

THE RECORD

Published by the National Tooling and Machining Association

A large, yellow industrial robotic arm is the central focus of the cover. It is shown from a low angle, extending from the bottom right towards the top left. The arm is composed of several segments, with visible joints and wiring. The background is dark, making the yellow arm stand out. The arm's gripper is visible at the bottom right.

INSIDE THIS ISSUE

Using Data, Automation, Technology,
and Robots to Improve Sales as in
Operations
pp 22-23

Total Transformation: Building
a High-Tech Workforce
p 28

and so much more ...

TECHNOLOGY, AUTOMATION, & ROBOTICS... THE JOURNEY CONTINUES

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THE RECORD

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SEND US YOUR STORY

Each issue of The Record will feature stories
from members – and we want to hear from you.
Send us stories of success, or those that fit the
theme of the month's issue. The submission
deadline is the first of the month prior to
publication. Contact editor@ntma.org
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FUTURE THEMES

September 2023: MFG Day 2023...Your
Time to Educate & Advocate

October 2023: Leadership Growth...Identify,
Invest, Develop, and Grow

November 2023: Workforce Development...
A Never Ending Focus



UPCOMING NTMA EVENTS

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PRESIDENT'S UPDATE

Technology, Automation, and Robotics...The Journey Continues

As I write this article, it is hard to believe it is for August 2023, meaning that we are on our way to closing the third quarter of the year, leaving only four months of 2023 to go. For so long, it seems like we have gone from one challenge to another. Once we endured the challenges created by the pandemic, we were faced with the need for skilled workers and the challenges of people wanting to work. In some cases, it was a struggle to even find people willing to learn or be introduced to our industry. Now we may be facing some type of economic recession/downturn. While one may question the idea of a downturn, the machine tool industry and tooling industry are seeing a decline. Recent articles have targeted a potential downturn for the large OEM-type manufacturers while the job shop contract manufacturers still seem to be in demand.

If we accept that as fact, the need for skilled workers is still a challenge that remains. Those who study employment trends continue to point to an ongoing shortage of workers. As a result, this month's Record theme of **Technology, Automation, and Robotics... The Journey Continues** remains a key solution to our workforce challenge. I ask each of us, "Is your journey continuing?" The reality is that for many across our industry, the journey never started. For some, it may have started, and others are well into the process.

In talking to manufacturers across the country, I find very few, if any, who will argue against the opportunity that automation can bring to our industry regardless of where they are personally on their journey. In many of those cases, automation could

enhance their operations and yet there is no effort or plan to initiate it. As I ponder these situations, I've concluded that for many, the challenge is not the need to believe in automation. The real challenge is the lack of "time resources" to give to the journey. For many shop owners and managers, the challenges and daily struggles of running a contract manufacturing company choke out the "time" for considering automation, researching the plethora of options, talking to and trusting automation providers, much less the overwhelming thought of implementation. Thus many in our industry can't move forward in what is becoming a necessary choice and a road for survival and sustainability.

I do realize that some who read this article will say "they are different and unique" and I would first say, find a contract manufacturer who does not think what they do is unique. However, I would agree that there are some niche market providers for which automation may not be their solution; but whether the solution is automation or something else, we cannot continue to do business as usual.

Recently, I met with an industry partner that is focused on digitization within our industry, converting paper-based systems into a digital format using smart technologies and tools. When implemented correctly, digitization can increase product efficiency, worker productivity, and overall accuracy. They understand that many small to medium manufacturers do not know what digitization really is, but their conclusion was that our industry must

move towards digitization or it will hinder forward progress for many. In no way am I writing this article to scare, intimidate, or push anyone into change whether it be automation or digitization, or something else, but what I will tell you is that in my career I have seen both sides of this coin. In my experience, the reluctance to change, the lack of change, or the lack of "time" to change seemed to only make the challenge or the hill to climb taller and more difficult, thus limiting or prolonging the path to success. However, when the need to change was accepted, the journey became smoother, more manageable, and moved us forward with greater success.

What we found when we did embrace change was that time breeds more time, change breeds more change, automation breeds more automation, and progress breeds success. I believe that the difference today, versus the last twenty years, is that machine tool suppliers, automation suppliers, tooling suppliers, and ERP providers have made more of their product designs focused on automation and the idea of their products helping users be more productive, efficient, and do more with the same number of people. For the US manufacturing community to thrive in the years to come, we must accept change, automation, and digitization of our industry which means acceptance and implementation by OUR OWN INDIVIDUAL COMPANIES.

As I said earlier, the challenge is not believing automation can be good and could enhance your operations, but giving it the required "time" to

consider "your journey." Many times I have written that this industry is not for the faint of heart and to not try to go it alone. Your membership and participation in the National Tooling and Machining Association (NTMA) is a key part of your "journey." NTMA has created relationships with industry partners who are committed to your success. These partners provide information, potential solutions, and in the end, if desired, the successful implementation of those solutions. Whether your definition of automation is a new machine tool, new tooling, bolt-on automated features/robotic arms, new ERP systems to plan and control workflow, or machine monitoring to make adjustments faster, our NTMA partners are here to help and support.

The key point to "your journey" is the **START**. Once started and the opportunities are seen, there will be "time" available for focusing on the future. Don't let

the everyday struggles and challenges of this industry keep you from looking ahead. Lift your head, look around, identify, and implement, and you will find your journey and path will be more clear.

NTMA and fellow NTMA members are here to help each other. NTMA serves as the **VOICE** of the small to medium size manufacturing community. Our industry thrives when we all thrive together. Many across our country are truly concerned over the decline of our nation's industrial manufacturing base and rightly so. While they are concerned, the reality is, we are the doers and the overcomers that must join together to lead our country forward. Never think we are too small and do not matter. I will remind you that of machine shops in the NAICS code 332 and 333, that 98% are less than 100 employees, 94% are less than 50, 82% are less than 20, and 45% are less than five employees.

