# IndustryWeek.



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A business management guide from *IndustryWeek*.





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# Manufacturing Outlook eBook

From currency to technology to supply chains to management, a look at what manufacturers should be considering in the new year.



By Robert Schoenberger Editor-in-Chief IndustryWeek

elcome to the "IndustryWeek eBook: What to Expect in 2023 Manufacturing." Over the next few pages, we have articles from our editors and top contributors, sharing their thoughts and research about what to expect in the new year.

These are all educated guesses. I'd love to say that we're psychic or smart enough to predict anything, but that would be coming from someone who predicted U.S. car buyers would purchase more than 17 million new vehicles in 2020 (year-end total, 14.6 million).

Making prognostication even more difficult are the number of unknows faced in late 2022 and early 2023. Is inflation moderating or will the Federal Reserve have to continue aggressively raising interest rates? Are supply chains back to pre-COVID levels, or are constant disruptions the new normal? Will the job market remain the tightest it's been in decades, or will employers finally be able to start filling in open slots?

The best answer that I can offer is maybe to all of those, but thankfully, we have a great staff of editors over here and access to some really smart people in the manufacturing world who can offer more than a confused shrug.

If history is any guide, something will happen this year that none of these experts considered. That was certainly the lesson of 2020... and 2008 and 2001. And when the unexpected happens, we'll do our best to provide fresh information and commentary to deal with those changes.

Thank you for reading, and enjoy our crystal ball stare into 2023.



By Lauren Pittelli

ow that 2022 is in the rearview mirror, it's time to consider the top global logistics trends that will impact manufacturing businesses in 2023. Here are the issues and trends that we have in our headlights.

#### **Carrier Market Disruption**

Rapid supply and demand changes during the pandemic reshuffled team rosters and altered every carrier playbook. The ocean carriers were flush with pandemic profits and invested in vertical integration. Two of the largest global carriers, Maersk Lines and CMA CGM, expanded into air cargo and contract logistics. Mediterranean Shipping Company (MSC) purchased the African logistics division of Bollore.

Non-traditional players decided to get into the logistics business, too. Retailers such as Home Depot took supply chain matters into their own hands, chartering vessels to overcome supply chain snarls. Amazon increased its air-service offering and expanded its fulfillment services to companies not selling on the Amazon platform. TikTok announced plans to offer U.S. fulfillment services.

Now the bloom has faded off some of these initiatives – demand for space has fallen precipitously and transportation rates have gone south with the missing demand. Carriers have responded by scaling back or eliminating their new services. For example, Amazon is subletting excess warehouse space while CMA CGM suspended all its U.S. cargo flights.

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To avoid service disruptions in 2023, avoid the flash-in-the-pan by strengthening ties with established carriers.

Lauren's advice

#### Geopolitics Interrupts Business as Usual

We're in a new era of industrial policy, one that considers protecting national security and minimizing climate change when setting the rules businesses operate by.

Export controls are being used to advance broad national security objectives. To protect U.S. leadership in the high-tech sector, the Biden administration restricted the sale of advanced semiconductors and chip-making equipment to China. Additional actions will follow that protect our dominance in biotech and clean energy development. Russia has been shut out from purchasing U.S. high-tech in reaction to its invasion of the Ukraine. TikTok has been banned from government cellphones over privacy and security concerns.

Trade policies are also considering climate impacts for the first time. The Biden administration is working with Europe on a proposed global consortium to promote trade in "green" steel and other metals. The Global Arrangement on Sustainable Steel and Aluminum is designed to bolster domestic production of steel and aluminum while also reducing environmental impacts. The proposed consortium would jointly impose tariffs against metals produced in environmentally harmful ways in countries such as China.



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#### Lauren's advice

Will these policies result in a tit-for-tat with China or a decoupling of our economies? We don't know, but tensions can flare unexpectedly. Today's more muscular trade policy is yet another reason to evaluate where companies make and sell their goods. Outsourcing or offshoring decisions taken years ago may no longer make sense.

#### **Investment in Green Logistics Brings Opportunity and Challenge**

In the last 12 months, Congress passed three substantial bills to rejuvenate our industrial base, upgrade U.S. infrastructure and transition the U.S. to a clean energy future. The Inflation Reduction Act and the Infrastructure Investment and Jobs Act include green transportation incentives supporting the development of EV cars and trucks, EV manufacturing, battery production and sustainable aviation fuel (SAF).

These investments and tax credits come with U.S. sourcing and content requirements, a boon to U.S. manufacturers and their employees.

Concern about the negative health impact of tailpipe pollution is also spurring the transition to green logistics. Tighter emissions requirements set by California, Illinois and other states take effect in January. These new requirements will take older trucks off the road. In California, it's estimated that 25% of the port drayage trucks do not meet the new requirements and will have to be retired. The need for newer equipment will improve carrier dependability at the expense of capacity. Trucking rates may increase as well.

The EPA just released revised emission standards for heavy trucks. Our current emissions limits are over 20 years old. Effective in the 2027 model year, diesel trucks will have much stricter emissions standards. The new limits are designed to spur diesel engine performance improvements, providing a pathway to the envisioned zero emission trucking future.

## **Changing Worker Expectations in a Tough Labor Market**

3.5 million Americans left the labor force since the beginning of the pandemic. Workers over 65 are a large share of the still missing workforce. 1 million older workers accelerated their retirement plans and are unlikely to return to work.

