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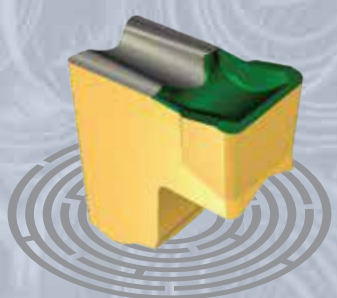

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*"Revolutionary Aluminium Unveiled"*

# A crucial place in Electric Vehicle revolution

Leading economic contributors including machine manufacturers, technology providers, Electric Vehicle (EVs) manufacturers and business outsourcing entities have made India the fifth-largest global economy, and the Economic Survey predicts a promising 6.5% growth rate for 2023-24, affirming India's economic trajectory. EVs are at the forefront of discussions, with policy incentives and technological advancements driving their manufacturing and adoption, transforming India's approach to this sector.

Electrification and efficiency are key trends, leading to a surge in aluminium demand shaping the industry's evolution. Moreover, product innovations are playing a vital role in shaping the downstream aluminium sector, as explored in this issue. Keeping this in the backdrop, the Cover Story issue highlights aluminium's critical role in enhancing EV sustainability, propelling the EV industry and impacting aerospace, defence, railways and renewable energy sectors.

We also introduce 'Industry Edge' by Mr Arun Bharadwaj, Editor of EM and A&D, that talks about India's automotive electrification and sustainability, along with the pros and cons of EV technology. Other focal points of the magazine include Casting and Forging, Grinding Machines, Engineering Materials and Sustainable Manufacturing that showcases cutting-edge concepts reinforcing EM's commitment to providing relevant content.

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

## MANAGEMENT NOTE

The industrial sector has been undergoing constant transformation in the past decade. With the advent of Industry 5.0, we can expect it to reach even further, even sooner. Along with the industry, we are also undergoing a metamorphosis. We began this process with the ***Manufacturing Technology Summit Pune 2023***, a successful industrial summit discussing the latest trends in varied sectors.

Our digital journey has now integrated an interactive comments section for our articles and stories, further implementing any requirements and suggestions our readers may have. Platforms like ***Morning Bytes with Anushka*** and ***Sunday Musings*** (by Dr Anil Lamba) are garnering industry attention. Moreover, our recent incorporation of the Flip Book magazine with videos as well as articles is an interactive experience just a few clicks away!

We will be posting some interesting updates on further events, initiatives and webinars, where we bring together major industry leaders to discuss the biggest developments in the manufacturing, automotive and EV industries. Soon, we will be hosting such conclaves in cities like Chennai, Ahmedabad, Delhi NCR and other industrial hubs in the country. Stay tuned for more with our official website www.pi-india.in.

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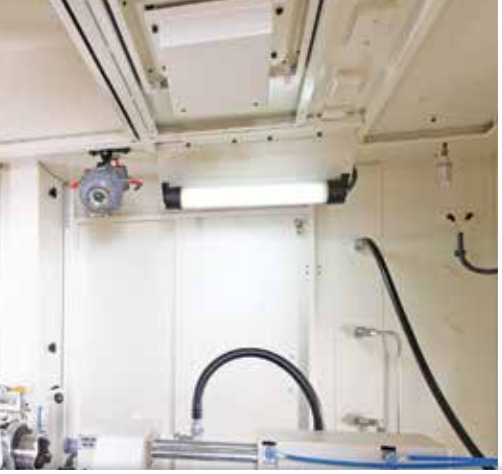
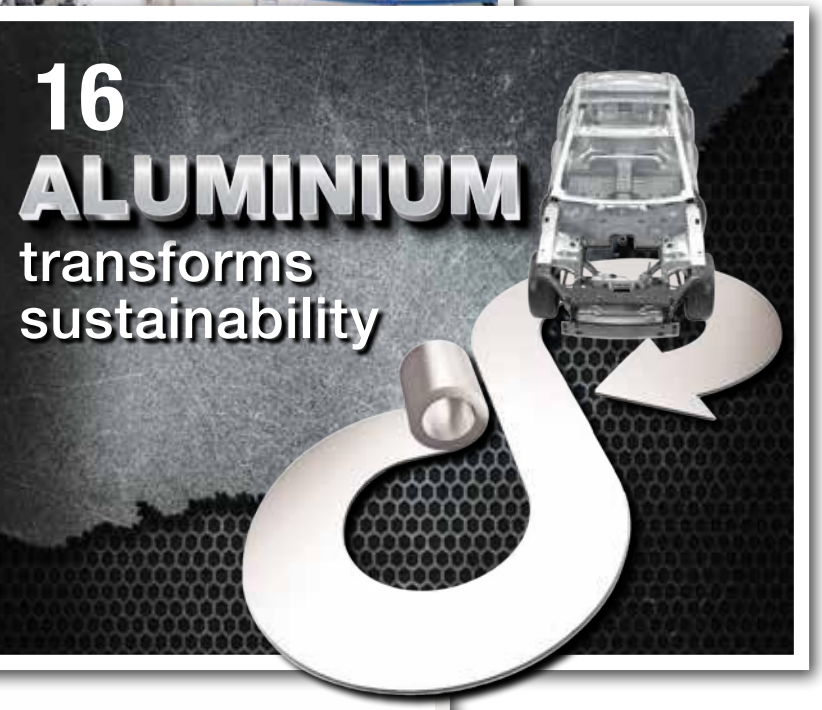
**43**
**INDUSTRIAL SAFETY**
Need for fire safety equipment at industrial sites













## SPECIAL FEATURE



## NEW PRODUCTS

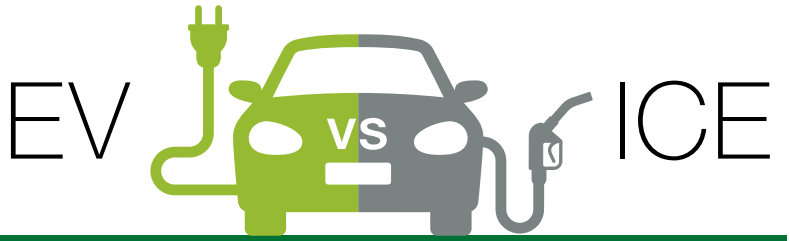


## Columns

**Arun Bhardwaj**
Editor, EM and A&D India

Talk

*EVs and ICE vehicles are at the forefront of the automotive industry's ongoing transformation. Here is a detailed differentiation between the two for better understanding...*




# Settling an age-old debate

| Features | EV | ICE |
|---|---|---|
| Environmental impact | EVs produce zero tailpipe emissions, reducing greenhouse gas emissions and contributing to improved air quality. | Internal Combustion Engine (ICE) vehicles emit pollutants and particulate matter, causing air pollution. |
| Energy efficiency | Electric motors are more energy-efficient than ICE engines, converting a higher percentage of energy from the battery to power the wheels. | ICE engines have lower energy efficiency because of energy losses from combustion, heat dissipation and mechanical components. |
| Fueling and infrastructure | An EV can be charged at home, public charging stations or workplace chargers. Expanding charging infrastructure is improving accessibility. | Gasoline and diesel fuel are widely available, with an extensive network of fuelling stations. Refuelling is generally quicker compared to EV charging. |
| Operating and maintenance costs | EVs have lower operating costs due to lower electricity prices compared to gasoline or diesel. Maintenance costs are typically lower as EVs have fewer (approximately 20) moving parts. | Fuel costs for ICE vehicles can vary based on fuel prices and vehicle efficiency. Maintenance costs can be higher due to more complex mechanical systems (with approximately 2,000 parts). |
| Performance and range | Electric motors offer instant torque, providing quick acceleration. EV range has been improving, but longer trips may require planning for recharging. | ICE vehicles offer a longer driving range and quicker refuelling, making them more suitable for long-distance travel without frequent stops. |

In conclusion, EVs offer a multitude of advantages that position them as an attractive and environmentally responsible alternative to conventional ICE vehicles. With their clear environmental benefits, energy efficiency, lower maintenance costs and adaptability to different commuting needs, EVs are driving us towards a more sustainable and cleaner future for transportation. Despite geopolitical events impacting electricity prices, the overall affordability and long-term cost savings by EVs make them an increasingly viable and impactful choice for environmentally conscious drivers.

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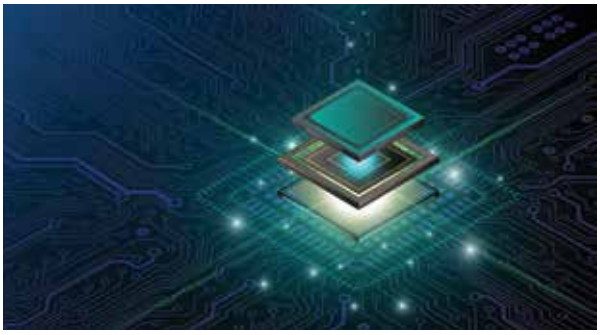
## ANCA Manufacturing Solutions rebrands to mark a new stage of growth and expanded customer solutions.

**ANCA Manufacturing Solutions (AMS)** recently announced a significant milestone in its evolution, unveiling its new name and offering to the market. Effective immediately, ANCA Manufacturing Solutions, formerly known as ANCA Sheet Metal Solutions, offers expanded capabilities, expertise and industry focus. Nicholas Doyle, AMS General Manager, said, "As a contract manufacturer, AMS delivers innovative and high-quality solutions to meet the specific requirements of our customers. We have expanded our scope of capabilities, so that we can partner with customers to offer a complete solution. AMS can offer in-house engineering, design, fabrication, coatings, mechanical assembly, electronics integration, wiring and sourcing of components from reputable suppliers across Asia". ANCA Manufacturing Solutions already serves customers across various industries, including agriculture, mining, 4×4 off-road accessories, renewables and EVs, electrical cabinets and enclosures. The new name captures the company's dedication to providing tailored contract manufacturing solutions that extend beyond sheet metal, encompassing a broader range of products and services.

## Vedanta adds Semiconductors and Display Glass to its portfolio

**Vedanta** recently announced the addition of semiconductors and display glass manufacturing ventures to its diversified portfolio. This represents a large growth opportunity for India, where the semiconductor market stood at $24 billion in 2022 and is estimated to reach $80 billion by 2026. The display panel market is estimated to be worth $7 billion, and is expected to grow to $15 billion by 2025. Currently, India imports 100% of these requirements. Vedanta's twin ventures will provide added momentum to the Government's goal of *Atmanirbharta* in electronics. The global semiconductor industry is at an exciting juncture. India is in a sweet spot to capitalise as the world looks to diversify critical supply chains in semiconductors and display fab. Speaking on the development, David Reed, CEO, Vedanta's Semiconductor Business, said, "I believe that India can become the next semiconductor hub for the world. It has all the ingredients for success".



## Tata Tele Business Services launches Smartflo UCaaS integrated with Microsoft Teams

**Tata Tele Business Services (TTBS)** has recently announced the launch of Smartflo Unified Communication as a Service (UCaaS), a unique voice solution integrated with Microsoft Teams. The Smartflo UCaaS solution works with Direct Routing for Teams, allowing users to place PSTN calls (to a landline or mobile number) from their desktop, laptop or mobile device using the corporate network. This model provides the convenience of unified communication with built-in privacy for users. It replaces traditional PBXs and enables key calling capabilities with a cloud-based call control system. With the increasing number of enterprises perpetually operating with a blend of an onsite and remote workforce, the demand for UCaaS solutions is expected to rise. BFSI, IT, ITes, Services and Manufacturing are among the top industries to adopt UCaaS. Speaking on this announcement, Vishal Rally, Sr Vice President, Product, Commercial and Marketing, Tata Teleservices, said, "Smartflo UCaaS has been developed to bridge the gap between remote employees and the office while enhancing business efficiency".

## Godrej & Boyce to invest in a Material Handling business to meet growing rental demand

**Godrej & Boyce** recently announced that its business, Godrej RenTRUST has planned to invest ₹ 100 crore in capital assets over the next three years. This strategic move comes as the company foresees a significant surge in material handling requirements across the country. In the Q4 of FY23, Godrej RenTRUST secured orders deploying 100+ units of equipment to esteemed clients across multiple industries such as shipping, 3PL, e-commerce, FMCG, manufacturing and F&B, demonstrating the company's commitment to long-term partnerships. With a strong belief in the potential of the rental market, Godrej RenTRUST aims to cater to the evolving needs of industries including auto, engineering, chemicals and pharma, F&B, FMCG, logistics, 3PL, e-commerce and retail. Commenting on this, Anil Lingayat, Executive VP and Business Head, Godrej Material Handling, said, "Our focus is on empowering businesses to thrive by providing flexible rental options that eliminate high upfront costs and offer optimal equipment tailored to their specific needs".


## UCIMU: An Eminent 2022 for the Italian Industry of Machine Tools, Robotics and Automation

**UCIMU** recently produced a framework for the Italian Machine Tool Industry Summit held in 2022. The review suggests that the summit was extremely positive for the Italian manufacturing industry of machine tools, robots and automation systems, and registered double-digit increases, setting new records for most economic indicators, mainly production and consumption. This framework was summed up by Barbara Colombo, President, UCIMU-SISTEMI PER PRODURRE. According to the final data processed by the Economic Studies Department & Business Culture Centre of UCIMU, in 2022, the Italian production of machine tools, robots and automation systems reached €7,280 million, recording a 15% increase versus 2021. Consumption grew by 26% to €6,311 million, leading to a rise in both domestic deliveries (€3,812 million; +21.6%) and in imports (€2,499 million; +33.3%). Based on the forecasts elaborated by the Economic Studies Department & Business Culture Centre of UCIMU, the year 2023 should also close with a positive trend; however, the order intake of the first half of the year is at a standstill.

