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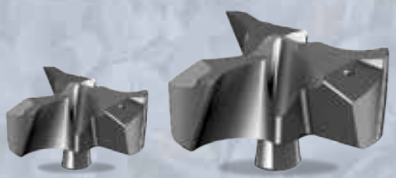

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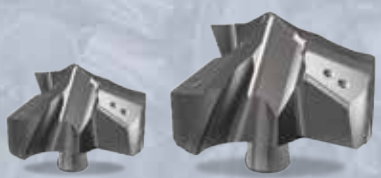

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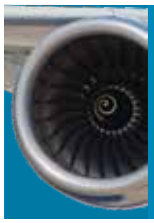

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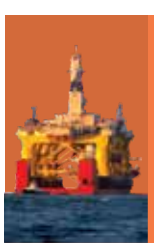

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As we navigate through an era of rapid technological developments and ever-evolving customer demands, it is essential for manufacturers to simultaneously take care of present operations while preparing for the future. The International Monetary Fund expects India to average a growth rate of 6.1% over the next five years, with India predicted to contribute 15% of global growth in 2023, helping to make it the world's third-largest economy by 2027. This means the Indian industry must focus on encouraging investments, nurturing businesses and expanding its manufacturing and exports. The manufacturing industry is embracing new perspectives and exploring opportunities to foster the growth of ancillary businesses. With a visionary approach, the industry aims to harness the potential of the Indian market and propel the overall development of the country's industrial landscape.

Our Cover Story delves into the manufacturing and automotive industry, shedding light on the significance, benefits, challenges, and strategies employed by these ambidextrous pioneers. This issue takes a deep dive into various topics, including the Industry Focus on Auto-components in Manufacturing ; Technology Focus on Additive Manufacturing, VR/AR support for Touchless Service Models and a Special Feature on Industrial Safety. With our commitment to such approaches, we promise to bring you an array of fascinating and insightful topics, ranging from manufacturing advancements to technological breakthroughs. Our aim is to keep you at the forefront of knowledge and provide you with valuable insights that will empower you in the ever-evolving realm of manufacturing.

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

MANAGEMENT NOTE

We stand at the forefront of an exhilarating digital revolution, thanks to the unwavering support each one of you has provided since the inception of our remarkable journey. This expedition has not only transformed our print and digital products but has also redefined the very essence of our existence. Today, we proudly announce that it is time to march in perfect harmony with the ever-evolving market trends.

We are thrilled to unveil an interactive flip magazine experience for our both the magazine EM and A&D. Our flip magazine will transport you to a realm where every page comes to life, inviting you to explore a realm of knowledge and inspiration.

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Machine Safety Tailor-made!

SPECIAL FEATURE

NEW PRODUCTS

COLUMNS

Remembering the scientific genius Dr Jnan Chandra Ghosh

4 September 1894–21 January 1959

Sir Jnan Chandra Ghosh or Jnanendra Chandra Ghosh was an Indian chemist who was best known for his contributions to India in the development of scientific research, industrial development and technological education. He was motivated to study the technical uses of the synthesis of phosphatic fertilisers, ammonium sulphate, formaldehyde and potassium chlorate from Indian raw materials by his mentor, Acharya Prafulla Chandra Ray.

Dr Ghosh supported close communication between administrators, instructors and students. His long and illustrious career began with the position of lecturer of the Chemistry Department at the Rajabazar Science College, Calcutta. He received a meritorious scholarship and an award that enabled him to travel to the University College of Science in London for a PhD.

After his doctorate programme, he returned home as Dean of the Faculty of Sciences in 1924 and Provost of the Dacca University Hall from 1925. Throughout his illustrious life, Dr Ghosh guided research work on technical problems relating to the production of Indian raw materials in chemical processes of synthesis. His most intensive research was carried out in the field of photo-chemistry, bio-chemistry and agricultural chemistry. Many scientific researchers and devotees were attracted by his scientific research.

His service at Dacca University is considered to be the best period in his career in shaping science education in India. He pioneered research on the Fischer–Tropsch synthesis for obtaining liquid fuel from carbon monoxide and hydrogen and the step-wise mechanism of ammonia synthesis from its elements, nitrogen and hydrogen; these findings were also published in a book titled 'Some Catalytic Gas Reactions of Industrial Importance'.

He introduced several subjects for study and research like power engineering, fermentation technology and high-pressure and industrial gas reactions. One of his greatest achievements is the development of the anomaly of strong electrolytes and the dissociation which was then called the ionization theory.

In 1954, he became the Vice Chancellor of Calcutta University, where he started focusing on the improvements of living conditions of students. This was also the year in which the Government of India awarded him with the third-highest civilian award of the country, the Padma Bhushan, in recognition of his service to the country. His demise in 1959 was mourned by countless scientists, industry professionals and academics around the world. His contribution to the work of industrial science and engineering is one of great notoriety. □

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ArcelorMittal Nippon Steel India selects IBM for a Cloud-powered Transformation

ArcelorMittal Nippon Steel India (AM/NS) recently announced a joint venture with IBM Consulting to reinvent mission-critical processes to boost agility and efficiency with digital transformation. With capacity expansion plans in full swing, the AM/NS recognised that its core business processes would require the necessary scalability and flexibility to support growth. Therefore, the collaboration aimed towards cloud-powered business transformation capabilities and deep expertise in the metals and mining industries prevalent in India. Amit Harlalka, CFO, ArcelorMittal Nippon Steel, said, "With this collaboration for SAP S/4 HANA, we are looking to build a Digital Core Platform for AM/NS India. This initiative will provide the requisite financial transparency, and operational agility to help us chart the next crucial phase of growth while setting precedent in the industry". Moreover, Kamal Singhani, Country Managing Partner, IBM Consulting India/South Asia, said, "This collaboration has leveraged our deep knowledge of the steel industry and expertise in high-impact SAP migrations and technology transformations, driven by our robust ecosystem partnerships".

WIKA defines 'Future Ready' Business Strategy

WIKA recently introduced a future-ready business strategy through 'Smart in Sensing' branding, thus commemorating its 75 years as a leading manufacturer worldwide. The transformation to 'Smart in Sensing' comes after nearly 20 years of business in which the WIKA Group established itself as a 'Part of your Business', reflecting a reliable partnership that creates trust through anticipation and solves customers' problems. Gaurav Bawa, Senior Vice President, WIKA India, said, "The social megatrends are characterised by the 3Ds, digitalisation, decarbonisation and demographic change, which are altering our lives. 'Smart in Sensing' along with a roadmap of continuous optimisation, market development and customer orientation, and an uncompromising approach to quality and environmental protection, leverages the manufacturing system to the next level". The company covers the entire value chain, from installation of the sensors, measuring instruments and gateways to a secure connection to the cloud or the local data server as well as configuration of the customer application and customer training. In this way, the company supports digital transformation across industries.

