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Azadi Ka Amrit Mahotsav

# DARK FACTORIES – Next phase of Smart Factories

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EM - Interview

**Prashant Sardeshmukh,**
Managing Director,
MMC Hardmetal India (p. 12)

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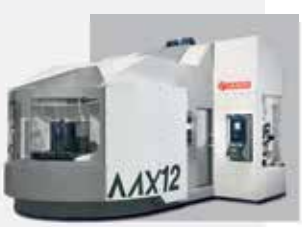


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*"Dark Factories are becoming a reality!"*

# Key to getting manufacturing right

Ratan Tata once said, "Digital India is no bubble; it's here to stay." Well, this is certainly here to stay, as post-pandemic, we have witnessed how an ecosystem of organisations across several industries has evolved with the help of digital transformation.

Integrating intelligent technology into all levels of an organisation has also been key for businesses to increase efficiency, improve customer service, and reduce costs. Historically, machines have both created and replaced jobs. With technological advancements in IoT and Virtual Reality & Augmented Reality, machines are replacing human labour as they can accomplish both cognitive and manual processes without humans' help.

With this in the background, the Indian manufacturing sector is steadily moving towards more automated and process-driven manufacturing. To expand at an exponential rate, Indian manufacturers must focus on creating cutting-edge products, seizing export prospects, focusing on productivity and efficiency through technology implementation, and targeting global volumes so as to obtain global cost competitiveness.

With this acceleration in disruptive and digital technologies, there is a possibility that fully automated 'light-out environments' or 'Dark Factories' will become a reality. Our Cover Story in this issue explains, how such factories operate without any human intervention and at the same time enable the growth of the industrial spectrum as manufacturing organisations explore the 'factory of the future'.

Highlighting such advanced concepts, EM magazine will continue capturing and circulating relevant content, facilitating manufacturing enterprises, and identifying and applying technology upscaling strategies to transition their businesses forward towards an intuitive future.

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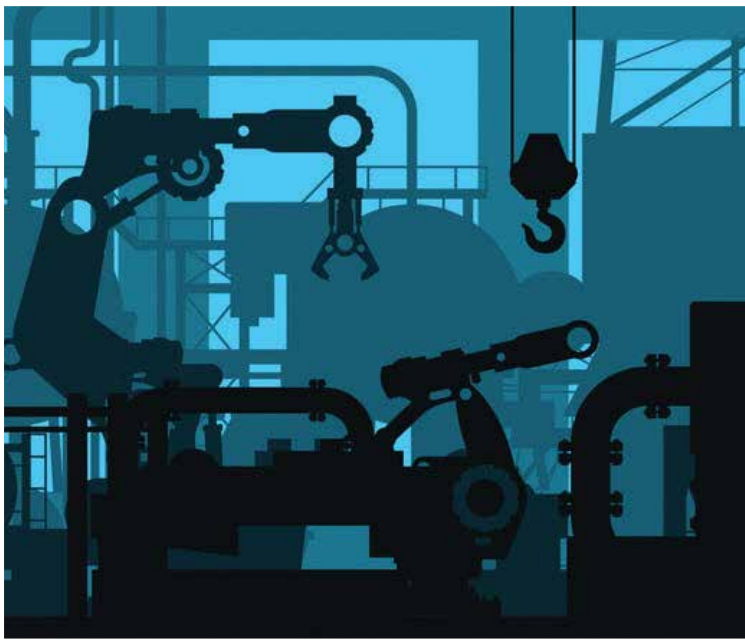






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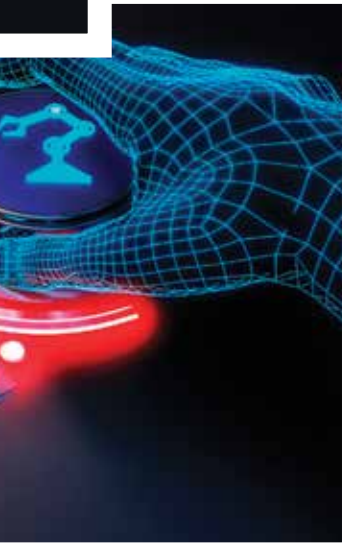

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Bharat Gite,
MD & CEO,
TAURAL INDIA

In a volatile macroeconomic environment, economists speak in rave terms about how India could be an outlier to the recessionary fears. From the IMF forecasting robust growth for India in 2023 to financial giants like Moody's and Morgan Stanley endorsing India's economic power and trusting it to become the third-largest global economy by 2027, 2021-2030 looks like India's decade to leave its mark on the world.

Considering India's manufacturing capability, as called out by the commerce and industry ministry in their India @ 2047 umbrella goals, we can capture 10% of the global trade, and I believe we will certainly surpass that target if the current optimism sustains in the long run. This optimism is justified by the fact that India's manufacturing prowess is pegged on domestic consumption alone.

Catalysing our growth is the growing global distrust against China in the post-pandemic world. On the other hand, the EU as a whole is descending into hyperinflation as geopolitical tensions erode the finances of large economies.

**The manufacturing springboard**

Today, India is the sixth-largest manufacturer globally and boasts a workforce that is over 50 crore strong. Our strength comes from our young demographic, effectively ensuring that the country will seamlessly transition into a manufacturing powerhouse in the near future. Bolstering our manufacturing prowess is the combined power of our developed states like Gujarat and Maharashtra. The latter pulled in FDI inflows of $58.7 billion in FY22, accounting for 26% of the cumulative inflows into India. Other states will soon reinforce their capabilities once we enable and empower the bottom of the pyramid and the workforce with the necessary skill set, infrastructure, and support.

*"INDIA IS EVOLVING INTO A MANUFACTURING POWERHOUSE OF THE FUTURE"*

**Turning challenges into opportunities**

First and foremost, the Indian manufacturing industry needs to strengthen its ecosystem to deliver exceptional solutions with a good turnaround time and global quality, which in turn will augment India's prominence on the global stage. India's private sector will have to increase its investment in infra-Capex, and bigger players will have to take incremental steps towards delivering world-class, end-to-end solutions. We should be proud of the tremendous progress we have made, but we should maintain our focus on digitising processes, upskilling our people, and sustaining operational efficiencies to produce reliable solutions.

We need to encourage the government to continue investing in infrastructure and bring in better policies and regulatory mandates to help achieve our dream of being a manufacturing powerhouse. We must strive to collaborate with them to support local sourcing and eventually create a supply chain ecosystem that leaves no man or material behind.

**The road ahead**

In any goal worth achieving, there are bound to be roadblocks. However, with better regulatory support, entrepreneurial vision, and skilled labour we can overcome them in our bid to become a manufacturing powerhouse.

Our central government has been the wind in the sails of the manufacturing sector given its aggressive focus on expanding Capex and bolstering infrastructure spanning roads, railways, ports, and airports. It is at this very juncture that the private and public sectors must leverage opportunities to capitalise on indigenous know-how and technical skills and move ahead strategically while cutting back on foreign dependency. The need of the hour is for each one of us to listen to the clarion call of our country's golden hour and be instrumental in advancing India on the global stage. ❐

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## BFW and M2NxT have finalised a firm system sale contract with ADaMS

**Bharat Fritz Werner Group (BFW)** and **M2NxT Solutions (M2NxT)** recently announced that they have finalised a firm system sale contract with Additive Design and Manufacturing Systems Laboratory (ADaMS), Department of Mechanical Engineering, University of Alberta, Edmonton, Canada. As the first metal AM Directed Energy Deposition System Made in India to be shipped to any international location, this export transaction represents a significant turning point for the entire Indian metal AM sector. This project is part of BFW/M2NxT global vision to democratise metal AM-DED solutions worldwide via innovation, automation, integration, and utilising the most premium technologies available in the industry, & as such, a strong tick mark in its journey to move aggressively forward with DED solutions for the Indian & global industries. Talking about the contract, Ravi Raghavan, MD, BFW India, mentioned, "We are happy to initiate the export of the first-ever LDED powder system from India. We stay committed to industrialise large format LDED & EBAM applications here in India – for the world."

## Bridgestone India announces organisational changes

**Bridgestone India** recently announced that Parag Satpute, MD, Bridgestone India will be assuming a new global role in Bridgestone's Solutions Business and will be stationed at Amsterdam, Netherlands on January 1, 2023. He is succeeded by Stefano Sanchini, VP Region – Middle East & Africa, Bridgestone who will assume Satpute's role at Bridgestone India. Sanchini will take up the position of Managing Director, Bridgestone India and will be based out of Pune, India. During the announcement, Sanchini, said, "I am looking forward to working in India. As we move into new technologies and mobility solutions, the Indian market is going to be a focus area and I am happy to be here as we spread out these solutions to the vast Indian customer base." On his move into a global role Satpute, expressed, "It has been an enriching experience heading Bridgestone India and working alongside a dedicated team that saw Bridgestone India gain leadership in the Indian market. I am also excited and looking forward to contributing towards Bridgestone's ambitions as a global leader in mobility solutions."


## ABB India publishes Industrial Energy Efficiency playbook under the energy efficiency movement

**ABB India** recently published the Industrial Energy Efficiency playbook which highlights 10-point action plan to help industries adapt and enhance energy efficiency and reduce emissions. Speaking at the launch, Sanjeev Sharma, Country Head & MD, ABB India, alluded, "This 10-point action plan is a blue-print for Indian industries to embark on their energy efficiency journey and walk along the sustainable growth path towards a brighter future." Adding his views, Kevin Lane, Sr Program Manager – Energy Efficiency, International Energy Agency (IEA), stated, "Energy efficiency is a win-win for companies and the climate. While industry needs to address climate change on all fronts – such as increasing use of renewable energy, investing in low-carbon processes and developing circular business models – energy efficiency stands out as the business-focused opportunity with the best near-term prospects for emission reductions." Further, Tarak Mehta, President – Motion Business Area, ABB, added, "So, rather than turning the lights off and halting production to save money, this important new report explains practical steps executives can take to reduce energy use and their bills while maintaining current operations."

## Cummins Inc and Tata Motors signs MoU to accelerate India's journey towards net zero emissions

**Cummins Inc** and **Tata Motors** recently signed a Memorandum of Understanding (MoU) to collaborate on the design and development of low and zero emission propulsion technology solutions for commercial vehicles in India, including hydrogen-powered internal combustion engines, fuel cells, and battery electric vehicle systems. The MoU was signed in the presence of N Chandrasekaran, Executive Chairman, Tata Sons, and Tom Linebarger, Executive Chairman, Cummins Inc, on November 14, 2022, at the Tata Sons headquarters, Bombay House, Mumbai. On this occasion, N Chandrasekaran, Executive Chairman, Tata Sons & Chairman, Tata Motors, said, "Our aim is to indigenise the cutting-edge hydrogen technology to offer our customers an expanded portfolio of green and future ready commercial vehicles, accelerate the adoption of sustainable mobility in the country, and to contribute towards India's net zero carbon emission goals." Adding to it, Tom Linebarger, Executive Chairman, Cummins Inc, stated, "Our collaboration in India is an important milestone for both the companies as we work together to accelerate the shift to a carbon-free economy and a zero emissions world."

## Virtuoso OptoElectronics opens a new manufacturing facility in Nashik, Maharashtra

**Virtuoso OptoElectronics (VOEPL)** has added a new manufacturing facility at Wadiware in Nashik, Maharashtra. Further, this is also in line with the committed investment by the company for the PLI scheme for white goods and LED lighting, for which VOEPL received approval last year. The third manufacturing unit of VOEPL will have in-house capabilities of manufacturing sheet metal components with presses ranging from 63T to 310T and will also have a state-of-the-art powder coating setup. The facility will further increase the ODU manufacturing capacity of the company, which is being done in line with the expectations of its customers and based on the received projections. Addressing at the occasion, Sukrit Bharati, MD, VOEPL, cited, "We need to meet consumer expectations by upgrading and enhancing our manufacturing capabilities as per their requirement. We received projections with increased demand from our customers and have decided to increase our capacities accordingly. The investment incurred for machinery used in this unit is part of the PLI scheme of white goods that the company has got sanction for."

Rajesh Rege, President, Honeywell India

## Honeywell and NewSpace Research & Technologies to collaborate on unmanned systems technologies

**Honeywell** recently signed a Memorandum of Understanding (MoU) with NewSpace Research and Technologies to collaborate on navigation systems for unmanned aerial systems. The two companies will jointly bring enhanced operational capabilities to unmanned platforms for military use, leveraging Honeywell's advanced navigation technologies. Giving views on the partnership, Rajesh Rege, President, Honeywell India, opined, "We are excited to bring our global capabilities in navigation systems for Unmanned Aerial Vehicles (UAVs) to advance research in the field in India. This will be a significant step towards helping develop India's defence capabilities and contributing to the vision of achieving Aatmanirbhar Bharat in defence." Speaking on the announcement, Matt Picchetti, VP & GM – Navigation and Sensors, Honeywell Aerospace, said, "Honeywell's resilient navigation system significantly reduces the Global Navigation Satellite System (GNSS) outage and jamming risk and enables UAVs to carry out missions in GNSS challenged scenarios." Adding to it, Sameer Joshi, CEO, NewSpace Research and Technologies, cited, "We are integrating some of the best resilient navigation technologies for robust operations in adverse and denied environments like the tactical battlefield area."


## Renishaw smart manufacturing solutions return to IMTEX 2023

**Renishaw** will showcase its latest innovations for measurement, calibration, and motion control, at IMTEX 2023, from January 19-25, 2023, at the BIEC, Bengaluru, India. The stand, Hall 3A, stand B103, will also feature a full end-to-end manufacturing demonstration of Renishaw's smart manufacturing technologies. Innovations on display include the FORTiS enclosed optical linear absolute encoder series which is ideal for use in harsh environments such as in machine tools and other industrial machinery. The RUP1 probe, showing for the first time in the IMTEX 2023, is a single-sided ultrasonic thickness measurement solution for use with the REVO® 5-axis multi-sensor system for Co-ordinate Measuring Machines (CMMs). Also on display will be Renishaw's new ACS-1, a machine tool probe calibration device aiming to make calibration more consistent, accurate and easier compared to traditional manual methods.

Visitors to the stand can also see industry-first, blue laser technology, and improved optics, Renishaw's NC4+ Blue systems deliver significant improvements in tool measurement accuracy, ensuring components can be machined more accurately and efficiently, through intermediate machining operations, to quality verification, the exhibit provides a clear insight into the full range of solutions that the company offers manufacturers.Expressing his views on return of IMTEX, Paul Weaver, Director – Sales & Marketing, Renishaw India, explained, "The cancellation of IMTEX 2021 was challenging for us all. Having an opportunity to finally take part in a large India exhibition again, reconnect with manufacturers, and display alongside industry suppliers and close partners is a welcome one."