## Batt:RE's R&D unit bags government recognition by DSIR

**Batt:RE Electric Mobility** recently announced that its in-house Research and Development (R&D) unit has been accorded government recognition under the certification TU/IV-RD/4916/2023 by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (Government of India). The recognition of the company's R&D centre in Jaipur, Rajasthan, affirms the company's commitment to providing the safest and most efficient electric vehicles to its riders across the country. The in-house R&D centre is the heart of the company's innovation. The centre, which started in 2020, has already received 20 patents, including 12 patents for its electric scooters and 8 patents for upcoming motorcycles. The R&D centre focuses on design and sketching, building prototypes, market research, vehicle testing and validation, 3D modelling and structural analysis. The company has several upcoming products in the pipeline. Nishchal Chaudhary, Founder, CEO, Batt:RE Mobility, said, "Our R&D centre is constantly innovating to ensure that our electric vehicles meet the highest safety standards and provide the best riding experience to our customers".

## Vitesco Technologies presents innovative electrification solutions for two-wheelers

**Vitesco Technologies** presented its innovative electrification solutions for a range of segments in the two-wheeler market at the facility on July 06, 2023, in Talegaon, Pune. For the first time, the company will also be publicly showcasing a demo version of its 48-volt system for electric light motorcycles and scooters with 3–7 kW output (equivalent to up to 150 cc for combustion engines) in India. In addition to the company's two decades of expertise in two-wheeled vehicles, in its new developments, the company also benefits from in-house series products in the automotive sector. The company will be showcasing the highly integrated EMR3 (3rd generation of Electronics Motor Reducer) electric axle drive, which has already proven itself in the passenger car market, as a tailored solution for high-performance three- and four-wheelers. Klaus Hau, Executive Board Member and Head of Powertrain Solutions Division, and Anurag Garg, Managing Director & Country Head, Vitesco Technologies India, unveiled the Demo scooter at the facility in Talegaon and said, "I truly believe that the future is electric. India's automotive industry is currently undergoing what is possibly the most significant transformation in its history. E-mobility is becoming a mainstream phenomenon, and our portfolio clearly focuses on global, scalable platforms for electrified vehicles. We are well-positioned due to our experience, electronics expertise and large product portfolio". Anurag Garg, Managing Director & Country Head, Vitesco Technologies India, said, "We are excited to present a demo version of our 48-volt system for electric light scooters and bikes in India for the first time to the public. Our aim with this concept was to discover the vision of a new generation of EVs while also establishing standards for other e-mobility projects. Globally, we have been investing in this segment since 2006 and have successfully brought e-innovations to market for well over a decade. We will continue to enhance the efficiency and range of innovative electrification solutions for two-wheelers and powersports in India using cutting-edge technologies".

# "Collaboration is crucial for the future of India's manufacturing sector"

…says **Mannu Singh,** Vice President, Tata Teleservices. In an interview with Neha Basudkar Ghate, describing the market trends that he foresees in connectivity solutions. Excerpts…

**What are the major challenges in the Indian SME sector today? How is TTBS helping SMEs in their digital journey?**

Small and Medium Enterprises (SMEs) are immensely contributing to the country's economic growth by creating value and opportunities for communities. However, they need to constantly modernise their operations and adopt digital technologies to remain competitive in this digital era. TTBS is committed to fuelling the growth of SMEs as a trusted digital partner by continuously providing the expertise, technologies and guidance they need to overcome the challenges during the digital transformation journey and achieve their business goals.

**Your business portfolio focuses on delivering customised solutions. How do you classify the market drivers?**

TTBS is proficient in digital and connectivity spaces. The growing need for a digital transformation across industries is a significant market driver for TTBS. We provide the necessary Cloud, SaaS, UCaaS, Cybersecurity and Digital Workplace solutions and services to enable this transformation smoothly, such as Smartflo and SmartOffice®. For BFSI enterprises, we offer *Ultra-Lola*, a technologically superior point-to-point solution with micro-second latency. Our *Smart Internet Leased Line* comes bundled with cloud security features. Moreover, we offer *SD-WAN iFLX* and integrated digital solutions to enterprises.

**Can you share TTBS' key milestones or success stories when it comes to providing services for the manufacturing industry?**

At TTBS, we recognise the significance of the manufacturing sector and are actively contributing to its growth. We strive to leverage our expertise in smart technology to enable digital transformation and connectivity in the manufacturing industry. TTBS is helping thousands of SMEs build resiliency and manufacturing firms gain high-scale automation, operational efficiency and cost-effectiveness with its smart collaboration and connectivity solutions. TTBS has also been bestowed with prestigious industry awards that are testimony to its long-standing commitment towards creating a '*digital first*' ecosystem for enterprises.

**Where do you think India's manufacturing sector is headed in the coming years?**

India's manufacturing sector is poised to witness several positive trends. The industrial focus is currently shifting towards smart manufacturing characterised by advanced technologies like IoT, AI, big data analytics and robotics for real-time monitoring, predictive maintenance, intelligent automation and seamless connectivity, leading to optimised production processes and improved quality control. At TTBS, we believe that collaboration is crucial for the future of India's manufacturing sector. Through strategic partnerships, we can collectively address challenges, leverage emerging technologies and create a conducive environment for the growth of manufacturing in India.

# "Offering affordable and reliable electric mobility solutions to Indian consumers"

…says **Nishchal Chaudhary,** Founder, Batt:RE Electric Mobility. In an interview with Neha Basudkar Ghate, discussing the Indian e-mobility industry and its challenges. Excerpts…

**Currently, what are the lows and highs of the Indian electric mobility industry?**

The Indian electric mobility industry is currently experiencing both lows and highs. Nevertheless, one of the major challenges we are facing is the lack of robust charging infrastructure across the country. This poses a hurdle for the widespread adoption of EVs as consumers are concerned about range anxiety, availability of charging stations and higher upfront cost. However, the Government has actively been promoting electric mobility through various initiatives and incentives like the FAME scheme, which have led to increased awareness and a growing market for EVs.

**What made you come up with Batt:RE Electric Mobility? How has your company grown since its launch in 2017?**

The idea behind Batt:RE Electric Mobility was to offer affordable and reliable electric mobility solutions to Indian consumers. We recognised the need for a smart, connected and sustainable mode of transportation in the country. Since our launch in 2017, we have expanded our product portfolio, introduced new models and strengthened our distribution network across multiple Indian states. Batt:RE has sold over 34,000 scooters to date, establishing a network of around 400 dealerships across 21 Indian states. Notably, we have remained profitable, demonstrating the strength of our business model and ability to meet the market's evolving demands. The company has received 20 patents for its Electric Scooter Stor:ie and upcoming motorcycle Dune.

**Can you tell us about the technological innovations that set Batt:RE Electric Mobility apart from other e-mobility startups in the market?**

Batt:RE Electric Mobility differentiates itself through its technological innovations. We have developed an advanced Battery Management System that optimises battery performance, enhances range, ensures longevity, enables remote monitoring and diagnostics and provides users with real-time data on battery health and performance. Our scooters use smart features like IoT connectivity, GPS tracking and vehicle-monitoring app to track rides and locate charging stations, enhancing the user experience and enabling data-driven insights for efficiency and maintenance, and has been crucial in boosting EV adoption across India. We have also focused on creating a stylish and ergonomic design for our scooters, ensuring that they appeal to the modern urban consumer.

**What are your short-term plans to generate growth/profit in your company for the future?**

In the short term, our primary focus is on expanding our market reach and increasing sales. We are actively working on enhancing our product portfolio by introducing new models and variants that cater to different customer preferences and market segments. We are exploring strategic partnerships and collaborations to leverage synergies and accelerate our growth. By optimising our supply chain, streamlining manufacturing processes and leveraging the benefits of localisation, we aim to improve margins and drive profitability in the near term.

# “We are transforming towards becoming a cloud company”

…signifies **Mathew Thomas,** Country Manager and Managing Director, Siemens Digital Industries Software India. In an interview with Neha Basudkar Ghate, he discusses their evolution and how they aim on penetrating the digital landscape. Excerpts from the interview…

**Q How do you overview the digital transformation in business recently and how well do you think has Siemens been able to embrace this digital journey?**

I think businesses, fundamentally, are looking to become more competitive. If I look at competing countries, which we aspire to compete with, then 25%–30% of your GDP should be from manufacturing. If I look at what’s happened over the last two years, we are transforming towards becoming a cloud company. We are probably the earliest ones among the industrial software companies to do that. The reason that we’ve been able to move well is that we are very uniquely positioned because we can combine the real and the digital worlds because of our presence in the IT and OT segments. If we aim towards becoming the third-largest economy by 2030, our manufacturing industry should be competitive. Siemens is the best partner for this, as we combine the real and the digital worlds with a combination of IT/OT integration using the Siemens Xcelerator platform.

**Q Can you tell us more about next-generation solutions based on Siemens’ focus on optimising solutions and working towards them?**

If you look at the heritage of our company, we were probably focused mainly on the mechanical side of things. However, we realised that if we have to develop the next generation solutions and meet the requirements of our customers, that’s when we looked at expanding our footprint. Our transition over the past few years has been across segments, and I think these are very smart and well-thought-out acquisitions, which help us address the requirements of the customers. To begin with, we acquired mentor graphics - the Siemens EDA solutions, which is really aimed at addressing the whole electrical/electronics segment. Further, we expanded from being purely mechanical to electronic/electrical and software and moved onto Mendix, an open enterprise platform that we used to develop applications. So, from pure design, which is an NX solution simulation, which is a Simcenter portfolio, planning which is Tecnomatix, production again, we have now moved into digital logistics. Simply put, we moved from just a mechanical, to electrical, to electronics, to supply chain, to quality and of course, service with IoT. If I look at the evolution, we were able to address the whole operation of a customer. Now, these solutions are real time,

because for example, it's all put together by our underlying digital thread, which is our Teamcenter - which is our heritage product, and that's where it all ties together. Because if you make a change in something, how do I track it? How do I manage the chain? And that's exactly how this all comes together. So that's the evolution of what we've been able to do.

**Q With its presence in varied industries like marine, aerospace, defence, automotive, transportation and many more, how does Siemens Digital Industries Software cater to customised market state segments and consumer demands with its portfolio?**

We are not a company for one industry, because it is clear we cater to a variety of industries. Traditionally, we may have been in manufacturing purely. If I talk in context, there was an ~37% increase in the capital allocation in the last budget announced by the Indian government. This 130 billion is being allocated to railways, defence, infrastructure, economies, etc. Because we have a specific focus on automotive (industrial machinery, heavy engineering, aero and aerospace, marine, defence and transportation), we have solutions specifically catering to them. It is all based on the Siemens Xcelerator platform. It is not only for a large enterprise but also for small and medium enterprises as well. We have specific industry threads that could cater to various segments. Furthermore, we're also expanding as we go along.

**Q Can you throw some light on the advanced manufacturing visualisation that Siemens would like to comment on and how it affects your business strategy? What is your vision for business operations in the next coming years?**

If we look at it the advanced manufacturing that you asked me about visualisation, it enables us to see the future of a factory and the advanced manufacturing systems through the industrial metaverse before the production readiness. We do have products which can actually simulate a plant and see it visually. Now, using the Nvidia solution and digital twin technologies, I can feel my way there, walk through it and see how it is laid out or experienced. According to our global estimates today, the market comprises approximately 10 billion or so globally, expected to go almost 10 times in the next five years. Just imagine transforming from a pure mechanical software company to a whole piece where we are talking about partnerships with Microsoft, AWS, IBM and Nvidia is where all this comes together because it's an evolving thing.

**Q How do you see the future of digital transformation and innovation? How would you like to give your perspective on being part of Siemens and your pure outlook?**

I've been working in the IT industry for the past 32 years; if I look at it, I've seen the whole journey from client-server computing to internet computing. I have been very fortunate to have witnessed this transformation. I think, sometimes, it is hard for me to believe the progress made; if I had to travel 30 years back, I still had to wait for that physical ticket jacket before I went to the airport. Today, you don't even print the boarding card, but rather just have it scanned. Moreover, if you're on a Digi Yatra, you scan your boarding pass from your phone and can go through it. That's the transformation that is taking place, and there is no way out for companies they must remain competitive. The digital transformation is a must; it's a given.