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Roger Atkins, President – NTMA

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IN THE NEWS

SPEEDS AND FEEDS CHALLENGE

By: Dale Davis

The trophy was made by our 4th year master instructor Chris Weigel who works for Innovative Machine and Manufacturing and plated with a Electroless Nickel process which was provided by Mike Deye, owner of Hale performance Coatings (both are members of the WLENTMA.)

During Graduation Chris and I discussed how to incorporate the trophy into his 4th year class as some type of competition. I have heard from several people who are now going to be running a half marathon as a

result of the challenge - with one of them losing 28 lbs. I am hoping to get more chapters involved next year with a possible virtual 5k.

The event was held from 1/23 to 4/23 14 weeks.

- We had 48 people take part and logged 11,120 miles over this period
- We had 2 people from Texas participate, as well as a team from National
- We had 8 teams total, which overall doubled the number of teams from last year.



ONE VOICE: FEDERAL GOVERNMENT ADVOCACY PROGRAM

As US manufacturing continues to navigate the unique challenges and changes brought on by the last year – and a change in administrations – it remains important to have a partner in advocacy. NTMA helps provide this support by working closely with the team at One Voice: the combined federal government advocacy program representing small-and medium-sized business manufacturing in the US.

With regulations, policy, and shop safety all constantly evolving, One Voice has a wealth of fantastic resources, developed to help keep your shop informed and prepared for whatever comes next. In addition to ongoing COVID-19 response information – in line with any and all changes that our industry may need to know – the team at One Voice also provides informative policy webinars, news releases, educational materials, video recaps, and much more.

Don't forget about the Talking With One Voice podcast – every episode, the One Voice advocacy team breaks down how the latest news from Washington impacts manufacturing businesses across the country.

It's yet another way your shop can get quick, concise information on everything from tax development to loans and even workforce development issues. You can send in your key questions to be answered by emailing onevoice@policyres.com. We hope you continue to utilize this key partner in One Voice – one that ensures that millions of manufacturers across the country have their voices heard.

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SIGNING DAY FOR HIGH SCHOOL SENIORS

By: Jessica Gardner

General Carbide celebrated nine high school seniors from four different high schools who will become full-time members of the General Carbide family upon their graduation in June. These seniors have been working part-time in a pre-apprenticeship program since January 2023.

This event was General Carbide's 2nd Annual Signing Day. The first was held last year at Hempfield High School when one student signed on for full-time employment. After seeing the students' positive response to the event, General Carbide wanted to turn this first celebration into something bigger. So early in the 2022-2023 school year General Carbide teamed up with numerous Workforce Development partners and made a strong push to recruit high school seniors to become the next generation of General Carbide employees. General Carbide hosted tours, visited schools, and promoted the company's values to ensure that each student knew what made their

to make the decision that this was where they wanted to start the next chapter of their lives.

Pre-Apprenticeship Coordinators Joanne Finoli and Wendy Jorgenson of Greensburg-Salem High School said, "It is evident that General Carbide values investing in the younger generation and empowering them to reach their full potential. The impact of this pre-apprenticeship program on students' lives cannot be overstated. Their commitment to nurturing the next generation of talent and bridging the gap between education and industry is truly commendable." Leading up to the May 22 signing day, General Carbide's pre-apprenticeship and immersion into manufacturing is setting the standard for students to explore possible career paths through experiences.

Mona Pappafava-Ray, President, and CEO of General Carbide; said, "I am proud of the work and time the General Carbide team has invested in the next



workforce a strong, viable choice for them as they sat in classrooms planning their futures. Students were informed that they could have lifelong careers at General Carbide—from Powder to Polish and everything in between.

Jeff Eutsey, Shape and Engineering Manager shared, "The General Carbide Learning 2 Earning program is a great way for educators and students to get a firsthand look at General Carbide's manufacturing process. This exposes the students to what immediate opportunities we have to offer and to what long-term potential is possible for them." For the General Carbide managers, it was exciting to watch the pre-apprenticeship program evolve into full-time careers as graduation drew closer and these students began

generation of employees. It is exciting to see how signing day for our seniors evolved from an idea Jessica Gardner, our Human Resources Manager, adopted from the sports world just a little over a year ago. I am honored that the concept of signing day for students going into the workforce started here at General Carbide adding to our strong legacy. Jessica has taken the lead with this event and has grown it into a monumental milestone by creating a ceremony where students have a place to celebrate their decision to join the workforce. Students have signing events for athletics and academics, and now because of the efforts of our General Carbide team we are leading the way for signing days into manufacturing careers."



Jessica Gardner shared her inspiration for this event by saying, "Every April and May you turn on the news or glance at social media and you hear about students going to four-year colleges or getting amazing athletic opportunities. You don't often hear how students choosing to go into the workforce are celebrated. It became frustrating to see this group of students who are doing things just as big get unrecognized. This is where the concept of a signing day was born with the help of all of our amazing partners in workforce development in Westmoreland County."

The General Carbide team framed the event after college "athletic letter of intent" signing days, except switched the focus to honoring high school students who will use their career and technical education and training to take their next step following graduation into the trades.

"We want to express our excitement and gratitude for the extraordinary signing day event General Carbide organized for our students. It was truly an unforgettable experience to witness our students officially joining General Carbide as new apprentices. The presence of Mona Pappafava-Ray during the event showcased your dedication to investing in young talent and highlighted the importance you place on welcoming and celebrating each new member of your team. The support and encouragement shown by the entire General Carbide leadership team made the event even more special and memorable for our students," Joanne Finoli and Wendy Jorgenson shared. Signing Day has become an anticipated yearly tradition that the General Carbide, celebrating the students that they are mentoring every day. "It was a pleasure working with the high school students in the pre-apprenticeship program. These kids are bright, eager to work, and full of good ideas. I am looking forward to them being around for a long time," Denis Pasay, Director of Sales and Marketing.

This year's Signing Day Ceremony included students from the class of 2023 from Hempfield High School, Greensburg-Salem High School, Jeanette Senior High School, and Central Westmoreland Career and Technical Center. The General Carbide team is excited to welcome this next generation of employees and is already making plans for next year's Signing Day.