# "All eyes on India in the wiring harness sector"

…says **Rohit Munot,** Director- Operations, Harnex Systems. In an interaction with Sanjay Jadhav, he talks about the growing wiring harness market and how the automotive sector is driving its size. Excerpts…

**The global wire harness market is expected to reach $197.39 bn by the end of 2031. How do you think Indian companies can strengthen their manufacturing potential along the same lines?**

Originally coined way back in 2013, the strategy of China Plus One is where companies around the globe have started shifting their focus away from China. India is one of the major beneficiaries of such businesses. The world is also feeling the heat of the same since the COVID-19 pandemic emerged. Wiring harness being a labour-intensive industry, all eyes are on India for the same. Compared to other competing countries, the cost of labour is extremely cheap in India. With the Make In India initiative, instead of importing raw materials from other countries, India can build the infrastructure in-house & build a great competitive advantage.

**An increase in demand for wire harnesses in the automotive sector is driving the size of the global market. How are you strategizing your business to meet the ever-increasing demand?**

With EVs emerging strongly across the globe, there is going to be a huge demand for wiring harnesses in the coming days. Not just the automotive industry, but all other industries (genset, off-road, road constructions equipment, etc) are also moving towards the use of alternate fuel. To keep up with this increasing demand, we have been increasing our capacity and have set up two new plants. One of which is located in Central India (Pithampur, MP). From here, we can cater to all parts of India. We have also been exporting certain wiring harnesses and are looking to expand our foothold in the export market.

**What are the key emerging trends in the wiring harness industry? How will they benefit the Indian market?**

Increasingly partnering with technology solutions is one of the emerging trends. Automation techniques like the use of IoT in machines, Industry 4.0, etc, are some ways of working efficiently. Wiring harnesses play a major role when it comes to working within the space and weight constraints of the vehicle. India's market, being full of resources, has an upper hand in contributing towards the above factors.

**With focus being given to sustainable solutions, how is Harnex Systems working so that its manufacturing facility meets the requirements?**

With one of our core values being eco-consciousness, our company has been awarded the Green Factory award. Moving towards a sustainable future, we work towards a lot of initiatives, like promoting the use of bicycles. There is an incentive of ₹500 per month for employees who use bicycles daily. We have solar panels installed at our facilities. The use of single-use plastic bottles is strictly prohibited. We also undertake tree plantation drives periodically.

**As a new-age leader, what are your future visions for the company?**

We believe in conducting our business according to certain values that we live by. We also believe in collaborative growth and are an extremely people-centric organisation. We encourage our people to explore their potential and help them realise it. With a purpose to create a sustainable society, our vision is to lead the industry through innovative solutions.

# "Disrupting drone operations in India"

…says **Shantanu Bhede,** Founder & CEO, DroneAdda. In an interview with Neha Basudkar Ghate, he highlights how Drones as a Service (DaaS) will be a game-changer in supporting the country. Excerpts…

**Can you brief us on how you started DroneAdda and how the journey has been so far?**

During my bachelor's, I got introduced to aeromodelling and drones which eventually landed me a job as a UAV engineer at my co-founder's (Amit Nimje's) startup.

But when the pandemic hit, we had to find means of survival, so we pivoted to provide IoT solutions to the enterprise. But I was obsessed with drones and always wanted to make an impact on the drone ecosystem. I spoke to the huge Indian drone community and identified a gap that I strongly believe we can fill. That is how DroneAdda was born.

**Can you elaborate on the present market scenario? What kind of business opportunities do you see in this segment?**

The GoI has been pushing hard to make the Indian drone industry more export-oriented. With drone policy liberalisation and schemes like PLI in place, we anticipate more investments and established names in the scene.

In addition, the massive opportunity for mapping and surveying for the government through tenders is creating a demand for service-based drone companies. We hope to see more investments in R&D and newer use cases and applications.

**There are multiple players operating in the same domain. Is this a highly competitive market?**

DroneAdda does not manufacture/build/assemble/white-label drones. We are a component manufacturer specialising in flight controllers, ESCs, control links, data links, etc. We are not into building drones since the vision behind the company is to enable more drone businesses. We are aligned with the GoI's vision of making India a global drone hub by 2030.

**Can you share your growth story so far?**

We are a pre-revenue company, still in the prototype phase. But it was nice to see such a huge interest in the domain from investors and the public alike. We even raised some pre-seed funds of around $60,000 when the company was still in its ideation stage. We plan on raising more in the pre-seed round, mostly for team expansion and inventory building. We are also in touch with many of our potential customers, and they have shown immense interest in our customisation service as well, which we believe is going to disrupt how drone companies in India operate.

**What are your plans regarding expanding the company in 2023?**

We plan to expand as efficiently as possible. We aim to build a good engineering team and expedite our R&D efforts. Along with that, we aim to set-up an assembly unit to lower our overheads and improve our unit economics.

# "Making the most of India's conducive business climate"

…states **Prashant Sardeshmukh,** Managing Director, MMC Hardmetal India. In an interaction with Neha Basudkar Ghate, he talks about the business dynamics of the company & analyses disruptive technology in the cutting tool industry. Excerpts...

**How is India placed in the global cutting tools market? How are you developing the business strategy for a promising outlook in the coming years?**

Currently, India's contribution to global output is negligible. India stands 10th in consumption and 13th in the production of cutting tools. One of our strategic developments is about making the most of India's conducive business climate. We are putting a major thrust on Make in India activities, thereby reducing our dependability on imports.

As a part of our strategic development, we have set up a facility at Aurangabad to manufacture the special tools to integrate with the market and extend speedy service. We have also launched a world-class technology centre in Pune to provide total technical support to customers in the Indian subcontinent. All these and many other efforts are intended to improve customer engagement and integrate the market.

**Looking back at your journey with MMC Hardmetal India, what do you think are the major milestones that you would like to share with us?**

Some major milestones for me include setting up the state-of-the-art manufacturing facility at Aurangabad, Maharashtra to integrate with the market and provide speedy service.

In addition, setting up the Mitsubishi Materials Technology & Education Centre (MTEC) at Pune is massive. It is a hi-tech facility providing total technological support to customers in the Indian subcontinent. Early this year, we acquired business rights for products manufactured by Moldino Tool Engineering. This company is known for the best quality tooling solutions for die & mould industry. With this acquisition, MMCI now has a wide product canvas and resourceful services on offer. Lastly, we are proud to expand our sales operations beyond our shores to cover the overseas markets viz gulf region, Sri Lanka, and Bangladesh.

**Optimising cutting conditions is critical to reducing time for customers. How is your R&D working towards this?**

Due to advanced digitalisation in the manufacturing area, all machines are interfaced with the main server. This helps to have better flexibility in manufacturing and results in dynamic machining practices.

To optimise the cutting conditions, it is necessary to accurately understand or identify customers' needs and future technological trends. Our R&D division closely connects with the customer support team, sales team, and distributors to understand the pulse of the market. We organise customer engagement programmes and interactive sessions to share our technological developments.

While providing new proposals that precisely meet the customer's critical needs, we pursue the interactive session called Materials Premium, which is intended to have a

*Prashant Sardeshmukh, started off his career as a Trainee Engineer at Bajaj Auto. He further moved on to Pune Heat Treat as Production Executive engaged in the manufacturing of steering components for all Maruti Suzuki Vehicles. He then championed his growth as CNC & Tool Engineering Executive at KSB Pumps and then went on to become a Senior Sales Engineer at Widia India. Sardeshmukh has completed his BE (Mechanical) from Walchand College Of Engineering, Sangli and now he is the Managing Director, MMC Hardmetal India.*

threadbare analysis of the machining process, component metallurgy, tool geometry, finish tolerance of the components, machine speed-feed, and so on.

Similarly, the work holding of the component and the yield due to machining thrust are taken into consideration because nowadays we see more and more components made from aluminium alloys. These are vulnerable to work holding.

**With India looking to corner a role for itself as a global manufacturing hub, how is the cutting tool industry seizing the opportunity?**

The cutting tools industry in India has a marginal standing on the global scale. But considering India's favourable business environment and encouraging the growth of the Indian economy, it has the potential to achieve phenomenal growth. The government of India has recognised this potential and has launched many initiatives and programmes to give a fillip to the cutting tool sector. Many key players are partnering with the government to seize the initiative. This is helping us to reduce import dependence.

> "THE CUTTING TOOLS INDUSTRY HAS THE POTENTIAL TO ACHIEVE PHENOMENAL GROWTH AT GLOBAL SCALE

The cutting tool sector is also pushing for support to encourage the machine tool industry because it is considered to be the mother of the manufacturing world.

**How do you assess the disruptive power of new technologies at an early stage and build a sustainable plan to respond to the technological disruptions?**

Any technology or innovation that significantly influences the consumers' habits and lifestyles, as well as industrial and business operations, can be termed as a disruptive technology. It sends old technology and business practices into oblivion. Certain examples of disruptive technology in our day-to-day lives are e-commerce, mobile banking, digital wallet apps, online shopping, GPS, and so on. They supersede the older processes, products, or habits because of their superior technological attributes compared to the older technology.

When it comes to building a sustainable plan to respond to technological disruptions, we need to recognise the potential of disruptive technology. Companies or businesses that fail to account for the effects of this technology are likely to find losing their ground to the competitors. Therefore, it is necessary to integrate our systems and operations with this kind of technological innovation and advance with the changing times. In other words, we can synergise with it and evolve our model by integrating our best practices with it, but without compromising our business values, safety, ecology, environment, and quality of our products and services.

**What are the key areas you are focusing on in the coming years for effective business development?**

Considering the likely business landscape for the cutting tool industry in the coming years and the challenges and opportunities that may unfold, we look forward to enriching and energising our resources. We focus on making our team versatile, motivated, and agile to grab opportunities as much as possible. Similarly, we are keeping ourselves updated in terms of our technical knowledge, emerging engineering trends, new-age technology, advanced software, and specialisation in metal cutting, etc.

At present, we are mainly catering to the automotive sector, like many others. However, considering the high growth prospects of other sectors like die & mould, oil and gas, aerospace, renewal energy, defence, railways, medical, etc, we are intensely expanding our business horizons to cater to these sectors. □

# Dark Factories – Next phase of Smart Factories

The evolution of the industry has seen standardisation, mechanisation, automation and intelligent & self-governing machines as part of the Industry 1.0 to 4.0 or 5.0 stages. As an extreme side of automation, the concept of self-running, completely automatic factories without any intervention of mankind are getting known as 'Dark Factories'. A read on…

Shirish Kulkarni,
Founder & MD,
STROTA ConsulTech

Evolution of Dark Factories

As the industry evolution continues with the perspective of smart manufacturing, IIoT (Industrial Internet of Things), Industry 4.0 -> 5.0, AI/ML for data-based decision making- the concept of factories, which can work continuously and independently - without any human intervention – round-the-clock is getting evolved as 'Dark Factories'.

With such factories, there are indeed gains like increased productivity, even up to 250%, errors decreased by 80%, reduced production costs, lesser outages and revenue losses, and reduction of scrap are ensured, while the higher initial costs, involved and sophisticated product systems, complexity in safety and failure prevention are definite aspects that raise the challenges in the design, development, deployment and running of these Dark Factories.

## Adopting Dark Factories

It is evident that Dark Factories is a concept to be around and will stay to become a part of reality and would be constrained by the balancing concepts in Industry 5.0 like human centricity, resilience and sustainability. It is proposed to have a maturity framework for evaluating any existing factory for its readiness to become a Dark Factory – which will get established and would be leveraged as entry-baselining criteria of evaluation. Some of the global companies have already shown some proof points and we would see more and more portions of industries adopt it.

As a technical definition Dark Factories are futuristic factories where machines will be fully automated and can function without human power or with less human power when compared to the current smart factories. Dark Factories are claimed to increase productivity with zero-error in manufacturing processes and are estimated to eliminate almost 90% of the human workforce without compromising the production routine.

The section below will outline the possibilities, constraints, pros-and-cons of the Dark Factory – from concept to realisation and bring out some realities to set a baseline for the future.

## Evolution of Dark Factories

Industry 4.0 brings about the concepts of connected, self-governed, self-decision-making and intelligent manufacturing (and other parts of the value chain) in an enterprise. While Industry 4.0 and smart factory are not a fantasy but a reality that can bring in a more effective and agile system, less production downtime, transparency and help place themselves better in the competitive marketplace.

As we progress on these lines and the industries evolve with a higher level of maturity, this will automatically result in less or non-manual intervention. This means machines will work round-the-clock and all-days-a-week and all-days-in-the-year.

The intervention and maintenance processes are also automated, self-triggering and self-corrected using AI and ML. Humans can be remote and watch the control element from dashboards and check if the exceptions are handled by the self-learning system as a checkpoint. This is exactly how the concept of Dark Factories has evolved. An equivalent term for Dark Factories is Lights-out Manufacturing, which implies that the plant continues to be productive even when the lights are out.

## Analysing possibilities

During the pandemic, industries with advanced machinery had a higher chance of continuing their manufacturing processes. It has brought a clear realisation that there is a need to have more sophisticated and automated systems for the industries to run on an auto-pilot mode, and surely this will lead to the implementation of Dark Factories.

With fully automated factories, we will never have to worry or wait to begin front-line production. It can be turned into a continuous process. Incorporating lights-off methodologies into floor plans saves cost, space and time. Research reveals that a fully automated factory can increase productivity even up to 250% and the errors decreased by 80%. No doubt within a period of five to

The current advances on the technology front are resulting in a lot of movement of factories

ten years, industries across the world will embrace the change of becoming smart factories and those who already run a smart factory will transform into fully automated Dark Factories.

## The positive drivers

The current advances on the technology front are resulting in a lot of movement of factories to following directions, emerging as the positive drivers for making Dark Factories a reality.

- The rapidly falling price of robots (on a side note: we also need to emphasise the fast growth of the cobots market where ease of use and flexible advanced cobots attract buyers while the strict separation between robots & cobots disappears)
- Continuously increasing labour costs in manufacturing (let's also not forget the labour shortage and skills gap that exists for some years in some countries in manufacturing)
- Classic drivers such as cost savings and increasing production output
- The need of companies to expand production capacity beyond traditional shift hours, for instance, to take on additional orders and other reasons to ramp up production (remember how the pandemic hindered manufacturing output)
- The need to be more flexible (one can think of unexpected production of a-typical goods as during the pandemic here too), more resilient (business resilience being the new holy grail), and shock-proof
- The opportunities 'lights out' offer to innovate and embrace new opportunities and manufacturing approaches
- Sustainability possibilities with energy-saving opportunities during production hours.