Cummins India Bags the 'Excellence in Environment Management' Award

Cummins India (CIL) received the Excellence in Environment Management Award for the Manufacturing Sector at the prestigious CII-ITC Sustainability Awards 2022. The award recognises CIL's innovative approaches and exemplary results in employing policy and practice to reduce the company's environmental impact. Nitin Gadkari, Union Minister of Road Transport and Highways, presented the award to Shirish Bhide, Operations Leader, Power Systems Supply Chain, Cummins India, and Rajendra Kulkarni, Plant Head, Kothrud Engine Plant, Cummins India, at the award ceremony held in 2023 in Delhi, in the presence of eminent business and industry leaders, subject matter experts and policy-makers. On receiving the award, Shubhankar Chatterji, Chief Supply Chain Officer, Cummins India, said, "The award is the cynosure of all sustainability awards, and we are honoured to receive it. This award is a celebration of our progress towards our PLANET 2050 and Destination Zero aspirations to reduce our carbon footprint and address climate change through sustainability initiatives focused on reducing greenhouse gas emissions, volatile organic compound emissions, water consumption, and waste of all kinds across Cummins India facilities".

Mitsubishi Electric India Inaugurates a CNC eXPerience Park

Mitsubishi Electric India CNC announced its strategic expansion in the Peenya Industrial area with the launch of its new manufacturing facility and technology centre named 'CNC eXPerience Park'. The new Smart Technology Centre is launched to establish Mitsubishi Electric as a prime solution provider in the Machine Tool Industry with its state-of-the-art technologies and improved delivery of supplies. Mitsubishi Electric India started its CNC manufacturing facility in Peenya, Bengaluru, in 2016 to support the 'Make in India' initiative. The all-new 'CNC eXPerience Park' technology centre is designed for further network expansion and to provide a world-class workplace experience for its employees, visitors and customers, allowing them to work and learn in an environment that promotes innovation and sustainability. Addressing the occasion, Masaya Takeda, General Manager- CNC Systems, Mitsubishi Electric India, said, The Machine Tool industry of India is backed by advanced CNC machines and solutions. This expansion will strengthen manufacturing capacity with, reduce the delivery time, encourage technological innovation, enhance skill development and support our key contribution towards the 'Make in India' initiative'.

Honeywell's Environmental Index proves Business Leaders' Sustainability

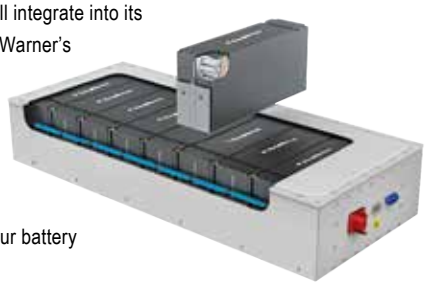
Honeywell recently released its 2Q 2023 Environmental Sustainability Index (ESI), a quarterly indicator of key trends, market sentiment and major sustainability initiatives produced in partnership with the Futurum Group. As per the ESI data, organisations were overwhelmingly focused on process-driven approaches to environmental and sustainability initiatives in 2022. This quarter, the shift towards tech-driven approaches has increased significantly. The ESI has proven that 56% respondents have consented to leveraging more technology for achieving environmental sustainability goals over the coming year. Vimal Kapur, President and COO, Honeywell, stated "Our data shows that companies aren't wavering in their commitment to sustainability. Not only are leaders keeping it at the top of the priority list despite other looming challenges, but they are also increasingly taking actions. This upward trendline in optimism goes hand-in-hand with technology adoption — more organisations are turning to newer, more efficient, more sustainable technologies to help achieve their goals. Honeywell's solutions are ready now to support ESG efforts and help organisations around the world reach their sustainability targets".

Scandron Partners with CriticaLog India to Tap B2B Market

Scandron recently announced a strategic partnership with CriticaLog India to tap the B2B and hub-to-hub markets in the country. The collaboration is expected to garner business worth ₹500cr–600cr in the next two years and will cover hub-to-hub drone deliveries across 160 cities Pan-India, as reported by Scandron in their statement. Under the partnership, CriticaLog will handle all customer-facing operations, and Scandron will manage all drone-related operations. Arjun Naik, CEO, Scandron, said, "The collaboration with CriticaLog India brings drone-based logistics solutions to the B2B and hub-to-hub segments in India. Our range of Cargo Max logistics drones, combined with CriticaLog's expertise in logistics, will be a game-changer and create new opportunities for us to serve customers and provide innovative solutions to meet their delivery requirements." Sujoy Guha, Managing Director and CEO, CriticaLog India, said, "We are excited to work together to ensure timely and efficient delivery of critical shipments across verticals such as healthcare, automotive, ITes, etc. across 160 cities in India".

BorgWarner to provide Battery Packs for Electric Buses

BorgWarner has been recently selected by a global power technology leader to supply battery packs for a series of electric buses. BorgWarner will provide a pair of standardised ultra-high energy packs and a battery management system that the company will integrate into its electrification package for each vehicle. The package will be sold to an electric bus manufacturer in Georgia. BorgWarner's ultra-high energy battery packs provide active cooling and deliver industry-leading energy density. Furthermore, they are safe and reliable containing state-of-the-art safety features including current overcharge protection, cell-level passive propagation resistance, and electrical disconnection at the individual cell wire bonds that satisfy the industry's strict electric vehicle battery safety standards. Additionally, the 98 kWh packs offer active cooling and deliver an industry-leading energy density of 274 Wh/liter and 177 Wh/kilogram. Volker Weng, Vice President and General Manager, BorgWarner Drivetrain and Battery Systems, said, "This new business win with our battery technology broadens our industry reach and delivers a more efficient option for school transportation".



Marposs Group acquires Mesys to expand Range of Li-ion Battery Production

The Marposs Group has recently acquired the German company Mesys and aims to expand their range of solutions dedicated to the production process of Li-ion batteries. MeSys specialises in non-contact, radiation-free measurement systems for very thin and flexible flat materials for over 30 years. Through this operation, they aim to become an increasingly important player in e-Mobility by complementing its portfolio of technologies for the automotive industry with specific new applications for the production of electrodes and separators used in Li-ion batteries. Leveraging the devices developed by MeSys, Marposs will expand its range of solutions dedicated to the battery cell production process and consolidate the strategy that has allowed it to become increasingly competitive in the e-Mobility sector, owing to its advanced systems for testing automotive electrics and battery pack, module and cell durability and seal resistance.

"Strengthening market position with innovation"

…says **Rishi Aggarwal,** Managing Director, JCBL Group. In an interview with Sanjay Jadhav, he describes the Indian automotive market landscape and highlights the market trends for rapid response mobility services.

Your company targets to double last fiscal's numbers and aims for 800 tippers from Chennai plant? Can you brief us more on this?