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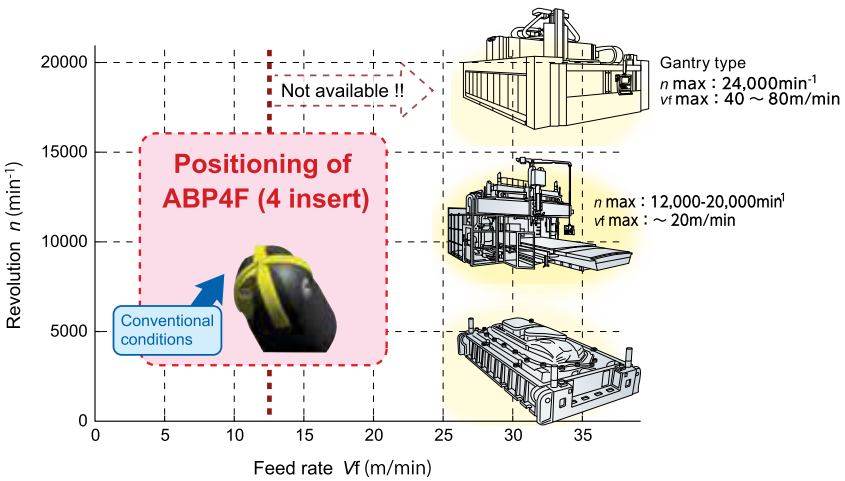
# ABP4F type

## Ball Precision Multi Flutes ABP4F

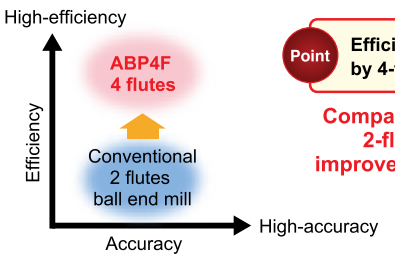
・New product: 4-flute ball end mill ($\phi$20 to $\phi$30) compatible with machines ranging from general-purpose manufacturing machines to the latest high-speed machines

## Example of large press die for automotive parts




## Processing advantage of 4-flutes end mill

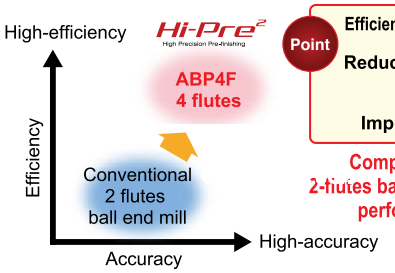
Figure Finishing




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**
↓
**Reduce the processing load on semi-finishing**
↓
**Improve finishing accuracy**

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

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# ALUMINIUM transforms sustainability

**The rise of Electric Vehicles (EVs) has ushered in an era of sustainable materials in the automotive industry. Among these, aluminium stands out as a pivotal player, offering numerous benefits over traditional materials. We sat down with Bharat Gite, a prominent figure in the aluminium industry and a representative of Taural India, to discuss the Cover Story on how aluminium contributes to the sustainability of EVs, its role in shaping the future of the EV industry, and its impact on other sectors such as aerospace, defence, railways and renewable energy.**

**Bharat Gite,**
MD and CEO,
Taural India

## Aluminium and sustainability

Aluminium is a lightweight material and plays a pivotal role in reducing the overall weight of Electric Vehicles (EVs), thereby improving their energy efficiency and extending their driving range. This lightweight characteristic also leads to lower energy consumption during the vehicle's operation. Moreover, the use of aluminium in EVs causes a substantial reduction in greenhouse gas emissions across the entire life cycle of the vehicle, starting from its manufacturing to its end-of-life disposal. Calculations reveal that vehicles equipped with an aluminium body emit ~12.6 kg of fuel-related CO2 per 100 km, compared to the 13.5 kg emitted by vehicles with a steel body. Over time, these accumulated emissions savings can significantly contribute to lowering the carbon footprint of the automotive industry, aligning with our paramount objective of achieving net-zero goals for preserving our planet.

Aluminium boasts high recyclability, enabling the establishment of an efficient closed-loop recycling system. This approach reduces waste and helps minimise the need for continuous production of primary aluminium, further mitigating the environmental impact of the automotive sector. Thus, the strategic incorporation of aluminium in electric vehicles enhances energy efficiency and driving range and serves as a potent means of combating climate change. As we ardently pursue a sustainable and environmentally responsible future, harnessing the eco-friendly attributes of aluminium can pave the way for transformative change within the automotive industry and contribute to keeping the planet greener and healthier.

## Aluminium and e-mobility

Undoubtedly, aluminium is poised to play a pivotal and transformative role in shaping the future of the EV industry. This sentiment resonates strongly within the automotive sector as well. As per a recent survey conducted by global consulting firm Ducker Carlisle, auto manufacturers and Tier 1 suppliers anticipate a tremendous surge in aluminium demand by the end of this decade. The aluminium content per vehicle is estimated to increase significantly, nearing 100 net pounds per vehicle by 2030.

The attributes that make aluminium appealing for EV manufacturing are its lightweight nature, excellent corrosion resistance and design flexibility. These characteristics position it as the ideal material for the manufacturing of EVs. As the demand for EVs continues its upward trajectory, the widespread adoption of aluminium also opens up remarkable opportunities for innovation and sustainability efforts. Its low carbon footprint and exceptional recyclability hold the potential to substantially reduce Green House Gas (GHG) emissions, aligning perfectly with the core principles driving the EV industry's vision.

However, amidst the transition towards using aluminium as the primary material in EV manufacturing, there are foreseen complications, including potential challenges related to limited raw material availability and energy-intensive refinement processes. To fully capitalise on the advantages of using aluminium while meeting the industry's large-scale transitional demands, we must support capacity and technology growth and develop the required recycling infrastructure. By doing so, we can harness the impressive recyclability of aluminium, making significant strides towards an eco-friendlier automotive manufacturing landscape, an objective that lies at the heart of the EV industry's mission.

## Evolving usage over the years

Aluminium light-weighting has become a critical focal point for automakers aiming to enhance fuel efficiency and reduce emissions. As the focus shifts towards fuel efficiency and decarbonisation, the use of aluminium is expected to expand, driven by advancements in manufacturing technology and research into improved applications of aluminium alloys. With ongoing technological advancements and cost reductions, the applications of aluminium may likely extend beyond the current limited use in high-end luxury vehicles or advanced military and aerospace components to a wide range of mass-market vehicles. Progress in aluminium alloy development has broadened its applications in the automotive sector, offering opportunities for stronger alloys that can enable new design possibilities and enhance the metal's suitability for automotive use.

Aluminium may find even more applications in developing EV batteries due to its high durability, excellent

thermal conductivity and favourable strength-to-weight ratio. Many swappable batteries already rely on aluminium extrusion for battery casings. Given the automotive industry's growing emphasis on sustainability and recycling and the potential of scale, automakers might prioritise using recycled aluminium in vehicle manufacturing to a large extent. Such a shift can contribute significantly to India's journey towards achieving net-zero emissions by 2070, especially because the automotive industry currently stands as the nation's third-largest CO2 emitter. By making aluminium a prominent player in automotive manufacturing, we can effectively reduce GHG emissions, promote sustainable business

practices within the automotive sector and simultaneously reduce dependence on primary aluminium production. This multi-faceted approach can lead us towards a greener and more environmentally responsible function in the automotive industry, aligned with our sustainable development objectives.

## Advantages to various sectors

The dominance of aluminium in EV manufacturing is a significant trend, but its versatile properties have also made it an increasingly popular alternative in various other major industrial applications. At Taural India, as essential players in the downstream chain of aluminium businesses, we have personally seen this shift happen. Manufacturers like us have been collaborating to innovate and provide solutions that cater to diverse industries seeking the benefits of aluminium. Our clientele spans different sectors, including energy, defence, infrastructure, healthcare and marine and aerospace engineering. All of these industries have turned to aluminium to address modern challenges and benefit from its unique advantages.

In the defence sector, where mobility and fuel efficiency are critical for military vehicles, naval vessels and aircraft, aluminium's lightweight nature becomes indispensable. It ensures uncompromised mobility and also enhances payload capacity in these defence vessels. For infrastructure projects, especially in coastal regions and marine applications prone to corrosive environments, aluminium emerges as a game-changer. Its inherent corrosion resistance ensures durability and longevity and significantly reduces maintenance costs.

The energy sector finds worth in aluminium's exceptional combination of good electrical conductivity, high corrosion resistance, low density, and cost-effectiveness. These qualities make it a viable alternative for use in power transmission lines, ultimately improving energy distribution efficiency. Above all, aluminium's infinite recyclability makes it the perfect sustainable choice across all the mentioned sectors. As the demand for eco-friendly solutions rises, aluminium continues to stand out as a versatile material that meets the evolving needs of multiple industries while contributing to a greener and more sustainable future.

## Advancements in aluminium casting

In recent years, aluminium alloys, specifically those containing copper, zinc or lithium, have gained significant traction as the materials of choice in critical aerospace applications. Notably, aluminium–lithium alloys have demonstrated their ability to reduce aircraft weight by ~10%, offering substantial gains in fuel efficiency and overall performance. Researchers are relentlessly working to develop new and improved aluminium alloys, aiming to augment the advantages of the existing ones. These efforts focus on enhancing crucial properties such as higher strength, improved corrosion resistance and longer fatigue life. By achieving these advancements, the integrity and durability of aircraft and space exploration vehicles can be better maintained even under the most demanding conditions.

India has played a pivotal role in contributing to these innovations. Our scientists have successfully developed an eco-friendly process called micro-arc oxidation, which improves wear and corrosion resistance in high-strength aluminium alloys by a significant measure. This enhancement has increased fatigue life, improved stress-bearing capacity and heightened suitability for aerospace applications. The metal has also found its way into India's recent space exploration mission, Chandrayaan-3, which used an aluminium alloy case to protect lithium-ion batteries in the rocket's orbiter, lander, and propulsion modules.

This application highlights the metal's desirable properties, including high specific strength, ductile benefits and elastic stiffness and low mass density — making it an ideal choice for space explorations.

The aluminium casting industry continues to evolve, presenting exciting possibilities for further advancements and innovations. The integration of 3D Printing processes has ushered a revolution in the manufacturing landscape, enabling the production of large and complex parts with reduced lead times. As we stand at the cusp of even more remarkable breakthroughs, the constant pursuit of excellence in aluminium research and development promises a future where aerospace and other industries will benefit from the metal's exceptional properties and continue to push the boundaries of innovation.

## Aluminium in railways

India's freight trains stand as a compelling testament to the transformation brought by aluminium to our railway networks. In a significant milestone, the country launched its first all-aluminium wagon freight train in October of the previous year. With an ambitious vision ahead, the Indian Railways plans to gradually shift towards adopting aluminium-bodied trains, which promise remarkable advantages. By embracing aluminium coaches, the railway network stands to gain a 30% reduction in weight, leading to substantial benefits. These lightweight coaches are estimated to slash $CO_2$ emissions by over 2.5 million tons while boosting the coaches' resale value to an impressive 80%.

France's TGV Duplex train has also harnessed the potential of extruded aluminium, yielding a notable 20% reduction in structure weight. In addition to the undeniable advantage of weight reduction, aluminium boasts a unique feature that sets it apart from iron or steel: its rust resistance. This exceptional corrosion resistance ensures the durability and longevity of railway infrastructure, even in the face of diverse geographical and climatic conditions, leading to enhanced efficiency and decreased maintenance costs. Integrating aluminium components in railway networks is a milestone revolution for the industry as it has provided lightweight alternatives to traditional heavy materials. With India's extensive railway network spanning over 68,000 kilometres, now ranking as the fourth largest in the world, the transition from conventional materials to aluminium is poised to deliver a tremendous positive impact. Expectations include improved energy efficiency, enhanced speed and overall performance and a way to optimise the budgets.

The strategic adoption of aluminium in India's railway network exemplifies how this remarkable material can elevate and redefine the transportation sector. As the industry progresses towards greater sustainability, aluminium's unique properties contribute to a greener, more efficient and cost-effective railway system that will undoubtedly pave the way for a brighter and more advanced future.

## Renewable energy and promoting sustainability

Due to rapid infrastructure development and urbanisation, India's power requirements have shot up significantly and have touched their historical peak in FY'23. Taural India's expertise can help companies involved in electricity generation and distribution to step up to this imminent challenge and take measures to meet exceptionally high-power demands. Our intricately casted aluminium parts, with exceptional integrity and pressure resistance, can be used to manufacture top-quality Gas Insulated Switchgear. Being lightweight, space-saving, leak-proof and low maintenance, they have considerable advantages over Air Insulated switchgear.

While we are yet to foray into the industrial applications for renewable energy, as this sector is still in a nascent of aluminium adoption in India, we are constantly looking for opportunities to collaborate and create new or local solutions. The potential of aluminium's applications in the renewable sector is well established, and we hope to contribute to bringing a positive impact.

## Global aluminium market

The growth prospects for the aluminium market are undeniably promising. However, it is essential to adopt some key strategies and keep our focus on some specific areas to ensure continued success in the industry. Sustainability and

environmental responsibility must take precedence, as aluminium mining can impact the environment adversely if not managed well. Companies conducting aluminium extraction should embrace eco-friendly practices rapidly. Supporting regional and local aluminium suppliers can be an effective way to achieve this, in addition to a greater emphasis on using recycled aluminium to reduce primary mining.

Encouraging and facilitating innovation and technological advancements is paramount for sustaining the growth of the aluminium market. Investments in research and development can lead to increased efficiency in existing aluminium-based applications, streamlined manufacturing processes and the creation of new super alloys that deliver remarkable results with minimal environmental impact. Forging strategic partnerships across the entire industry's value chain is also crucial. Collaborations between manufacturers, suppliers and end-users can improve supply chain operations, eliminate inefficiencies and elevate the industry collectively. By implementing these strategies and enabling diversification, technological advancements, sustainability and supply chain optimisation, businesses in the aluminium industry can seize the projected growth opportunities and fortify their position in the global market. This forward-looking approach ensures a competitive edge while fostering a more environmentally conscious and responsible aluminium industry.

## Emerging trends

Industries across the spectrum are acknowledging the tremendous potential of aluminium and taking steps to revamp conventional processes, aiming to enhance efficiency, reduce costs and streamline the value chain. On the home front, Taural India has emerged as a pioneering force, driving India towards self-reliance by providing cutting-edge solutions for aluminium casting needs in various sectors. A notable milestone was the supply of 500 components to the Indian Army for the Sarath Infantry Combat Vehicle, a feat that marks a significant achievement as India previously relied on Russian imports for this critical component for 38 years. Now, with indigenised production, we have achieved self-sufficiency.