## Towards the new reality

Dark Factory is likely to be a new reality, and it is on its way to becoming the new norm for the next stages of mass production and automation. The expansion of lights-out production can be attributed to result into the following benefits:

- **Lower production costs** – The primary benefit of dark manufacturing is low costs. Employee salaries are eliminated due to the lack of a workforce, as articulated robots can work in dark and non-climate-controlled situations, thereby, conserving utilities.
- **Enhanced productivity and product quality** – Since a single robot can complete tasks that would typically need multiple employees, robots help boost plant productivity substantially. Besides, accuracy and precision lead to better product quality. As robots are designed to obey application-specific instructions, uniformity in workpieces results in minimal inconsistencies.
- **Eliminates labour availability issues** – Manufacturers have faced labour shortages in recent years, particularly for skilled labour roles. The pool of resources interested in manual labour has been shrinking day by day, making it challenging to fill vacancies and keep the continuity in the production line. This problem is solved by using automated equipment to fill robotic positioners instead of employees in Dark Factories.

## Challenges while rolling out Dark Factories

Dark Factories come with a mixed bag of pros and cons. One foremost disadvantage of changing to an automated facility is the initial costs. Existing traditional businesses tend to come across this issue more than newly designed facilities. The structural change that comes with automation, as well as new equipment to allow automation, can add up to a big initial investment.

Following are the challenges that a manufacturer may address when rolling out a Dark Factory:

**Human workforce:** A significant impact of automation affects the human workforce. Automation makes way for new jobs in different fields of expertise. There is the potential to assign human jobs, which are mundane, repetitive and full of risk/danger to life to robots and machines instead. The rise of Dark Factories also has the potential to cause a shift in the demand for jobs.

**Architecture transformation:** Some of the manufacturing facilities are decades old and are often in brownfield locations. A conversion to a Dark Factory would require a significant

Dark Factory is likely to be a new reality

change of architecture and hence capital, along with a suspension of operations, so that the new equipment can be installed, calibrated and tested before operations resume.

**Technical challenges:** Setting up completely automated processes can be a highly technical challenge that may require significantly advanced technological solutions, that allow manufacturers to collect and use machine data to automate processes, with ROI occurring in as few as five years or more easily and quickly.

**Complex production:** Simple, repeatable, mundane and risky tasks are the best fit for standardisation and hence automation. More complex tasks, which involves skills and tacit knowledge of human, as well as small-scale production runs and operations, may prove more difficult to roll out automation or experience enough value.

**Safety and failure prevention:** There is a catch with having no humans monitoring production. If something does go wrong, there may be no one to catch it, which could result in thousands of dollars' worth of scrap parts, or significant damage to machines. Luckily, remote monitoring and automated machine failure detection can work to avoid these issues.

## The technological advancement

The installation of a Dark Factory needs strategic planning for the effective use of tools and technologies. The lack of strategies could lead to various challenges like safety, reliability, flexibility, and network performance. Besides, expensive installation costs and a lack of quality are other major challenges. We can overcome these challenges through the effective use of the below technologies:

- Advancements in robotics, automation and 5G
- Innovative processes like 3D Printing
- Advancements in automated non-destructive inspection and quality technologies
- Operational Technology (OT) that conducts unattended production processes
- Artificial Intelligence/Machine Learning (AI/ML)
- Virtual Reality (VR) and Augmented Reality (AR) technologies designed for industrial applications

## Constraints

Industry 5.0 is a model of the next level of industrialisation is characterised by the return of manpower to factories, distributed production, intelligent supply chains and hyper customisation – all aimed to deliver a tailored customer experience time after time (Frost & Sullivan).

Industry 5.0 brings in the perspective of building a constraint or self-governance to the degree of automation, machine-dependency and inclusion of the human-element – by the three governing pillars named:

1. **Human-centric:** Engages human at the intelligence and correction level.
2. **Resilient:** Drives the flexibility element to accommodate the fast changing market requirements and dynamics due to technological disruptions.
3. **Sustainable:** Dimension of the sustainability of the ecosystem, environment and hence the planet.

These three pillars build a logical constraint to the self-wheeling growth of self-limiting and self-governing systems, which might result in getting into a risk of uncontrolled situations. Industry 5.0 recognises the power of industry to achieve societal goals beyond jobs and growth to become a resilient provider of prosperity, by making production respect the boundaries of our planet and placing the well-being of the industry worker at the center of the production process.

## What is the maturity framework?

A maturity framework to evaluate the state of any factory for its readiness to adopt the concept of Dark Factories is proposed. This will have tenets of mandatorily required elements put in various layers, right from the hardware to the analytics or dashboarding layers – covering perspectives of the state-of-the-art infrastructure, real-time data acquisition and processing systems, control systems, supervisory systems, and

Dark Factories have become popular among diverse industries

then the planning and management layers.

With this comprehensive framework, the factory's gap to reach the maturity for the required readiness to adopt the Dark Factory is calculated and becomes an indication of how far or how quick and expensive is the journey for this factory to reach the destination. This framework could also be used for the due-diligence phase to identify the gaps for each of the sub-elements and methodically be able to close them in a phased manner to aim at achieving the required readiness.

## Dark Factories – Some examples

In recent years, Dark Factories have become popular among diverse industries. China is number one in the world to adopt Dark Factories. Japanese robotic company FANUC uses Dark Factories. The company is making robots with the help of robots since 2001. The latest study says that the company is building around 50 robots in a day without light, heat, or air. Also, a Dutch company, Philips, has already implemented Dark Factories for making electric razors. The company has only nine humans working as quality assessors to supervise processes.

**FANUC** – A secretive Japanese company that is arguably one of the first companies to implement a Lights-out Manufacturing culture.

**Amazon** – The technology giant extensively uses robotic systems in their distribution centers with minimal human intervention.

**Philips** – A company known to produce electric razors, among other things, that boasts of a facility with 128 robots while employing less than a dozen employees for quality assurance.

A diesel automotive facility in China has also implemented more of a Dark Factory approach to automate its assembly line more fully. Sensors embedded in the robotics alert workers when bottlenecks occur, or when the machine's state and run-time require human intervention. Integrating advanced analytics and Internet of Things (IoT) technology has also helped the facility use predictive maintenance to avoid equipment breakdowns. These examples are going to make more and more manufacturing end-to-end use cases to be covered using the principles of automation, visibility, control and predictive modelling.

## Going ahead with Dark Factories

Dark Factories are meant to implement crewless operational areas on the shop floor, or crewless phases of the manufacturing process, a lights-sparse factory generates new efficiencies, lower costs, and in some instances, improved quality compared to the existing conventional operations. This approach is observed to result in benefits, such as:

- Reduced labour costs
- Automation of monotonous processes
- Agility and flexibility to meet changing demands
- Reduced error rates
- Material management efficiencies
- Accelerated product lifecycles
- Faster replication of processes to new sites

Digital transformation has become a priority in the manufacturing industry. For industrial companies, Dark Factories are a modern manufacturing choice where operations take place in a round-the-clock fashion. These businesses seek to execute tedious and risky operations in a safe environment. The arrival of Dark Factories is enabling to running of a factory using programming robots and automated manufacturing systems without human interference.

We are already aware that Dark Factory is the outcome of different technologies. Making technological advances using state-of-the-art solutions in manufacturing processes would encourage industries to adopt the future of factories to be competent in technology. There are factors to be considered as feasibility, benefits, associated regulations and compliance with business objectives irrespective of technologies. It is recommended to leverage the maturity framework to arrive at the readiness index for the factory under consideration to build the road map for the transformation into a Dark Factory state. □

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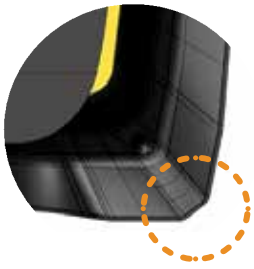

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# Data drives the operational efficiency

In the data-driven economy, turning data into actionable analytics is the best way to boost efficiency, quality, & productivity. This column illustrates, data playing a crucial role in industries increasing the manufacturing operational efficiency.

Siddhant Bery,
Managing Partner,
KSP INC

With the high rate of adoption of sensors and connected devices, there has been a high increase in the number of data points generated in the manufacturing industry. The term Big Data refers to increasingly complex, massive data stores that can't be effectively processed using traditional methods. In the manufacturing sector, Big Data involves collecting information from a variety of sources, including machine sensor data, quality assurance information, data from suppliers, production output, maintenance, financial information, and basically any other measurable process that goes into modern manufacturing.

Manufacturers collect such data for a reason: this Big Data can be processed and refined into business insights that can help massive financial growth, customer retention, savings on maintenance, warehousing, and unexpected downtime, among other things. Using the power of Big Data and manufacturing analytics, manufacturers are able to add value, efficiency, and productivity to their businesses while knowing that the moves they make are calculated and based on accurate data. This increases not only the likelihood of success, but also confidence in the ideas that are implemented. According to some reports, the global Big Data industry in the manufacturing industry was worth $3.22 billion in 2018 and is projected to reach $9.11 billion by 2026, exhibiting a CAGR of 14.0% during the forecast period.

## Why is the use of data growing in the manufacturing industry?

To make increasingly complex decisions and gain deeper insights, modern day manufacturers are relying more and more on data from a variety of sources. As more data is gathered from the shop floor and transformed into usable reports, data-driven decisions can be made that were simply not possible before.

Another reason the use of Big Data is growing in the manufacturing industry is because it's easier to access. The barrier to entry for implementing industrial internet of things (IIoT) devices and smart factory equipment is at a historical low. Manufacturers can easily and affordably measure many aspects of their business, both in terms of data capture and

data warehousing & storage. Also, modern markets push manufacturers toward the use of Big Data in order to stay reliable, efficient, and relevant to their target consumers, while remaining competitive in the marketplace. Big Data is allowing manufacturers to take the next step in their journey of continuous improvement. Additionally, the benefits of data in the manufacturing industry range from several preventive level advantages to aiding in predictive decisions.

## Greater competitive edge

The manufacturing sector has been at the centre of technological innovations. Whether it is mobile connectivity, industrial IoT, or next-generation hardware, the data that is generated through all the different mediums helps raise competitiveness to the next level. Big Data provides greater insights into market trends, a better understanding of customer needs, and future trend forecasts. In a nutshell, it provides everything that gives manufacturing houses a massive competitive edge.

## Less downtime

Hardware downtime can be a major productivity hazard in the manufacturing sector. It doesn't just hamper employees' time but also requires a lot of maintenance and troubleshooting. Now, the solution that the manufacturing industry has found for the issue is using industrial data analysis to perform preventive and predictive maintenance on their hardware. It also assists manufacturers in keeping track of hardware quality assessment by analysing their efficiency and daily work.

## Greater customer services

The manufacturing industry is now utilising advanced sensors to provide big-data powered alerts to field technicians regarding maintenance requirements, as well as Radio-Frequency Identification (RFID) tags to monitor the condition of units and data-driven reports that offer accurate suggestions for improving customer service.

## Supply chain management

Big Data analytics in manufacturing enables manufacturers to track the location of their products.This ability to track down the location of a product using new age technologies such as radio frequency transmission devices and barcode scanners solves the problem of products becoming lost or difficult to trace.What this means for customers is that businesses are able to give them a more accurate delivery timeline.

## Production management

One of the key productivity indicators for a manufacturing industry is determining what the market needs and what volume of goods they need to create. Earlier, when Big Data in manufacturing did not exist, businesses relied on human estimates that led to goods being produced either in excess or in shortage. Also, it helps with giving businesses important predictive insights that help them make the right choice.

## Agile response to fluctuations in market demand

The incorporation of real-time manufacturing analytics, specifically in the Customer Relationship Manager (CRM) system, can help the manufacturing industry forecast the future in real-time. The analysis of data can showcase the difference in order and consumption patterns that can be used to drive the adjustment in production. Also, the Big Data-driven intelligence gathered from the CRM data can help with knowing what the customers are asking for and then preparing the production cycle in a way that the time to respond is minimised.

## Speeding up the assembly

With Big Data analytics in manufacturing, businesses have the capability of segmenting their production and identifying the units that get manufactured faster. Big Data helps the manufacturing industry know where to focus its efforts to get maximum production. It also helps manufacturing houses identify the areas they are most efficient in, along with the ones they need to work on.

## Identification of hidden risk in process

The analysis of data around the equipment's past failures enables the manufacturing houses to forecast its lifecycle and set up the correct predictive maintenance schedules, which are either usage based or time based. It also assists in detecting gaps, reducing waste and downtime, and assisting businesses in developing a recovery plan in the event of an unexpected failure. Additionally, Big Data when combined with Artificial Intelligence (AI), enables the manufacturers to automate the processes so that they self-optimise without human intervention.

## Product customisation is feasible

Manufacturing houses have focused on producing at scale and left customisation to enterprises serving the concentrated market. Data analysis for manufacturing makes customisation possible at the manufacturing process by predicting its demand


In the coming years, big data will continue to grow depending on market projections

and then giving the manufacturing houses enough lead time to produce customised products at scale. Additionally, using Big Data, manufacturers are able to streamline their manufacturing processes by eliminating waste and predicting demand. This streamlining helps them with the time they require to do mass personalization of the products.

## Improvement of yield and throughput

Big Data technology helps manufacturing houses find hidden patterns in their processes, enabling them to pursue their continuous improvement initiatives with greater certainty. The result of this can be seen in a rise in production.

## Price optimisation

The price point of a product can be decided with the help of Big Data. The technology can collect and analyse data from multiple stakeholders, like customers, suppliers, etc, to determine the best price point that suits both customers and businesses.

## Image recognition

A manufacturing house can find a range of image recognition specific use cases for Big Data analytics. Let's see an example: suppose you require a specific spare part, but you don't know what it's called or how much it costs. A Big Data powered image recognition software can help businesses capture the image and give the details back to the manufacturers.

## Improved customer service

The ability to analyse customer data at every stage of their journey, from marketing to sales to reviews on social media, means that customers are able to receive top-notch, data-driven service that addresses their real wants, needs, and concerns.