The construction industry is experiencing significant growth in our country. As an organisation, we aim to capitalise on this opportunity. Therefore, we have recently undertaken expansion of our facilities in Chennai. This expansion will enable us to meet the demand of 800 tippers per month, which is a considerable increase. Recently, we secured a substantial order from BEML, a major defence company, to manufacture heavy-duty trailers for the Indian defence sector. Considering our market presence, we made a significant expansion to our capacity in Chennai. During this expansion, we strategically focused on moving up the value chain.

With the automotive industry moving towards electrification, how do you look at the Indian market?

Electrification is no longer a distant concept but a concrete reality that we all need to prepare for. In my view, electrification will have a significant impact, particularly in the two-wheeler and three-wheeler segments. However, the transition may be somewhat slower for four-wheelers due to certain factors.

What do you believe are the major market trends for rapid response mobility services?

In the past, a single truck would be used to transport different types of cargo, such as steel and cement. However, the demand for efficiency has led to specialised trucks catering to specific needs. Similarly, in terms of time management and rapid reach, the market is rapidly evolving. Also, efficiency has become a critical factor for survival in this dynamic market.

Armoured vehicle manufacturing is one of the key areas of expertise for JCBL. Can you tell us about challenges you face when manufacturing armoured vehicles?

We protect more than 60% of the top 20 most highly secured individuals in India. One of the challenges we face in this industry is competition from the unorganised sector, which poses risks associated with substandard armoured vehicles. When JCBL refers to armoured vehicles, we prioritise the use of imported glass and internationally recognised steel standards. Another challenge we encounter is the lack of proper documentation for bulletproofing requests. Consequently, we have to decline certain requests that fail to meet these criteria, such as requests for specific police NOC.

Finally, can you give us a glimpse into the future of JCBL and the company's plans for expansion and growth?

We believe that our strategic moves and timely selection of sectors have greatly contributed to our success. Additionally, external factors such as the strong 'Make in India' initiative by the government and the 'China plus one' policy have further boosted our prospects. As JCBL moves forward, we are actively pursuing high-tech areas and projects that offer greater value addition. Our focus is on enhancing technology and innovation to further strengthen our market position.

"The EV industry is witnessing a significant growth"

…says **Ashutosh Mani Tripathi,** Director, Mani Infra and Strategic Solution. In an interview with Neha Basudkar Ghate, he shares his thoughts on the need to prioritise sustainability and green energy in the EV industry.

How has your company evolved over the years? What are the key milestones you have achieved recently?

Mani Infra and Strategic Solution is a Lucknow-based bootstrap its one word startup incorporated in 2019, steadily growing ever since. We are a recognised vendor for UPPTCL and accomplish technical projects on a turn-key basis. We are dealing with Green Energy, Commercial Mobility with EVs and establishing EVCS. Our vision is to create a sustainable future for India by promoting the use of EVs and clean energy solutions. Some key milestones are as follows:

- 2020: Our book, Best Operation & Maintenance Practices for EHV Substations & Lines in UPPTCL, published and inaugurated by the Chairman of UPPCL, followed by state electricity substations.
- 2021: Supported UPPTCL in organising the Defence Excpo.
- 2022: Joined hands with Exicom to establish EVCS across varied locations in UP.

What are the challenges in EV transition as well as the future of EVs?

The shift to EVs represents a significant step towards sustainability. India's complete transition to EVs faces challenges like higher cost, less charging stations, range anxiety, grid capacity and proper environment-friendly battery disposal. Despite these, EVs are expected to dominate transportation media in the years to come.

How do you look at the government's policy to promote EV and EVCS in the country?

Some of the initiatives promoted by our government to promote the adoption of EVs and curate the establishment of EVCS are the National Electric Mobility Mission Plan, Zero-Emission Vehicle policy, Green Urban Transport Scheme, reduction in GST and increase in charging infrastructure.

What are your long-term goals for the company and how do you plan on achieving them?

As a long-term goal, we aim to reduce greenhouse gas emissions, expand market share, and increase efficiency. Our key strategies include investing in R&D, partnerships and collaborations, adding marketing and promotional investments, gaining government support and incentives. As the government, consumers and businesses increasingly prioritise sustainability and clean energy, the EV industry is likely to evolve and grow.

"The water-injected compressor was introduced to eliminate oil in the system and be environmentally friendly"

...says ***Dr Jairam Varadaraj,*** Managing Director, Elgi Equipments. In an interaction with Neha Basudkar Ghate, he explains the significance with a series of strategies to globalise while remaining relevant in India.

You have mentored the organisation's business strategy for nearly 30 years now; looking back, how do you trace this journey?

The journey started in the early 90's when India was going through a lot of changes. It was opening up its economy and integrating itself into the world at that time. Until then, there was a licensing system with the markets protected and high import duties for all products. Since this was being dismantled, we had to rethink our strategy. We were into eight to nine different products at that time, and we decided to sell or shut down quite a few.

We anticipated an opportunity in our compressor and automotive business and retained them at the time. We identified that our automotive segment would be a dominant, India-centric business while compressors would be a global business

for us. While the global opportunity was significant, even to remain relevant in India, we invested in the backend with a focus on technology, processes, and products that were world-class.

Then, with a series of strategies to globalise, we experimented with a lot of markets and realised that the strategy we are focusing on today is the right one for us. We tested this strategy in select markets internationally and gained confidence that the markets accept our products, and the value propositions we give to our distributors and customers are quite compelling. Therefore, from 2012 onwards, we truly started expanding globally.

Today, we have identified six key strategic geographies for us to focus on - North America, Europe, India, Indonesia, Thailand, and Australia. While we continue doing business in 100-plus countries across the world, these are the geographies where our focus will remain strong, and we will deploy our resources accordingly. In the last ten years, we have systematically implemented this strategy, and it's consistently going where we want it to go.

How vital is the Indian market for achieving your long-term revenue targets, and how is your company working towards this?

We have just completed our financial year and crossed INR 3000 crores in revenue. Our goal is to hit US$1.6 billion by 2035–2036. The Indian market is a very small percentage of the global market, but it is our home market, and we want to be dominant in our home market. But in terms of financial numbers, the Indian market is not big enough to contribute significantly. Hence to reach our goal of US$1.6 billion by 2035–36, a bulk of it will come from outside the country.

How do you position ELGi today? How are your products benefiting the environment, thereby creating sustainability?

One of the biggest portions of the life cycle costs of a compressor is electricity consumption. If we can keep improving the efficiency of our product, then we reduce energy footprint for the customer and, in turn, contribute to a greener environment. We have been continuously improving the energy efficiency of our compressor over the last 20 years, and it is an important goal of our overall ESG Program.

The second goal is the elimination of oil. When you don't have oil in the system, then it is more environmentally friendly. Hence, we introduced a water-injected compressor four years back. Along with these, there are many programmes that we are currently running that really contribute to the environmental well-being of the planet.