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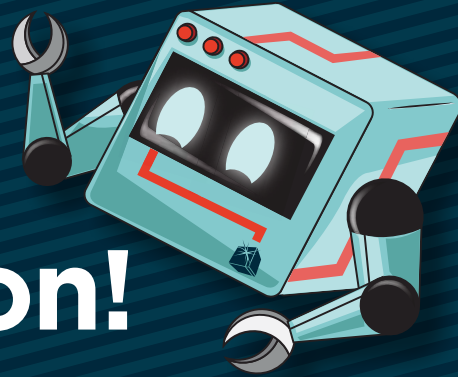
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The new SINAMICS S210 next generation servo-drive system is ready for digitalization and brings an enhanced level of safety and security to stand-alone or multi-axis machines for use in various manufacturing industries.

With the SINAMICS S210 next generation servo-drive system, comprising a digitally native drive with a wide range of corresponding motors and gearboxes, Siemens brings a new level of high-dynamic, motion control in mid-range operation to stand-alone and multi-axis machines, recently introduced to the North American manufacturing industry.

This next-generation servo-drive system introduces a new level of safety and security to discontinuous motion control in the mid-range segment, as well as moving, processing and positioning functions on a wide assortment of packaging, printing, labeling, pick-and-place, stacking, assembly, chip sorting and filling machines, with a special emphasis on food-and-beverage and pharmaceutical applications, owing to the availability of stainless-steel motor and planetary gearbox options.

SINAMICS S210 offers DC link coupling on 3-phase units for increased power efficiency on multi-axis applications. Corresponding SIMOTICS highly efficient synchronous motors feature high-resolution 22- or 26-bit absolute encoders, single or multi-turn. One-cable connectivity is standard and all motors feature IP64, IP65, IP67 or IP69X protection. Easier setup and selection are assured with the integrated EMC filter and braking resistor.

For the engineering of SINAMICS S210, machine builders and machine users can utilize the embedded web server or Startdrive integrated with the Siemens TIA Portal. Easy implementation of the SINAMICS S210 servo-drive system for global use is provided by universal standards and certification compliance.

SINAMICS DriveSim model integrates into simulation software to allow machine builders to create a digital twin of the drive and motor in a project's planning phase to ensure the highest efficiency and performance of the equipment in use. In the field, the S210 is capable of communicating status through Edge or cloud-based data capturing for continuous monitoring and data analytics. Using the Siemens Analyze MyDrives application, machine users can monitor key conditions for advanced anomaly detection. Seamless transfer of data from the drive to the machine controller, Edge device and the cloud are maintained for truly digital native operation from planning through operations.

In the area of cybersecurity, SINAMICS S210 comes standard with integrated security for network connectivity, providing enhanced communication, integrity and authenticity checks to protect against tampering, plus the drives offer User Management and Access Control (UMAC) within TIA Portal.

These new servo-drives are paired with the popular Siemens SIMATIC S7-1500 PLC or ET200 SP open controller and various SIMOTICS servomotor and planetary gearbox designs. Increased engineering efficiencies are gained with integration into the TIA Portal and TIA Selection Tool for optimized system selection and programming.

With Safety Integrated onboard, the SINAMICS S210 servo-drive system offers machine users up to SIL3 level of protection across an extended range of safety integrated functions including safe stopping and safe limited speed or direction. Integrated into the Startdrive advanced software, the menu-guided safety acceptance testing assures proper operation and safety validation.

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For more information, please contact Linda Warner at lwarn@ntma.org or 216-264-2824. Applications and self-assessment documents can be found here: <https://ntma.org/resources/ntma-awards> Applications should be sent to 6Saward@ntma.org

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Before a Machine Shop Invests in Robots, Technology and Automation

By: Shahrukh Irani, PhD, President - Lean and Flexible, llc

The typical machine shop is a job shop. A job shop does not lend itself to cookie-cutter implementation of the best practices of the Toyota Production System because a job shop does not work like an assembly line, as is clearly shown in the Product-Process Matrix .

(<https://www.productplan.com/glossary/product-process-matrix/>).

Before any capex investments are made in the latest-and-greatest robot or automation, or IoT technology, a machine shop owner should ask themselves the following questions based on the Principles of Lean .

(<https://www.lean.org/lexicon-terms/lean-thinking-and-practice/>):

1. Are our performance metrics keyed in on the three "golden metrics" of the Theory Of Constraints: Maximize Throughput, Minimize Operating Expenses, Minimize Inventories?
2. Have we segmented our product mix into Runners, Repeaters, and Strangers using key business parameters of Volume, Revenue, and Demand Repeatability?
3. Have we replaced our previous Functional Layout with a hybrid combination of cells (to produce our Runners and Repeaters) and a smaller job shop (to produce our Strangers)?
4. Do we control work order releases to the shop against good knowledge of (finite) capacity constraints on the bottleneck machines?
5. Have our employees been trained extensively in the Toyota Kaizen Methods and IE science of Work Study and Human Factors Engineering?

If the answer to any of the above questions is NO, it is best that the company defer investment in hi-tech before they correctly and completely resolve all their lo-tech problems, as exposed by their answers to the above questions.

IF YOU APPROVE THE ARTICLE:

I will approach a precision machine shop whose owners are good friends of mine and ask them if they would share their opinions on how my nuts-and-bolts down-to-earth thinking may have influenced their 10-year growth plan.



Shahrukh Irani, PhD
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High-Feed or High-Speed Milling?

By: Marco Morgado is Director, Global Sales Operations - Pilot Precision Products

When it comes to milling, there are two schools of thought: Slow and deep or fast and shallow. It's almost like in football or racing: People are fans of one team, but they can appreciate when another team deserves to win.

Because we offer tools for both techniques, our engineers have provided you with some tips on how to choose the best technique for your application. Let's start with a couple of definitions and parameters:

High-Feed operations are generally used for applications requiring high metal removal rates with low depth of cut. In more concrete terms, feed rate is the distance a tool travels during one revolution of a part. We measure that distance in inches per revolution (in/rev) just as we would gauge the rotation of wheels on a car in revolutions per minute (rpm). Feed rates affect tool life, machining time, and surface finish, but their effects on the success of a given operation are less significant than that of cutting force.