## Cloud technology will make Big Data more accessible

One of the major advantages of cloud computing is that it allows people to access applications from anywhere. Big Data will most likely become more pervasive throughout the business in the coming years and will no longer be the domain of specialists. Each manager and other non-managerial employees, will be assumed to be capable of working with Big Data, just as most knowledge workers today are supposed to have basic computer knowledge to gather data. A study of large data sets will be a requirement for almost every business decision, much as a simple cost/benefit analysis is for manufacturing houses.

## Metadata system will be smarter

The organised information that comprises Big Data about the properties of other details is called metadata. This permits huge data measures to be restricted, mixed, captured, and also handled in the distribution and across several data stocks. As the entire process is secure, data is increasingly available and can likewise be used for future undertakings. This is one of the upcoming Big Data trends that will lead to automated metadata processing in the manufacturing sector. These will be gradually designed with AI to allow versatile, dynamic, and fast data systems.

## Big Data will continue to grow

In the coming years, there will be a lot of regulation and monitoring of data usage in the public and private sectors. Big Data will continue to grow depending on market projections. This will affect the way companies and organisations look at business information. The companies should be eager to strengthen their efforts to adjust their business operations. Moreover, it has saved operators time, as machining no longer needs to sort the scrap parts, allowing both them and the machines to be focused on producing good parts and generating revenue for the company. Furthermore, manufacturers use Big Data to keep factory floor workers on track through the use of visible statistics that update in real-time. With this, workers are able to understand where they stand in relation to production goals, as well as react quickly to any problems on the shop floor, such as a downtime event. ❐

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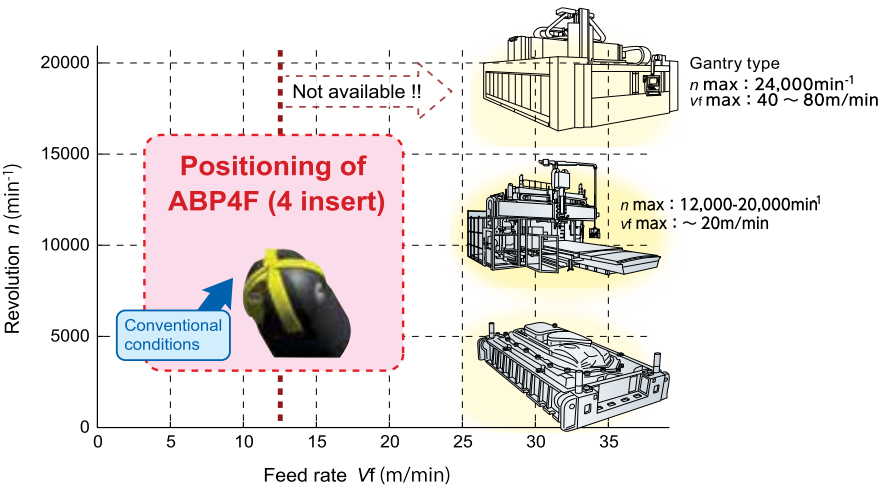
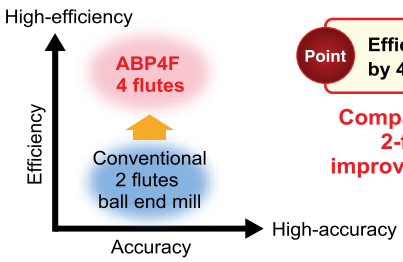



## Processing advantage of 4-flutes end mill

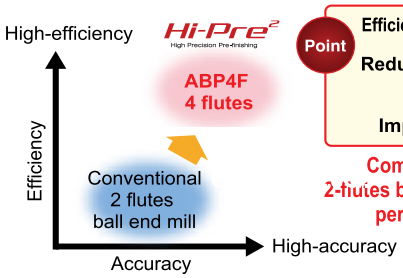
Figure Finishing




Point **Efficiency improves by 4-flutes end mill**

**Compared with conventional 2-flutes ball end mill, improves cutting performance.**

Figure Semi-Finishing




Point
Efficiency processing with small pitch
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**Compared with conventional 2-flutes ball end mill, improves cutting performance and accuracy.**


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Images courtesy: Deloitte

# Cybersecurity to safeguard operating technology

The fourth industrial revolution heralds an era of tremendous potential for innovation and growth. It also brings new risks and challenges, this might be most evident in today's manufacturing cyber landscape. This section explores how cybersecurity has been prioritised by manufacturers, with a focus on OT cybersecurity to safeguard operating technology assets, systems, and processes from cyberattack and comply with strict regulatory requirements.

Somnath Banerjee,
CISO,
WhizHack Technologies

Manufacturing has long been a foundational part of the global economy and a leader in technological innovation. In a world dominated by a focus on the fourth industrial revolution, and what has been called Industry 4.0, manufacturers have increasingly adopted robotics, Artificial Intelligence, Machine Learning, and advanced analytics.

## Adoption of new technologies

In an effort to increase productivity in their operations, many manufacturing companies became some of the earliest adopters of technology. Paperless trends among other industries, manufacturers using technology to store employee records, credit accounts, transaction information, banking account transactions, and even trade secrets. Industry 4.0 is revolutionising the way companies manufacture, improve, and distribute their products. As manufacturers strive to keep pace with adopting new technologies that come with the next phase of the industrial revolution, it has resulted in manufacturers digitising their environments.

However, while this has its benefits, such as increased automation, process improvements, and new levels of efficiency,

it is also exposing critical Operational Technology (OT) to security vulnerabilities and presenting new windows of opportunity for cybercriminals. Since last year, there has been an 88% increase in OT vulnerabilities, which are used to attack critical infrastructure and expose vital systems to potentially devastating breaches. More specifically, 89% of electricity, oil & gas, and manufacturing firms have experienced cyberattacks impacting production and energy supply over the past 12 months. With OT systems supporting high-level control systems & other essential industrial equipment, attacks on these vital assets can inflict severe economic damage and even endanger public health and safety.

Manufacturers are aware of the threat, and the cybersecurity of their networks is being prioritised in response. In fact, cybersecurity is an urgent priority for 63% of manufacturers, with almost half (43%) investing in security, firewalls, and anti-virus precautions. However, one of the biggest challenges is that not all OT assets can be easily patched or run anti-virus and other endpoint protection agents. Industrial control systems in OT environments often use legacy or outdated equipment and software that no longer receives security updates. Scanning the systems may disrupt operations, and applying patches requires taking these systems offline for maintenance, which is not only expensive but disruptive to critical operations.

## OT security challenges

OT systems are burdened with a long list of cybersecurity concerns, including:

- Equipment with decades-long life cycles
- An inability to patch systems due to stability concerns
- And a lack of basic cybersecurity features such as user authentication or encryption

OT cybersecurity has traditionally been its own discipline. OT cybersecurity can be defined as: "The practises and technologies used to protect people, assets and information involved in the monitoring and/or control of physical devices, processes, and events, particularly in production and operations." Over the years, as IT has been incorporated into OT systems, the approaches to cyber protection have also merged, but the primary goals of the two disciplines remain distinct. The weakest spot for OT attacks might not be the networks. Organisations are struggling with the complexities and the lack of protocols and entrusting standardisation. Almost every ICS/SCADA vendor is aware of how the risks permeate the OT environments and how crucial it is to protect the networks. On the other end, the ongoing digital transformation efforts will expose decades-old legacy systems to malware attacks. The structural problems are worsened by the lack of (OT specific) cybersecurity controls in these environments, which allows hackers to take advantage.

## OT security solutions

Manufacturers should be focusing on creating a specific OT cybersecurity plan, integrating OT and IT cybersecurity efforts as much as possible, and looking to bundle OT cybersecurity more fully into broader enterprise risk management strategies. Business considerations are driving a wholesale revolution in manufacturing technology deployment, and OT cybersecurity strategy needs to be viewed as a foundational core competency within manufacturing organisations.

Recently, Indian companies have developed OT security solutions that can be scaled up and applied to on-premises assets, including specialised infrastructure such as fuel sensor networks in oil refineries. New deception technologies can first disrupt attackers' attempts to probe the network and then feed false information to them. This is quickly becoming imperative for organisations that have begun introducing digitisation, AI, and cloud-based infrastructure. The most effective unified security systems encompass all OT and IT elements, including IoT, industrial IoT, mobile, and wireless devices.

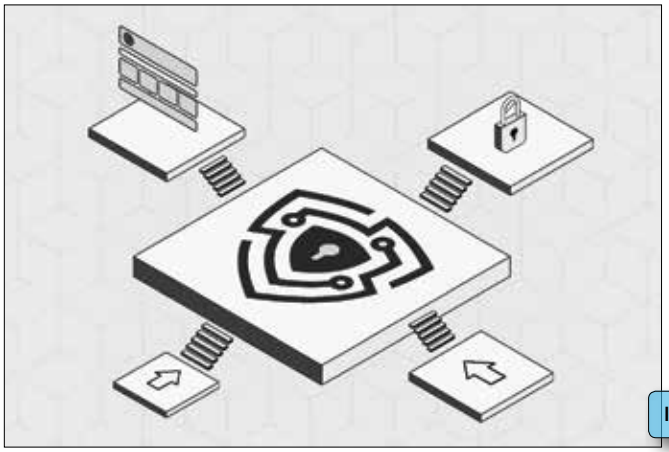
## Next phase of OT security

The next phase of OT security will be adopting stable cloud infrastructures for storing Big Data from both a manufacturer and its customers. By combining these in a data lake, companies will be able to apply Machine Learning algorithms to gain additional insights and recommendations.

Traditionally, security was not as critical a consideration because a manufacturer's OT network was designed to be isolated, running less-known industrial protocols and custom software. Those systems had limited exposure, whereas, today, OT environments have converged and are often no longer air-gapped from IT networks, meaning that the lack of security measures poses a critical risk. Unfortunately, this connectivity has not gone unnoticed by threat actors. ICS and OT-specific malware such as Indus Troyer, Triton and In controller are evidence of the increasingly sophisticated capabilities that attackers have begun to deploy in attacking ICS and OT facilities, resulting in many serious incidents.

## Insecure by design

Furthermore, recent research has revealed 56 new



Insecure by design practices

vulnerabilities in 10 operational technology (OT) vendors' products that demonstrate significant insecure-by-design practices. Of the sectors observed, manufacturing is at the top (26%), with almost a third of affected devices still in use. Alongside this, the research has found affected products to be prevalent in industries such as oil & gas, chemical, nuclear, power generation & distribution, water treatment & distribution, mining, and building automation.

Most OT devices are insecure by design, with vulnerabilities stemming from unauthenticated protocols, insecure firmware updates, and unsafe native functionality. For instance, 38% of the vulnerabilities discovered allowed for credential compromise, and 21% gave attackers a way to introduce poisoned firmware into the environment. In addition, 14% of the flaws stemmed from native functionality — such as logic downloads, firmware updates, and memory read/write operations — that gave attackers a way to execute malicious code remotely on OT systems.

In fact, one of the biggest issues facing OT security is not so much the presence of unintentional vulnerabilities, as it is the persistent absence of basic security controls. These devices often lack the critical controls needed to authenticate users and actions, encrypt data, and verify whether firmware updates and software are signed and verified. When these mechanisms are present, they are often weak and easily hacked or seriously undermined by other issues, like the presence of hard-coded and plaintext credentials on the device.

The research also found that many insecure-by-design devices have security certifications, which often results in a false sense of security, & can lead to significantly complicated risk management efforts. The testing requirements of these certifications are sometimes limited to functional verification of features rather than stress testing of defensive capability; so as long as the feature is present, it is assumed that it is secure. Another issue is a general lack of common vulnerabilities and exposure (CVE) reporting for industrial control systems. Issues considered the result of insecurity by design have not always been assigned CVEs, so they often remain less visible and actionable than they ought to be. Vulnerabilities in supply chain components also do not have a great track record of being reported by affected manufacturers.

## OT attacks can be minimised by having the below solutions

**1. Endpoint management software**

Manufacturing companies use many types of devices that are connected through the IoT/IIoT. In order to prevent the threat of hackers, endpoint devices such as laptops, smart phones, tablets, bar code readers, and more should only be allowed to access your network after it has been proven that they comply with the network's security criteria.

**2. Policies, procedures, training, and testing**

Identifying the strengths and weaknesses in the systems and cross-checking between departments, functions, and personnel can help to ensure process flows are up-to-date. Combining this with a properly designed and enforced system of operational and financial controls can help defend the resources. It is also crucial that the employees understand the policies and procedures and are trained to know what to look for when it comes to IT/OT security.

**3. Network segmentation**

Manufacturing companies can reduce their risk of a full-fledged intrusion by dividing their network into zones and conduits. Not only does this improve the security, but it also improves the ability to monitor and control what is happening in company's network.

**4. Layered security models**

Having multiple layers of security in place is a step towards securing your manufacturing company from outside intruders. If these security measures are performing correctly, hackers will have many obstacles to jump through, making detection and remediation easier. Uses triple layer engines containing industry standard mature signature technology with highly optimised Machine Language (ML) and Deep Learning (DL) based models working in conjunction to detect network-based attacks on data captured by multiple agents. □

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# Solving real-time complexities with digitalisation

The article explains how technologies like Augmented Reality and Virtual Reality will enable the manufacturing industry to increase efficiency, improve customer service and reduce costs.

Sudhir Kunder,
Country Director,
DE-CIX India

In a world that is becoming more and more digital, the terms Augmented Reality (AR) and Virtual Reality (VR) are crucial. They are a crucial component of the manufacturing of the future, and by giving workers an immersive experience at work, manufacturers may increase their productivity.

Augmented Reality also gives manufacturers a chance to incorporate holographic technology into their product development process. This will allow them to test products without having to invest money in creating an entire facility for this purpose. An improved virtual experience as an extension of physical presence in manufacturing environments has a variety of intriguing use cases. However, as well as implementing the digital imagery and developing AR and VR applications specific to manufacturing needs, it is also necessary to ensure the highest quality, secure and resilient connectivity to make this a success.

## Application of AR and VR

AR and VR technology have been around for decades. However, with the introduction of smartphones and tablets and their ability to show high-definition visuals on their screens, their use has increased dramatically in recent years. Manufacturing (i.e., quality assurance, customisation), healthcare (i.e., medical imaging), education and training

A digital twin is a virtual representation of a system, product, or process that is used for testing, developing, and simulation

(i.e., virtual classrooms), construction (i.e., CAD/CAM modelling), hospitality services (i.e., hotel room decorating), transportation services (i.e., car design), and media production are just a few of the industries that are using AR/VR technologies.

The world of technology has been evolving quickly, and the sector is growing more and more complex on a daily basis. Many of these new technologies are finding their way into production, where they may have an impact on how goods are created, promoted, and sold.