We are hopeful that this promising trend will continue on a global scale. Soon, we can expect many countries to actively use aluminium in industrial operations to improve efficiency and impact. The development of new and improved aluminium alloys, the onset of innovative manufacturing processes like 3D Printing and advancements in surface treatments and coatings further enhance aluminium's relevance in these sectors. The future holds even more remarkable possibilities for aluminium's applications. As an industry expert, I foresee extensive usage of aluminium in automotive manufacturing and defence engineering across land, air and marine domains as well as energy and infrastructure sectors. The healthcare industry also exhibits tremendous potential for applications with aluminium as the alternate new-age metal. Indeed, this is just the beginning of a transformative journey with aluminium at the forefront. As we push the boundaries of innovation and embrace the versatility of this exceptional metal, we open the door to a host of new opportunities and advancements that will shape industries and pave the way for a more sustainable and efficient future. □

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# Unravelling the Indian casting and forging industries

**Castings and Forgings are used to manufacture engines, transmissions and other parts. Moreover, 90% of all manufactured goods and machinery have casting applications. Here is a detailed insight into this industry and the Indian market.**



**Sagar Gupta,**
Director,
Ekkaa Electronics

India is on the threshold of major growth and transformation with a vision to be a $5 trillion economy by 2024–25. It is said that the barometer of an economy's progression is manufacturing. The sector uses metals to the maximum possible extent and among the metals steel, aluminium, iron and copper make up the majority of the metals used in this sector. Talking about metals, casting and forging come to play a significant role in the metals industry. They form two significant portions of the metal sector and can be found in almost every industry possible, from construction to transportation vehicles, medical equipment, aerospace, machinery and much more. Castings are also used to manufacture other components like gears. However, what exactly are Casting and Forging?

Casting is the process in which a metal is heated in a furnace until molten. When it liquefies, the liquid metal is poured into a die or a mould to create a component shape. Casting is highly beneficial for the mass production of a certain part as the same mould can be reused. Forging, on the contrary, is the process in which thermal and mechanical energy is applied to ingots to cause the alloy to change shape when in a solid state. Metal casting is typically done using non-ferrous metals such as Zinc, Copper, Aluminium, Magnesium, Lead, Tin-based alloys and the likes. Research indicates that the Indian metal casting industry reached $11,667.5 million in 2022, and is expected to reach $17,608.2 million by 2028 — a 6.7% CAGR during 2023–2028. With a similar trend, the Indian metal forging market size was valued at $3.86 billion in 2021. The market is expected to grow from $4.32 billion to $8.0 billion by 2029, implying a 10.69% CAGR during the forecast period.

## History and evolution

History has it that the oldest and most primitive metal castings date back to roughly 4000 BC, when gold was the first metal to be cast. However, the oldest known casting is said to be a copper frog, and have been created in Mesopotamia (present-day Iraq) in about 3200 BC. It is believed that, later, Bronze emerged as the preferred metal for casting, and was molten and cast into a variety of tools and weapons. It is estimated that the Shang Dynasty of China was the first to introduce sand casting while melting

metals. Later, the Zhou Dynasty introduced cast iron to the world around 500 BC. Subsequently, the Qin Dynasty used cast iron for making weapons and decorative items. With a wide range of applications, castings and forgings are used to manufacture engines, transmissions and other parts. Because castings can be made from various metals like steel and aluminium, they are also used in pump manufacturing. It is noteworthy that 90% of all manufactured goods and all manufacturing machinery have casting applications.

Currently, according to estimates, India is the third largest casting producer in the world after China and USA. The Indian casting and forging sector is in an advantageous position to generate higher revenues from the Indian automobile sector. Some of the other sectors that rely on casting and forging are Railways, Energy and Construction equipment. The decision to go in for casting or forging depends on the metal component, its application and overall use. As a thumb rule, it is preferable to use casting for large and complex components and forging for simpler, small-sized products. There are a few factors to be considered while choosing between casting or forging. They are:

- Quantity of the material
- Economics/cost
- Design (simple or complex)
- Mechanical properties
- Metal type
  (Normal steel or customised alloy materials)
- Surface finish

## India in casting and forging

The Indian foundry industry (aka casting) is known for producing high-quality castings at lower costs vis-à-vis other countries, thus making India an export hub for casting products. It is one of the oldest and largest industries in the country, contributing approximately 2.3% to the GDP of the country and employing over 2 million people in about 4,500 foundries spread across the country. The industry has also innovated and harnessed technology to be cleaner and greener. The Indian foundry industry has been investing heavily in Research & Development (R&D), with an estimated 40% of the foundries having dedicated R&D facilities. Among industries that consume the largest quantum of castings is the automotive sector, accounting for around 35%–40% of the total castings produced in the country. Other sectors like railways, power and defence have also shown an increasing demand for casting products.

The forging sector is also experiencing buoyancy with the automotive sector accounting for a major chunk of contribution. Among the most common uses of forged components in the automotive sector include connecting rods, camshafts, crankshafts and others. In the forging sector, too, India is considered to be one of the major metal forging production hubs. A report reveals that Carbon Steel material occupies the top slot in forging, followed by Alloy Steel, Stainless Steel and other materials like Titanium, Aluminium Alloy and Nickel. According to the Engineering Export Promotion Council of India, the metal forging sector is one of the key sectors for export growth. The Government of India's 'Make in India' initiative has given an impetus to the manufacturing sector by creating a positive environment.

In summary, the Indian casting and forging sectors are poised for a major leap with key sectors like railways, aerospace, transportation and more. Both industries' focus on continuous modernisation, innovation, R&D and adoption of cleaner and greener technologies has made the Indian casting and forging industries globally competitive while addressing several challenges. Simultaneously, rapid Electric Vehicle (EV) adoption is likely to impact the casting and forging Industry, according to a report by the Association of Indian Forging Industry. The report cites that, since there would be lesser moving parts in EVs vis-à-vis traditional vehicles, the industry would be saddled by lower capacity utilisation. The report also notes that almost 60% of sectoral players could be affected by rising input costs unless the government pushes for hybrid vehicles rather than pure EVs. ☐

# Auto components in manufacturing

Traditionally, India's auto component industry has been inclined towards imports, resulting in a trade deficit. However, recent years have witnessed a notable shift in this trend, bringing forth a significant turning point for the sector.

**Mridu Mahendra Das**
Co-founder, CEO, Automovill

**The Indian automobile industry has experienced a remarkable transformation in recent decades, propelled by a flourishing manufacturing sector and a burgeoning domestic market. Within this industry, the automobile component sector in India can be categorised into two segments: organised (Original Equipment Manufacturers (OEMs) that specialise in the production of high-value precision instruments) and unorganised (lucrative after-market services, meeting the diverse needs of automobile owners).**

**Diving deeper into the intricate web of the automobile components industry in India, one encounters various sub-sectors that form the intricate tapestry of this sector's contributions. These sub-sectors encompass a wide array of specialised components, such as engine parts, drive transmission and steering parts, body and chassis components, suspension and braking systems, electrical parts and other intricate elements like fan belts, die-castings and sheet metal parts. This diverse range of components underscores the industry's multi-faceted nature and ability to indulge the diverse requirements of the automotive sector.**

**Traditionally, India's auto component industry has been inclined towards imports, resulting in a trade deficit. However, recent years have witnessed a notable shift in**

this trend, bringing forth a significant turning point for the sector. In the fiscal year 2022, a milestone achievement was reached as the industry witnessed a trade surplus for the first time, amounting to a substantial $700 million. The global competitiveness of the Indian automobile component industry is evidently growing. This showcases the industry's capacity to excel at both domestic as well as international markets, bolstering India's position as a key player in the global automotive supply chain.

## Significance of auto components

Auto components form the backbone of the automotive industry, acting as essential building blocks in the production of vehicles. These components encompass a wide range of parts and systems, including engines, transmissions, chassis, electrical components, braking systems and more. The quality, efficiency and reliability of these components directly impact the performance and safety of automobiles. Several factors have contributed to the growth of the automobile, such as:

### • Domestic demand

The automotive industry in India has experienced substantial expansion over the preceding decade, propelled by the rise in disposable incomes, urbanisation and the flourishing middle-class population. This surge in automobile sales has consequently precipitated a heightened appetite for automotive components. Moreover, the Indian government's determined impetus towards electrification and the implementation of rigorous emission standards have further fuelled the requirement for sophisticated components, thereby fostering continued progress within the sector.

### • Favourable Government policies

The Indian government has deployed an array of policies and initiatives to stimulate the production and export of automobile components. One such notable endeavour is the inception of the 'Make in India' campaign in 2014, which envisions establishing India as an eminent global manufacturing nucleus. Parallelly, the *National Automotive Testing and R&D Infrastructure Project* and the *Automotive Mission Plan 2026* have served as catalysts, propelling R&D and technological innovation within the industry. These strategic measures will foster an environment conducive to advancements and bolster the nation's standing in the realm of automotive manufacturing and expertise.

### • Export opportunities

India has risen as a pivotal contender in the worldwide automotive supply chain, proffering auto components that combine cost efficiency with exceptional quality. The burgeoning exports to both developed and emerging markets have proven instrumental in propelling the ascendance of the Indian auto component industry, fortifying its trajectory of growth and affording it enhanced prominence on the global stage.

### • Collaborations and joint ventures

Within the Indian automotive landscape, a multitude of auto component manufacturers have astutely forged strategic alliances and entered into joint ventures with esteemed global counterparts. More importantly, these strategic partnerships have fostered an environment of cross-pollination and mutual learning, wherein Indian manufacturers have had the invaluable opportunity to observe and emulate international benchmarks of success. This exposure to diverse perspectives and advanced methodologies has effectively reinforced the continuous enhancement of their product offerings, manufacturing efficiency and adherence to stringent quality standards.

### • Quality standards and certifications

Indian auto component manufacturers have increasingly focused on meeting international quality standards and

obtaining relevant certifications, which has been instrumental in expanding export opportunities, enhancing credibility, attracting global customers and gaining a competitive edge in the global market.

## Challenges faced by the industry

While the Indian automobile component industry has seen impressive growth in recent years, it is not without its challenges. The World Bank has noted that the industry faces significant hurdles in achieving international quality standards. According to the organisation, only 47% of the automotive companies in India have internationally recognised quality certification, compared to the 83% in China. This quality deficit is particularly acute in the case of Tier 2 and 3 suppliers, many of whom lack the production systems necessary for defect traceability and debugging. Furthermore, the proliferation of Tier 2 and 3 suppliers, driven by the desire to save costs, presents a significant risk to the industry. As the industry looks to maintain its growth trajectory, other challenges that need to be addressed include:

### • Technological upgradation

Embracing emerging technologies such as Electric Vehicles (EVs), connected cars and autonomous driving systems necessitates substantial investments from organisations, enabling manufacturers to navigate the intricate landscapes and capitalise on the vast potential offered by these transformative innovations.

### • Skill development

To cater to the dynamic requisites of the automotive industry, the cultivation of a highly proficient workforce becomes imperative. Regrettably, the sector grapples with a shortage of suitably trained technicians and engineers. It is of paramount importance to bridge this disparity by implementing specialised training programmes and fostering synergistic partnerships.

### • Cost pressures

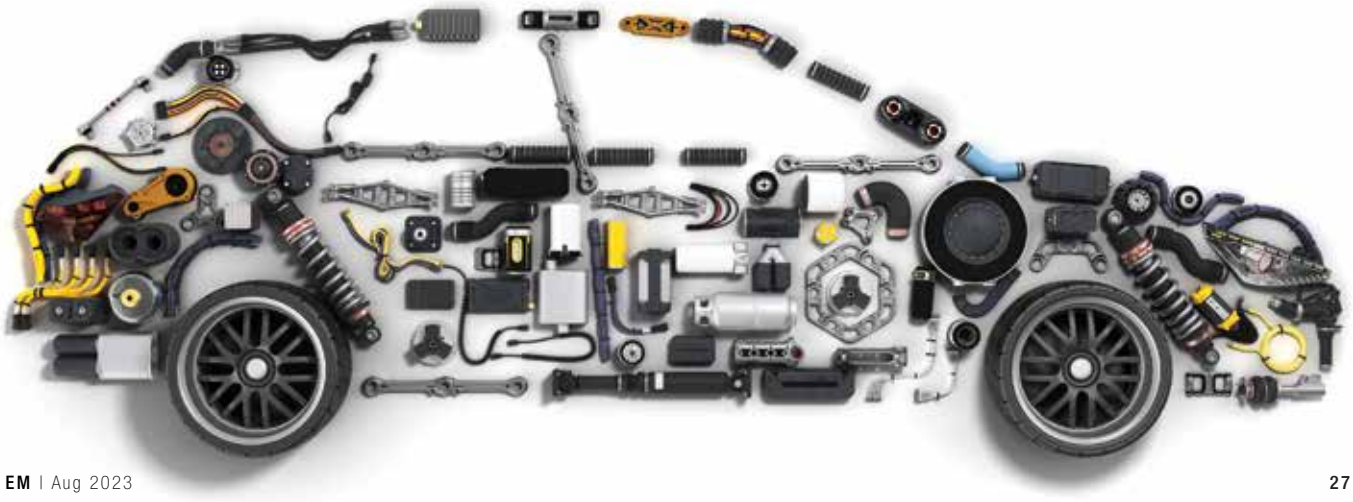
In the fiercely competitive realm of the global automotive industry, auto component manufacturers grapple with a formidable challenge in the form of cost pressures. To navigate this demanding landscape successfully, manufacturers must embark on a perpetual quest for optimisation.