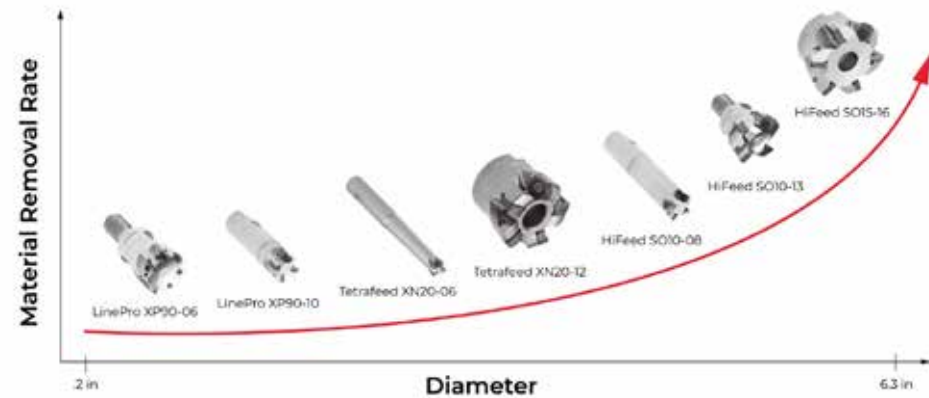
Applications best suited to High-Feed milling are ones that require large amounts of material that need to be removed quickly, such as roughing processes, and a relatively small depth of cut, usually no more than 2 mm. Such an operation tends to produce a thin chip that diverts heat away from the cutting edge.

High-Speed milling is suitable for any material ranging from steel to high-temp alloys because there are grades of carbide inserts and insert coatings available for any application. It is well-suited to the use of small-diameter tools and end mills. Using the car analogy, cutting speed is like the speed (i.e., linear velocity) of the vehicle, which depends upon the wheels' diameter and rpm. We measure it in feet per minute (ft/min) or meters per minute (m/min). High-Speed milling operations tend to feature lighter milling passes, high spindle speeds, and high feed rates to achieve high metal removal rates that help to reduce cycle time while increasing tool life and productivity.

High-Feed and High-Speed milling are two distinct approaches that have unique advantages. To achieve maximum productivity and choose between High-Feed and High-Speed milling for a given operation, there are numerous resources available to help you make the best tooling decisions.

Per the chart below, one size shoe does not fit all.

It can become a challenge to find the right tool. This is where the partnership between Palbit and Pilot Precision Products comes to the rescue. Palbit has a



long tradition of making "Tooling for You." A personal approach to tooling that comes with technical advice and support.

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Marco Morgado is Director of Global Sales Operations for Pilot Precision Products (<https://pilotprecision.com/>), a manufacturer and master wholesaler of cutting tools for use in a wide range of industries and applications. Pilot is based in South Deerfield, MA.



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The Service Awards are given out each year at the Manufacturing Engage Conference. We need your help finding the best candidates for these awards.

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L.A. SOMMER MEMORIAL AWARD

For outstanding and continuing service of the highest magnitude; emphasis is placed on service to the Association by a regular member, both of the highest order and over a period of time, connoting excellence in a particular role in NTMA, rather than as a participant in a single event.

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For a company or individual (regular member or education member) which consistently demonstrated strong support and active participation in structured training for the precision custom manufacturing industry.

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Submit your nomination(s) by Friday, August 11th, 2023.
For a nomination form, contact Linda Warner at lwarner@ntma.org

Using Data, Automation, Technology, and Robots To Improve Marketing and Sales as in Operations

By: Ed Marsh - Growth & Strategy Consultant

“
You don't wander a tradeshow and buy a robot to take back hoping to figure out where to try to make it work in your operation.”

Why Only Automate Physical Steps?

Industrial automation is mainstream. What started as a cost reduction technique evolved into quality improvement, improved safety, increased output, and even continuous operations as skilled labor became harder to recruit and retain.

While automation projects in the physical space can often be identified by just walking the factory floor and observing operations, it's harder to identify opportunities for automation in the virtual space. Some feature of automation, such as purchase replenishment thresholds in enterprise resource planning (ERP) systems, have created hassles that exceed their value. That creates hesitance and skepticism.

Let's step back and reframe how we think about the buyer's journey, sales process, and revenue growth. Imagine if there was a production floor we could walk, looking for inefficiencies. What would be possible?

Process Engineering for Revenue Growth

Marketing and sales are as complex as manufacturing. Both are subject to the foibles of individuals, and both can be improved with “fixtures”, processes, and automation.

Just as you measure your materials, processes, and output in production, you can use metrics to test and compare most aspects of marketing and sales. From

the profile of companies with which your sell cycle and margins are best, through specific text and graphics in prospecting emails, to attributing every dollar of revenue to the specific sales and marketing steps that impacted it, you can measure and optimize.

That requires the right technology, automation, and, yes, even robotics in marketing and sales.

You likely automate operations with the benefit of lessons learned from fellow NTMA members and through vendor best practices. We can do the same with revenue growth, learning from investor-owned technology companies that provide a rich base of best practices upon which we can draw.

A Marketing and Sales Tech Stack

You don't wander a tradeshow and buy a robot to take back hoping to figure out where to try to make it work in your operation. You identify what you need to achieve and figure out the best automation solution, if any.

We need to do the same in sales and marketing.

[According to ChiefMartec there were already >8,000 software tools for sales and marketing in 2020.](#) With so many gadgets, it's important to understand the goal of automation and the high-level categories you'll likely need.

The goals are simple.

First, improve the buyer experience. Ensure that the buyer tools and experience you provide are consistent with the quality of your service and products.

Second, improve your sales efficiency and effectiveness. Today's buying journeys are convoluted; decisions often made by committee; and risk aversion is increasing. Reps need help to compete and win.