Industrial use cases that use augmented reality to improve the information supplied in photos of manufacturing facilities and products include quality assurance programmes. For instance, in the beginning of 2020, Lufthansa enabled the transition to remote table inspections for their Engine Services business unit. To make this a success, it was necessary to ensure the highest possible quality of images and videos, to allow for precise diagnostics. The solution was a 5G campus network: with the greater bandwidth and low latency of 5G, high-resolution photos and videos could be made available to customers. Due to this, it is now possible to guarantee the safety of aircraft parts even when no one has physical access to them.

## Creating digital twins

However, there are other options besides using images and videos of actual parts and manufacturing facilities. The creation of digital twins of actual objects is an additional choice. A digital twin is a virtual representation of a system, product, or process that is used for testing, developing, and simulation. By 2030, it is expected that the use of digital twins will have multiplied ten-fold, with the manufacturing, automotive, and aviation sectors leading the way. Over 90% of all Internet of Things (IoT) platforms are expected to be able to do some kind of digital twinning by 2027. For instance, data-driven twins of machinery can be used to do predictive maintenance, allowing the replacement of parts before issues become evident. These twins are based on current data from real-world machinery. Equally, systems involved in supply chains can be modelled to identify bottlenecks and optimise inventories. These digital twins depend on data generated by sensors on real-world machines, which must then be fed into the simulation.

The usage of digital twins by Lufthansa for their augmented reality project, which displays movable design components like furniture against a real-time video image of the interior of the cabin for personalised, opulent VIP interiors, is once again amazing. This is also beginning to take off in the automotive industry for e.g. enabling far greater individualisation in the design of electric vehicles (EVs) – here, varying body shapes and interiors can be added to the standard chassis. This customisation is being powered by fully immersive VR, allowing the end-customer to experience and alter the design, with the feeling that they are sitting in there as yet unbuilt new car. Customised body parts can then be produced through – although still in its early days – Additive Manufacturing or 3D Printing.

## Ensuring the right connectivity

To enable end-user capabilities for VR-based customisation, an immersive simulation of the product concerned needs to be made available publicly. This necessitates exceptionally high bandwidth and low latency connectivity between the end-user access networks and the manufacturer's data centre (or the

Increasing operational efficiency in industries

cloud from which the simulation is sourced). While FTTH/B and 5G networks are capable of delivering high bandwidth and low latency on the factory floor, it is crucial to make sure that this level of connection can be offered end-to-end, from the manufacturer to their clouds and apps, and then on to the end-customer networks.

By directly integrating with other networks at an Internet Exchange, you can ensure the highest level of connection and resiliency. This enables the manufacturing company to control data flow to business partners and suppliers, to clouds and applications, and to customer networks, bypassing the public internet. As a result, the data channels are shorter and more direct, resulting in lower latency, improved application performance, and high-end digital content, like VR simulations, with the added benefit of greater data flow security. To make sure your business stays competitive in the new digital world, you need to put in place a plan that includes the following:

1) **Implementing AR technology:** This will allow you to test products in real-time and see if they are functioning properly before releasing them into production. Additionally, it will enable you to train staff members on how to utilise the product so that they won't require additional training after it is put into production.

2) **Implementing VR technology:** This will allow you to have an immersive experience when interacting with your customers or clients so that they feel as though they are part of what is going on around them rather than just watching from afar like they would if they were using traditional media such as television or internet videos today.

Augmented Reality is one of the most common ways that technology is being incorporated into manufacturing. It's already present in almost all physical processes that involve product design or production. Augmented Reality refers to the use of computer-generated images to enhance or enhance an existing environment through technology like cameras and screens.

VR is another way that technology is being integrated into manufacturing processes. Similar to a video game where you may move around in a simulated environment instead of just sitting at home playing video games on your computer screen, virtual reality employs computer software to create an immersive virtual world for users to interact with in real time.

## Increasing operational efficiency

In recent years, AR and VR have become popular tools for businesses. While virtual reality uses computer technology to create an immersive environment that can be experienced through special goggles or glasses, augmented reality uses computer visuals to overlay information on the real world. Businesses have embraced technology to lower costs, boost efficiency, and enhance customer service. For instance, a business might give clients more individualised service by utilising AR or VR technologies to give them the impression that they are speaking to real people rather than computerised systems. The same is true of manufacturing facilities.

AR and VR, and all associated visual digital content present enormous possibilities for manufacturing companies as they digitalise to keep pace with the modern world. But before any of these can be used to their fullest extent, a business must first do its homework, developing and building digital infrastructure to guarantee the highest level of connectivity, dependability, and security, safeguarding its vital data flows. An important element in this infrastructure is an Internet Exchange – allowing companies to directly interconnect with their valuable business partners and customers in a high-performance and secure manner. □

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# AI transformation from conventional manufacturing into digital

With various demanding technological advancements coming to the forefront, one can fairly say that industries are optimising efficiency, performance, productivity, and, ultimately profitability like never before. This article explains how AI plays an influential role in this transformation and how it has been key in driving the transformation from conventional manufacturing to digital. A read on…

Gaurav Vohra,
Chief Business Officer,
UNext Learning

Efficiency, productivity, and profitability have been the quintessential mantras for manufacturing industries. We have collectively worked for centuries, beginning with the first industrial revolution, to optimise these three critical factors. With the onset of industrial revolution 4.0, we can fairly say that we are optimising efficiency, performance, productivity, and, ultimately, profitability like never before. We have incorporated some of the most in-demand technologies, like Artificial Intelligence (AI), Machine Learning (ML), data science, Industrial Internet of Things (IIoT), cloud computing, and more, into our manufacturing processes and workflows for precision outcomes and reduced overhead expenses.

We even have real-world examples. A France-based food producing company, Danone Group, shared that with the implementation of Machine Learning, they were able to reduce forecasting errors by 40%, reduce lost sales by 30%, and decrease the workload of demand planners by around 50%. Not just this, even our very own 184-year-old FMCG giant, Procter & Gamble Co, is taking the smart manufacturing route by implementing advanced algorithms, predictive analytics, and IoT in its paper

AI robots powered by autonomously Machine Learning algorithms

towel manufacturing division. While this is happening across manufacturing companies at scale, there is still a haze around the benefits of AI in digital manufacturing and how it has been key in driving the transformation from conventional manufacturing to digital.

## Ways AI is transforming manufacturing industry

### 1. AI in logistics

One of the most common ways for manufacturing companies to lose revenue is when they either over-manufacture or under-manufacture. Logistics, an integral part of the manufacturing process, takes care of stocks and inventories, letting retailers and wholesalers get a fair estimate of demand for a specific product.

AI's role in this reflects on accurately pointing out demand, forecasting, and cutting any inventory-related loss for an organisation. AI and ML-powered algorithms can also optimise supply chains by accurately monitoring and managing fleets of vehicles, saving fuel by suggesting optimal routes, creating club orders from multiple orders bound by a common geographic location, and more. Rolls-Royce deploys concepts like Advanced Image Recognition and Machine Learning to enable its fleet of self-driving ships to improve supply-chain efficiency.

### 2. Robots in manufacturing

General Electric (GE) was one of the first companies to deploy a concept similar to a robotic arm on its conveyor belts in 1961. It was called Unimate. It sowed the seeds for what was possible in the manufacturing space for technology, and today, AI robots powered by autonomously Machine Learning algorithms are deployed in industries to take care of all the heavy-lifting tasks. Such robots are being controlled by humans to optimise not just the manufacturing process but to pave the way for increased workplace safety as well.

Furthermore, 3D printers are reducing the costs associated with importing intricate parts. An engineer has to just visualise the part on a computer and get it 3D printed in real-time in the actual material. Thanks to the possibilities that 3D Printing opens up, its market is also expected to grow at a rate of 37% on a yearly basis. 3D printers are most predominantly deployed in industries such as healthcare, aerospace, and automotive.

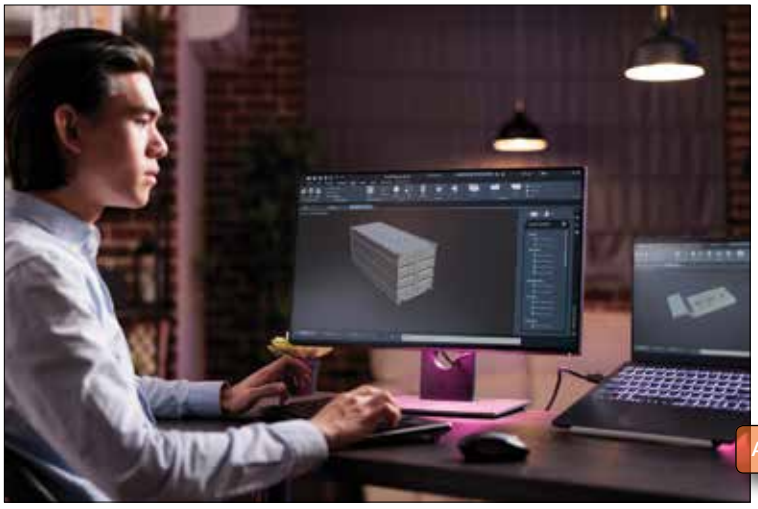
### 3. Large-scale factory automation

Automation is a key to improving productivity and efficiency in manufacturing. While many redundant tasks are controlled and executed by humans today, the onset of AI and automation can revolutionise industrial productivity. So, apart from reducing labour expenses, AI can:

- Autonomously detect anomalies in equipment, thanks to consistent real-world data processing
- Accurately predict when a device is most likely to malfunction through device health supervision
- Schedule equipment service even before it stalls
- Bring additional clarity to operations by making manufacturing data accessible and interoperable
- Drastically reduce the required volume of human power to execute tasks
- Scale production up and down as needed, and more

### 4. Industrial Internet of Things (IIoT)

A manufacturing company can become smart only when



AI-driven product development

powerful devices can function autonomously on the premises. Thanks to the rise of embedded computers and the IIoT, we can now push the limitations and restrictions we have been facing in conventional manufacturing.

Firstly, workplace hazards can be reduced significantly thanks to detection devices that can sense heat, sparks, toxic gases and substances, and more. Because the goal is not just reducing overhead expenses and increasing profits but also minimising carbon footprints and taking initiatives to become a more sustainable entity as well. With IIoT, the deployment of installations such as smart illumination, HVAC systems, and more is made possible.

### 5. Product development

Manufacturing is not just about the production of goods but involves the designing and development of them as well. There are dynamic expenses involved in trial-error methodologies in product development, which can be reduced or even completely eliminated with AI and emerging technologies.

Manufacturing is not just about the production of goods; it also involves the designing and development of them. There are dynamic expenses involved in trial-and-error methodologies in product development, which can be reduced or even completely eliminated with AI and emerging technologies.

Simulation of products in a virtual environment, concepts such as digital twins, AI-powered collaborative product development platforms, and more are revolutionising this phase of the process. With the incorporation of AI, a module for consistent feedback is created, probable bugs and errors in products are predicted, and expenses in go-to market are minimised as well.

### 6. Airtight cybersecurity

Some of the most brutal attacks are targeted at manufacturing companies after NBFCs. From ransomware to shutting down assembly lines, there are diverse forms of attacks targeted at them. This not only stalls productivity and their targets for a specific period but also scars their reputation as well.

Also, with the incorporation of IoT systems, we are only opening up more avenues for attackers to exploit. So, when AI steps in for cybersecurity, it makes detecting anomalies in networks more intricate, secures cloud and server architecture, paves the way for a more secure deployment of applications, and more.

## Ultimate lead towards growth and profitability

The impact of AI in manufacturing is not just felt in organisations where smart systems and advanced algorithms are deployed. It is, in fact, felt by customers, vendors, and every other stakeholder in the manufacturing ecosystem. From providing the most relevant product for a customer's concerns to getting them delivered on time, the market benefits of AI implementation in a manufacturing unit are aplenty. This ultimately leads to the growth and profitability of a venture.

We are just knocking on the doors of opportunity with respect to AI in manufacturing. As we make progress and discover new avenues, it will be exciting to see what other possibilities we unlock. ☐

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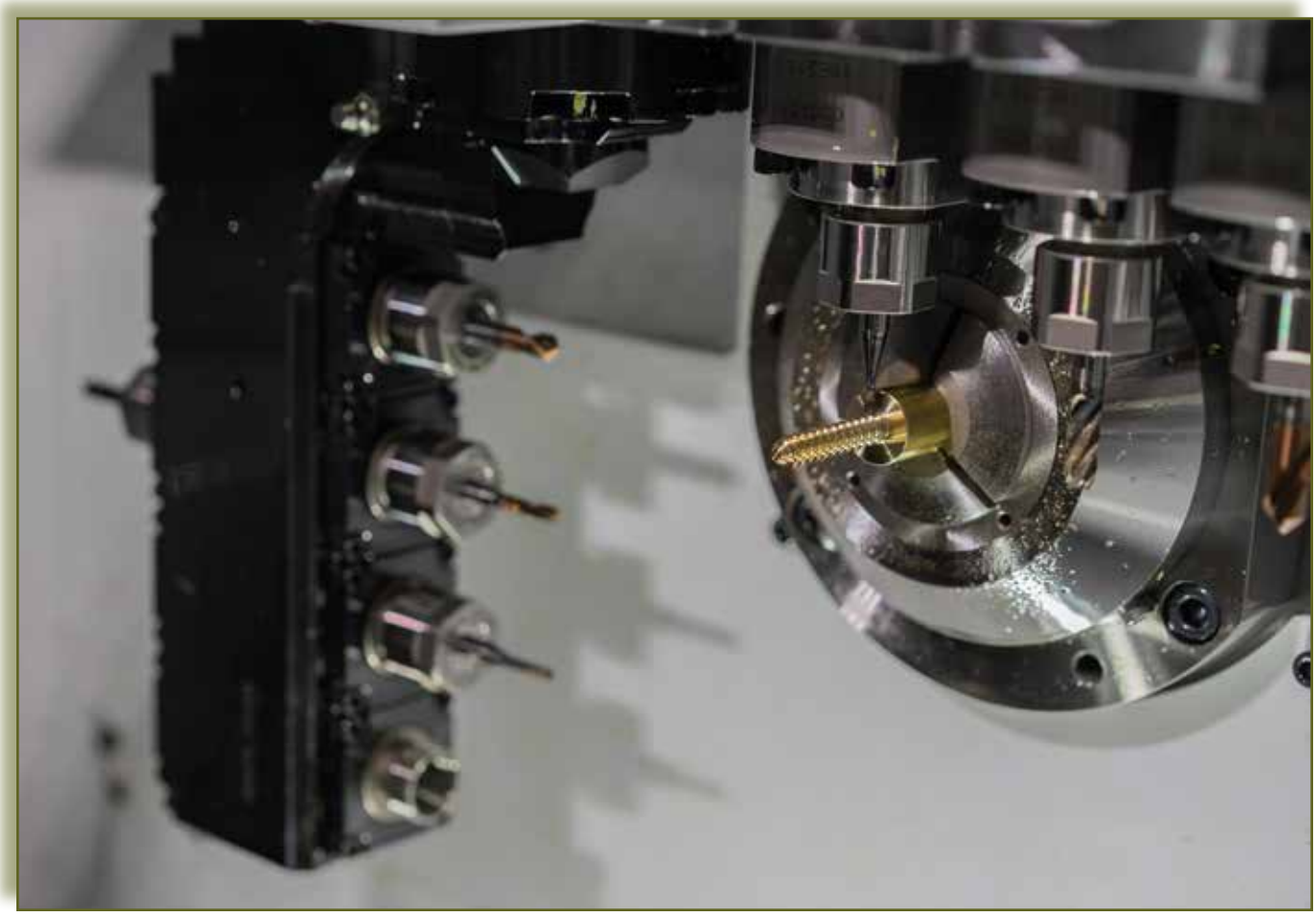


# Transforming the production of medical components

The medical component manufacturing industry plays a key role in producing several life-saving devices and parts that directly contribute to a better quality of life for citizens. With ageing populations, emerging healthcare challenges, and the growing emphasis on health, the demand for these products is only set to increase drastically.