What are the key things to consider while developing the business objectives to achieve better ROI, revenue, and margins?

Well, the only way to improve your profitability is to provide better value to your customer. If you can provide better value, the customer provides a better price to you. If you are going to drive low cost, then your profitability will be low because the cost of producing a product can't be significantly different. So, the question is, what value can you provide to the customer?

How is the vocational training school in Coimbatore helping in creating the right set of technical expertise? What do you think about women's participation on your company's shopfloor?

Situated in Singarampalayam, India, the ELGi Vocational Training School strives to provide holistic development to young students from underprivileged backgrounds by equipping them with technical training and on-the-job skillset. At the centre, students receive technical training. They get to learn basic engineering concepts and production technologies. This is augmented by the centre's facilities, such as multimedia classrooms and training spaces for fitting shops, machining, welding and electrical work.

We also realise the importance of diversity and see value in initiatives that will lead to more women joining the workforce. Today 50% of the students in our vocational school are women. When all of them join our shop floor, over the next two to three years, close to 30% to 35% of the employees on the shop floor will be women. Even now, all women employees working at our shopfloors work at par with our male employees, handling the same tasks without any difference.

What are the company's plans for future growth and expansion, and how do you plan to achieve them while maintaining profitability and business development?

Well, the goal for the company is to expand its business globally, and we have already identified the markets we want to expand in North America, Europe, India, Indonesia, Thailand and Australia. These markets constitute close to 90% of our revenue and 70% of the global opportunity. We will continue to invest in these markets to reach our goal of US$1.6 billion by 2035–36. ❐

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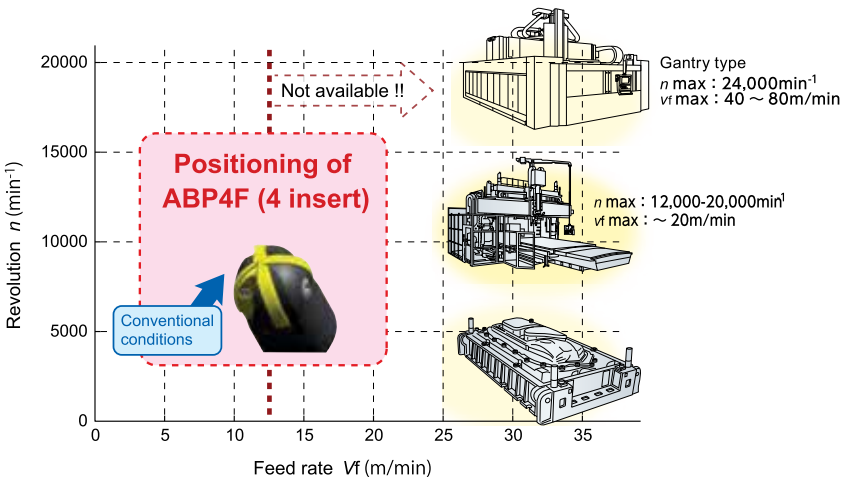
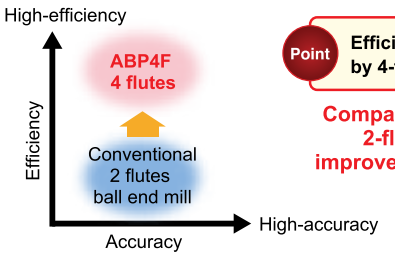
Example of large press die for automotive parts



Processing advantage of 4-flutes end mill

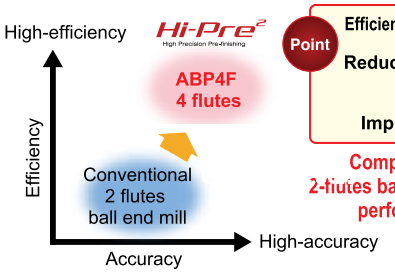
Figure Finishing



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
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Improve finishing accuracy

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

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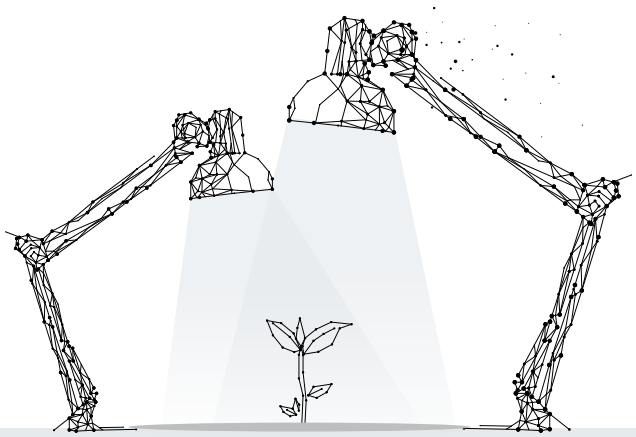
Chief of Operations, Ashok Leyland



In the realm of manufacturing's dynamic dance, ambidextrous factories twirl with present prowess and future foresight, optimising efficiency and adaptability to triumph in the competitive crescendo of progress.

In today's fast-paced and ever-evolving manufacturing landscape, the concept of an ambidextrous factory is gaining significant attention. The term "ambidextrous" refers to the ability to simultaneously manage present operations while preparing for the future. This innovative concept enables companies to simultaneously optimise their efficiency and adaptability, allowing them to thrive in a dynamic and competitive market.

In the rapidly evolving world of manufacturing, flexibility has become a crucial aspect of success. Managing CV industry has multiple challenging one with its cyclicality. The thrill increases more with the need to serve both B2B and B2C customers. These demands agility and adaptability.

The products manufactured in this industry are not mere products; they are the livelihoods of owners, drivers, and businesses. Therefore, it is imperative for manufacturers to prioritise reliability, robust design, and sophisticated processes to ensure customer satisfaction and loyalty.

In today's day and age, to address the dynamic needs of customers, automotive manufacturing companies must prioritise reliability in their products. Robust design ensures durability, performance, and safety. Additionally, organisations must have efficient processes in place to respond promptly to breakdown calls, reducing downtime and enhancing customer satisfaction. Also the shift in trend towards higher tonnage vehicles add more challenges too.

Organisations must interact with customers, comprehend their problems, and offer practical answers if they want to develop a genuine connection with them. Given the importance of people's livelihoods, it is crucial to utilise technology to establish connections with both automobiles and customers. For instance, Ashok Leyland has incorporated IoT technology into their i-Alert system, allowing for preventative maintenance and real-time monitoring. This has helped in 1.5 lakhs vehicles capturing 130+ data points in every 6 sec. 1TB data being captured daily. This pro-active strategy reduces breakdowns and increases vehicle uptime, guaranteeing client satisfaction.

Additionally, technology must be integrated into manufacturing processes to guarantee efficiency and eradicate mistakes. To guarantee process adherence and get rid of false part forwarding, Ashok Leyland's Manufacturing Process Assurance System makes use of connected and programmed machinery. While all these help in bringing flexibility and speed of resolution.