#### Lauren's advice

Whether it is because of federal investments, new regulations, or customer demand, green initiatives will be a top logistics trend for industry in 2023. While we undergo the hard work of transitioning to a green economy, position your company for success by taking advantage of all the available investment incentives. The Dept. of Energy publishes a link to a national database of state incentives for renewables, energy efficiency and EVs. This database is a terrific tool to ensure your company benefits fully from all the financial opportunities arising from the transition.

At the same time, those still working are re-evaluating their priorities and expectations. This is seen most clearly in the push for unionization. A recent Gallup poll showed that the share of Americans who approve of unions is at its highest level since 1965. The NLRB reports that there were over 1200 union elections in 2022, a 50% increase over 2021. These union drives were successful three quarters of the time.

## Lauren's advice

For manufacturers to thrive in what will be another tough hiring year, companies must take a proactive approach to staff retention. Focus efforts on enhancing positive work relations rather than just developing a union avoidance strategy. Investments in training, good working conditions and advancement opportunities are critical for success.

In addition to challenges on production lines, every warehouse and transportation department is short-handed and looking for workers. Even manufacturers that have direct carriers or own trucking fleets have challenges filling openings.

As the economic outlook for 2023 is uncertain, these logistics trends can take hold in unanticipated ways. Plan for multiple scenarios, outline specific actions and be open to a more fluid environment in 2023. IW

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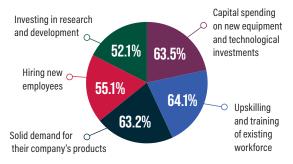
# NAM OUTLOOK SURVEY: Manufacturers to Invest, Despite Recession Worries

Credit: © Wutthichai Luemuang | Dreamstime.com

early two-thirds of manufacturing leaders (62.4%) believed the U.S. economy will slip officially into a recession in the new year, according to the National Association of Manufacturers' outlook survey conducted in the fourth quarter of 2022.

The survey, which surveys manufacturers of all sizes on a quarterly basis, notes that 75.7% of respondents listed attracting and retaining a quality workforce as being the No. 1 business challenge. Supply chain challenges and increased raw material costs follow at 65.7% and 60.7%, respectively.

Although workforce and economic difficulties remain, respondents report planning for:



With the weakest reading since the third quarter of 2020, 68.9% of respondents felt either somewhat or very positive in their company's outlook, down over six percentage points from the third quarter. Large manufacturers were the least positive in their business outlook.

"Congress failed to act on essential tax reforms, which complicates investment, increases inflationary pressures and could stifle economic growth," said NAM President and CEO Jay Timmons.

When asked what they see as the most pressing priorities for the 118th Congress, more than three-quarters of respondents answered pushing back against regulatory overreach.

"Much-needed permitting reforms and provisions to strengthen our ability to conduct research and development, buy machinery and finance job-creating investments—which we need to promote growth within the sector—were left on the cutting room floor last year. Those reforms, combined with manufacturers' ongoing efforts to inspire, educate and empower the future workforce, are critical to our competitiveness," Timmons said. IW

# What's Ahead for DIGITALIZATION IN 2023? By Dale Tutt

Credit: © Arcoss | Dreamstime.com

ndustry faces a year of uncertainty and potential in 2023 that can be encapsulated in three major trends: supply chain disruption, sustainability and workforce turnover. Each of these challenges is connected, and each offers an opportunity for innovation and transformation, especially considering advancements in digital technologies. Digitalization offers a foundation for companies to embrace exciting technologies: additive manufacturing, artificial intelligence and machine learning (AI/ML), augmented and virtual reality (AR/VR) and the industrial metaverse.

Each of these technologies has benefits and capabilities that can help companies solve the challenges that supply chain disruption, sustainability and a changing workforce bring in 2023.

# 1. Disruptions cause supply chain uncertainty

Despite the growing complexity and breadth of supply chains around the world, many companies continue to rely on relatively simple means of tracking and managing their supply chain processes. The difficulties of recent years have illustrated the limitations of this approach. Instead. The digital twin can be used to model supply chains and business processes, helping companies better understand the complexities of their value chains, identify problems and prescribe solutions. With the significant amounts of data available from across a company's supply chain, digitalization is necessary to gain such a perspective.

One of the key deficiencies of today's most common solutions for supply chain management is an inability to provide context or situational awareness across an entire supply chain. A comprehensive supply chain digital twin hosted in the industrial metaverse, which leverages existing technologies

including AR/VR, can be used to create intuitive visualizations that are easier to digest than numbers in a table or points on a chart. The industrial metaverse enables companies to harness the power of large-scale computing and in-depth visualizations to analyze and interrogate the digital twin, providing a higher level of situational awareness on a global scale—again, dependent on the availability of huge amounts of data.

Additionally, the integration of AI/ML into the industrial metaverse platform can further enhance the value extracted from the digital twin. AI/ML is already excellent at sorting and classifying large data sets to help uncover the most useful information. When applied to supply chain management, this capability can help quickly sort and organize the massive amounts of data that a modern global supply chain generates, making it easier to focus on the most important trends and patterns. Also, the more an AI/ML system is used, the better it gets at recognizing patterns and even predicting future supply issues before they occur.