Mohamed Maitheen,
Business Development Manager,
Hexagon, Manufacturing
Intelligence Division

The process of manufacturing medical components is often complicated and faces some unique challenges. Quality is paramount since a faulty product could even mean the difference between life and death. Given this, compliance with stringent regulatory guidelines is also part of the territory. As the demand for medical components goes up and their complexity increases, traditional manufacturing processes can no longer cater to industry requirements. The adoption of new-age technologies and processes is critical for medical component manufacturers to survive and thrive in this industry.

## Addressing increasingly complex machines

Take the case of FMI, a Netherlands-based contract manufacturer for the global medical device industry that specialises in the serial production of orthopaedic implants and instruments. FMI historically programmed parts at the machine control until it realised that it was unable to maximise the potential of the increasingly complex machines it acquired. Also, the company had grown rapidly from just two people to a large operation with three shifts with several employees and machines. It became more important than


Knee prosthesis

ever to get jobs right the first time by maximising the technology that drives them.

The company produces medical parts such as spinal hooks, rod and screw systems, bone screws, and hip stems, in addition to surgical instruments such as pliers, grippers, retractors, and spinal-screw insertion devices. These are specialised parts, often with tolerances of ±0.0002. The company needs to work with solid models supplied by customers and modify them. In these circumstances, achieving on-time delivery for each customer and ensuring a superior quality of parts was always challenging. To address these issues, the company purchased computer-aided manufacturing (CAM) software to program its Mazak mill-turn and Citizen Swiss-turn machines.

## Computer-aided manufacturing

Software tools now offer a build preparation workflow within the CAM environment to provide a single, streamlined platform for both the additive build and finishing operations with a part-to-build workflow. In series production, a given part is typically produced hundreds of times with the same build plates, orientation, support structure generation, and exposure strategy assignment. A part-to-build workflow addresses part preparation and job preparation with dedicated functionality within one piece of software, making manufacturing smarter by enabling volume efficiencies and automating repetitive tasks such as slicing.

CAM software provides the digital tools needed to prepare 3D-printed components for manufacturing using powder bed fusion (PBF) technologies. Today, PBF is the most mature Additive Manufacturing technology for industrial production and represents 86% of the worldwide machine install base.

Software can read and manipulate all popular parametric CAD formats and automatically identify those surfaces that require support. The software can also assist with the creation of support structures, generating parametric surfaces with teeth, fragmentation, and perforation. Once a part is sliced, it can be imported into the software's job preparation environment and reused whenever needed.

## Smart manufacturing solution for machining application

Esprit is an example of a high-performance CAM system for CNC programming, optimisation and simulation, supporting any class of CNC machine via a common user interface and workflow. Using a digital twin of the CNC to simplify the programming process, this application Esprit delivers edit-free G-code. Combined with the company's ability to solve workflow challenges with individually tailored automation solutions. Medical component manufacturers have integrated the company's CAM software to solve many machining difficulties related to tight tolerance intervals, weak machines, and refractory materials. By default, they choose complex and high-accuracy machines to produce their components. In the real-world, Esprit CAM supports high-end, complex, and multi-tasking machines.

Medical bone plate

## Higher levels of automation

Combining build preparation in the CAM environment is the first step on the journey to true computer-aided manufacturing using additive methods, enabling higher levels of automation and productivity. Such an approach brings several advantages to the manufacturing and machining process for medical components.

• **Eliminating human error and ensuring consistent quality**

Eliminating operations can also help eliminate mistakes from human error. Also, since one can check the entire part for quality in complete dimensions instead of making guesses, the quality improves drastically since it eliminates mistakes made due to back-figuring dimensions that will be machined on a second or third operation. The application software offers post processors, which are built in the machine tool factory to test and eliminate any sort of errors in the post-processor which makes edit-free G-code with a higher confidence level of programming, it also eliminates unwanted dry run in the machine to test the G-code before cutting the component, altogether there is great savings of programming time, testing time using the software.

• **Efficient machining and improved turnaround time**

Knowing that a program is done and correct before it goes to the machine helps ensure faster set-up times. Also, identifying areas that first need to be turned makes the machining much more efficient. At the same time, the elimination of manual calculation reduces the number of programs required to get the job done. The software's powerful feature recognition tool offers an easy programming method to any user, which saves a lot of programming time.

• **Digital machine package allows toolpath verification**

With software's digital twin, machinists' & programmers' lives become easy with the virtual machine models, controller emulators, machine parameters, and post processors—the system delivers accurate simulation and machine-optimised G-code. Factory-developed post processors that produce edit-free G-code are available for your machine tools, allowing you to take full advantage of your machine tool investment. The company offers accurate cutting tools and machine tool simulation with a dynamic stock-aware toolpath that reduces the unwanted air passes offering the program highly optimised in the first go and keeping the machine concentrated for the product.

• **Ability to produce more complex parts**

The powerful combination of machines and software can enable the machining of increasingly complex parts with tight tolerances. This frees up designers to design more complex parts since the software can accommodate all sorts of complex machines to support any complex design.

## Competitive advantage with CAM software

With increasingly complex parts, success hinges on the ability to be versatile and deliver quality products on time. CAM software can help ensure that machines are leveraged to make parts that they are designed to make. This makes the manufacturing process smoother and gives them a competitive advantage. □

Images courtesy: shutterstock

# Ramping battery cell manufacturing required to meet EV goals

The Electric Vehicle (EV) market is developing at a rapid pace. EVs are gaining attention across the globe as they help reduce emissions. The article sheds light on how battery cell manufacturing needs to be boosted in the current scenario.

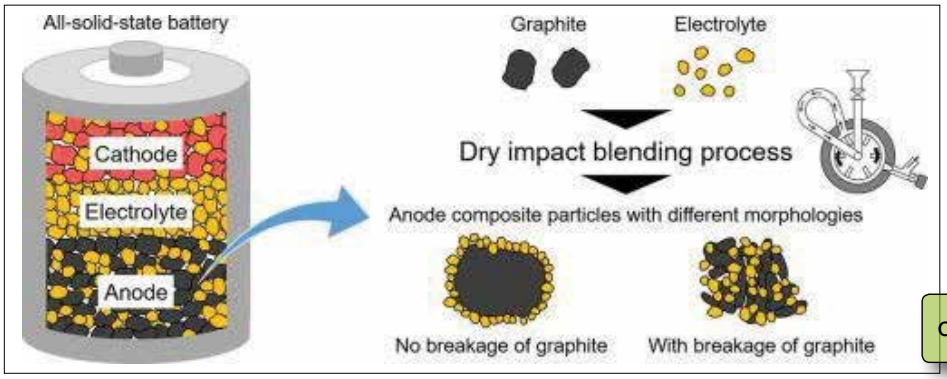
Vikrant Aggarwal,
COO,
EVI Technologies

Indian companies are increasingly exploring opportunities to set up battery cell manufacturing operations to meet the demand for components in electric vehicles (EVs). The Indian government is encouraging domestic lithium-ion cell manufacturing, which is being conducted by NITI Aayog. India would have to manufacture lithium-ion batteries domestically to meet its EV targets without relying on imports.

The government initiated the National mission on transformative mobility in 2019 to encourage phased manufacturing programmes for batteries and EV components. The initiative aims to aid in the setting up of an intricate framework of state-of-the-art battery manufacturing units all across India. To support cell manufacturing, the country needs a sufficient supply of raw materials, mainly lithium, cobalt, nickel, etc, through mining grounds within the country or in its peripheral countries. Over the next decade, NITI Aayog proposes to set up mega factories that aggregate up to capacities near 50 GWh, with an estimated cost of $5 billion. This is expected to reduce India's dependency on foreign imports, thus encouraging the supply of indigenously manufactured batteries.

## Taking lessons from China

It is said that India can learn a lot from China, which has aggressively expanded in the EV battery space over the last 10 years, conquering each part of the supply chain to emerge as the dominant player in e-mobility. China now leads in next-generation EVs through large investments in R&D, favourable




Components of the solid state battery

government policies, foreign direct investment inflows, and aggressive acquisition of raw material resources across geographies. Taking lessons from India's neighbour in the north, improved access to raw materials can be provided in multiple ways, including the reduction of import duties on raw materials, improving bilateral ties with countries rich in the natural resources of the raw materials, and encouraging Indian companies to acquire those resources.

"Comprehensive policies from the government that encompass the complete battery value chain from acquisition of natural resources to recycling of batteries will go a long way in providing a necessary push to the industry," said the report titled E-mobility: Cell Manufacturing in India. Steps such as tax subsidies and the development of special economic lithium parks across countries to promote investments in raw material refining and cell manufacturing capacities, and continued PLI schemes and subsidies for cell manufacturing, will be key.

## Need of local EV value chain

EV cells are the most critical part of the e-mobility value chain, and the Indian EV industry suffers from overdependence on imports and limited local manufacturing, finite access to raw materials, and limited refining capacities. To accelerate India's electric mobility growth, the government and the industry ecosystem must collaborate to nurture a self–reliant, local EV value chain, with the established battery, manufacturers, OEMs, and startups investing in continuous R&D partnerships and global alliances to create a strong supply chain.

The increasing demand for electric vehicles and the rising shift towards clean energy resources will drive the lithium-ion battery market's growth in the coming year. An analysis conducted by JMK Research and the Institute for Energy Economics and Financial Analysis (IEEFA) estimated that the Indian lithium battery market would grow from 2.3 GWh in FY2021 to 104 GWh in FY2030, with Electric Vehicles (EVs) accounting for 90% of the total industry. The Indian government has set a 30% electric car sales target by 2030. The Central Electricity Authority predicts that India will need 34 GW/136 GWh of battery storage to add 450 GW of renewable resources. This will speed up the country's move towards becoming a significant user of lithium batteries. The technology of lithium batteries is constantly evolving. Until recently, the two dominant chemistries seen in the Indian market were Lithium Ferro Phosphate (LFP) and Nickel Manganese Cobalt (NMC). In Indian contexts, LFP chemistry is considered safer, but NMC chemistry has a higher energy density.

Li-ion battery technology allows for the highest level of energy density. Performances such as fast charging or temperature operating windows (from -50°C to 125°C) can be fine-tuned by the large choice of cell designs and chemistries. Furthermore, Li-ion batteries display additional advantages such as very low self-discharge and very long lifetime and cycling performances, typically thousands of charging/discharging cycles. In lithium-sulphur (Li-S) batteries, there are no host structures. During discharge, the lithium anode is consumed and sulphur is transformed into a variety of chemical compounds; during charging, the reverse process takes place.

A Li-S battery uses very light active materials: sulphur in the positive electrode and metallic lithium as the negative electrode. This is why its theoretical energy density is extraordinarily high: four times greater than lithium-ion. Major technology barriers have already been overcome, and the maturity level is progressing very quickly toward full-scale prototypes. For applications requiring long battery life, this technology is expected to reach the market just after solid-state lithium-ion. Solid-state batteries are intrinsically safer because they are non-flammable, and much research is being done in this field. Also, it permits the use of innovative, high-voltage, high-capacity materials, enabling denser, lighter batteries with better shelf lives as a result of reduced self-discharge. Several kinds of all-solid-state batteries will likely come to market as technological progress continues. The first will be solid-state batteries with graphite-based anodes, bringing improved energy performance and safety. In time, lighter solid-state battery technologies using a metallic lithium anode should become commercially available. In this decade, there will be further advances in lithium battery technology, which can lead to higher adoption. □

# AI - Ahead of the curve

AI, which was coined decades ago, is busting myths and misconceptions and permeating the industry ecosystem, playing an integral role and assisting with power efficiencies. This feature explains how AI's paradigm shift within the manufacturing industry specifically—one that increases competitiveness and boosts profits as well as productivity—works in tandem with revolutionary technology.

Piyush Goel,
Founder & CEO,
Beyond Key

Around six decades ago, at an academic conference, John McCarthy coined the term 'Artificial Intelligence', and mankind has since been on a quest to discover new possibilities for what computer software can do. Now, around 65 years later, Artificial Intelligence (AI) is in almost everything that surrounds us; it is embedded into the very existence of human life. To speak in a layman's language, AI can be understood as a computer's ability to comprehend and execute complex tasks or a set of tasks that are usually carried out by humans; hence, require human-brain-like cognitive functionality. This is made possible by programming software to identify and replicate the thinking patterns of human beings and also with the help of huge data; it can then be processed in numerous combinations to solve new problems or execute complex tasks.

## Breaking the myths about AI and at its major purposes

Even though, over the years, inventions and breakthroughs in the field of science and technology have weaved AI across a host of different sectors that concern human life such as medicine, education, banking, finance, the automotive sector, and even mankind's ventures to space exploration; there have been various myths pertaining to AI, its use or rather its probability of being misused. In the long list of myths surrounding AI, one is that AI is all about big

AI has weaved its strengths to host different sectors that concern mankind's ventures

machines, and black boxes; people often tend to surmise that Artificial Intelligence and Machine Learning, aka ML, are the same, but they are not. ML can be understood as a sub-field of AI that focuses more on techniques or patterns to perform certain and limited tasks in a controlled setting such as a factory. Another common misconception about AI among people is that it is exorbitantly expensive, but the fact is with new optimisations the use of AI in both commercial and personalised projects are becoming cheaper and much more affordable.