Ambidextrous organisations harness advanced analytics and data-driven insights to make informed decisions for future mobility. By leveraging the power of data, organisations can identify inefficiencies, predict maintenance requirements, optimise inventory levels and enhance production planning, leading to improved operational efficiency and cost savings.

To cater to customers' pan-India needs, manufacturers should consider enabling facilities across pan-India spread across the country. Ashok Leyland has 52,921 touchpoints

across the length and breadth of the country. This approach enables quicker response times, reduces transportation costs, and enhances customer service. Additionally, integrated factories that encompass the entire production chain, from foundry to engine to chassis to bus body, streamline operations and improve overall efficiency.

For instance, Ashok Leyland has established production plants throughout India, strategically positioned in both the north and south. They can reach customers across India thanks to this strategic placement, which also reduces delivery lead times and guarantees timely service. The eco-system around these facilities to help us in establishing frugality / flexibility and reliable supply chain too.

Despite the benefits of flexible manufacturing, factories face numerous challenges. Multi-model complexities, volatile volumes, technological disruptions, rework, high working capital, and the need for special processes for customised products pose significant obstacles. Additionally, high capital expenditure for new products, rising costs of materials, energy, and OEM parts, and the scarcity of skilled resources further complicate the manufacturing landscape.

Organisations must use strategies that support the idea of an ambidextrous factory, managing the present while planning for the future, to overcome these obstacles. Companies should set up dedicated teams to implement these ideas and promote a culture of innovation and operational excellence at the policy level.

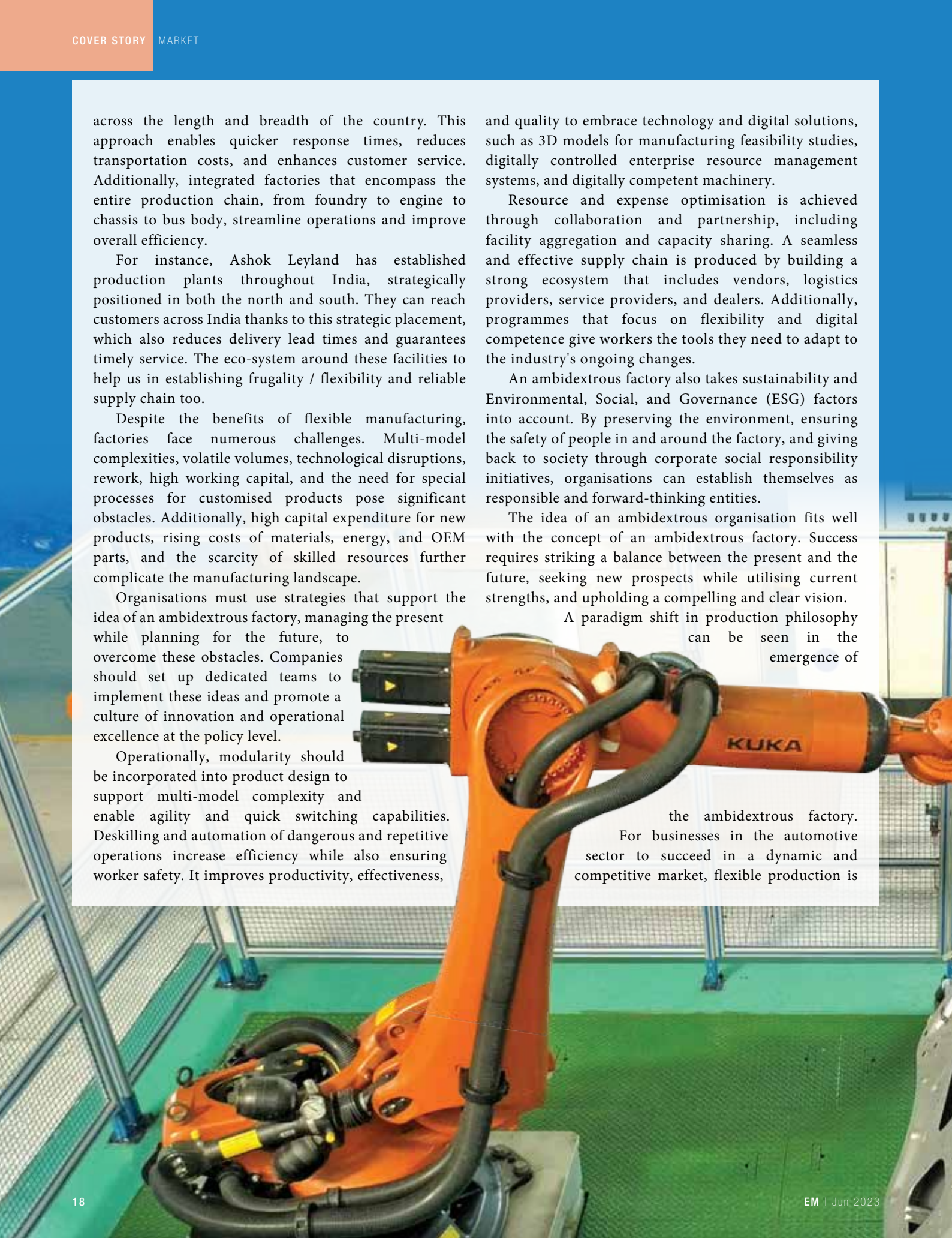
Operationally, modularity should be incorporated into product design to support multi-model complexity and enable agility and quick switching capabilities. Deskilling and automation of dangerous and repetitive operations increase efficiency while also ensuring worker safety. It improves productivity, effectiveness, and quality to embrace technology and digital solutions, such as 3D models for manufacturing feasibility studies, digitally controlled enterprise resource management systems, and digitally competent machinery.

Resource and expense optimisation is achieved through collaboration and partnership, including facility aggregation and capacity sharing. A seamless and effective supply chain is produced by building a strong ecosystem that includes vendors, logistics providers, service providers, and dealers. Additionally, programmes that focus on flexibility and digital competence give workers the tools they need to adapt to the industry's ongoing changes.

An ambidextrous factory also takes sustainability and Environmental, Social, and Governance (ESG) factors into account. By preserving the environment, ensuring the safety of people in and around the factory, and giving back to society through corporate social responsibility initiatives, organisations can establish themselves as responsible and forward-thinking entities.

The idea of an ambidextrous organisation fits well with the concept of an ambidextrous factory. Success requires striking a balance between the present and the future, seeking new prospects while utilising current strengths, and upholding a compelling and clear vision.