# 2. Technology enables new sustainability solutions

The year 2023 will also be important for the pursuit of sustainable industries, which will in turn help companies become more efficient and competitive and better-prepared. Advanced digitalization technologies can facilitate the analysis and characterization of current practices and improve a company's ability to develop sustainable solutions. In many ways, the challenge of becoming a more sustainable business is closely tied with constructing and managing a global supply chain. As a result, sustainability programs can also benefit greatly from the power of AI and ML. For example, an AI/ML engine can help automate the aggregation of

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Switching to additive
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all the information a company needs to generate collective intelligence without over-taxing employees with tedious information retrieval. This collective intelligence will then help a company make objective assessments about their sustainability performance and create solutions to address deficiencies.

Additive manufacturing is another important tool in the pursuit of sustainability. Casting and machining are common processes that produce waste as a matter of course. Switching to additive processes can greatly reduce the material cost of parts by eliminating the need for molds and the waste material produced in the subtractive machining process. Additive is also exciting because of the relative lack of design constraints it imposes compared to other manufacturing processes. As a result, designers can create components that are more efficient in several ways, including material usage, thermal performance and strength-to-weight ratio, helping companies reduce energy consumption and use fewer resources.

#### 3. Digital solutions aid workforce development

Finally, many companies will be managing a transition in their workforce, with recent trends in employment continuing in 2023. First, the most experienced employees at many companies are reaching retirement, taking with them valuable knowledge and experience that, unless captured, will be lost.

Second, there is a shift in demand toward employees with skills in advanced software and electronics, driven by the changing nature of products. This is creating a skills gap in many industries.

The third major workforce trend is the changing expectations and needs of prospective employees. The next generation of employees are seeking a technologically advanced workplace that matches the technology experiences in their personal lives. Additionally, the most desirable employers are those with strong records of sustainability and corporate responsibility.

Addressing this dynamic workforce market will require a nuanced approach. Simply investing in the digitalization of processes without intention or strategy risks leaving employees behind. It will be important for companies to strike a balance between modernizing for the sake of attracting new talent and not alienating current employees. Technology that is intuitive and easy to learn will help both new and current employees come up to speed more quickly.

In other roles, an immersive training environment may be more valuable. Technicians and manufacturing employees can benefit from hands-on, virtual training sessions conducted in the metaverse that offer a learning environment where mistakes are far less costly. The industrial metaverse also will change the way companies work by creating a virtual space to work on real-world projects that are more collaborative, interactive and immersive.

Some of the uncertainty of 2022 will persist in 2023 – supply chain disruptions, a continued push for sustainable innovation and a changing workforce. Yet, on the optimistic side, digital technologies will help companies foster collaboration, gather and leverage data and explore innovative solutions while saving time and money. IW

**Dale Tutt** is vice president of global industries, Siemens Digital Industries Software.

# **Industry**Week

# Where Manufacturing Technology Goes in 2023



Courtesy of Flex.

# **PART ONE:**

# SMART FACTORIES

By IW Technology Editor Dennis Scimeca echnological development at its best provides rapid and fundamental change, entirely new theories and hardware and conceptual thinking that open new possibilities and pave the way for more rapid and fundamental change.

Those giant leaps are few and far between, however. At its usual pace, technological development happens at a glacial, incremental pace. And that better describes the manufacturing technology world in 2022. We didn't see any revolutionary innovations or game-changing strategies, rather the evolution of established technologies like additive manufacturing, IIoT and the rest.

So we asked our cavalcade of industry experts what they expected to see in the world of manufacturing technology in 2023. Will we see any giant leaps forward or a continued slow but steady progression of learning how best to use established technologies?

# Getting Smarter About Smart Manufacturing

Generally speaking, the idea of a smart factory revolves around information gathering and analysis, with the most "intelligent" factories generating digital twins that allow for a granular understanding of process and the ability to run accurate simulations and forecast the result of changing conditions like delayed supply chains or to predict maintenance cycles.

"When we talk about digital evolution, smart manufacturing, industry 4.0 or Internet of Things the common factor is data. Whether coming from simulations or sensors, today the challenge is not about having data available; it's more about efficiently and effectively using it," says Livio Mariano, director of Math and Systems at Altair.

"Digital twins will be increasingly adopted to process sensors data coming from the field and turn it into a readable form by unveiling or augmenting the information contained in it—e.g., calculating theoretical key performance indicators (KPIs), correction actions, detecting anomalies in the system," says Mariano.

"Smart factory initiatives unlock new horizons," says Jason Bergstrom, Smart Factory Go-to-Market leader at Deloitte Consulting. "While companies have been using artificial intelligence and machine learning (AI/ML)



Courtesy of Ericsson.

on customer sentiment and quality control, implementing it on the factory floor will be key to providing insights and capabilities needed to make their factories more predictive, adaptable, efficient and competitive.

"[In 2023], many companies will begin using or enhancing their usage of digital twins to represent the factory's product and production systems and reduce the time and cost associated with assembling, installing and validating those systems to ensure they are making timely and insightful decisions based on finances and consumer demand," Bergstrom continues.

"Data scientists [will] flock to the factory. The factory of the future is digitized, connected, automated and powered by next-gen sensors and tech. But that's not the reality for every manufacturing organization today," says Hooi Tan, president of Global Operations and Supply Chain at Flex.

"In 2023, data scientists, engineers and architects will be the most critical factory workers around. These employees will be instrumental in laying the infrastructure to digitally transform the factory and connect it to other aspects of the business, such as the supply chain, so leaders can draw actionable insights from machinery and make impactful business decisions," says Tan.