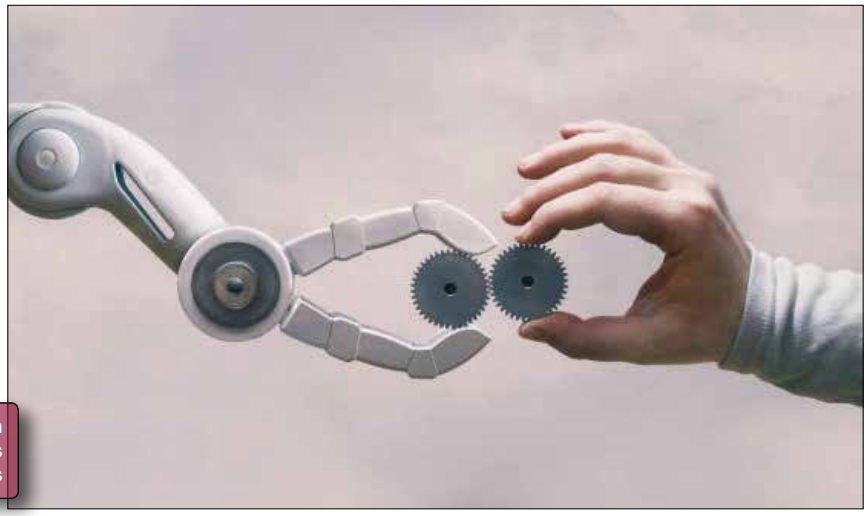
One of the major purposes of AI is efficacy in work and efficiency in monetary terms. At a micro-level, the initial cost involved in the setup and development of AI may seem higher, but from a macro-level standpoint, AI saves significant costs and efforts involved in the hiring, training, managing, and retaining of human resources. The deployment of AI has been underway for quite some time. In factories and manufacturing plants, AI-driven mechanical ecosystems are responsible for many thriving businesses across sectors. Since AI programming can be done to deliver desired tasks and its operational costs are quite low, it is considered ideal for solving an extensive list of problems.

In the manufacturing world, the use cases and practicality of AI are significant and now rather integral. According to a McKinsey report, with AI and ML working in tandem by the year 2025, approximately $3.7 trillion worth of value can be created, of which AI alone can generate approximately anywhere between $1.2 and $2 trillion in manufacturing and supply chain management. The vast data storage capacity and quick interpretational powers that AI can provide to stakeholders are unfathomable. Thriving manufacturing and logistics companies have utilised this to maximum potential resulting in 10-19% decrease in operational costs and 6-10% uptick in overall revenue. Some major problems that AI can solve are efficiency and waste reduction; lowering of labour costs regardless of geo-political disruptions; operational challenges; and end-to-end visibility of manufacturing operations.

## AI permeates Industry 4.0 ecosystem

In this era of AI, it is not just the tech and data giants of the global business ecosystem that are harnessing the power of AI or developing it, small and medium-sized organisations are now actively involved in the AI-driven revolution across the globe. Lately, post-COVID, the manufacturing sector has observed an influx of new players; many of them are utilising AI in innovative ways and solving recurrent problems. An outcome of this widespread use of new technology to bring about change within an industry is establishing the next frontier of Industry 4.0.

By definition, Industry 4.0 refers to a new phase in the industrial revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data. This new phase has brought with it certain promises within the manufacturing industry specifically - one that increases competitiveness and boosts profits as well as productivity in tandem with revolutionary technology. The complete change of Industry 4.0 can only be realised when manufacturers embrace Artificial Intelligence, Machine Vision, Machine Learning, cobots (collaborative robots), cloud architecture, data, and more. These aren't just nice-to-have perks; they're must-have capabilities that are defining the future of the industry.



The wave of new AI and other tech-driven advancements solves the roadblocks across the industrial operations

## AI and tech-driven advancements

With the wave of new AI and other tech-driven advancements, it is evident that software-defined manufacturing based on logic and intelligence is the future rather than hardware. This paradigm shift will apparently be able to tackle persistent issues that have been posing recurrent roadblocks across industrial operations for years. Some of the most common issues that need urgent rectification are – expensive, inflexible equipment that impacts the bottom line, economically and environmentally damaging operational processes, and manual, mundane assembly line tasks that deter fresh talent from pursuing the manufacturing industry.

Diving down to the basics of AI-based software-driven manufacturing is the Microsoft Power Platform, which is an integration platform with a line of business intelligence, app development, and app connectivity software applications. It was developed for expressing logic across platforms such as GitHub and Teams. Manufacturing requires fast analysis to manage complex inventory, quality, suppliers, and production processes; this is where AI plays an integral role and helps with power efficiencies. In the manufacturing industry, technicians are leveraging Microsoft Power Platform to speed up the repair process by looking up the manual for a piece of machinery by taking a picture, even if the UPC/serial number is not visible.

To understand its case study, one must first have a basic understanding of the four major components of the Power Platform, namely:

i) **Power BI:** It is a business analytics tool.

ii) **Power apps:** It is a dedicated application for the development of low- to no-code apps.

iii) **Power automate:** This component enables process automation.

iv) **Power virtual agents:** Simply put, these are intelligent virtual bots.

Some other ops-based use cases of AI in manufacturing are: invoice scanning; QR code generation and cloud printing; end-to-end tracking of the product processing lifecycle; Integration with the ERP system.

## Positive case stories keep AI ahead of the curve

A recent use case comes from a leading provider of manufacturing food products for pets. They offer an array of products, including health aids, grooming tools, collars, leashes, halters, leads, food, functional treats, supplements, safety and agility flooring, and other innovative products. As a manufacturer and distributor, their direct customers include pet professionals, retail stores and chains, e-commerce websites, and distributors. With the use of Power Apps Lot Tracking, the production team on the shop floor and the purchasing department used the application to scan and track items across the stages of food preparation. Employees used Power Apps on their mobile devices to observe strict food processes and product dates.

Given the pace of AI in manufacturing and related trends, the market is expected to grow from $1.1 billion in 2018 to $18.5 billion by 2025. (source: Zion Market Research). That is an annual growth rate of 49.7%. over the next 5 years to reach this market size. To be ahead of the curve, players in the manufacturing industry must have a plan, set up a budget; integrate their current technologies; communicate with employees; and improve data collection efforts. The next decade will see an interesting explosion in Artificial Intelligence. Enterprises in the manufacturing industry need to take advantage of it before their competitors do. ❐

# Eminent leaders we heard in 2022

**Sharad Kulkarni,**
Vice-President Sales & Marketing,
Dormer Pramet India

**Anvar Jay Varadaraj,**
Executive Director,
ELGi Equipments

**Vikas Gupta,**
Managing Director,
PG Electroplast

**DM Sheregar,**
President, TAGMA
CEO, Devu Tools

**Stefan Louis,**
CEO,
Nexcharge

**Arun Mote,**
Executive Director & CEO,
Triveni Turbines

**Shatyabrata Das,**
Senior General Manager,
IAC International Automotive India

**Deepak Razdan,**
Director, JFY Business in India and JFY International (Member of TRUMPF Group)

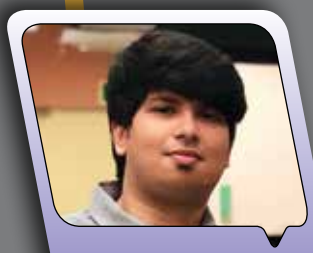
**Amit Saluja,**
Senior Director & Head,
NASSCOM Centre at Gandhinagar, Gujarat

**Sridhar Balaram,**
Managing Director & Founder,
Intech Additive Solutions

**Santosh Ner,**
Senior Manager,
Business Development Manufacturing Solutions, India-Pacific & ANZ, Hexagon

**Kiran Naik,**
Director – Sales,
Güdel India

# The budding innovators of 2022



**Moin SPM,**
Co-founder,
Agnikul Cosmos

**Ashwin Shankar,**
Founder,
BatteryPool

**Omer Basith,**
Co-founder,
Virtual Forest

**Jonathan Carrier,**
Co-founder,
Zip Charge

**Abhijith Bhat,**
Co-founder,
Abhiwins

**Guruprasad Bangle,**
Co-founder & Chief
Technology Officer,
SolutionBuggy

**Nemin Vora,**
Chief Executive Officer,
Odysse EV

**Inian Tamizh,**
Founder,
Frigate

# Steering the industry in 2022

"Lightweighting of vehicles is crucial in sustainable auto component manufacturing" – Deepak Jain, Chairman & Managing Director, Lumax Industries

"Producing other leaders in the ecosystem is critical" – Parakramsinh Jadeja, Chairman & Managing Director, Jyoti CNC Automation

"India is uniquely positioned to be a key player in this digital future" – Mathew Thomas, Country Manager and Managing Director, India, Siemens Digital Industries Software

"Get comfortable with ambiguity and chaos" – Vijay Kalra, Head - Mahindra Institute of Quality, Member - Group Corporate Office Leadership Team, Ex ED & CEO MVML and Chief of Mfg Operations AD, M&M

"The future will be all about 'Creating in India' in collaboration with willing global players" – Kishore Jayaraman, OBE, President - India & South Asia, Rolls-Royce

"Critical thinking is key" – Maarten Durville, Managing Director, GKN Fokker Elmo India

"Bigger the challenge, larger the opportunity" – Dr Pramod Chaudhari, Founder and Executive Chairman, Praj Industries

"We drive local solutions to seize local opportunities" – Anil Kumar, Managing Director and President, SEG Automotive India

"Constantly anticipate, look ahead of the curve and set a future target" – P Kaniappan, Managing Director, WABCO India

"ISRO should distribute key technologies developed by them for free or low cost" – Col H S Shankar, VSM (Retd) Chairman & Managing Director, Alpha Design Technologies (ADTL)

"We need cheaper, affordable, safe & sustainable solutions" – D K Sharma, Consultant – Business Transformation and Immediate Past President, TAGMA India

"Robots will become modular with software being their central component" – Mahesh Wagle, Co-founder & Director, Cybernetik

"A rapid rise in the demand of air filtration solutions" – Ashok Pandey, Director-Automotive, Pharmaceuticals & Consumer Filters, Freudenberg Filtration Technologies India

"Indian mould makers are looking for optimal lead time & high performance" – Pulkit Datta, General Manager, Tool Steel Products, Hitachi Metals India

"Providing ready solutions to the Indian market" – Jürgen Möller, President, Walter – Asia Pacific Region, and Brajesh Kumar, Managing Director, Walter Tools India


# Celebrating customer success and manufacturing excellence

Blaser Swisslube recently celebrated the 4th edition of the 'Blaser Swisslube Productivity Trophy 2022' India edition in Chennai, India on December 2, 2022. This award ceremony was attended by top-notch industry leaders and the company's successful customers. A post-event report...

Neha Basudkar Ghate
Assistant Editor
neha.basudkar@pi-india.in

Blaser Swisslube, a Switzerland-based company, is a global manufacturer and provider of an extensive range of high-performance cutting fluids and cutting oils suitable for almost all machining operations and materials. At the 'Blaser Swisslube Productivity Trophy 2022 India edition held in Chennai, on December 2, 2022, the company aimed to celebrate the significant collaboration with Blaser Swisslube's end-users and their mutual success.

The chief guest of the event was Ganesh Mani, President & Chief of Operations, Ashok Leyland India, while Soarabh Pathak, General Manager, Outsource Services, Maruti Suzuki India was the speaker at the event. They were accompanied by Mark Blaser, CEO, Blaser Swisslube; Patricio Villard, Chief Sales Officer, Blaser Swisslube; Punit Gupta, Managing Director, Blaser Swisslube West Asia (India & South East Asia); and other experts from the company.

The award winners at the Blaser Productivity Trophy were – Rakesh SB, Vice President, Sansera Engineering who won Tool optimization trophy; Jitendra Lakotia, Chief Executive Officer, AAKAR Foundry winning Productivity increase trophy; Jaydeep Kumar, Plant Head, JTEKT India received Total costs of ownership trophy; Amey Divekar, VP – Operations 2W BU & Pavankumar Patodi VP-Operations 4W BU, ADVIK Hi – Tech earned Process optimisation trophy; S. Jayakumar – Managing Director, JKS Precision Engineering won Metalworking fluid optimisation trophy and lastly Satish Patil – Deputy General Manager – Manufacturing, FIAT India Automobiles won Sustainability trophy.

## *Team EM interviewed the award winners, and the following are the excerpts...*

**S Jayakumar,**
Managing Director,
JKS Precision Engineering

### *Award* – Metalworking fluid optimisation

"We are into an innovative mechanical design focused on manufacturing compressor valves and aerospace parts along with some other product portfolios. We primarily use CNC machines, where we require coolants. We have been using Blaser products for the past five to six years, and we are happy with the coolant's performance as it has no smell and is user-friendly. Tool life is the major part of machining, and by using Blaser products, we are able to achieve increased tool life."

### *Award* – Productivity increase

"Our journey with Blaser started in April 2017, and I must agree that it is a fabulous product because productivity is the heart of any manufacturing company. After using Blaser's products, our productivity has increased by 7% to 8 % and the tool life has shot up by 10%, the cutting parameters have been enhanced by 11 to 12% and Blaser products have also helped boost the tool life by 15%. Besides, the machine downtime has also been reduced, which increases the operational efficiency of the overall productivity and has helped to increase the profitability."

**Jitendra Lakhotia,**
CEO,
AAKAR Foundry

**Satish Patil,**
Deputy General Manager,
Fiat India Automobiles

### *Award* – Sustainability

"We are glad to receive the Sustainability award. Our journey with Blaser started almost 15 years ago. For any automotive manufacturer, the engine is the heart, and while making the engine components, coolant contributes as the unique and swift element needed to manufacture any engine parts. To maintain top-notch manufacturing quality, coolant is essential, and Blaser has proven that their product not only provides a smooth flow but also helps us adhere to our sustainability policies."

### *Award* – Process optimisation

"We manufacture several machine components with aluminium using different cutting tools. These are high-precision products that are manufactured with expensive, high-quality cutting tools while maintaining product quality.We used to have failures like rusting in the early stages, and the rejections caused multiple losses. But after using Blaser coolant, we achieved the aim of achieving zero failure of the tooling life and received the quality, persistence, and surface finish that are needed for the machines. The most important point is that the coolants are user and environment-friendly."