Important categories of marketing and sales automation include:

Marketing

Marketing automation, content management/website (CMS), chatbots, data sources, email, search-engine optimization (SEO) tools, reporting, call tracking, data hygiene, and behavioral tracking.

Sales

Customer relationship management (CRM) tools, email tracking, salesforce automation, sales content management, configure/price/quote (CPQ), sales alerts, sales video, conversational AI (for coaching), e-commerce, playbooks, and short message service (SMS, or texting).

Examples of Marketing and Sales Automation at Work

Technology should make it easier for buyers to buy, and for your team to help them do so, as these examples illustrate.

Data Augmentation and Maintenance

Automatically curated lists of target accounts should be automatically populated with all typical buying team roles (now more than 10 people.) The consolidated contact database can automatically add/update contacts from outside data sources. That reduces unproductive sales administrative time and errors, and constantly delivers actionable sales info. As a bonus, you can automatically add these contacts to LinkedIn ad lists to build off of prior to sales!

Conversion Cobots

Manufacturing cobots optimize for ease of implementation; chatbots can do the same. Yes, buyers use bots, even in your industry. Many prefer them to ease their research process. A “cobot” makes it easy for buyers to engage and then easily switch to a live chat, with the right person, when they're ready. Many have the capability to quickly jump to a live Zoom meeting or calendar app to schedule. The bot does its part – engaging, qualifying, steering – until it's time for the experienced human to do theirs. It

improves the buyer's experience and helps the sales team get involved at the right time on the buyer's terms.

Data Driven Decisions and Processes

Great reps have their limits. Many can't effectively manage a list of hundreds of customers and prospects, yet economics dictate that they must. Often targets are overlooked, leads ignored, prospecting is limited, and convenience dictates sales activity. Automation can “score” contacts and accounts-based behaviors and activity. Reps can be quickly notified of specific activities (e.g. a key contact on a pending opportunity opens a quote) then contacts and/or companies can be automatically added to priority lists based on aggregate activity so reps reach out with the right message at the right time to the right people.

Feasible and Affordable

Investing in manufacturing automation often requires large capital investments. That makes decisions complex. In contrast, much of the automation opportunity in marketing and sales can be realized with much more modest investments in software, training, and operations. The biggest hurdle is often organizational mindset. For companies that commit to improvement, the return on investment (ROI) is often clear with more accurate forecasts and just a couple of additional deals.



Ed Marsh
Growth & Strategy Consultant

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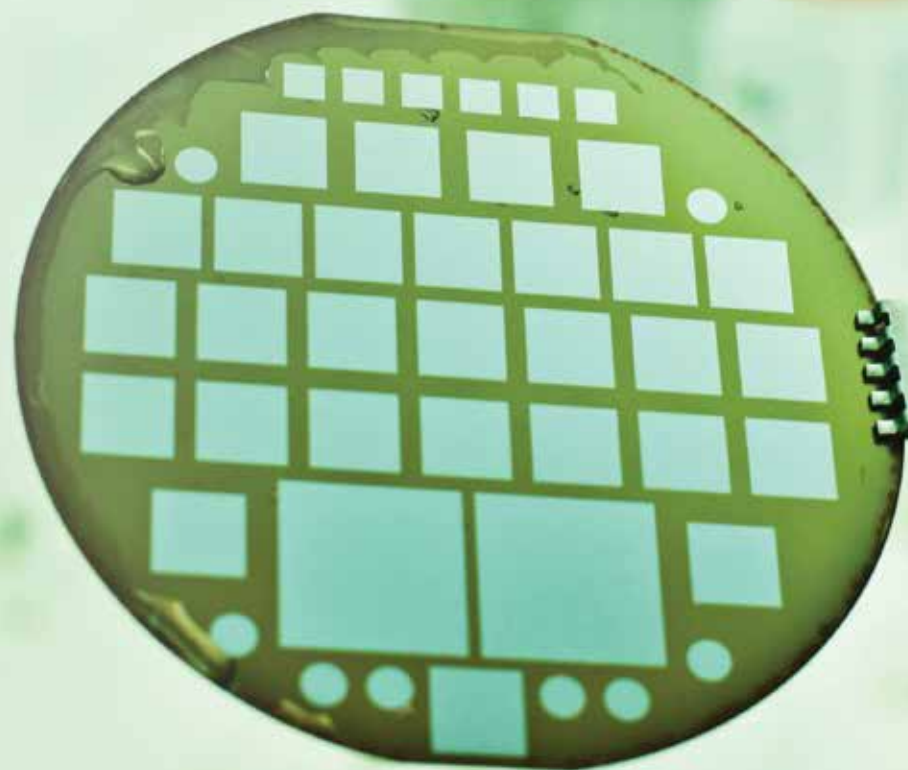
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When Generalizations Don't Apply: Automation for the Aerospace and Defense Industries

By: Bob Baldizzi, Regional Sales Manager – Eastern USA, Fastems



I'd be willing to bet that you've worn something labeled "one size fits all" at some time or another. I'd go even further and bet that you spent the entire day uncomfortable and distracted. Even knowing how these "perfect solutions" usually turn out, though, it is tempting to believe that we can fix all of our problems with one singular panacea. This is especially true in manufacturing.

Let's consider a problem facing the entire aerospace and defense industry: the current chip shortage. Semiconductors control radars, navigation equipment,

and communication electronics, to name a few. Defense systems require an enormous number of microchips to function. Manufacturers in the aerospace industry all over the US are trying to increase capacity and streamline the production of these semiconductors.

Semiconductors come in a huge range of shapes and sizes, as do the dies that are used to produce them. Machining approaches used to make semiconductors are as varied as the uses for the chips themselves. Management, manufacturing focus, and building layout – these all differ from company to company. It follows that any one shop engaged in semiconductor

manufacturing will look markedly different from another doing just about the same thing. So why would we prescribe a one-size-fits-all approach for automating them?

Finding the perfect combination of automation systems for a specific shop is a matter of knowing your automation options and tailoring them to fit your needs. Ideally, your automation supplier should be able to do this for you, with your guidance and approval. The end solution will be one that combines several automation systems in a configurable balance.