"Large enterprises spent 2022 scaling IoT/IIoT investments, solving for and scaling incremental use cases (benefits) as they leveraged the insights from various digitalization initiatives," says John Lytle, director, manufacturing, with global technology research and advisory firm ISG. "Moving into 2023, a growing focus will be around leveraging digital twins for products and plants for predictive maintenance and performance monitoring. Digital threads will connect the full value-chain of engineering to production to aftermarket services."

"We may see more advancements in connectivity technologies that allow robots and machine vision systems to connect and interact safely on the factory floor," says Matthias Thoma, robotics system manager at TI industrial systems. "Design engineers enable IoT connectivity by connecting more devices and machines together, allowing constant monitoring of data from the smallest sensor to CNC machines and industrial robots."

"Smart manufacturing will continue its current growth, and the demand will increase for cloud-based digital manufacturing that is hardware-agnostic and technology neutral," says Reji Puthenveetil, executive vice president of Industrial Solutions at 3D Systems.

"It is the energized adoption of emerging smart manufacturing technologies that will be the story for 2023," says Paul Rogers, president and CEO of the

Americas at Hexagon AB's Hexagon Manufacturing Intelligence division. "In the past, a supplier customer would not seriously consider a new software platform or metrology solution until they could verify their OEM customer was also a user. In the new paradigm shift, conventional suppliers are now taking the initiative to be the first company on the block to implement and leverage advances in automation, simulation and metrology. Data-driven solution integrations translate to a head start and a competitive edge when competing with more nimble start-ups."

# Embracing the New (Even if We Don't Need it)

Even if incremental improvements and gradually increasing rates of adoption defined manufacturing technology in 2022, that's not to say it's a downer for enthusiasts. A slow and steady advance arguably makes more sense than taking risks on giant leaps.

"The companies that will thrive in the next wave of the digital economy won't be the ones clamoring over the shiniest new technologies, such as AI, crypto or Web3. New inventions capture our attention, but innovation is doing something in a new way that generates value. Using something that's been around for a while can be even more innovative than using something that has just been invented," says Scott Varho, chief evangelist at 3Pillar.

"Organizations that will thrive in 2023 won't build technology for technology's sake. They will assess their target market(s) to determine the why behind the technology, test their hypotheses in a low fidelity, lean way and ultimately understand where the value lies," Varho says. IW

# Where Manufacturing Technology Goes in 2023



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# **PART TWO:**

# SUSTAINABILITY & AUTOMATION

By IW Technology Editor Dennis Scimeca

## **Technology Aids Sustainability**

Manufacturers increasingly pay attention to ESG requirements not only to enable Lean policy but also to attract employees and customers. Technology plays a significant role in this effort.

"Organizations are building new, true Indus-

try 4.0 facilities from the ground up to maximize visibility and unlock new decision-making and performance-optimization capabilities," says Jason Bergstrom, Smart Factory Go-to-Market leader at Deloitte Consulting.

"One interesting benefit we see emerging from Industry 4.0 initiatives is the enhanced transparency provided to sustainability programs," says John Lytle, director, manufacturing, with global technology research and advisory firm ISG. "Reporting frameworks are emerging from the system integrators, leveraging the vast amounts of data these plant systems are generating to enhance and automate reporting."

"Many customers will continue to drive for higher levels of sustainability across their entire ecosystem, including additive manufacturing," says Reji Puthenveetil, executive vice president of Industrial Solutions at 3D Systems. "While AM is inherently less wasteful than subtractive processes, I expect there will be a need to address



Courtesy of First Solar.



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and provide strategies around the recyclability of advanced materials, bringing manufacturing closer to the customer (reducing transportation), energy used versus traditional methods, production on-demand and other efficiencies that will lead to a sustainable future."

"Green tech start-ups are taking advantage of our new technologies faster. These agile players are amplifying this evolution with fresh eyes and willing attitudes," says Paul Rogers, president and CEO of the Americas at Hexagon AB's Hexagon Manufacturing Intelligence division. "Heading into product development with the ability to measure quality parameters of design intent and simulate these results is leading the industry to reduced costs, accelerated time to market and exciting new material development."

### **Automation's Steady Robotic Advance**

The staple technology when it comes to modernizing plants, automation now includes more than just large, industrial robots. Smaller cobots, often in the form of robot arms, work on the line near humans. And, autonomous mobile robots can handle material transport across plant floors.

This technology perfectly addresses the "three D's" of plant operations—dirty, dull and dangerous—and lets employees shift to tasks that require human intuition and problem-solving and/or upskill to new positions. In 2023, automation will continue to advance.

"No-code and easier-to-use robotics will become more commonplace in 2023," says Jeff Burnstein, president of the Association for Advancing Automation (A3). "Making robots easier to use, especially with no programming required, allows more companies to automate, especially small and medium-sized companies who are new to automation and don't always have the in-house capabilities to handle complicated programming and set-up tasks."

"Mobile robots should continue to show strong growth in the year ahead in manufacturing factories as well as warehouses and distribution centers, with the e-commerce demand and continued labor shortages. As every industry struggles to find people, the move to automation will continue" says Burnstein.

"In 2023, economic uncertainty will put additional momentum behind the technology that makes reshoring possible. In creating a distributed network of factories, automation offers a better handle on costs and enables a high level of flexibility that makes scaling easier," says Paolo Avagliano, COO at Bright Machines.