This can be achieved by meticulously fine-tuning their production processes, streamlining their supply chains, and embracing innovative cost-saving measures. By embracing such strategies, manufacturers can strike an equilibrium between economic efficiency and the delivery of exceptional products, thereby fortifying their competitive position in the industry.

## Future prospects

As the world embraces the paradigm shift towards sustainable transportation, the ascent of EVs becomes increasingly conspicuous. India, in consonance with this global trend, finds itself amidst a rapid surge in EV adoption. Within our nation's evolving landscape, a significant opportunity emerges for auto component manufacturers to channel their efforts towards the production of EV-specific components, encompassing batteries, electric drivetrains and charging infrastructure.

Auto component manufacturers also need to capitalise on localisation strategies to curtail reliance on imports and bolster local manufacturing. This strategic approach entails the establishment of production facilities near automotive hubs, thereby curtailing lead times, enhancing supply chain efficiency and accommodating the unique demands of the domestic market. In this unfolding narrative, the prospects for the auto component industry in India appear promising and multi-faceted. By investing in the burgeoning EV ecosystem, manufacturers can actively contribute to the nation's sustainable mobility goals, while simultaneously carving out a distinct niche within the country's evolving automotive landscape. ☐



# Technology and **precision grinding**

As technological advancements push the limit in manufacturing, grinding machines have also seen a great revolution in their functioning. Let's explore the remarkable progress made in precision cylindrical grinding machines, with a focus on the integration of new technologies.

**Rajesh Kumar,**
Sr Manager – Marketing, Micromatic Grinding Technologies

Precision cylindrical grinding machines have long been an essential tool in the manufacturing industry, enabling the production of high-quality components with tight tolerances. Moreover, recent advancements in technology have brought about a revolution in this field, pushing the boundaries of what is possible with these machines. The remarkable progress made in precision cylindrical grinding machines is helped by the integration of the Internet of Things (IoT), Artificial Intelligence (AI), automation and their connection to the rapidly expanding Electric Vehicle (EV) market.

## Advancements with IoT

IoT has transformed various industries, and precision grinding is no exception. IoT integration enables real-time monitoring and data collection, empowering manufacturers to optimise production processes and improve machine performance. By equipping grinding machines with sensors, valuable data on machine health, process parameters, and material characteristics can be collected and analysed.

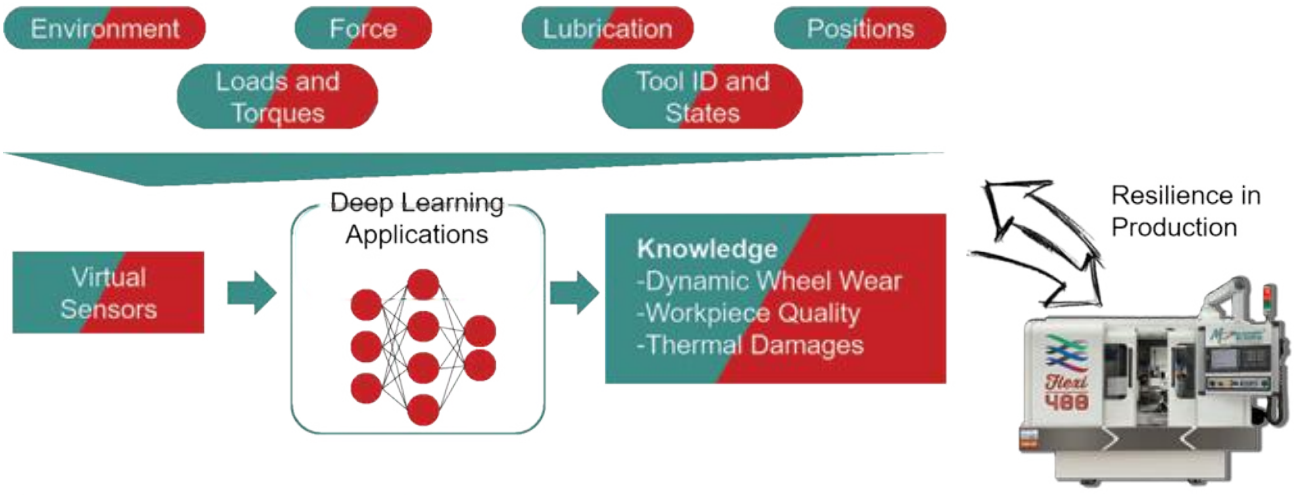
For instance, sensors can monitor temperature, vibration and power consumption, providing insights into potential maintenance needs and identifying anomalies that could affect precision. This predictive maintenance approach reduces unplanned downtime and maximises machine availability, resulting in increased productivity.

Furthermore, IoT connectivity allows for remote monitoring and control, enabling experts to provide support and troubleshoot issues from anywhere in the world. This capability not only reduces response time but also facilitates continuous improvement through remote software updates, ensuring that grinding machines remain up to date with the latest advancements.

## AI and precision grinding

AI technologies have played a significant role in advancing precision grinding machines. By harnessing the power of AI algorithms, manufacturers can enhance the accuracy and efficiency of the grinding process. AI-powered systems can learn from historical data, optimise grinding parameters and make real-time adjustments based on feedback from sensors and actuators.

One notable application of AI in precision grinding is the development of adaptive control systems. These systems continuously monitor and analyse grinding conditions, dynamically adjusting the feed rate, wheel speed and dressing frequency to optimise material removal rates while maintaining surface quality. Thus, we can see improved productivity, reduced scrap rates and enhanced process stability as a positive resultant.




*Vision of AI-based framework in grinding*

AI also enables automated defect detection and quality assurance. Advanced machine vision systems, integrated with AI algorithms, can quickly identify surface defects or deviations from specified tolerances, ensuring consistent quality in the produced components. This level of automation minimises human error and significantly reduces inspection time.

## Automation and robotics in precision grinding

Automation has transformed the manufacturing landscape, and precision grinding is no exception. Automated grinding systems provide numerous benefits, such as increased productivity, improved worker safety and enhanced process control. Robotic arms equipped with grinding tools can perform repetitive tasks with high precision and consistency, allowing human operators to focus on more complex operations.

Collaborative robots (cobots) are increasingly being integrated into grinding processes. These robots can work alongside human operators, enhancing productivity and ergonomics. By automating loading, unloading and tool changeovers, cobots streamline the grinding process, reduce cycle times and improve overall efficiency. Additionally, automation facilitates lights-out manufacturing, where machines can operate autonomously during non-working hours. This extended production capability increases machine utilisation and allows manufacturers to meet demanding production schedules.

## Focusing on the EV market

The rise of the electric vehicle market has created new demands and challenges for precision grinding machines. EV components, such as electric motors, battery cells and power electronics, require high-precision manufacturing to ensure optimal performance and efficiency.

Precision grinding machines play a vital role in producing critical EV components, such as motor shafts, bearing races and gears. These components demand tight tolerances, superior surface finishes and precise geometries to ensure optimal power transmission and minimise energy losses.

Moreover, the light-weighting trend in the EV industry necessitates the use of advanced materials, such as composites and lightweight alloys. Precision grinding machines equipped with advanced grinding wheels and machining techniques enable the efficient processing of these materials, contributing to the overall weight reduction of EV components.

## Summarising…

The technological landscape of precision cylindrical grinding machines has undergone remarkable advancements and innovations. IoT integration provides real-time monitoring, predictive maintenance and remote-control capabilities. AI algorithms optimise grinding parameters and enable automated defect detection, ensuring consistent quality. Automation and robotics enhance productivity, worker safety and process control. Furthermore, the EV market's rapid expansion has driven the need for high-precision grinding machines in order to manufacture critical components.

As technology continues to evolve, we can expect further advancements in precision cylindrical grinding machines. The integration of IoT, AI, automation and their alignment with the EV market will enable manufacturers to achieve higher levels of productivity, efficiency and quality in the production of precision components, contributing to the overall progress of the manufacturing industry. ☐

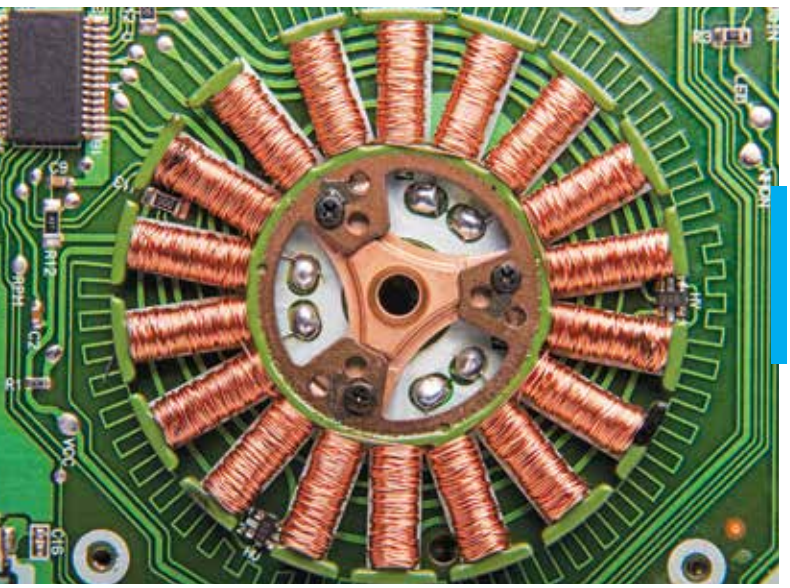
# Manufacturing energy-efficient **BLDC Fans**

The Indian appliance industry witnessed the arrival of BLDC fans in the year 2012, but is India truly ready for this technological revolution? Let's dive in and find out!

**Dr Mayur Sundararajan,**
Business Head, Superfan, Versa Drives

As a tropical country, India represents a massive fan market, with ~60 million units sold annually. By transitioning to Brushless Direct-Current motor (BLDC) fans, the country has the potential to achieve substantial energy and cost savings, thereby significantly reducing its carbon footprint.

Traditional ceiling fans relied on energy-hungry induction motors for years. However, a new era has dawned with the rise of BLDC technology, offering energy-efficient fans without compromising on-air delivery. BLDC fans can slash power consumption up to 69% due to their advantages over induction motors: lower electricity usage, lesser noise and enhanced lifespan. The Indian appliance industry witnessed the arrival of BLDC fans in the year 2012. Let's dive in to see our progress so far...



## Energy savings and sustainability

Firstly, BLDC Motor Fans offer remarkable energy efficiency, setting them apart from traditional AC Motor Fans. The energy consumption of AC Motor Fans remains high even at lower speeds. In contrast, BLDC Motor Fans are designed to operate efficiently at variable speeds, consuming significantly less energy as the speed decreases. BLDC Motor Fans can consume up to 70% less energy than their AC counterparts. This impressive energy efficiency helps reduce overall energy consumption and contributes to a reduced carbon footprint. Given the significant contribution of 400 million fans in India to greenhouse gas emissions, adopting BLDC Motor Fans presents a valuable opportunity for households and commercial eestablishments. This will help the country's initiative in creating a greener and more sustainable future.

India has pledged to decrease its emissions intensity from the 2005 levels by 35% by 2030. To promote energy efficiency, the Energy Efficiency Services Limited (EESL) has planned the deployment of 10 million energy-efficient fans (both 3-star and 5-star rated) across India starting September 2023 to reduce energy consumption, contributing to sustainable energy management.

Secondly, DC fans boast a longer lifespan than traditional AC motor fans. AC fans tend to wear out over time, decreasing performance and efficiency. In contrast, BLDC Motor Fans do not have carbon brushes, resulting in a significantly longer lifespan, reducing the replacement frequency and minimising discarded fans' waste. Moreover, BLDC motor fans have a significant advantage as they last much longer on battery backup and inverters. With their low energy consumption, they can operate up to thrice longer on inverter backup, making them especially beneficial in regions like rural areas in India where uninterrupted electricity supply is a challenge. In addition to cost savings, BLDC motor fans offer environmental benefits by reducing electricity consumption, lowering carbon emissions and supporting sustainability efforts. This is crucial in a country like India.

## BLDC v/s AC induction motor

A BLDC motor comprises a rotor made up of permanent magnets and a stator with windings. Unlike an AC induction motor, where the magnetic field is generated in the stator and induces a current in the rotor, in a BLDC motor, the permanent magnets generate the magnetic field in the rotor and the stator contains the windings. The current to a BLDC motor is a constant direct current, while the motor requires a varying current to move. The electronic controller provides this varying current with a microcontroller. This controller switches the current in the stator windings on and off in a sequence. This switching sequence (or communication) creates a rotating magnetic field in the stator that interacts with the magnetic field from the permanent magnets in the rotor. This interaction generates torque, causing the rotor to spin and drive the fan blades. The electronic controller can precisely control the switching sequence, allowing for precise speed control. This contrasts with the slip-in AC induction motor, which makes precise speed challenging.

Furthermore, a BLDC motor uses permanent magnets rather than inducing a current in the rotor, generating less heat, thus leading to less energy wastage and a longer lifespan in principle. In contrast to ACIM, BLDC motors can achieve a near-unity power factor. This is because the electronic controller in a BLDC motor can adjust the current to align with the voltage, minimising phase

differences. When the current and voltage waveforms are in phase (i.e. they reach their peak values simultaneously), the power factor is 1.0, and there is no wasted power. This improves efficiency and reduces the power supply load, leading to potential cost savings for the electricity grid.