A paradigm shift in production philosophy can be seen in the emergence of the ambidextrous factory. For businesses in the automotive sector to succeed in a dynamic and competitive market, flexible production is



essential. We inbuilt flexibility of >30% month on month volume. The fluctuations not only in plants as well as entire value chain. These factories enable businesses to meet the demands of a market that is changing rapidly while maximising operational performance by fusing efficiency with adaptability. The ambidextrous factory will be crucial in determining the future of the manufacturing industry, fostering innovation, and facilitating sustainable growth as manufacturers increasingly recognise the advantages and potential of this approach. In the constantly changing environment of the automobile industry, manufacturers can guarantee their long-term profitability and customer happiness with the correct strategies and a dedication to operational excellence. ☐

• **Reference of Ambidextrous author:** HBR, Innovation The Ambidextrous Organization by Charles A. O'Reilly III and Michael L. Tushman From the Magazine (April 2004)

Auto Components and Macro Growth

Tanmoy Ganguli,
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India's automotive components manufacturing industry is projected to grow significantly in the global auto supply chains. Local companies are anticipated to experience a rapid growth in market share in the upcoming years.

The auto component manufacturing industry serves as a vital sector that not only fuels the growth of the global automotive industry but also plays a pivotal role in driving macroeconomic growth, development and generating substantial employment opportunities. Additionally, the industry has witnessed remarkable growth in the demand for auto components globally, further reinforcing its importance and impact.

Importance of the Industry

Currently, the overall Indian auto components industry accounts for 2.3% of India's GDP. Moreover, it is set to become the third largest global industry by 2025. A recently-issued research states that the auto component exports from India are expected to expand five times over the next ten years. It is imperative to highlight that the sector's shift

towards sustainable mobility, which is being facilitated by the government through various initiatives, has accelerated the growth of this industry tremendously. Initiatives such the PLI scheme and FAME scheme have stirred an exponential growth in the industry.

In addition, the global push for supply-chain diversification and bolstering of the domestic Tier II and III supplier base has become a catalyst for the macroeconomic growth of the auto component segment. Despite concerns about a recession in the US and Europe's major markets, the Automotive Component Manufacturers Association of India has stated that India's auto component sector was valued at approximately $56.5 bn in FY2022, and is predicted to increase by 10%–15% till FY2024, supported by both domestic and export market demand. Additionally, as per Invest India, the auto components industry in India is expected to grow to $200 bn by 2026, and here is why:

• Fostering Industrialisation

By attracting investments, encouraging local entrepreneurship and developing a robust supply chain, this industry has become a catalyst for the overall industrial development of the country.

The sector also attracts Foreign Direct Investment (FDI), technological expertise and export capabilities due to the growth potential it poses. FDI inflows in the auto component industry bring not only capital but also knowledge transfer, technological infusion and access to global markets.

• Employment Generation

The industry creates a significant number of direct employment opportunities, ranging from skilled engineers and technicians to assembly line workers. The growth of this sector leads to job creation, thereby addressing unemployment challenges and supporting economic development.

The industry generates indirect employment as well by fostering ancillary businesses and supporting the local supply chain. Moreover, the industry is directly linked to creating several job opportunities that, otherwise, would not have reached the country.

• Export Competitiveness

The growth in auto component manufacturing has enhanced the country's export competitiveness by producing high-quality components. Auto component exports are expected to grow and reach $30 bn by FY2026. Due to the huge number of players it has, India has a competitive edge over the other countries; this factor is expected to result in increasing exports in the coming years and will enable the country to become an integral part of the global automotive supply chain, contributing to foreign exchange earnings and a favourable trade balance.

• Technological Advancements and Innovation

The technological advancements in the auto components industry are primitively spurred by Research and Development (R&D). By investing in R&D, manufacturers are able to innovate and improve design, functionality and performance of components. These innovations directly benefit the industry and contribute to technological progress. Achievements in such areas also give rise to collaborations and partnerships that, in turn, foster knowledge-sharing, facilitate technology transfer and promote innovation across the industry. Furthermore, such collaborations strengthen the entire automotive ecosystem.

Key Factors Driving Growth

The industry has been advancing at an exponential rate in the previous years. As a result, the country's auto components industry and its export quantity and value has risen significantly. While multiple shifts in the market drive this change, a few key factors driving this are:

• Government Initiatives

In September 2021, the Government of India approved the PLI scheme for the Automotive and Auto Component Industry. The main objective of the initiative was to enhance local manufacturing capabilities and global competitiveness in the sector. The PLI scheme has not only brought about a plethora of opportunities for the industry but also addressed major issues faced by the sector, such as cost disadvantages faced when manufacturing products locally. The push and support from the government has encouraged several companies to set up their R&D base in India, which has further caused a boom in the industry.

• Industry Shift towards Green Mobility

The budget 2023–2024 aims to promote the switch to greener transport and speed up the domestic manufacturing environment. The emphasis on boosting Electric Vehicle (EV) adoption will further expand the growth trajectory, strengthening the base even further. With the declaration of a customs tax exemption on the import of capital goods and machinery necessary for the manufacture of Li-ion batteries that commonly power EVs, the budget ensures the desired momentum behind expanding EV sales. This will stimulate local manufacturing networks, foster a greater use of EVs throughout the nation and increase employment possibilities.

This remarkable move poses to strengthen the EV ecosystem by lowering the price of EVs throughout the nation. The growth of the EV start-up environment, its emphasis on localisation and supportive government regulations will all contribute to accelerating sustainable mobility in the country.

• Introduction of Vehicle Scrappage Policy

Another significant announcement in this year's budget was the scrappage policy for vehicles older than 20 years. This not only increases the number of newer, cleaner automobiles on the road but will also increase a demand for new cars, functioning as a kind of stimulus to boost sales. Furthermore, this will help the auto components industry as well, because original equipment manufacturers will be under the pressure to produce more cars to fill rising orders, which will increase demand for components.

• Localising of Semiconductor Chip Production

Shortage of the semiconductor chips post COVID affected several sectors across, and the automotive sector was no exception. However, the government's allocation of ₹3,000 cr for the 'Indian Semiconductor Mission' aims at not only creating a robust and resilient supply chain, but also localizing and setting up a manufacturing base in the country. In a recent report by Deloitte, the Indian semiconductor market will reach $55 bn by FY2026, with more than 60% of the market being driven by three industries, namely smartphones and wearables, automotive components and computing and data storage.

Conclusion

In conclusion, the auto component manufacturing industry serves as a catalyst for macroeconomic growth, with its contributions encompassing economic development, employment generation, technological progress and global competitiveness. Governments, policymakers and industry stakeholders must recognize and support this industry's potential, fostering an environment conducive to its growth and ensuring its continued impact on national economies. ☐

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Additive-ly Conquering Manufacturing

Rajiv Bajaj,
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The manufacturing sector embraces 3D Printing for prototyping. Let's explore its potential for reform and discover where to start…

The foremost challenges facing manufacturing are global issues like supply chain resiliency, rising energy prices, workforce availability and general market buoyancy. While they affect us as well, we are also a part of the solution for manufacturers. Adopting Additive Manufacturing (AM) throughout the manufacturing value chain can increase manufacturers' flexibility, giving them great scope for dealing with outside forces. There still lies a huge scope for AM to continue its advance in replacing other manufacturing technologies and materials, such as replacing machined metal with 3D-printed engineering polymers and composites.