**Pavankumar Patodi,**
VP- Operations 4W BU,
ADVIK Hi-Tec

**Today, environmental sustainability is critical to green manufacturing. How is Blaser working towards improving the production environment?**

***Marc*** – We look at sustainability in a very holistic manner, which means we want to see how much impact we have on sustainability at what cost when we use our products and solutions. Therefore, if we look at productivity itself, with higher output with the same machines, people, and footprint, that is the substantial benefit of sustainability. Even though we have only one category called sustainability, we can take all of these projects and look at them from a sustainability point of view. So everything is related to them.

**Looking back at your vast expertise, can you brief us on the major factors driving manufacturing excellence globally? How do you see the Indian manufacturing industry contributing to this?**

***Marc*** – I think the Indian manufacturing industry has the best possible setup to enable the growing importance of the global manufacturing market. We have a lot of human resources, infrastructure, power supply, and efficient policies. Along with it, we have willing investors, but most importantly, we have engineering excellence, from education to operation. It is not just an easy way to provide products and solutions here in India; it has always been challenging, there is always a question, and one needs to have the capability to work differently. This was our route to continuously improve and outperform the market in the long run.

**From a customer's standpoint, selecting the right cutting fluid is crucial. How do you ensure this?**

***Marc*** – Customers are our priority. They all come from a background, in either tooling, machine tooling, or manufacturing. So, they speak the language of customers and have this unique mindset and focus. On the customers' side, we look at every situation equally, starting with an in-depth situational analysis, and then we look at where our challenges and opportunities are to improve based on our knowledge. It is then tested to demonstrate that what we have promised is true and substantiated by its true and competitive advantage at a lower cost.

**Can you brief us on the latest technological breakthrough, especially around automation practices that have been integrated to modernise your manufacturing facilities?**

***Punit*** – I think automation and Industry 4.0 are buzzwords where different companies are working in different ways. At Blaser Swisslube, we strive to serve our customers. We introduced the liquid tool analyser a few years ago to bring transparency to data and help customers simulate project outcomes on their shop floor.

This has been a great success, as it is helping the customers see different impact areas on different dimensions of productivity. So, when we look at different dimensions like – liquid tool, it proves to be a value proposition. This creates an impact by producing a greater number of products, improving tools' performance, improving processes' impact on the material, lowering rejection rates, and having a positive impact on the human environment and sustainability.

We are testing a unique proposition, and the rollout has even started in Europe this year. It is a smart automated fluid management system. It is a modular approach that launches right from sensing the data of coolant, up to filling, topping up, and even the possibility of adding additives automatically. This will enable them to have a secure and stable process, which will help them increase their productivity in the future. These are the various dimensions of the automation Industry 4.0.

**There is a growing demand for lightweight components in high-performance applications, and the use of metalworking fluids is helping to expand this scenario. How do you see the global metalworking fluids market expanding metalworking fluid demand?**

***Punit*** – It is a very interesting time for us as a metalworking fluids manufacturer. On one side,

we see disruptive technologies coming in, whether additive or not, that will replace the machining operations, whether it's MIM technology or a shift from ICE engines to EVs. However, the complexity of manufacturing machining is increasing, so the components are becoming more and more complex. Therefore, there has been an increase in demands like surface finish requirements and machining accuracy. And we are very happy to take up that challenge.

**Tell us about the large investments and growth strategies planned for all business lines in the coming years.**

***Punit*** – We have been constantly investing in people, R&D, and manufacturing facilities. In India, during COVID-19, we set up competence centres at our Gurgaon headquarters. This centre equips people with chemistry, microbiology, and machining know-how who analyse customer samples and connect on a real-time basis with the Switzerland R&D lab, bringing added value to the customers.

**How does product development in the company's R&D centre innovate to consider the latest technologies to cope with the market demands?**

***Punit*** – It is vital to put the customer at the centre, so we always look at customer processes and their requirements. Our objective is to help customers win, and the Productivity Trophy event is to celebrate customers' success. When we look at it from the customers' point of view, they always need help to become more competitive in their area of expertise. Our R&D and technology centre is always working towards this.

**Lastly, how do you look at the Productivity Trophy Award Ceremony 2022 in India this year?**

***Marc*** – The Productivity Trophy is an approach to highlighting customer projects. Many of the productivity studies we conduct with customers are done because we need to look at the relevant details of the customer to ensure that we truly deliver and add value, not just produce aesthetically pleasing results. So, the productivity trophy for us is a way to honour certain customer projects where we believe outstanding results have occurred. It is the means by which we can highlight and spotlight some of the noteworthy work that enters the industry each year and at every customer touchpoint.

***Punit*** – This is a very special event, and I am very happy. What makes it special is that we are celebrating the customer's success. We do projects with customers because that is our mission, and we categorise the projects in those dimensions. Then we look at where the execution has happened so that the customers can say that they have benefited from the coordinated and cooperative project. □

## Powder bed fusion system

**ALD Vacuum Technologies** recently built E-PBF system, EBuild® 850 system, which combined three proven technologies for Additive Manufacturing for metal and alloy processing for large components while maintaining high productivity, high temperature vacuum environments, efficient electron beam technology, and powder distribution under vacuum. In its basic configuration the system is designed to produce metal parts with dimensions up to 850*850*1000 mm³ out of metal powder by layer-wise selective electron beam melting and subsequent solidification. The main system components include an electron beam gun, a retractable build chamber, a process chamber connected to an advanced powder application system, as well as mobile withdrawal and extraction units. A second build chamber may complement this setup in order to perform the melt and cool down processes in one chamber while extracting the parts and powder from the second one and prepare it for the next built. The high-precision withdrawal unit can position a powder bed weighing up to 15 t with an accuracy of approx 0.01 mm and a total build height of approx 1,000 mm.

**EBuild® 850 system**

**ALD Vacuum Technologies India | Mumbai**
**Email: milind@aldvt-india.com | Tel: +91-91520 03246**

## High-speed steel lathe tools

**Alok Tools** offers a wide range of High-Speed Steel (HSS) cutting tools & solid carbide cutting tools. The set consists of different M2 HSS tools for turning and facing work on lathe. These tools can be used for machining most materials including wood, plastic, aluminium, brass, and steel. Also, the tools retain their hardness at high temperatures. The major advantage of HSS tool is their ability to be easily sharpened. It has standard grinding wheels. Few of the specifications of cutting tools are as below –

**High-Speed Steel (HSS) cutting tools**

- Made with the high-end raw material
- Perfect for precise industrial application
- Sharp blades for application-driven results
- Thick coatings on the tips for long lasting life

The shank size is 3 mm while the length is 60 mm. One set of cutting tools consists of 8 pieces.

**Alok Tools | Gurugram**
**Email: info@aloktools.com | Tel: +91-92052 98520**

## Micro medical extrusion tooling

**Guill Tool & Engineering** recently introduced the new micro medical extrusion tooling, TD2, an extrusion crosshead that uses micro-fine adjustment screws for precise concentricity adjustment. The precision of concentricity reaches 0.008" or finer per revolution. This single point concentricity adjustment is an innovation from the company for the extrusion of thin-walled and precision ID/OD medical tubing. One adjustment bolt controls 360° of adjustment. The features of the micro medical crosshead include a patented cam-lock deflector for quick changeovers, with a residence time of one minute at 0.5 lb/hr material flow, optimised usage with extruders measuring ½" and ¾", and a max die ID of 0.250". Additionally, the new micro medical crosshead offers great flexibility to its users. It not only accepts both vacuum and micro-air accessories but is also ideal for pressure and sleeving applications. Fluoropolymer designs are available upon request.

**TD2**

**Guill Tool & Engineering | USA**
**Email: websales@guill.com | Tel: +1-401-828 7600**

## Compact miniaturisation module

**HARTING** recently presented the new Han-Modular® Domino modules and Han® HPR Compact, which opens up savings opportunities for users with interfaces in harsh industrial environments. The combination of both components is unbeatable. Han® HPR Compact enclosures save a fifth of the installation space compared to conventional solutions. Also, the compact enclosures can even grow with their tasks – also after their installation if required. For modifications, 3 cm high extender frames are available for modifications, allowing flexible and uncomplicated scaling. This is best achieved in combination with the modular Han® Domino modules. Their miniaturisation enables the reduction of the total number of interfaces in an application area down to the absolute minimum. With the help of the halved mating face compared with the previous standard Han-Modular®, the Dominos can accommodate twice as many transmission types or different power and voltage levels in the housing of one size.

**Han® Domino Module and Han® HPR Compact**

**HARTING India | Chennai**
**Email: in@HARTING.com | Tel: +91-44-4356 0415**

## CNC fibre laser cutting machine

**HG Laser Engineering** has built WALC series, which consists of large-format 3D five-axis cutting machines from 1-12 kW, these are large and custom-built machines for special applications such as large-area five-axis groove cutting equipment on the high-speed and high-precision with Siemens control system. Few of the features of the machine are –

**WALC series**

- **Cross-section beam:** Large cross-section beam integral moving structure, double pinion & rack synchronous drive
- **Airborne structure:** A variety of core components, such as machine tool electric cabinet, water and gas circuit system, Z axle box, cutting head and operating table, are installed on the beam
- **Fixed workbench (customised):** This is convenient for large plates to be loaded & small plates can be processed alongside the materials

The machine is used for various purposes like, sheet metal, all standard profile like round, square, rectangle, C channel, I channel, etc. The laser power of this series ranges from 1000 to 12000 W while the focal length is 200 mm with automatic focus. The series runs on SIEMENS840D SL.

**HG Laser Engineering | New Delhi**
**Email: info@hglaser.com | Tel: +91-99904 98535**

## Metal powders for Additive Manufacturing

**Kennametal** recently expanded its offering of gas-atomised cobalt, nickel and iron-based alloy powders optimised for additive manufacturing. These metal additive powders are field proven in a variety of additive processes, including powder bed fusion, direct energy deposition, and Binder Jet Technology (BJT). The metal additive powders are used in aerospace, oil & gas, automotive, energy, and medical 3D Printing applications—or in combination with our end-to-end AM capabilities to produce fully-finished components and tooling. Kennametal Stellite™ powders can be tailored to meet the customer's particle size distribution requirements. With superior process control, exceptional powder flowability and sphericity can be achieved. The cobalt-based Stellite™ alloys combine excellent mechanical wear resistance, especially at high temperatures, with good corrosion resistance. The Stellite™ alloys are mostly cobalt-based with additions of Cr, C, W, and/or Mo. The nickel-based Nistelle™ alloys are designed to be corrosion resistant rather than wear resistant, particularly in aggressive chemical environments where their high chromium and molybdenum contents provide excellent pitting resistance. As a class, they are also generally resistant to high-temperature oxidation and hot gas corrosion.

**Metal additive powder**

**Kennametal India| Bengaluru**
**Email: bangalore.information@kennametal.com | Tel: +91-80-2219 8444**

## Industrial gear units

**Nord Drivesystems** recently developed the MAXXDRIVE® XT industrial gear unit. It provides output torques of 15 to 75 kNm with speed ratios from 6.3 to 22.4 and is offered in seven sizes for powers from 22 to 2,100 kW. Its robust design makes the MAXXDRIVE® XT resistant to dirt and reliable in rough operating conditions. A special sealing concept reduces maintenance. Large roller bearings and centre distances increase the load capacity and service life of the components. As standard, the industrial gear unit is equipped with a heavily ribbed UNICASE housing and an integrated axial fan. Due to the increased surface and the airflow covers, the cooling airflow is optimised, and a very high thermal limiting power is achieved. In many cases, additional cooling is not required. As with other application areas, the drive solutions by the company for the industry are individually configured for customers according to the modular principle. This is based on a comprehensive range of frequency inverters, motors and gear units, as well as coupling and brake systems, each with a wide variety of options.

**MAXXDRIVE® XT**

**Nord Drivesystems | Pune**
**Email: india@nord.com | Tel: +91-20-3980 1217**

## Snap-tap - laydown insert threading system

**Seco Tools** recently introduced a range of Snap-Tap® thread turning tools, which can be used for advanced manufacturing processes to produce the precision cutting edges. The process eliminates the need for secondary grinding or honing operations, which makes these tools a highly economical choice. Pair these tools with the anti-twist toolholders and solid suggestions from the company's thread turning wizard software. The range of turning tools are available in three insert chip breaker geometries for the successful machining of steel and stainless steel. While each geometry serves a unique purpose, they all feature the CP500 grade that features a highly wear resistant PVD coating to provide dependable machining for a large majority of common thread turning applications. The toolholders made for use with Snap-Tap® inserts offer the best possible holding power available for long tool life and high accuracy. They employ an anti-twist insert locking system that features a carbide pin in the back of the insert pocket that resists wear and prevents the insert from turning or twisting under pressure during machining. For added insert and toolholder rigidity, a D-style clamp securely pulls the insert down and into the pocket.

**Snap-Tap® thread turning tools**

**Seco Tools India | Pune**
**Email: seco.india@secotools.com | Tel: +91-2137-667300**

# Highlights – January 2023

» **Metal Cutting Technology**
Metal cutting technology is a manufacturing process in which a cutting tool is used to remove material from a work-part. So that the remaining material becomes a desired final shape and size by a controlled material-removal processes. This section will provide a brief presentation of metal cutting technologies in the 21st century, in line with all other developments. It presents the developments in metal cutting technologies in categories, from conventional metal cutting operations to cutting tool materials.

» **Industrial Bearings**
Bearings play a crucial role in the movement of any machine. From a pressing machine to a power plant, nearly every part of industrial equipment depends on bearings in some type of form and make. The upcoming article will speak about how the implementation of Industry 4.0 will pose dual benefits for bearing manufacturers, bearings as a smart component and bearing manufacturing via smart machines.

» **Embedded Metrology**
Embedded system is an application system. The upcoming article will talk about, the embedded system developing process using the operating system becomes inevitable. Embedded microprocessor is the core of the entire embedded system hardware and operating system software running the basic platform.

» **Industrial Maintenance**
Emerging technologies continue to give industrial maintenance processes the potential to be more efficient from cost and productivity standpoints. Industrial maintenance or plant maintenance is key to ensuring the peak performance of assets throughout the supply chain lifecycle. Considering the maintenance process which takes up a significant amount of operational budget, it is important that plants have a clear roadmap on ideal maintenance strategies for their operations. The upcoming segment will elaborate on the ideal maintenance strategies, the role of Industry 4.0 on industrial maintenance and more.

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