## BLDC manufacturing and supply chain

The manufacturing process of BLDC fans is markedly different from that of conventional fans with AC induction motors, both in terms of motor manufacturing and the supply chain.

- **Motor manufacturing:** Manufacturing a BLDC motor involves the assembly of permanent magnets on the rotor and windings on the stator. The stator winding process is similar to AC induction motors and includes permanent magnets in the rotor. These magnets need to be correctly aligned and securely attached.
- **Electronics manufacturing:** The electronic controller requires some specialised manufacturing techniques. The manufacturing of BLDC fans requires the assembly of varied electronic components, such as semiconductors, capacitors and resistors, onto a printed circuit board.
- **Firmware embedding:** The firmware for the electronic controller is another critical aspect of a BLDC fan, as it requires programming the microcontroller. The embedded firmware is then tested to ensure that it operates correctly and provides the desired operation.
- **Supply chain:** The supply chain for BLDC fans is different: the permanent magnets in the rotor are sourced from specialised suppliers. Similarly, the electronic components for the controller require a supply chain that can provide high-quality electronic parts.

## Conclusion

Notably, India's fan industry has witnessed substantial export growth in recent years, showcasing the industry's standards and progress as recorded in India. This also aligns with India's pursuit of net-zero carbon emissions by 2070, supported by several astute initiatives. In the era of evolving consumer preferences, government policies promoting sustainability and a growing awareness of eco-friendly lifestyles, adopting BLDC fans is poised for remarkable growth. The revolutionary impact of BLDC fans is set to reshape the fan industry, introducing a wave of highly efficient, environment-friendly solutions. ☐

# COBOTS in Indian manufacturing

Industrial automation is no longer just a choice; it is swiftly becoming a requirement to maintain a competitive edge. Let's discuss how COBOTs can enhance manufacturing and more.


**Neelesh Chipade,**

Head, Product Marketing, Servo, Motion and Robotic Solutions, Mitsubishi Electric India

Automation is rapidly and undeniably taking over the manufacturing industry. Manufacturing COBOTs (or collaborative robots) are ideal to fit in the advanced era of automation. With the help of collaborative robots, both large corporations and small businesses can expand and automate processes in their factories, warehouses and research facilities. COBOTs particularly, can perform repetitive, hazardous or precise tasks alongside human workers. Let us look more closely at how COBOTs in manufacturing will undoubtedly play an important role towards the sector's development.

COBOTs are a relatively new aspect of industrial robotics. Because they are simpler, easier and more flexible, COBOTs are designed to be reliable partners that can work hand-in-hand with humans and increase work efficiency and productivity. They pose no risk, require little-to-no programming and simplify connectivity. Because of these benefits, COBOTs are a game changer for a variety of applications. COBOTs are a low-cost, easy-to-use solution that increases productivity while posing fewer risks and providing numerous benefits.

## Industrial robots vs COBOTs

In the manufacturing industry, the distinction between COBOTs and robots is based on their intended use and, hence, the type of task assigned to them. Both collaborative robots and industrial robots are used to increase productivity and efficiency by providing more force, energy, accuracy and data. However, reprogramming industrial robots is a complex process which requires a skilled engineer or a developer. COBOTs, on the contrary, are easier to program and quickly learn new skills as they are a fusion of a human and machine which is the most efficient and reliable combination.

The following are the differences between Industrial Robots and COBOTs:

**• Partnership with humans**

A COBOT can double up as an assistant to a human operator. It is designed to work in partnership with humans, while traditional robots are programmed to finish an automated task with little-to-no human interaction.

**• Programming**

When compared to industrial robots, COBOTs are easier to program. One of the most marketed features of collaborative robots is the ease of programming. COBOTs manufacturing involves user-friendly aspects to aid their application.

**• Safety**

COBOTs are designed to work alongside people. This means that they are safe enough to function around humans and hence do not need the safety infrastructure that industrial robots require.

**• Heavy manufacturing**

Industrial robots are capable of handling larger, heavier materials like the ones used in auto manufacturing. Hence, they are well-suited for heavy manufacturing. However, COBOTs are not designed for heavy manufacturing owing to their size and their requirement of working in proximity to human employees.

**• Functionality**

Traditional industrial robots are usually fixed equipment created for extremely high-precision, volume and speed production. As far as COBOTs are concerned, they are well suited for manufacturers with low volume, high-mix production or those who want to safely automate processes alongside workers.

As compared to conventional robots, COBOTs can easily be moved and used in various areas of production. A majority of them can easily be mounted on any surface.

Moreover, they are often light-weight and can be carried by a single person.

## Benefits of COBOTs in manufacturing

Trained COBOTs can help businesses scale up and automate various production processes, which can lead to consistent working even in the absence of a human for a particular task. The bottom line is that COBOTs in manufacturing can improve quality control, increase effectiveness and intensify output. They improve the workers' security by taking control of less desirable or dangerous tasks. COBOTs are generally beneficial to SMEs because they can assist humans efficiently and can prove to be economical for a variety of processes in the long run.

## COBOTs' shortcomings in manufacturing

The disadvantages of COBOTs in manufacturing are not related to their functionality, but rather to the question of whether a particular business should use them or not. For example, as previously stated, COBOTs are not designed for heavy manufacturing and cannot perform heavy lifting. They are not entirely automated and are always dependent on a human to operate them, which can prove to be an advantage as well as a disadvantage, depending on their usage.

However, there are still some constraints for collaborative robots in terms of cognitive and skilled tasks. Nonetheless, as technology advances, COBOTs — or, more precisely, their engineers and developers — will most likely overcome these. In manufacturing, we can use COBOTs to perform a variety of routine tasks, such as picking and placing; bin-picking; palletising; packaging; machine maintenance and supervision; testing and quality control; screwing, gluing and sealing and tasks related to the process, such as soldering and welding, sanding, polishing, deburring and grinding.

COBOTs are used in a variety of fields and industries due to their adaptabilities, such as the production of goods for the electronics, aerospace, automotive, furniture and plastic modelling industries, to name a few. They also work in agriculture (picking and placing), labs, research, security (monitoring), food services and production (precision tasks, repetitive tasks), healthcare and pharmaceuticals, among other fields.

## How the future looks

Expectations as per the various reports state that the COBOT market might show massive growth shortly. COBOTs are quickly becoming a significant component of manufacturing automation as the technology proves to be reliable and more businesses are willing to use it. COBOTs will become more advanced and adaptable over the next few years. Precision and cognitive tasks performed by COBOTs will improve in sync with AI's capabilities. Furthermore, with the Industrial Internet of Things (IIoT), COBOTs can already connect to other machines, gadgets and network databases. In the future, COBOTs will be able to improve a variety of factory workflows and even offer useful real-time data analytics.

Mitsubishi Electric, under its factory automation advancements, has created the collaborative robot ASSISTA. ASSISTA is an advanced Collaborative Robot that assures security and can work alongside humans. It is simple, easier and more flexible. Furthermore, ASSISTA requires no robot programming expertise, offers immense ease of operation and allows hassle-free connectivity with a wide range of components. ASSISTA epitomises versatility, providing a wide range of components such as Vision, Fingers, Grippers and other peripherals that are developed by MELFA Robot Partners. These tools allow for easy setup and can easily be configured for specific applications. ASSISTA, can also be configured to move freely either as a mobile robot or as a part of an AGV/AMR. With its adaptable design and simple operation, ASSISTA presents a compelling case as a Collaborative Workspace Partner. Moreover, the operators can easily adjust the robot arm's position and set waypoints. The six-colour LED ring mounted around the robot's forearm constantly displays the operational state and fault diagnostics is also notable. ASSISTA, as a Collaborative Workspace Partner, has a lot to offer: flexible design, simple programming, easy use and the ability to connect and work with a variety of components, which is perfect to increase the productivity and efficiency of a human. ☐

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# Embracing INDUSTRY 4.0 and beyond

India is rapidly adopting Industry 4.0, integrating advanced technologies into manufacturing for a connected and intelligent future. With innovation, upskilling and collaboration, India is well-positioned to shape its industrial landscape, exploring Industry 5.0's potential.

**Ranjan Chopra,**
MD and CEO,
Team Computers

India, a powerhouse in various industries, is rapidly embracing the transformative wave of Industry 4.0. This global trend, characterised by the integration of advanced technologies into manufacturing processes, is revolutionising traditional factories and paving the way for a more connected and intelligent future. With ongoing efforts in innovation, skilling and collaboration, India is poised to leverage Industry 4.0 and shape its future industrial landscape. Let us learn how Indian industries are embracing Industry 4.0 and also touch upon the concept of Industry 5.0.

## Transforming Indian manufacturing

• **Automation and Robotics:** With the adoption of automation and robotics, Indian factories are witnessing significant improvements in productivity, efficiency and quality. Automated systems are streamlining assembly lines, reducing human error and allowing for round-the-clock production. This technology is particularly valuable in labour-intensive industries, such as automotive manufacturing and electronics.

• **Internet of Things (IoT):** The IoT has found its way into Indian industries, enabling the interconnection of machines, devices and systems. Real-time data collection and analysis help optimise operations, enhance predictive maintenance and minimise downtime. IoT integration is revolutionising supply chain management, enabling companies to monitor inventory levels, track shipments and optimise logistics.

• **Big Data and Analytics:** Indian industries are leveraging big data and analytics to extract valuable insights from the vast amounts of data generated. Analysing production data helps identify bottlenecks, optimise processes and improve overall efficiency. Data-driven decision-making enables companies to respond swiftly to market demands, identify trends and develop targeted strategies.

• **Artificial Intelligence (AI):** AI technologies, such as machine learning and cognitive computing, are empowering Indian industries to automate complex tasks and make intelligent decisions. AI-powered systems can analyse patterns, detect anomalies and predict maintenance requirements. This transformative technology is driving innovation, enhancing product development and enabling personalised customer experiences.

• **Industry 5.0:** While Industry 4.0 is already making waves in Indian industries, there is growing anticipation for the next wave, Industry 5.0. Industry 5.0 aims to combine the efficiency of automation with the unique problem-solving abilities of humans. It envisions a future where humans and machines work collaboratively, each leveraging their strengths.

• **Collaborative Robotics:** Industry 5.0 emphasises the use of collaborative robots (cobots) that can work alongside humans in factory environments. These robots are designed to assist humans in tasks that require precision, strength or repetitive actions, freeing up human workers to focus on more creative and complex aspects of production.

• **Human–Machine Interaction:** Industry 5.0 places a strong emphasis on human–machine interaction, enabling workers to communicate with machines intuitively. Advanced user interfaces, such as Augmented Reality (AR) and Virtual Reality (VR), provide immersive experiences and simplify complex operations. Workers can receive real-time guidance, training and assistance, enhancing their skills and productivity.

Indian industries are undergoing a significant transformation as they embrace the principles of Industry 4.0. Automation, IoT, big data and AI, among other new technologies, are revolutionising manufacturing processes, leading to increased productivity, efficiency and competitiveness. Moreover, the concept of Industry 5.0 is on the horizon, promising a future where humans and machines collaborate harmoniously to drive innovation and problem-solving. As India's factories continue their journey towards Industry 4.0 and beyond, it is essential for businesses to invest in technological advancements, upskill their workforce and foster a culture of innovation. By embracing the power of Industry 4.0 and exploring the possibilities of Industry 5.0, Indian industries are poised to make remarkable strides towards a digitally empowered future. ☐

Renewable energy allows manufacturing companies to address climate change, achieve cost savings, enhance energy security, comply with regulations, drive innovation and demonstrate corporate social responsibility. By transitioning to renewable energy sources, manufacturing companies can contribute to a sustainable future while reaping numerous economic and environmental benefits. Here is a deep dive into the transformative role of renewable energy in manufacturing and where you can begin.

# Powering **sustainability**

**Bheemsingh Melchisedec,**
Director of Operations,
Elgi Equipments

Unprecedented changes in weather patterns caused by human-induced climate change have increased the emphasis on renewable energy adoption in the manufacturing sector. As part of its strategy unveiled at COP26, India has set ambitious targets to install non-fossil fuel electricity, source 50% of its energy requirements from renewables and achieve

significant reductions in carbon intensity and net-zero emissions by 2030 and 2070, respectively. To attain these goals, investment in clean energy technologies is vital.

## Renewable energy in manufacturing

Renewable energy adoption is essential for sustainable manufacturing in India. The benefits of sustainable manufacturing are elaborated on below to understand more about how embracing these renewable energy sources can help manufacturers mitigate environmental impact, reduce reliance on fossil fuels and position themselves as environmentally responsible entities.

• **Climate change mitigation:** Manufacturing processes are often associated with significant Green House Gas (GHG) emissions, a primary driver of climate change. Manufacturing companies can significantly reduce their carbon footprint by transitioning to renewable energy sources such as solar, wind, biomass and hydroelectric power. Renewable energy technologies produce minimal or zero GHG emissions during operation, making them crucial for mitigating climate change and meeting emission reduction targets.

• **Cost savings:** The costs of renewable energy technologies have steadily declined over the years, making them increasingly cost-competitive with traditional fossil fuels. By adopting renewable energy sources, manufacturing companies can achieve long-term cost savings. Renewable energy systems have lower operational and maintenance costs than conventional energy sources. Thus, renewable energy systems aid manufacturing plants in having an improved financial performance and reduced energy expenditure over time.

