a lot on their plates to make everything and everyone work well together.



What's so different about each generation and what makes them work differently? Let's break it down for a better understanding.

## Baby Boomer (born 1946-64):

This generation prefers leadership that is smart, wise, and experienced. They tend to be loyal to companies they work for and will stay employed for a long time with the same company if possible. Their communication style tends to be fact-to-face, enjoying productive conversations over coffee or lunch. Their biggest work challenge is dealing with change.

## Generation X (born 1965-1981):

This generation feels that a trustworthy leader is key to a healthy workplace. They tend to work well individually and appreciate the opportunity to manage their workloads with minimal supervision. Their preferred communication style is email – short and sweet interaction. Their biggest work challenge is work-life balance.

## Generation Y / Millennials (born 1982-1995):

This generation prefers to collaborate with leaders and colleagues in the organization. They tend

to favor working remotely when possible and can adapt quickly to technological changes. They prefer communicating over text messages – brief and to the point.

Their biggest work challenge is not being taken seriously.

continued on p. 28



# SPEED. PRECISION. YOU CAN HAVE BOTH!

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# Advancing Your Career: Long-Term Opportunities in The Welding Industry

Just like in the corporate world, ambitious welders can gain experience to bolster their resume, build specialty skills and obtain more senior-level roles. Let's look at four ways you can climb the ladder in the welding field.

## Complete an Apprenticeship

An apprenticeship is unique because it provides training, an entry-level position and a path for advancement — all in one. In welding, apprenticeships are usually offered through trade associations such as ironworking, pipefitting or boilermaking. Depending on the program, it can take three to five years to complete and includes both classroom and hands-on instruction. While training on the job, an apprentice gets paid and works alongside an experienced welder to learn the ins and out of the trade.

At the end of the apprenticeship, the welder takes a test to earn journeyman status. Having a

journeyman's card can increase a welder's salary or help them land a more prestigious job.

## Earn Professional Certifications

At any point in a welder's career, there are opportunities to earn advanced certifications through the American Welding Society (AWS). These certifications can help your child specialize in a type of welding or transition to a different position later in their career.

- Certified Welder — Provides proof of knowledge and skills in a widely used welding practice
- Certified Robotic Arc Welding — Demonstrates understanding in both welding principles and operation of advanced robotics and automation equipment
- Certified Welding Supervisor — Prepares a professional to oversee welding operations at a company and manage a team of welders
- Certified Welding Inspector — Evaluates welds to ensure the work meets standards for quality and safety
- Certified Welding Educator — Enables a professional to instruct welding students at a technical school or community college
- Certified Welding Sales Representation — Distinguishes a sales professional by providing the most knowledgeable product and technology recommendations



## Specialize in a High-Paying Industry

Welding is an industry where the more you know, the more you can advance your career. Getting involved in a challenging specialty such as welding and fabricating with exotic materials such as titanium, Inconel, or Hastelloy can be a surefire way to land high-paying jobs. There are also specific industries and jobs that are especially lucrative, including pipeline welding, underwater welding and boilermaking, just to name a few.

## Earn a Degree in Welding Engineering

Whether after high school or working in the field for a few years, your child can go to college to earn a bachelor's degree in welding engineering. This field is devoted to the science of metal (metallurgy), improving building practices and maintaining code compliance of projects. The median salary of a welding engineer is \$79,000 a year.

## How to Get Started

With welders in high demand, now is an excellent time to consider entering the field. With the right skills and experience, there are countless ways to advance your career and achieve a successful future. ■

Explore [CareersinWelding.com](https://www.careersinwelding.com) today to learn more about welding careers!

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# CCAI's FAB to FINISH Production Experience Expands at FABTECH 2021



Launched as a trial project at FABTECH 2017 with just two participating exhibitors, CCAI's FAB to FINISH Production Experience at FABTECH 2021 will include eleven exhibitors. As indicated in its name, the program enables attendees to witness the production of a part, from fabrication through the complete finishing process, firsthand.

Attendees start by visiting the Mazak Optonics booth (A4402) where they will see the FAB to FINISH souvenir part laser cut on the OPTIPLEX NEXUS 3015 S7 FIBER machine featuring 7kW of power and Mazak's high precision air system. Each participant will take a fabricated part and a route card that will direct them to the FINISHING Pavilion, where they will experience the various operations required to produce a quality finished part.