AM beyond Prototyping

The ongoing transformation from 3D Printing as solely a prototyping technology to its transformation into both prototyping and manufacturing is fundamental.We are at an inflexion point at which the development of new materials for AM is accelerating, and the technology

Prototype manufactured using 3D Printing technology

platforms are maturing. This is happening at a time when manufacturers are going through a period of disruptive change, making AM's benefits even more compelling.

Materials are playing a central role in creating more touchpoints with manufacturing. Our lead times for new materials have drastically reduced thanks to the adoption of a more open materials model, in which customers get the flexibility to choose from both our materials and those of our ecosystem partners. Historically, a new fused deposition modelling material would come to market every 12 or 18 months; with these developments, however, we saw more than a dozen materials released in 2022 alone.

Furthermore, we are witnessing a move from the 3D printer being the sole focus of the conversation when talking about technology. As we have matured into manufacturing, the talk is increasingly about 'scaling up', with the whole ecosystem becoming more and more important. From the viewpoint of the 3D printer, the ecosystem goes upstream into the additive design, process certification, scheduling, file preparation and other functions and downstream into automating post-processing. Industry 4.0 integrations and advances in AI are likely to drive adoption in manufacturing in the years to come.

AM in Manufacturing

One impact of the maturity of additive manufacturing as a production technology is that it creates an incentive for AM vendors to provide broader and more complete solutions, which is driving consolidation in the industry. There is still plenty of innovation by start-ups present across the board that have been supported by well-established contemporaries. For example, we provide strategic venture capital funding for an innovative healthcare software startup called Axial3D, while also offering their solution for preparing 3D-printed medical models to our customers.

It is now commonplace for customers to purchase different systems from us that address different applications — prototyping, tooling and end-user parts. Moreover, they can all share a common software interface and a common support structure.

Taking on Bigger Challenges

The industry's maturity indicates that the requirements of manufacturers and the capabilities of AM are now coming together, meeting in the middle. When you look at manufacturing, you see that the requirements are moving towards smaller series, higher customisation and more onshoring. Producers see the value in having less high-volume production of spare parts, but on-demand spare part production. Meanwhile, you see AM capabilities growing: additional technologies, more materials, higher degree of certification and repeatability and lower cost per part and higher volumes.

We are beginning to translate these benefits in hard economic terms. For example, we have been defining exactly where AM makes more sense than injection moulding and how that translates into per-part costs because, at the end of the day, economics dominates features.

Today, the most compelling economics are for smaller, more complex parts at volumes under about 10,000 (1 cm_3)

for small, complex parts as well as over 200,000 can be less expensive than injection moulding. Looking ahead, I see more and more touchpoints between manufacturing requirements and 3D Printing, and each touchpoint opens up new use cases.

Where do you Begin?

Where do you start when looking for new opportunities to effectively apply to AM? The Bill of Materials (BOM).

A classical paradigm today is that if you have one product of 1000 components, you would probably be able to 3D print 300 of those components. Take those 300 3D-printable components and look at the economics, and you may end up with 50–60 components that can be efficiently 3D printed, based on the kinds of financial analyses we have been running, and those 50–60 components will have a faster return on investment.

Now, how do you analyse the BOM? There are increasing software solutions, some of them leveraging machine learning, that will conduct a BOM analysis and advise manufacturers on which 3D Printing technology would fit each viable component. The bigger challenge is for manufacturers to expand this effort and rethink the BOM looking for design changes that could bring 3D Printing into play. With some redesign of the remaining parts, manufacturers can open new opportunities and strengthen the overall case for 3D Printing.

Meanwhile, we are working constantly on the percentage of BOM that can be moved to 3D Printing, from 300 components to 350, 400 and even 500. This comes with advancing technology, more materials, certifications, reduced cost-per-part and so forth. Eventually, I expect manufacturers will soon realise that 500 out of 1000 ordered components can be 3D printed effectively. Moreover, instead of 50–60, it will be more economical for the company to manufacture 200–300 using 3D Printing.

Going Beyond the Printer

More than ever, additive manufacturing is about a lot more than just 3D printers. Particularly, we need a much greater focus on investing in more robust software capabilities and continued growth in the materials options that immediately open up new AM use cases across various industries.

There will still be new 3D printers (even exciting ones!), but what we are doing on the software and materials end of production will be just as compelling, especially as we get better at addressing entire digital workflows for key applications in dental, healthcare, fashion and manufacturing. An important ingredient of customer success in the adoption of AM is initial hand-holding and process optimisation to harness the full capabilities of advanced AM systems. ☐

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VR/AR's Support for Touchless Service Models

Kanav Singla,
CEO and Founder,
Metadome.ai

The pandemic has led to a large-scale boom in software development and accessibility. With AR & VR's personalised touch, it is all the more fitting that they are now evolving to accommodate multiple service models across all sectors. In this edition, EM delves upon the enhanced use cases of the touchless service models and more…

It is often easy to become numb to the onslaught of new technologies that are hitting the market, as they are responsible for revolutionising businesses in a new manner. It is not only bringing a change to how customers connect with a brand but also reshaping how they are catered to. The pandemic merely acted as a catalyst for disruption, transforming both online services and brick-and-mortar stores. Additionally, it also changed the consumers' behaviour, as they are now used to getting unique, personalised and instantly accessible experiences. To cater to their changing demands, brands have been considering leveraging cutting-edge technologies such as Augmented Reality (AR) and Virtual Reality (VR) to enhance customer experiences.

Brands in the market have started to apply themselves creatively and use these new-age technologies to add another layer of immersion for their customers. Be it an automobile company wanting its customers to experience a car's interiors from the comfort of their homes or a fashion brand wanting its buyers to try on clothes before they buy them online, they are all using this new-age tech to climb on the technological bandwagon. A concept that started as a response to the social distancing norms, as the use cases and advantages have emerged, has slowly and steadily become the industry standard. One such use case is the touchless service model that is considered by several brands; consumers prefer what it offers, while businesses are eager to adopt it to have a competitive edge in the market.

VR and AR: Enabling Touchless Service Models

Communication is a vital tool for businesses, be it for delivering their messages, establishing names in the market or engaging in customer support. However, for some, customers, support can be a painful phenomenon with awful downtimes and incessant levels of confusion, making it a daunting process. However, thanks to technological advancements, touchless service models have emerged as a solution.

The AR and VR technologies, instead of joining incoherent pieces of information, amalgamate video and audio feed with 3D objects that initially superimpose the customer's home environment. This provision makes them efficient to enable touchless service models. However, the utilization of AR and VR technologies is not limited to a single constraint. These technologies can be used for anything from basic troubleshooting of consumer issues to helping employees train, resolve contracting issues and get hands-free access to crucial data, resources and instructions.