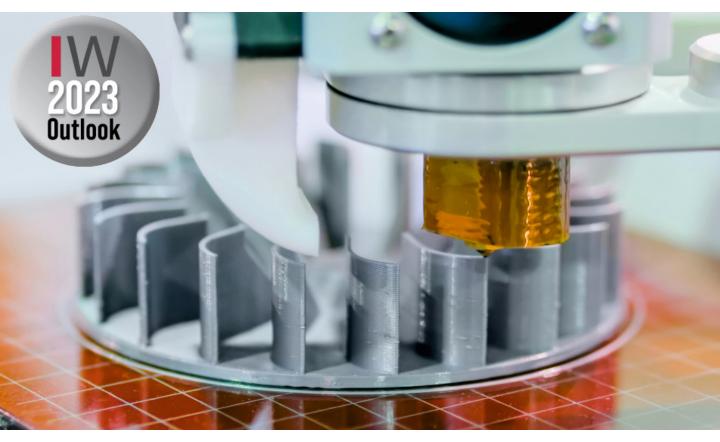
"In addition, unlike manual labor, the cost of implementing an intelligent automation solution varies little across geographies, allowing the industry to move production from low- to higher-labor-cost regions to build closer to where they sell and mitigate future risk. As a result, the rise of resilient, software-driven automation mitigating the barriers to reshoring will continue in the coming years," Avagliano says.

Related technologies that serve robotics deployments will also see advances in 2023.

"Advancements in edge AI computation are helping to simplify robot programming and make them more adaptable. More efficient processing will require hardware accelerators to compute AI algorithms more efficiently," says Matthias Thoma, robotics system manager at TI industrial systems.

"To enhance cobots, quality inspection, factory synchronization and inventory accuracy, companies will increase usage of computer vision regardless of their industry," says Jason Bergstrom, Smart Factory Go-to-Market leader at Deloitte Consulting. **IW** 

# Where Manufacturing Technology Goes in 2023



**PART THREE:** 

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# ADDITIVE MANUFACTURING

By IW Technology Editor Dennis Scimeca

#### Adding to Additive's Portfolio

Additive manufacturing (AM) has grown beyond its traditional rapid prototyping confines. While still employed widely for that purpose, additive also creates custom products for customers and new tooling for plant operators. The list of available materials expanded in 2022, opening up new avenues to exploit the technology. So what can we expect on the additive front next year?

"In industrial markets, there has been a tremendous uptick in the number of manufacturers that are embracing metal AM for the production of end-use parts, particularly in the aerospace and energy markets. I believe we'll see that activity continue and that it will be bolstered by composite materials gaining traction for production applications. This will be facilitated by the evolution of the materials as well as the 3D printing technology," says Dr. Jeffrey Graves, president & CEO, 3D Systems.

"In the year ahead, I anticipate new AM solutions that are designed specifically for mass production whereby manufacturers will be able to rely on the technology to accelerate their workflows in ways not previously possible. This will be further enabled by end-to-end software solutions

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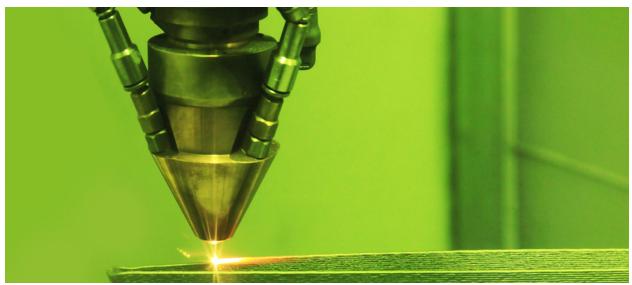


Photo 118407660 © Mastercard Popov | Dreamstime.com

that combine a variety of printing and finishing technologies to not only enhance productivity but also maintain the traceability required by highly regulated environments," Graves says.

"We continue to see an influx of companies moving to 'just in time' or 'made to order' parts designs that can be housed digitally to reduce physical inventory cost and remove the concern around where the physical inventory sits," says Brent Noonan, president of the Americas at Stratasys. "We believe the trend of digital inventory will continue in 2023 with parts being made more easily in multiple locations, eliminating transportation bottlenecks, shortening lead times and reducing carbon emissions from transportation."

"As I look ahead to 2023... I believe we'll see an increase in production-grade solutions targeting specific applications. An increasing number of materials are needed that meet custom, application-specific needs in different industries, including quality and regulatory standards," says Reji Puthenveetil, executive vice president of Industrial Solutions at 3D Systems.

"These materials must deliver parts with the look, feel, accuracy, precision, mechanical characteristics, quality and performance of end-use components. Customers no longer require production-like solutions. They need production solutions that can replace traditional manufacturing methods," Puthenveetil says.

"As industries with high-mix production environments such as service bureaus, healthcare and consumer goods strive to reduce the time and cost associated with preparing files for the printing process, I foresee AM software playing a key role in facilitating automation. This is possible due to

With the majority of businesses expecting supply chain issues to continue into 2023, there is a growing demand for sustainable, innovative manufacturing,"

Wayne Davey, HP Personalization & 3D Printing, HP Inc.

the use of modern AI techniques such as deep learning that can uniquely drive very high levels of automation not previously possible," says Ben Schrauwen, senior vice president and general manager at Oqton.

"As I look across the AM industry, I see a shift from AM being used mostly for low-volume production to a technology consistently demonstrating it is ready to deliver on high-volume, large-scale applications. This is becoming a reality not only in healthcare but also in consumer markets such as for toys, as well as for industrial applications such as electrical connectors," says Dr. Brent Stucker, chief technology officer at 3D Systems.