• **Energy security and independence:** Fossil fuels, such as coal, oil and natural gas, are finite resources susceptible to price volatility and geopolitical uncertainties. Relying heavily on fossil fuels for energy exposes manufacturing companies to supply chain disruptions and price fluctuations. In contrast, renewable energy sources are widely available and can provide a stable and secure energy supply. By investing in renewable energy, manufacturing companies can reduce their dependence on fossil fuels, enhance energy independence and ensure a more resilient energy infrastructure for the country.

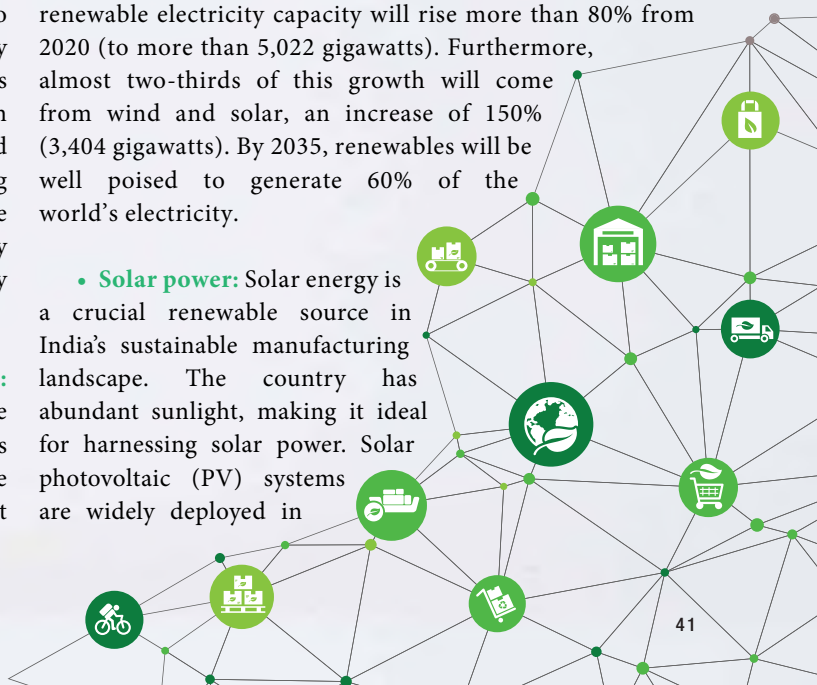
• **Regulatory compliance and market access:** Governments and regulatory bodies worldwide are implementing stricter environmental regulations and targets to address climate change and promote sustainable development. Manufacturing companies that adopt renewable energy can align themselves with these regulations, ensuring compliance and avoiding potential penalties. Moreover, many consumers and businesses prefer to engage with environmentally responsible companies. Embracing renewable energy enhances a company's reputation, improves market access and attracts environmentally conscious customers and business partners.

• **Technological advancements and innovation:** The renewable energy sector is characterised by continuous technological advancements and innovation. Investments in research and development drive improvements in renewable energy technologies, making them more efficient, reliable and cost-effective. By adopting renewable energy, manufacturing companies can contribute to the growth and development of these technologies, benefit from ongoing innovations and gain a competitive edge in the market.

• **A sustainable image for CSR:** Embracing renewable energy aligns with corporate social responsibility goals and demonstrates a commitment to sustainability and environmental stewardship. It enhances a company's reputation, appealing to customers, investors and stakeholders who prioritise sustainability. Manufacturing companies prioritising renewable energy showcase their dedication to reducing environmental impacts, supporting the global transition to a low-carbon economy and contributing positively to society.

## Sources of renewable energy

India actively promotes renewable energy sources to facilitate sustainable manufacturing practices. Manufacturers acknowledge the significance of reducing carbon emissions, improving energy efficiency and addressing the challenges of climate change. Industry estimates tell us that by 2026, global renewable electricity capacity will rise more than 80% from 2020 (to more than 5,022 gigawatts). Furthermore, almost two-thirds of this growth will come from wind and solar, an increase of 150% (3,404 gigawatts). By 2035, renewables will be well poised to generate 60% of the world's electricity.



• **Solar power:** Solar energy is a crucial renewable source in India's sustainable manufacturing landscape. The country has abundant sunlight, making it ideal for harnessing solar power. Solar photovoltaic (PV) systems are widely deployed in

manufacturing industries. Rooftop solar installations and solar farms are standard methods of utilising solar energy. The falling cost of solar panels, coupled with supportive government policies and incentives, has accelerated solar adoption in the manufacturing sector.

• **Wind energy:** Wind power is another significant renewable energy source for sustainable manufacturing in India. The country has vast wind resources, particularly along its coastlines and hilly regions. Many manufacturing facilities use wind turbines to reduce dependence on conventional power sources.

• **Biomass and biogas:** Biomass and biogas technologies play a vital role in sustainable manufacturing in India. Biomass boilers and gasifiers generate heat and electricity in manufacturing processes. Biogas, produced from the anaerobic digestion of organic waste, is another form of renewable energy used in manufacturing.

• **Small hydropower:** Small hydropower projects utilise the energy from flowing or falling water to generate electricity. India has numerous rivers, making small hydropower an attractive option for sustainable manufacturing. Micro and mini hydropower plants, typically with capacities below 25 MW, are employed in manufacturing units near water bodies. Small hydropower is a decentralised and environmentally friendly source of renewable energy.

• **Geothermal energy:** Although geothermal energy is still nascent in India, it holds tremendous potential for sustainable manufacturing. Geothermal energy harnesses the heat from the Earth's core to generate electricity and heat. India has some geothermal hotspots, such as the Puga Valley in Ladakh. As technology and exploration progress, geothermal energy could become a viable renewable energy source in manufacturing.

• **Waste-to-energy:** Waste-to-energy technologies involve converting waste materials, such as municipal solid waste or industrial waste, into energy. Incineration, gasification and anaerobic digestion are common methods used in waste-to-energy plants. These facilities generate electricity, heat or biofuels, reducing waste disposal while producing renewable energy for manufacturing units.

## Strategies to embrace renewable energy

One crucial aspect that manufacturing companies must prioritise to reduce their carbon footprint is to secure renewable energy sources to power manufacturing processes effectively. They can employ the following strategies specifically to achieve this goal:

• **Investment in renewable energy companies**

An alternative option is to invest in or acquire a small percentage of shares in companies that generate renewable energy. By doing so, manufacturers can access renewable power at a lower cost. This method requires minimal investment while promoting the growth of the renewable energy sector.

• **Purchasing renewable power**

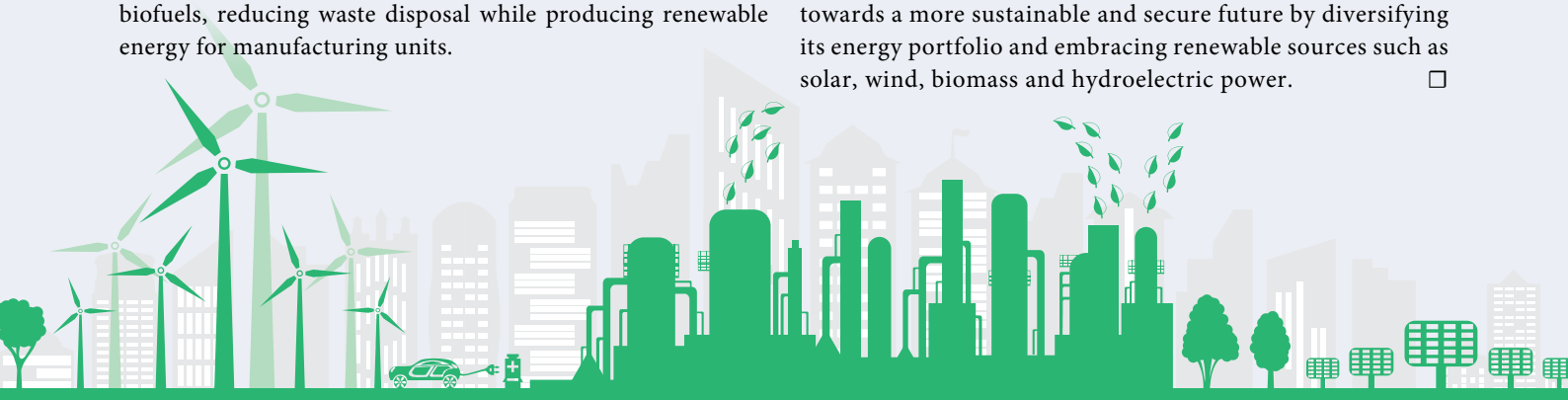
Renewable energy management companies possess extensive research databases accumulated over many years. This data includes valuable insights into wind patterns, solar light patterns and other factors specific to different geographical locations. Collaborating with these companies can enhance the value proposition for manufacturing companies seeking to secure renewable power.

• **Installing solar panels**

Manufacturing companies can leverage their infrastructure by installing solar panels on the roofs of their factories and car sheds. Utilising open spaces in compliance with statutory norms can maximise solar energy generation. Although this approach requires initial capital investments, the long-term benefits of energy savings and reduced environmental impact are significant.

## In summary…

Advancements in solar and wind capacity installations, coupled with innovation and collaboration, can enhance the accessibility and cost-effectiveness of renewable energy sources. The decreasing costs and technological improvements associated with renewables have already made them more competitive. The manufacturing sector can move towards a more sustainable and secure future by diversifying its energy portfolio and embracing renewable sources such as solar, wind, biomass and hydroelectric power. ☐



# **Need for fire safety** equipment in industrial sites

The manufacturing sector ranks fire as the third-highest risk, driven by rapid urbanisation and lax fire safety norms. Lack of proper fire safety equipment, fire stations and trained personnel compound the problem. Here is an overview of what industrial organisations must focus on to have proper safety measures and fire-proofed functioning.

**Rohit Mali,**
Director,
Firefly Fire Pumps

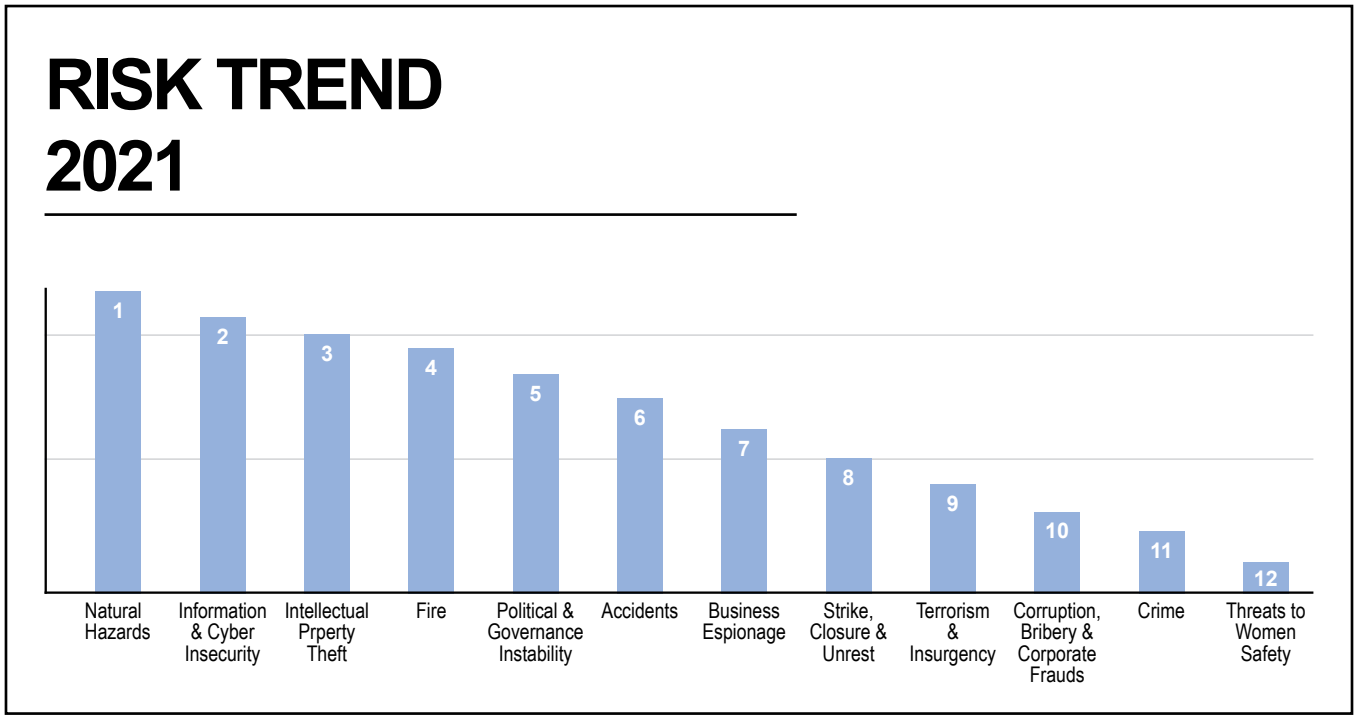



**Figure 1: https://ficci.in/India-Risk-Survey-2021-Report.pdf**

Fire is the fourth disruptive risk identified by businesses in India, as per the FICCI India Risk Survey 2021. Fire has climbed from tenth in 2019 to fourth in India in the Risk Survey 2021. It is a major concern for companies as it damages property and brings serious threats to life. Regarding the manufacturing sector, fire is ranked third due to the rise in fire incidents due to rapid urbanisation and less focus on fire safety norms and protocols.

To ensure the safety of workers and the environment on industrial sites, standardised fire safety equipment becomes essential. The equipment is needed to control fires, minimise the damage it causes, protect workers and prevent further harm to the environment by limiting air pollution. While there has been a decrease in overall fire incidents in the last five years, there has been a rise in the death toll due to accidents. This is alarming! It is speculated that the increase in death can be due to difficulty in emergency services.