The first stop in the FINISHING Pavilion will be at the booth of a participating pretreatment exhibitor where the part will be cleaned. This is a crucial step in the finishing process to ensure the coating adheres properly to the metal. Exhibitors participating in the pretreatment step of the process include:



Chemquest (D45577)



DuBois Chemicals (D45532)



Signage in the Mazak Optonics booth outlines the program production steps.



GAT Finishing Systems (D45340)



Henkel Corporation (D45549)

Once the part is cleaned, it will be powder coated at the booth noted on the participant's production route card. A variety of powder types and colors will be available, and participants will have the opportunity to try their hand at powder coating the part themselves. Exhibitors participating in the powder coating step are:



Gema USA Inc. (D45337)



Nordson Corporation (D45325)



SAMES KREMLIN (D45356)

Once powder coated, the part must be cured to create a finish that is both durable and visually appealing. Participants will witness the curing process and see the powder transformed to a bright, shiny finish before their eyes. Exhibitors participating in the curing step are:



Heraeus (D45158)



Nordson Corporation (D45325)



Trimac Industrial Systems (D45224)

A portion of this year's FAB to FINISH participants will have the opportunity to experience an additional finishing process after their part is cured. If the selective plating process is noted on their production route card, the fabricated part they pick up in the Mazak booth will have a mask over a portion of the part. This mask will prevent the covered area of the part from being cleaned and powder coated. The mask will also stand up to the curing process. After following

the production route through the fabrication, pretreatment, powder coating, and curing processes, the participant will visit:



Quaker Houghton/SIFCO (D45762)

The mask will be removed, and the selective plating process performed in that specific area.

All FAB to FINISH Production Experience participants can take their souvenir part, featuring the Chicago skyline, home with them.



FAB to FINISH participants have the opportunity to try their hand at powder coating.

# How Automation Has Changed the Manufacturing Career

## Complementary nature of automation, cross-training across a metalworking industry in transition

By Tim Heston, Senior Editor,  
FMA Communications Inc.

This year's FAB 40 – a listing of some of the top U.S. players in custom and contract metal fabrication, shows an industry in a rocketing recovery. A few exceptions aside, participants couldn't have been more positive – except, of course, when it comes to hiring. Never mind finding skilled or experienced people; fabricators simply can't find people, period. In fact, managers at some of the largest fabricators are saying the labor shortage (combined with material and supply chain challenges) is forcing them to turn down potential work worth millions of dollars.

The pandemic recovery has given the already acute labor shortage a one-two punch, with both customer demand and generous unemployment programs pushing entry-level wages skyward, even for those with no experience or relevant education. So, what can be done? Many fabricators are taking a two-pronged approach. First, they're cross-training; second, they're automating as much as they can. The two together, it seems, work better together than alone.

Consider the fabricator that focuses entirely on automation. What's the entry-level worker's day like? Well, he or she might spend it moving parts or working in assembly or shipping. Then one day some of the automation shuts down. As technicians rush to fix the problem, the plant is starved of work. That entry-level worker sees chaos around him. He doesn't know how to program or operate a press brake, and he's never lifted a welding torch in his life. After seeing the chaos repeat itself several times over the next several months, the assembler leaves for a job at Walmart.

Now consider a fabricator that doesn't automate and relies entirely on the skill of manual labor. This can work in certain market niches; think of high-end welding and prototyping shops. But the story changes as volumes rise. In so many operations, automated machines boost throughput to such an extent, a shop can't compete without them.

Still, automation has shifted the need for skill to different areas of the shop. In bending, the skill requirements are moving toward offline bend simulation and programming. And just like in welding, a brake programmer who knows how to operate a brake manually often makes better programs. But what if that talent is lost as the latest swath of baby boomer employees retire?

Here cross-training is playing an increasingly important role. In fact, cross-training has the potential to shift a shop's entire organizational structure. Instead of a pyramid, the future org chart might resemble a bulb. A few entry-level employees might stay at the bottom of the org chart, but most who stay long-term become cross-trained and, hence, move up the pay scale quickly. They might have an area of concentration, but most probably won't spend a career working in front of one type of machine.