"We also expect a lot of advancements in the coming year in the software that helps our largest customers really scale up," says Noonan. "Software has historically been mostly about setting up individual jobs on individual printers. That's changing. Now we need to manage fleets of printers and many operators, perhaps over a wide geographic area – essentially digital virtual factories that can span the globe."

"With the majority of businesses expecting supply chain issues to continue into 2023, there is a growing demand for sustainable, innovative manufacturing," says Wayne Davey, global head of go-to-market, HP Personalization & 3D Printing, HP Inc.

"The near endless design and production opportunities with 3D printing will not only motivate manufacturers to prioritize sustainable innovation but will also unlock new and exciting applications across industries that will completely reshape the production floor and secure a healthier, more resilient global supply chain," Davey says. IW



Credit: Dreamstime and IW Staff

ast year dealt the world's manufacturers and supply chains powerful lessons. Next year they will put those learnings to use, as makers and shippers everywhere invest in new ways to understand and respond to their worlds.

We started last year with expectations of something like a return to normal after the waves of COVID that began in 2020. Instead, we found ourselves dealing with the effects of war in Ukraine, inflation, scarcity of some basic materials, economic slowdowns and continuing COVID lockdowns in key countries. Contrary to many expectations, we're looking at fewer shortages but higher energy prices, geopolitical challenges and consequent rush to remake core systems.

It's not just that we won't go back to normal. It feels like whatever comes next, it will have its own shocks that require more visibility and better control of costs, supplies and timelines. The industry is accelerating moves to better data, more responsive systems and regionally based manufacturing and supply chain systems.

#### **Data-First Regional Systems**

At the heart of this is a data-first regional approach, increasingly leveraging analytics, artificial intelligence and machine learning solutions to provide both a real-time read on performance and

predict of future events. Regional manufacturing and supply chain systems will increase as a way to reduce risk and increase control by keeping things closer together.

Often this means increased labor costs, which will be offset with new ways to automate work and increase productivity. One of the most exciting is the use of immersive experiences, like using augmented reality headsets to determine the context of, say, an industrial machine's performance, carbon footprint, maintenance schedule or replacement parts availability. This speeds work, increases uptime and gives greater context not just to the individual machine—but when put into a larger database, the overall performance of a factory, loading port or railhead. Frontline people can work better and with more intelligence, and planners get a better system view.

#### **Evolutionary Revolutions**

In one sense, these big changes are an evolutionary realignment. Enterprise resource planning (ERP) software created efficiencies in the 1990s and 2000s. Offshoring and outsourcing took advantage of cheaper production costs in countries like China. ERP eventually limited system visibility and flexibility, though, since customers couldn't easily change practices or gain insight from new



Credit: Getty Images - 1149239358

data sources. China's increasing wealth made it a market to sell goods as well as produce them, while labor and land costs rose.

Through more and better inputs, however, an ERP-driven supply chain eventually becomes a data-driven supply chain. Automation, AR and other productivity improvements enable companies to transition to new and more sophisticated kinds of manufacturing and supply chain management.

Almost half of the industrial companies in North America have started this upgrade to some degree. They don't usually destroy their older capital investments, but layer on important modifications. The shocks of 2022 have increased the urgency, even as the choices of what can be added have become better and cheaper. Cloud-based data solutions augment older ERP practices. Flexible analysis systems allow modeling from the viewpoints of manufacturers, supply chains and customers—another way data gives greater context.

### **Ready for the Next New Thing**

There are entirely new considerations that older systems can't accommodate, however. The physical realities of climate change, and the politics around this, were never before something our industry needed to think about. They are now, and will be, as far ahead as anyone can see.

Regionalism may have the effect of reducing the industry's carbon footprint, but not if it comes without better planning – more ships traveling shorter distances just one-third full could be a net increase in emissions, and regulators will notice. Better reporting, better data and better forecasting will need to be part of the system.

Freakish weather and other climate-led disruptions will also call for more flexibility than we've seen in the past. Regional approaches, climate and regulation all play a role in creating new alliances and partnerships, creating additional needs for data sharing and transparency.

These all represent challenges to the industry, but I've worked in this sector long enough to know that it is fundamentally strong, forward-looking and unafraid of a challenge. If anything, I'm optimistic about what lies ahead. The investments we're making now, in both core infrastructure and related technology, will enable insight and innovation for years to come, whatever happens. IW

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vent risk has been extreme in the foreign exchange (FX) markets for some time now. Global manufacturers operating in multiple markets around the world are facing an especially complex FX landscape.

Consider just a few events from the past year that are impacting FX markets, beyond the pandemic-induced supply-chain disruptions that have resulted in cash flow uncertainty:

- The U.S. Federal Reserve has moved faster and more aggressively than many of our trading partners to lift interest rates to reduce inflationary pressures
- The war in the Ukraine has sparked an energy crisis, hitting European nations hard
- Geopolitical tensions have created uncertainty across a spectrum of asset classes, including FX

As a result of these influences, the value of the dollar has soared this year, spending much of its time at its highest levels in 20 years against many currencies. The rapid and seemingly relentless appreciation of the U.S. currency, combined with FX volatility, has created significant challenges for U.S. manufacturers who import materials from foreign suppliers and for those who sell their finished products to customers abroad.