At the heart of our automation systems is its manufacturing management software (MMS). This integral software schedules, directs, and monitors almost every aspect in a shop's production. Different modes control productions for pallet handling, part handling, stand-alone machines, or any combination of the three, which makes configuration easy. It is designed to link the various machining units with their corresponding automation products.

Raw material and works in progress are stored in automated storage and retrieval systems (AS/RS). These serve as a buffer for components that have no place in the current production line and would only get in the way. Rather than send them too far away to be called back quickly, users can deposit these parts and material in AS/RS. When directed by the MMS, the AS/RS will release a required unit to an automated guided vehicle (AGV) to be transported to a work cell.

When the material or part arrives, an autoloader device (ALD) is on hand to incorporate it into the machining center. Beforehand, the ALD will have introduced the correct work-holding into the cell and made any adjustments necessary. Then the part can be loaded and run. ALDs come in numerous different

configurations and have many different abilities, depending on their model.

Gantry tool storage (GTS) automates the tool processes. All of the usable tools within a shop can be stored here, in a central location that is easily accessed by any cell. These tools are tracked and coded so that their location is always known, as well as any parts for which they are to be used. When they are needed, they are sent to the applicable work cell. When the tools are returned, they are monitored for wear characteristics. As they need to be refurbished, they are then sent to the tool service cell (TSC).

When worn tools arrive at the TSC, they are replaced with fresh ones. A robot then takes the refreshed tools, cleans them, measures them, and returns them to service. The central MMS decides the order in which to prepare tools by analyzing average tool usage and planned production. These cells are especially useful for production scenarios in which tool life is shorter than average but tool demand remains high.

With a tangle of acronyms to choose from, we could dream up a multi-million-dollar solution to any manufacturing problem. It wouldn't take

any imagination at all. Formulating an efficient solution that is also a stable return on investment is more challenging. That's where a knowledgeable, trustworthy automation partner comes in. They will use sound engineering and financial moderation to find that sweet spot.

Further, automation partners should ensure the ease of use of their chosen automation amalgamation. For some, that may mean continued technical support. At Fastems, we invite users of all experience levels to train at our West Chester, Ohio facility. There, we have a live FMS system with which we can teach basic commands, demonstrate troubleshooting, and help users explore more advanced applications.

In the end, properly configuring an automation system is key. The more flexibility there is in possible solutions, the more easily we can solve unique concerns.



FMS Automation Control – The Fastems Flexible Manufacturing System (FMS) control center.



Dashboard 3.1 – Fastems MMS Manufacturing Management Software directs and monitors nearly every aspect in a shop's production.



FPT Overview – The MMS software provides an overview of Flexible Pallet Tower operations on the shop floor.



MLS GTS Full – The Fastems MLS Multi Level System features a Gantry tool storage, or GTS to automate tool processes.

Bob Baldizzi,
Regional Sales Manager
Eastern USA, Fastems



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Total Transformation: Building a High-Tech Workforce

By: Molly West, Pittsburgh Chapter NTMA

It's working.

Ryan Murtha of Greensburg, Pennsylvania first discovered his love of robotics in middle school when he built a robotic Lego car. Once he got to Hempfield High School, he started taking more advanced robotics classes and joined the school's BotsIQ team. "I remember my first year, when I was a freshman. You don't really know what's going on, but I remember going to my first competition and seeing our Battlebot in the ring competing, and that's what really lit a fire in me. I said, 'Oh, I really want to do this,'" Murtha remembered.



Murtha participated in BotsIQ for all four years of high school and now studies mechanical engineering at Penn State. "End of middle school, beginning of high school I started thinking, this is probably the route I'm going to take," he explained.

That wasn't by accident. Forward thinkers in manufacturing and education started building a workforce more than a decade ago by reaching into the schools to teach students about the clean, high-tech career opportunities that Pittsburgh manufacturers could offer. Many know Pittsburgh as Steel City. While the moniker is still a nod to the industry that built Pittsburgh, now, it's as much a statement on the resolve of Pittsburghers who have completely transformed their city in the last 50 years

from America's steel center to a hive of technology, robotics, and innovation.

The Pittsburgh Technology Council's State of the Industry reports more than 10,000 technology establishments in the 13-county region that the Pittsburgh Chapter NTMA serves. These companies are pioneering AI concepts, streamlining logistics, and designing solution-based software for a broad spectrum of business goals. They are building robots and cobots. They are focused on machine learning and innovative advancements. They're even building rockets to deliver scientific instruments, technologies, ideas, and innovations to space. And of course, these are the manufacturing companies that are using advanced automation and machinery for faster and more precise ways to get the job done. According to a 2023 report by the Rand Research Group, \$10 billion has been invested in Pittsburgh technology companies in the last decade.

For the type of total transformation that Pittsburgh has experienced and continues to experience, building the businesses is not enough. You must also build the workforce to support such an industry. Technology businesses in the Pittsburgh region employ more than 305,000 people making up nearly 26% of the regional workforce according to the Pittsburgh Technology Council's statistics. Ryan Murtha can now be counted in that number.

For the last two summers, Murtha has returned to his home in southwestern Pennsylvania and participated in the BotsIQ Summer Intern Program through the Pittsburgh Chapter NTMA. This year, he's one of two interns putting his robotics knowledge to work on General Carbide's Universal UR10E.

"They have a cobot. It's been sitting in a room for the past four years, and no one really has a place for it to go, so we have been tasked with learning the cobot and getting it up and running, and putting it into production so it can be put to use," Murtha said. Jessica Gardner is the Human Resource manager at General Carbide. "We gave them very little info

to start with. Any good learning project is, we are going to help you, but we aren't going to give you the answers. Let's make this as real-life as we can. When you graduate and go into the workforce, you'll be given a problem statement to solve. Do the research, get the resources, and work independently," Gardner said.