Once they move their way up to the middle, they know enough to keep most work moving even when the unexpected happens. For instance, if bending automation fails or has reached its capacity limit, cross-trained workers know how to load a program and bend at least certain parts on a manual press brake. They can also help elsewhere as needed. Automation helps increase throughput in certain areas, but not all. It's hard to find a fab shop with a fully automated assembly and packaging

department. Automation doesn't work everywhere.

The combination of automation and cross-training allows fewer people to produce more, which sends throughput and wages skyward. Still, to make this happen requires a deep bench of knowledgeable employees who know their way around the entire shop. This isn't easy to develop. But with demand pushing entry-level wages higher, fabricators might not be able to afford a pyramid structure with a wide foundation of entry-level jobs filled with minimally trained people.

Of course, many probably wouldn't want to work at a place full of people who clock in, do their job, and clock out, with little thinking in between. They'd probably prefer a shop full of curious, knowledgeable people, all of whom are paid competitively for their knowledge. Add the latest manufacturing technology into the mix, along with a shop culture that encourages people to think and question the status quo, and you have a recipe for a rewarding career in the automated fab shop.

Article originally appeared in *The FABRICATOR*, June 2021 issue.

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# Metal Additive Manufacturing Continues To Grow Rapidly

According to market research company Technavio, the metal AM segment is expected to grow by 4.42 billion dollars over the period 2020-2024, which represents an annual growth rate of 14%. Additionally, the Wohlers Report

2021 found 7.5% growth in additive manufacturing industry despite the pandemic. This growth will be driven primarily by manufacturers adopting AM to produce lighter, more complex and higher performance components. These

reports also note that investment in research and development will be higher as manufacturers rely on faster and more innovative processes.

Over the last decade, there has been a real boom in metal 3D printing, especially with the arrival of manufacturers who want to reduce the cost of available technologies. Examples of such companies include Desktop Metal or Markforged who have relied on Metal 3D Printing technologies to make affordable machines that historically cost tens of thousands of dollars. It's not surprising to see the growth of metal additive manufacturing as manufacturers are making greater use of 3D printing technologies to produce end use parts in key industry sectors such as aerospace, automotive and medical.

**FABTECH attendees interested in learning more about Additive Manufacturing benefits and opportunities are invited to use their badge to visit RAPID + TCT 2021, which is taking place at McCormick Place Lakeside Center, September 13 – 15.**

The two industry leaders in 3D technology events, SME and Rapid News Publications, have teamed up to produce the annual RAPID + TCT event, that has defined the crucial role of additive manufacturing and empowered the establishment of an industry that continues to conceive, test, improve and manufacture new products at a faster, more cost-efficient pace.

FABTECH attendees have complimentary access to the RAPID + TCT exposition, where they can discover additive manufacturing products, solutions, and innovations from the industry's leading companies, and network with additive manufacturing experts who go beyond the hype to bring real-world solutions that advance manufacturing processes.

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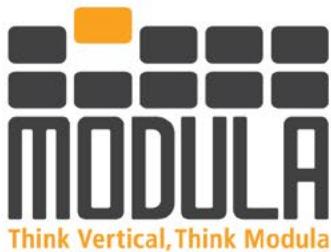
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# The Multigenerational Workforce: Working Together Effectively

continued from page 21

## Generation Z (born 1996-2009):

From their earliest days, Gen Z has been immersed in the online world. No surprise, these digital natives are highly visual learners.

This generation prefers leadership that is positive and collaborative. Interestingly, due to digital burn-out, their preferred communication style is face-to-face, similar to Baby Boomers. Their biggest

work challenge is struggling with anxiety.

At this year's FMA Annual Meeting, keynote speaker Sarah Sladek, XYZ University, posed the question:

Is team building even possible in an era of multigenerational workforces and unprecedented disruption? Visit [fmamfg.org/blog](http://fmamfg.org/blog) to watch the session and learn if and how multiple generations can work together successfully. ■

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COLE-TUVE is the exclusive North American distributor for Sahinler and sells a complete line of fabricating machinery. Visit COLE-TUVE at FABTECH in Booth A4550.