As treasurers and CFOs work on 2023 planning, many are taking time to assess their current FX strategies. If an overall FX strategy doesn't exist,

now is a great time to strongly consider creating one, or simply outline the measures that will guide those decisions for the next year. Companies who pay for their imports in foreign currency should evaluate their decision on when and why they might opt to hedge and when not to hedge, while those paying foreign suppliers in U.S. dollars should be taking steps to renegotiate with suppliers who've not improved their pricing or have been slow to

The same is true for U.S. manufacturers who sell their products internationally. They have the same considerations about hedging foreign-denominated receivables and important considerations if they're still invoicing foreign customers in U.S. dollars, as the cost of their goods is now significantly more expensive to a foreign buyer.

### **Identifying Currency Risk**

The identification of exposures is the best place to start because understanding where there is currency risk is critically important to the establishment of effective strategy. Manufacturers should consider five different sources of currency risk:

**Earnings translation risk.** For example, a U.S.-based medical equipment manufacturer who is U.S.-dollar functional, but has a European subsidiary who is euro-functional and sells their products



in Europe ends up with euro-denominated revenue. As that revenue is on their consolidated income statement and needs to be converted back to U.S. dollars, the manufacturer could have its earnings per share (EPS) impacted if the euro declines.

Forecasted transactions or cash-flow hedging. The manufacturer forecasts revenue from sales paid in euros. As the euro gets weaker and the currency is converted back to dollars, gross revenues would be lower than what the firm forecasted.

**Balance sheet re-measurement.** The manufacturer has items on the balance sheet, like accounts receivable or payable, that need to be remeasured monthly at the current (spot) rate, making those worth more or less depending on the spot exchange rate.

**Net investment risk.** The manufacturer has equity in a foreign subsidiary. When assessing the value of that subsidiary, perhaps when anticipating a future dividend or divestiture, changes in exchange rates could impact the U.S. dollar-equivalent value.

Event risk. For example, a manufacturer is looking to purchase a Canadian medical equipment manufacturer in a sale that will be priced in Canadian dollars. If the value of the Canadian dollar increases before closing, it might require more U.S. dollars to complete the transaction (this example is in simplest terms; M&A transactions have many considerations that make currency risk management a critical component that should be addressed early in the due diligence process).

#### **Currency Hedging**

FX hedging can have a significant impact on a company's performance. There are hedging tools that can be used to hedge the sources of risk just mentioned and could be in any manufacturer's toolbox. Each could be used to minimize currency risk, but companies will need to assess their unique circumstances before choosing the right tool.

**FX Forwards.** This is an agreement that a company will exchange one currency or another on a future date. For example, a manufacturer could agree to buy euro now that they need to pay a German supplier in three months. A forward contract allows the company to fix/lock in the exchange rate now, creating stability and predictability for their future expense.

**Options.** An option contract gives the buyer the right, but not the obligation, to exchange currencies on a future date at pre-established terms. For example, using the same example above, the manufacturer could use a call option to buy euro at a pre-determined exchange rate (strike price). The option offers protection at the pre-established (strike) price, but if the spot rate at expiration of the option three months from now is better, the company can buy the euro at the improved current (spot) rate. The option has a premium cost paid up front for the right, but not the obligation to settle at the strike price.

**Cross-Currency Swaps.** Cross-currency swaps offer a means of creating foreign-denominated debt or converting foreign debt to USD debt.

When a company decides to hedge any of the risks identified above, they'll typically develop a systematic hedging policy to guide their efforts throughout the year. A good hedging policy ensures: secured budget resources, timely



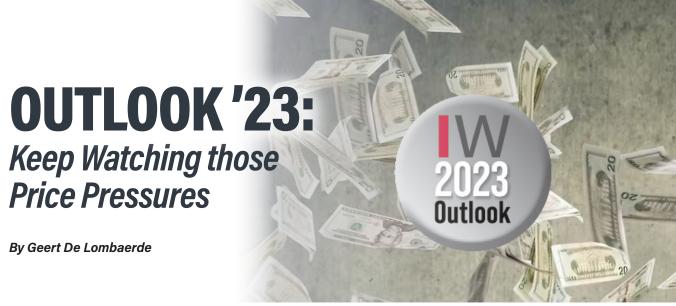
Credit: Getty Images - 1358927461

sharing of complete exposure information, preparation of accurate forecasts, periodic measurement of risks and analysis of outcomes. It also ensures the company has considered their philosophy about currency risk and the goals they're trying to achieve.

#### **New Urgency**

Managing currency risk has always been a factor for global manufacturers, but companies haven't always put systematic policies in place. The absence of a policy or defined goals often result in inconsistent hedging practices or negative cashflow implications. The strength of the dollar has brought new urgency to the practice. While there have been blips of currency volatility in recent years - e.g. Brexit, political elections - the currency markets usually smoothed out pretty quickly. What we're experiencing now is different, and we expect currency volatility to be a consistent challenge for manufacturers throughout 2023. Now is the time for treasurers and CFOs to work with firm management to understand the currency risks they'll face in the next year and determine when and how they'll reduce that uncertainty. IW

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Credit: Dreamstime, IndustryWeek's Tim Driver

ovember's Institute for Supply Management Purchasing Manager's Index brought an end to two and a half years of "official" growth in the manufacturing sector when it dipped just below 50% thanks in large part to drops in new orders and hiring.