## Fire-prone industrial sites

Industrial sites in India are increasingly prone to fires due to various causes. According to data from the National Fire Protection Association, there were 17,800 reported industrial fires in India in 2022 and 2023, resulting in over 800 injuries and 77 fatalities. Most of these fires were caused by careless smoking, electrical malfunctions and the use of combustible materials. Unsafe storage and handling of hazardous materials, also increased the number of fires.

The situation is only expected to worsen in the coming years if the proper measures are not taken, as the number of industries in India is estimated to double by 2030. To minimise the risk of fire-related accidents, industrial sites should ensure that all employees are adequately trained in fire safety, materials are properly stored and equipment is regularly inspected and maintained.

## Lack of safety equipment

In India, industrial sites are often prone to fires due to various reasons, such as improper storage of flammable materials or lack of maintenance. However, these sites' lack of fire safety equipment is a major concern. Without proper fire safety equipment, an unforeseen spark could quickly turn into an uncontrollable blaze in a matter of minutes. With no means to control it or alert employees, the situation can become catastrophic for workers and their families who depend on them for survival.

Moreover, insufficiently trained personnel equipped with firefighting skills only aggravates an already dangerous situation. Lack of coordination between management and staff during such emergencies can result in confusion and chaos that leads to further harm. Industrial site owners must prioritise investing in high-quality fire safety equipment that meets industry standards. Certified industry officials should conduct regular checks to ensure all systems are always functional.

## Dire need

India is one of the most populated countries in the world, which means that the distribution of resources and availability of safety services must be the nation's top priority. However, as per the case built by the National Disaster Management Authority during the 13th Finance Commission, India is in a 97.56%, 80.04% and 96.28% deficit of fire stations, firefighting and rescue vehicles and fire personnel, respectively. Hence, industries must also be self-reliant and have a fire safety pump setup. Industrial fire safety pumps, smoke detectors, fire alarms and sprinkler systems are essential firefighting tools for preventing a company's asset sales.

Mobile fire firefighting solutions like portable and trailer fire pumps and immediate remedies are necessary for fire outbreaks across multiple industries that cannot afford to wait for external help. These fire pumps combat major fires and act as quick support ensuring the fire is extinguished before it damages property and life. Multi-purpose fire pumps have applications that help not just in fire-fighting, but also in dewatering and flood relief as well as industrial washing. Fire pumps have foam solutions that assist in fighting chemical-induced fires that we see in most industrial fire cases. These pumps can be utilised for a longer term. Industries that might even have a 1% chance of fires breaking out should make an effective choice of selecting these compatible, affordable and highly standardised fire pumps for firefighting.

## Government policy implications

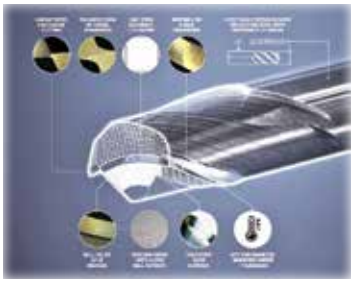
The Government of India has implemented various fire safety regulations for industrial sites. These regulations are laid down under the Indian Factory Act of 1948 and the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act of 1996, reducing the risk to employees and the infrastructure of the industrial sites. However, on-ground implementation is still an area of concern. The National Crime Records Bureau (NCRB) reported 11,902 fire incidents in factories and industrial establishments in India in 2020. This is a 6.1% increase compared to 2019. The Government, in many states, is laying out re-development plans for non-conforming areas to bring the manufacturing facilities to par with the regulations and safety. This will impact more than a million labourers, making them accessible to a safe working environment.

## Conclusion

Ensuring a safe environment for labourers must be the employers' utmost priority. Scheduling routine safety drills, remodelling the plant as per the increase in capacity and manpower, regular maintenance of fire safety pumps and equipment and other measures are necessary to avoid hazards. With the government's help in setting fire safety pumps and equipment standards, the industry can be provided with best-in-class products to minimise any potential damage caused by a fire. ☐

## Revolutionising precision manufacturing

**ANCA CNC Machines** recently introduced a nanometre control system that sets new standards in precision machining. This cutting-edge technology enables silky smooth movement of all linear and rotary axes, resulting in exceptional surface finishes on cutting tools. The nanometre control system offers unmatched accuracy, flexibility, and performance, empowering manufacturers to produce a premium range of cutting tools with the utmost precision. The smooth and precise motion of machine axes is crucial for achieving high-quality surface finishes on cutting tools. The system utilises a state-of-the-art servo control algorithm, allowing for silky smooth axis movement. This unique algorithm, combined with nanometre-level measurement capabilities, ensures an ultra-fast response to internal and external disturbances. ANCA's control system guarantees outstanding tracking performance. This system has the ability to reduce reversal errors to the nanometre scale when an axis changes direction during grinding.



**Nanometre Control System**

**ANCA CNC Machines | Bangalore**

## Printing machines to boost production efficiency

**Bright Laser Technology (BLT)** recently introduced the enhanced BLT-A400, a 5-Laser Metal 3D Printer. The upgraded printing machine comes in five laser configurations and has an integrated powder recovery system to accelerate production efficiency. The machine is a metal 3D solution that will offer Metal AM printing with industrial-grade materials for large-scale batch production of industrial parts. With its configuration of five lasers, the BLT-400 significantly boosts production efficiency, making it an ideal choice for mass production of industrial components. The new version 5-laser printer significantly increases productivity, boosts capacity without requiring additional space, improves plant efficiency per square metre, reduces operating expenses and better caters to the demands of mass industrial part production. The machine enhances production automation with the Powder Transfer and Recovery System. The BLT-A400's new powder recovery system ensures safe transfer, recovery, sieving, and reuse of metal powders within an on-site test laboratory. BLT provides multiple equipment powder recovery solutions for different production scenarios.

**BLT-A400: A 5-Laser Metal 3D Printer**

**Bright Laser Technology | Frankfurt**

## Valve with quick response and high accuracy symptoms

**Danfoss Power Solutions** recently launched a new section valve: Compact Valve Group 8 (CVG8). This new section valve inherited the Danfoss section valve family's modular design with its compact structure, smaller size and lighter weight. As a proportional electromagnet direct drive valve, CVG8 is equipped with quick response and high accuracy symptom. The minimum flow hysteresis can reach 5%, which can significantly increase the control accuracy of the application. The customised modular design allows the CVG8 valve to have a wide range of functional options, which will give customers a new experience in lower flow applications. The company offers a hybrid valve by combining CVG8 with the existing PVG valve family, which could provide various configuration options. Henrik V Joergensen, Controls Division President, joined the CVG8 launch in the HYA plant and the new assembly cell release ribbon-cutting ceremony, he said, "The CVG product platform has enlarged the spool valve product portfolio, which can enrich our customers applications through outstanding performance experiences".

**CVG8**

**Danfoss Power Solutions | Tamil Nadu**

## Module to convert waste heat into clean electricity

**Dürr** has added Cyplan® ORC 70 NT to its Organic Rankine Cycle (ORC) portfolio. The Cyplan® ORC 70 NT is a new ORC module developed by Dürr that converts waste heat into clean electricity in the low-temperature range from temperatures of just 85°C. A new addition to the portfolio, the low-temperature ORC lowers energy costs, reduces $CO_2$ emissions and is suitable for all industries. The first system has successfully passed the practical test at a machinery manufacturer. The ORC, a technology that converts thermal energy into clean electricity and useful heat, can make almost every industrial production process above a certain thermal energy threshold more environmentally friendly. The new Cyplan® ORC 70 NT now enables this in the lower-temperature segment, which is typical for hot-water networks, geothermal heat sources and multiple industrial processes. The low-temperature system has a maximum possible gross output of 70 kWe. Dürr modified the system control to implement projects as quickly as possible with tried-and-tested standard components.

**Cyplan® ORC 70 NT**

**Dürr | Pune**

## Super high-resolution optical system

**Optical Gaging Products (OGP)** recently announced a new product, the SmartScope® E45, a floor model addition to the all-new SmartScope E-Series family of Automatic Digital Zoom Metrology Systems. With the launch of the benchtop model SmartScope E7 in September 2022, OGP reimagined their trusted SmartScope line-up to be accessible for all skill levels and budgets. Along with E7, E45 features the brand new fixed lens IntelliCentric™ optical system, a fully telecentric optical system providing super high resolution images. Among major features, the digital zoom and standard all-LED lighting system are notable highlights. The E45 features a generous stage to handle large parts or a variety of smaller parts. Jim Stern, Director, OGP Applications Engineering, remarked, "SmartScope E45 combines innovative optical design, advanced camera technology, and OGP's class-leading image processing algorithms. The IntelliCentric optical system produces outstanding optical performance at low zoom, with fantastic image quality, telecentricity, and distortion-free imaging".

**SmartScope® E45**

**OGP | Pune**

## One-key precision measurement

**Hexagon's** Manufacturing Intelligence division has recently launched OPTIV Scope, an innovative vision measurement system that simplifies quality inspection for machine tool operators and quality professionals across industries. The system is ideal for inspecting high volumes of parts with similar geometries. With its ability to simultaneously measure multiple parts in seconds at the click of a button, OPTIV Scope eliminates the time-consuming process of manual part alignment before each measurement. With an accuracy of up to ±0.7 microns, the system provides reliable and repeatable measurement data independent of the operator. OPTIV Scope is available in six models with various work volumes and camera resolutions, with a maximum field of view of 300×200 mm. The system's versatility makes it an indispensable tool across sectors such as electronics, injection moulding, low-voltage electrical appliances, mobile phone accessories, printed circuit boards, medical equipment and many more. OPTIV Scope combines efficiency, accuracy, precision and ease-of-use, enabling businesses to save time and reduce the cost of quality inspection.

**OPTIV Scope**

**Hexagon | Pune**

## Efficient cable connectors: Quick installation

**Würth Elektronik** has expanded its range of coaxial cables and connectors to include a comprehensive portfolio of N-type cable connectors to satisfy MIL-STD-348 requirements with 50 Ω impedance. Jacks for connecting to the application PCB are available in straight and angled THT versions or as four-hole flanged panel connectors with a round post or solder cup. Besides pre-assembled cables, individual cable connections are also available for field assembly. The Würth Elektronik coax connectors are suitable for use outdoors or in harsh environments like those in radio base stations, signal distributors, GPS systems or ship antennas — just the application for which the N-type was thought to have been originally developed. Both the screw connections of the THT jacks as well as those for mounting packages are therefore available in protection class IP67. The gold-plated THT contacts have enhanced corrosion resistance compared to the standard tin-plated connectors, and the gold-plated Phosphor–Bronze centre contact material even reduces component costs compared to the beryllium-copper otherwise used.

**N type cable connectors**

**Würth Elektronik | Australia**

## Geometry to achieve improved finishing operations

**Walter** recently launched the new FW4 and MW4 wiper geometries. With the FW4 and MW4 wiper geometries, the two turning indexable insert geometries combines the 'wiper effect' with the new chip breaker geometries and extremely wear-resistant Walter Tiger·tec® Gold grades. The curved wiper edge sweeps over the surface again, making it possible to double the feed and increase productivity by 100% or double the surface quality while maintaining the same feed. With the new geometries, the company is now also transferring this effect from the FW5 and MW5 double-sided cutting inserts to indexable inserts with a positive basic shape. The result is the FW4 geometry with a narrow chip breaker for finishing operations and the MW4 geometry with an open chip breaker groove and longer radiused wiper cutting edge for medium machining. Both geometries are designed for universal application in ISO materials P, M and K, as well as for secondary applications in ISO S. Both products make it possible to achieve improved surface quality, productivity and process reliability.

**Walter MW4 turning indexable insert**

**Walter | Pune**

# Highlights – September 2023

» **Automotive Manufacturing**
Automotive manufacturing in the country has been a strong pillar of support for our economy. Ministry of India also reported that the auto industry's contribution to the GDP has risen from 2.77% in 1992–93 to 7.1% in February 2023. As the country aims to double the size of its auto industry by 2024, this section will mention the developments that auto industry leaders have reported firsthand.


» **PLM/Digital Manufacturing**
With the advent of Industry 4.0, we can see constant developments in the integration and application of technologies like AI, ML, IoT, cloud computing and analytics in manufacturing. The manufacturing sector foresees a remarkable evolution in the way PLM and digital manufacturing shape industries. With this section, we look into a key driver in the adoption and/or growth of PLM in digital manufacturing.

» **Tool Making**
Tool making involves producing tools that will help small to giant companies manufacture their products. It requires precise measurement and extensive research and development on the type of product your client will make. In the upcoming edition, let's take a closer look at what machine tool makers have to say about the developments in this sector.

» **Construction and Mining Equipment**
The Indian construction and mining sectors involve high-functioning equipment like bulldozers, excavators, loaders, compactors, cranes and more. New technologies like BIM, drones, modular construction, blockchain technology, digital twins, augmented reality and 4D simulations are revolutionising the production of construction and mining equipment. In this section, we present an article from a manufacturer of construction and mining equipment reporting on how the sector is developing.

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EM

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# Redefining precision

## Grinding machines from the JUNKER Group

The JUNKER Group is committed to absolute precision along the entire value chain and develops groundbreaking solutions. The technology leader's extensive product portfolio includes grinding machines with CBN, corundum or diamond grinding wheels for every task, batch size and requirement. The JUNKER Group impresses with a holistic system understanding and defines long-lasting and sustainable products and services with the greatest care.

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