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# Metal Additive Manufacturing Continues To Grow Rapidly

continued from p. 26

RAPID + TCT highlights that FABTECH attendee won't want to miss include:

- **Visionary Keynote Presentations** (9:00 am on the Main Stage):

**Melissa Orme, PhD, The Boeing Co.** (Monday, Sept. 13), **Terry Wohlers, FSME, Wohlers Associates Inc.** (Tuesday, September 14) and **Mark Wehde, Mayo Clinic** (Wednesday, September 15) will

provide unique perspectives on how additive is disrupting the aerospace industry, AM's impact on startups and the economy, and how this technology is changing the healthcare industry.



- **Thought Leadership Panels** (Main Stage): Hear speakers from global leaders in manufacturing including General Motors, GE Additive, Mayo Clinic, Boeing, US Army, Ford Motor Co., Northrup Grumman, Honeywell Aerospace, Joe Gibbs Racing, Stellantis N.V., Jabil, the Department of Defense and many more as they come together to discuss topics including Breakthrough to AM, Supply Chain Transformation, Production Readiness of AM, Design Workflow, Casting Roundtable Discussions and more.

- **Exhibits:** Experience 200+ hands-on Additive Manufacturing and 3D technology exhibits including 3D Systems, BASF, Desktop Metal, EOS, ExOne, Hexagon, HP, Markforged, Renishaw, SLM Solutions, TRUMPF, Stratasys, and more. ■

Learn more at [rapid3devent.com](http://rapid3devent.com).

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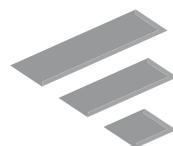
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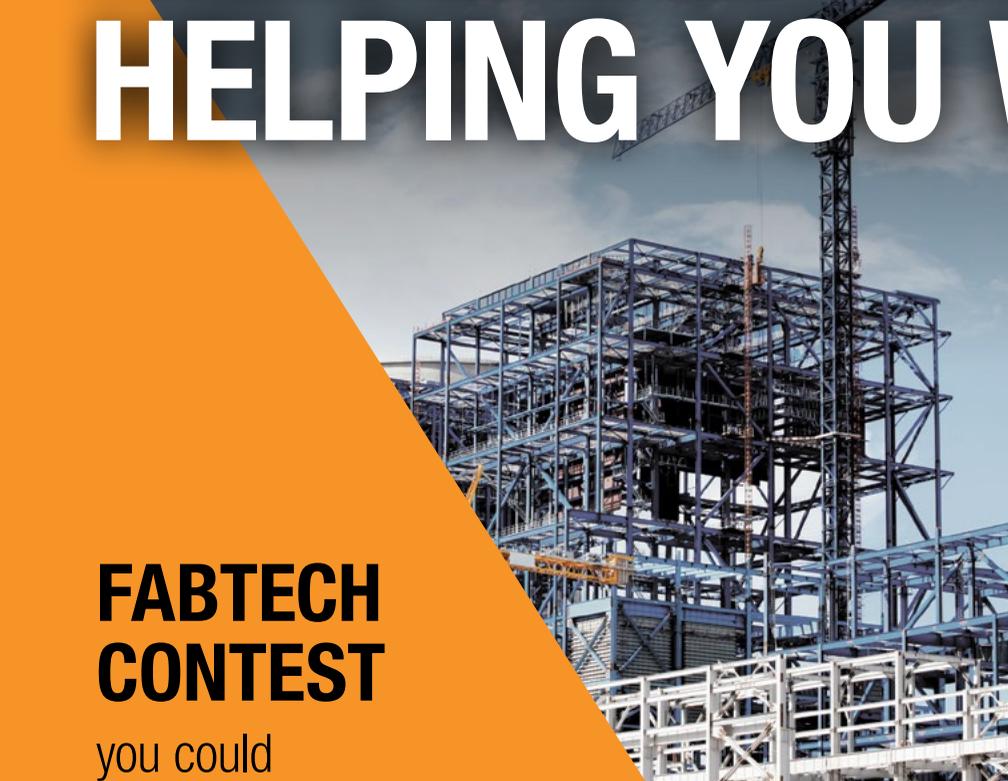
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