It's clear the economy is slowing and any recession that might arrive will be among history's most anticipated. But heading into 2023, it should also be said that the sky isn't falling: The ISM's production index is still firmly in expansionary territory, many companies have said recently they still have bumper backlogs and there are several tailwinds sustaining investment in and demand for industrial products. As Bank of America Institute economists David Tinsley and Anna Zhou wrote last week, 2023 is lining up to be a balance between some conventional cyclical softening and reasons to remain optimistic for the longer term.

"While the post-pandemic surge in manufacturing will struggle to be maintained, there are still some reasons for cheer as we enter 2023," they wrote. "We think the impending boosts from [pent-up demand for] autos and reshoring are enough to warrant a healthy dose of optimism."

Among the reasons to be upbeat, former Federal Reserve and White House economist Claudia Sahm wrote last week, is that inflation is broadly ebbing—a stance backed up by Tuesday's lower-than-expected November Consumer Price Index report. Encouraging data on gas prices, loosening supply chains, consumers' price expectations and wage data, Sahm said, are tilting the scales.

"The inflation hawks must tell us why their story remains so dire after the data during the past two weeks," Sahm, founder of Stay-at-Home Macro Consulting, wrote. "And remember: Good news is good news. The past two weeks have been good."

An *IndustryWeek* survey of manufacturing executives conducted from late November into early this month echoes several of the more upbeat demand data points out there—but also provides food for thought on the inflation front.

First, to the rosier and relatively clearer picture of demand: Of the slightly more than 100 executives who responded to our prompts, 58 are expecting 2023 to be somewhat or substantially better than this year while only 22 said their businesses will take a step back. Similarly, 47 are confident enough to want to add to their workforces while just four said they plan to lay off some employees.

On a related labor note, those saying the availability of workers is (somehow still?) getting worse outnumbered those saying that supply is improving by a 3:2 margin. But both of those camps combined were less numerous than executives saying the tight labor market will get neither better nor worse.

Not surprisingly, that slightly negative take on labor is broadly reflected in respondents' 2023 compensation outlooks. While nearly 40% of those surveyed said they are looking to hold the line on salaries and benefits in the coming year, nearly as many said they will boost either their pay or benefit levels, and 24% said they'll invest more in both key elements of their teams' compensation.



Credit: Getty Images - 820286556

That's a collective mindset that could sustain wage growth near its current 5% level, even as headline inflation numbers retreat below that mark. (That's already the case on a rolling three-month cycle but a while away for the 12-month CPI number.) Combined with ongoing inflation fears—nearly half of our respondents said the expectation of rising prices is among their top three concerns for the coming year—rising personnel costs could keep today's above-average inflation higher for longer since they typically retreat far more slowly than they rise.

Executives' plans to continue to raise prices after several years of rising input costs (and maybe also ahead off the still-higher prices they expect to pay) also look set to contribute: Nearly 70 respondents said they plan to raise their prices "slightly"—admittedly, that's a phrase open to some interpretation—while nine said they have "substantial" price hikes in the works, and just four said they will lower prices in 2023. And that's with November's Producer Price Index still clocking in at 7.4%.

More than 50 of the leaders who responded to our poll said their confidence in their ability to hike prices was one of their top three reasons for '23 optimism. (By contrast, 37 leaders said not being able to pass along costs ranked highly on their list of concerns.) That confidence raises the specter of finished-goods prices climbing for a sustained part of 2023, well after the bill for many raw materials as well as freight services and other input costs began noticeably falling this summer and fall.

#### Tinged by worries

A recent Nationwide survey of small- and mid-sized business owners as well as insurance agents also produced a combination of overall confidence tinged by inflation worries: More than seven of 10 small-business owners and 85% of mid-market firm leaders said their companies are "heading in the right direction" going into 2023. Similarly, 77% of the middle-market business leaders surveyed said they plan to hire more people next year.

Here's the inflation "but," though: About twothirds of both groups of business owners said they expect inflation to have a greater impact on their efforts in 2023 than it has this year. And inflation ranks highest among both groups' concerns about their outlooks, with no other factor coming within 10 percentage points.

Another report speaking more specifically to concerns about wage inflation was recently published by the Poole College of Management at North Carolina State University and consulting firm Protiviti. The survey of about 1,300 C-suite executives and board members from around the world showed that the risk of rising labor costs hurting firms' ability to hit profitability targets has risen to third on the list, up from sixth a year ago. (A related first: The ability to attract and retain talent.)

"With companies struggling to fill open positions and inflation running hot, this issue has the potential to be stubbornly persistent," the report's authors wrote, later pointing out that rising labor costs rank as the No. 2 risk among companies with less than \$100 million in sales.

Among the manufacturing and distribution leaders who responded to the NC State/Protiviti poll, supply chain uncertainty was the most acute concern for the second year in a row, although sentiment has improved slightly from 12 months ago. Labor costs ranked third among worries, slightly behind overall economic conditions, but showed the largest year-over-year increase among the most prominent concerns.

A few other findings from our own poll:

- Just how confusing is the supply chain situation? Nearly three years after the COVID virus began to spread and disrupt trade flows, an equal number of respondents (58) put the evolving state of their supply chains as both a reason to be upbeat about 2023 or as one of their top three concerns.
- The Inflation Reduction Act, many parts of which officially come into effect Jan. 1, is expected to be a nice tailwind: Nearly a third of our respondents picked it as one of their three top reasons to be optimistic about the 12 months ahead. **IW**