Murtha and his fellow intern have tapped into their education, their experience, the cobot's technical support, General Carbide's experts, YouTube, and even fellow NTMA member Kiski Precision to understand and utilize the cobot's capabilities. "We want to put it to use for pick and place alongside a CNC machine," he explained. Supervisors are confident that these interns will reach their summer goal. "Internships are a vital part of our pipeline," Gardner elaborated. "As much as we hope the students learn from us, we learn from them, also. They are learning cutting-edge things that we may not be aware of yet." Undoubtedly, they will also reach the underlying goal: preparing tomorrow's workers for the next phase of industry in the Pittsburgh region.

What began as a student robotics competition and a hunch about ways to reach the next generation has now proven to be a successful strategy for engaging tomorrow's manufacturers. Murtha is just one example of many who are proving the value of Pittsburgh Chapter NTMA's BotsIQ initiative. BotsIQ's offerings now include a full complement of innovative educational solutions including classroom sessions, summer camps, internships, tours, and hands-on experiences.

As more and more sophisticated technology finds its way to the forefront of Pittsburgh manufacturing, the Pittsburgh Chapter NTMA and BotsIQ will continue to offer cutting-edge educational solutions to prepare tomorrow's tech-savvy workforce—doing their part to keep the region as strong as steel.



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Unleashing the Power of Automation for Low Volume - High Mix Production

By: Thomas Saur

Imagine a world where your machines operate tirelessly, producing high-quality products with precision and speed. Where repetitive and time-consuming tasks are handled flawlessly, freeing up your workforce for more valuable and fulfilling work. It may sound like a distant dream, but automation has the potential to turn this vision into reality.

Automation of machine tools offers a multitude of benefits that can revolutionize low volume - high mix production. First and foremost, it leads to increased efficiency, allowing your machines to operate faster and more accurately. This translates into higher production speed and throughput, enabling you to meet customer demands swiftly and efficiently.

But the advantages don't stop there. By eliminating the risk of human error, automation ensures consistent and reliable production. Imagine the delight of your customers when they receive products of superior quality, free from defects and inconsistencies. Not only does this boost customer satisfaction and loyalty, but it also enhances your business reputation, opening doors to increased sales and revenue.

Now, let's address a couple of myths that may be holding you back from embracing automation in low volume - high mix production.

Myth #1

"I do not have the volume to automate my production since I am running 1-5 pieces."

The truth is, there are specialized systems available on the market designed precisely for low volume production. Integrated pallet-type systems, like Matsuura's MAM-series, Fanuc Robodrill Plus-K, Yasda PX30i, Makino DA300 and many others, provide a solution even for shops with smaller production runs. These systems often come equipped with a 5-axis table and peripheral systems that enable lights-out, unattended machining.

If you're looking to embrace automation without a significant budget, a practical approach is to incorporate a stand-alone system into your current machinery. Numerous systems are available in the market to choose from, but my personal favorite is the offering from ROBOJOB-USA. This system stands out due to its exceptional flexibility, user-friendly interface, substantial payload capacity, and cost-effectiveness. So, rest assured automation is attainable for your business, irrespective of your production volume.

Myth #2

"It does not make sense to automate my \$120,000.00 VMC with a \$150,000.00 automation system."

Consider this: If adding a \$150K automation system to your \$120K machine allows for an additional 8 hours of production per day, the potential for growth is remarkable. Imagine your machine running 24 hours a day, with 2 x 8 hours manned and 1 x 8 hours unmanned cycles. With the increased productivity, your daily revenue can soar.

Let's do the math. Previously, your machine generated \$1,024 per day. But with the automation system, it can now produce \$1,536 per day. That's an increase in daily revenue of \$512. Now, here comes the exciting part. If the automation system costs \$150,000, the payback period based solely on the additional revenue generated by those 8 extra hours of production would be around 293 days. In less than 10 months, your investment starts paying off.

Of course, this is a simplified example that assumes optimal conditions. But it illustrates the potential value of adding automation to your machine, even when considering only the increased production time and revenue.

However, it's essential to remember that automation is not a standalone solution. To fully capitalize on its benefits in low volume - high mix production, you must consider a few crucial factors:

A good CAM system with verification software is an absolute necessity to avoid errors in programming and streamline operations.

Nurture a team of committed employees who embrace the system. Encourage them to learn programming and operation skills, promising both personal growth and financial rewards. Organizations like NTMA offer valuable classes to enhance the knowledge of your staff.

Invest in a reliable coolant and filtration system. Remember, the automation is only as good as its supporting accessories. Ensure uninterrupted operation by preventing coolant shortages, tooling blockages, or overflowing chip bins. Equip your machine with a larger tool magazine to accommodate a wide variety of parts. This redundancy is particularly useful when dealing with challenging materials. Implement a tool and part probe to verify and inspect each step, eliminating misloads and ensuring uncompromised quality.

Finally, embrace a Zero Point system like HWR-Workholding's SOLIDLine to overcome loading issues, achieve repeatable precision, and eliminate set-up times between jobs.

In conclusion, automating low volume - high mix production offers a world of possibilities. There are numerous options available to transform your shop into an efficient and agile powerhouse. The key lies in embracing the 5P principle: Proper Planning Prevents Poor Performance.

If you seek guidance on your automation journey, reach out to the author Thomas Saur at tsaur@HWR-USA.COM. Remember, the future is now, and the power of automation is waiting to be unleashed in your production processes.



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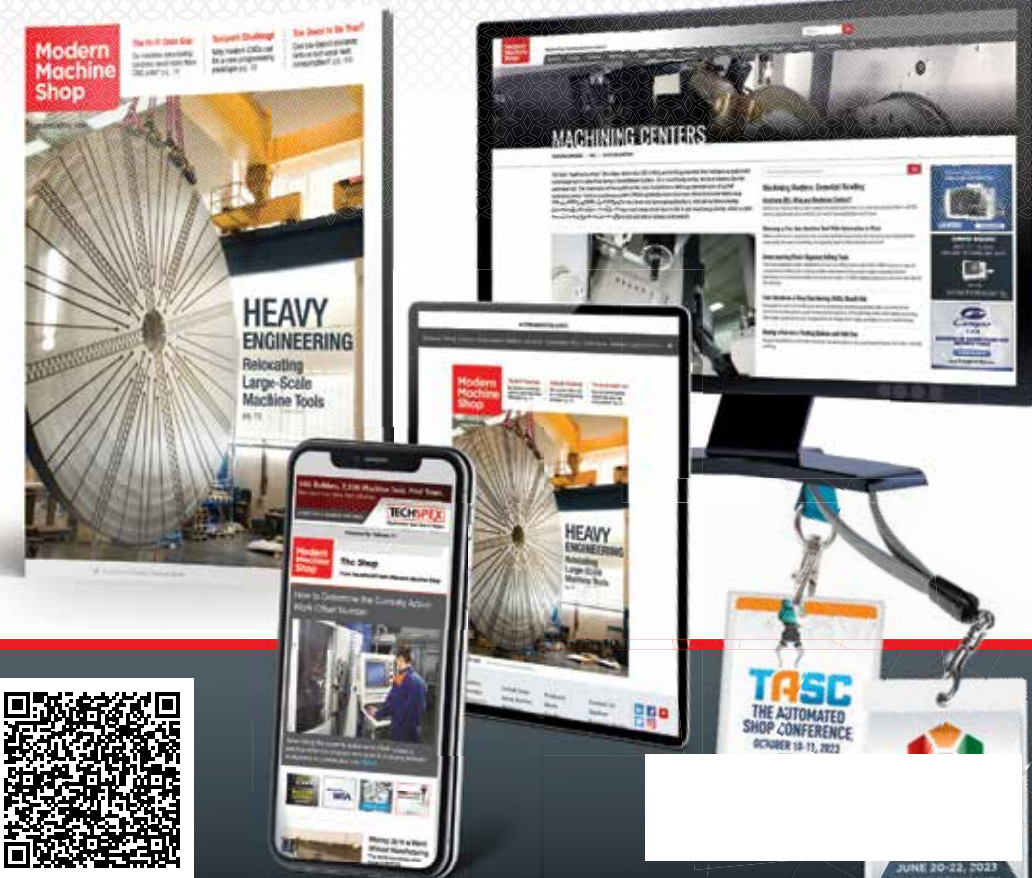
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Capacity-Enhancing Strategies in a Tight Labor Market

By: Dan Janka, President - Mazak Corporation

With the current headwinds buffeting the manufacturing industry and economy in general, it's imperative that shops evaluate and optimize their manufacturing processes to improve productivity and profitability. Even in the face of supply-chain challenges and a shortage of skilled labor, there are strategies and steps shops should be taking to maximize performance.

First, and most importantly, determine whether your existing equipment is operating at its full potential. Spindle utilization is the true metric of productivity, and there is no reason to make additional capital investments until your shop is operating at maximum capacity. A shop is only making money when its spindles are turning and cutting material. Everything else is simply parasitic time – downtime and waste that drag down efficiency and profitability.

In reality, most shops only get between 40% and 50% spindle utilization from their existing machines with inadequate tool management being the biggest source of idle times. Other contributors to parasitic time include lack of material availability and disruptive flow. To be fully productive, shops must eliminate waste as completely as possible to ensure their spindles are constantly cutting.

A clear understanding of spindle utilization on any given asset and how to improve it, however, is impossible without data. Specific operational information – feed rate, downtime, tool changes, cutting speeds – all need to be evaluated to

understand and inform your approach to optimization. Machine monitoring provides the data necessary for improved production capacity.

In our Mazak iSMART Factory in Florence, KY for example, we use MTConnect to network and monitor the utilization of individual machines and entire cells across our manufacturing floor. With that information, we can identify processes for waste elimination and cycle-time reductions. Monitoring each shop asset every minute of every day will tell you why a specific machine is running at less than full utilization and identify areas of waste.

To increase spindle utilization, shops must also engage in process optimization for improved capacity. One significant way to optimize processes is to invest in multi-tasking machines. By combining turning, milling, drilling, tapping, and deep-hole boring on one machine with a single setup, manufacturers increase cutting time without increasing labor costs while substantially reducing production lead times and part costs. Similarly, migrating from a manufacturing cell containing several two- or three-axis machines to a

five-axis vertical machining center with a rotary/tilt table such as the Mazak VC-500A/5X, for example, streamlines processes and eliminates multiple setups.

As an alternative to capital investments in new equipment and machines, shops might consider adding automation to their existing assets. Jobs that entail low variability with medium- to high-volume runs are well suited to robot-tending applications. A palletizing system, on the other hand, is appropriate for low-volume production of differing parts, with a separate pallet established for each family of parts. Cobots that allow unattended production are also becoming increasingly popular. Cobots are cost-effective, easy to teach, and can be redeployed from one asset to another with robot interface controls.

While there are multiple channels for technology to improve capacity, the current labor market challenges demand investing in your workforce recruitment and retention. Because the labor force is so much more transient than in the past, virtually every manufacturer today is spending more than they did previously on repetitive training. As a result, it is imperative that companies increase their investment in continuous and ongoing training to create additional opportunities and promote advancement for their employees. Plus, they must offer flexible, creative policies that foster lasting service.

Today's manufacturing presents unique challenges. However opportunities abound for shops with a trained, nimble workforce that is armed with the data and technology to optimize processes and capacity.



Dan Janka, President - Mazak Corporation



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N9560X0.Y-2.
N9570X4.8753Y-2.
N9580Y2.
N9590X0.Y2.
N9600X-4.8Y2.
N9610X0.Y0.2-2.02R-1.67
N9620G80
N9630H5
N9640G49G91G28Z0.M9
N9650G28X0.Y0.A0.
N9660M01
(TOOL - 5 DIA. OFF. - 5 LEN.
(Drill .500 holes - A0)
N9670M6
N9675T6
N9680G0690A0.S5000M3
N9685G54X-4.8Y-2.
N9690G43H5Z1.M8
N9700G98G81Z-3.3R-2.42F60.
N9710X0.Y-2.
N9720X4.8753Y-2.
N9730Y2.
N9740X0.Y2.

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