Resultantly, AR and VR are two favourable technologies that businesses are considering adapting to their processes. According to a report by Markets and Markets, the AR and VR combined market is anticipated to reach $114.5 billion by 2027, growing at a compound annual growth rate of 25.3%.

Reducing Friction for Customers

As times have changed, customers have been using smart devices and digital platforms to connect with brands. As staying online becomes a primary choice, consumers are choosing to conduct more activities on digital platforms before venturing out to stores. When they do choose to interact outside of their home, customers have new expectations for both themselves and any staff interactions. They particularly expect to shop without any hindrances, including any human intervention. According to a report by CapGemini, 77% consumers are expected to increase their usage of touchless technologies to avoid interactions that require physical contact.

As brands are upgrading themselves, they have adapted online transactions, provided online shopping and last-mile deliveries and considered hyper-personalized services on an

omni-channel level. The demand for a frictionless shopping experience has never been greater. In this regard, AR/VR are providing them with significant immersive and frictionless experiences without any ohuman intervention. Instead of requiring any physical touch, several operations can be initiated via touchless interactions, including gestures, voice detection, conversation AI and facial recognition.

Providing Remote Assistance

Traditionally, not all customers were able to resolve their issues, owing to a myriad of complexities, and turnaround time used to be a lot longer. Thus, a lot of customers were not satisfied and got frustrated, reducing brand loyalty. According to a report by KPMG titled *'Customer Experience in the New Reality'*, 90% of consumers regard resolution as their most important customer service issue. AR/VR remote assistance in this regard can be used to bridge the lacuna and cater to the needs of customers in an efficient manner. The amalgamation of video with AR allows tech support to analyse images and videos in real time on their own devices, embedding them in the physical environment.

The technology usually pairs live video streaming with AR, which in turn provides an immersive, engaging and satisfying customer–support experience. Furthermore, it also enables the support agent to solve the customer's issues more clearly, as they can ask multiple questions, identify their issues and explain the steps that could further solve their complete problem. It further facilitates showing the desired actions and steps visually, which can then be accessed by the customer to resolve challenges quickly and efficiently. Therefore, this technology creates a viable solution for a collaborative remote support environment.

Training Employees

For brands or manufacturers who have several products, they can leverage the power of AR and VR to train their employees effectively. Without being physically at a place, an employee can explore a generic product while gaining information about all its details and versions as well as compare them with different products to gain relevant knowledge. Hence, the companies are able to initiate several variations of a physical product with different characteristics on the AR/VR platform for the trainee to comprehend.

An AR/VR training module overlays an employee's current reality with digital data or objects that represent the experience. Once the targeted training processes and expected outcomes have been identified, the team can iterate on 3D models and interactivity for replication with incredible details. Instead of fragmented data, companies can identify precisely when and where an employee is struggling and improving, both of which impact productivity, focus and quality. PwC's 2022 study found that VR-trained workers were up to 4-times more engaged during training than e-learning workers and 1.75-times more engaged than their classroom peers.

Enhance Field Service Applications

The use of VR and AR allows field service providers to gain a 360-degree digital view of assets. With this, it is easier to determine how to prevent failure through remote identification and troubleshooting. Not only does this speed up the troubleshooting process, but also reduces travel costs and the risk of downtime.

Another very important area where AR and VR can play a big role is in bridging the skills gap between new on-board staff and senior staff within the organization. AR and VR technologies can help speed up the process of transferring and sharing knowledge between employees in real time. This, in turn, improves customer service and field service.

The typical complexity of product assembly procedures can be greatly simplified with a visual representation that is easy to comprehend. Furthermore, with 3D visuals, technicians will have a clear, logical understanding of what is going on with each product.

All Things Considered…

From providing an immersive experience to the customers to enabling personalised shopping provisions, AR and VR technologies have catered to the needs of businesses and aided them in having an edge in the markets. For many organisations, AR and VR can turn out to be excellent tools for marketing communications and an excellent brand experience. From product demos and choosing your favourite jeans in a virtual shopping experience to vehicle demos and virtually touring the insides of a vehicle, all will give a very realistic experience to the consumers.

In a bid to enhance customer experiences and transform their businesses, brands are leveraging cutting-edge technologies such as AR and VR at a time when touchless interaction is gaining ground. It is providing a frictionless shopping experience to customers, aiding employee training, easing remote assistance and enhancing field service applications. Looking at these myriad of use cases and advantages, there are dozens of industries that are quickly adopting AR and VR. These companies include automakers, electronic brands, fashion brands, manufacturers and more. In this regard, we can predict that brands that are willing to use new-fangled technologies such as AR and VR are likely to stay ahead of the curve. ☐

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1. Select a title that is most appropriate for your position

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- ❑ 02. Director, Supervisor
- ❑ 03. Group Leader, Project Leader
- ❑ 04. Manager, Specialist
- ❑ 05. Engineer, Technocrat
- ❑ 06. Other

2. Select a title that describes your principle job function

- ❑ 01. Management
- ❑ 02. IT
- ❑ 03. Safety & Security
- ❑ 04. Risk Management, Accident Management
- ❑ 05. R&D
- ❑ 06. Design Engineering (Plant Engineering)
- ❑ 07. Project Planning, Production Planning
- ❑ 08. Laboratory, Test, Field Service
- ❑ 09. Explosion Protection, Fire Prevention
- ❑ 10. Manufacturing, Production
- ❑ 11. Quality Assurance
- ❑ 12. Reliability, Evaluation, Services
- ❑ 13. Energy & Environment Technology
- ❑ 14. Facility Management
- ❑ 15. Sales, Marketing
- ❑ 16. Purchasing
- ❑ 17. Warehouse, Transportation, Logistics
- ❑ 18. Consulting / Advisory
- ❑ 19. Education
- ❑ 20. Other

3. Select the industry which best descibes your company's primary business activity

- ❑ 01. Industrial Machinery
- ❑ 02. Electrical & Electronics equipment
- ❑ 03. Communication & Information Technology
- ❑ 04. Power & Energy
- ❑ 05. Automotive Manufacturing
- ❑ 06. Steel / Metal
- ❑ 07. Optics & Precision Mechanics
- ❑ 08. Chemical & Pharmaceutical Industry
- ❑ 09. Bio-& Environmental Technology
- ❑ 10. Mining, Oil, Gas
- ❑ 11. Wood, Paper, Printing
- ❑ 12. Food & Beverage
- ❑ 13. Textile, Leather
- ❑ 14. Building Automation
- ❑ 15. Technical Consulting, Engg. & related services
- ❑ 16. Machine Tools
- ❑ 17. Plastics & Polymers
- ❑ 18. Construction
- ❑ 19. University, Education
- ❑ 20. Other

4. What is the approximate number of employees in your company?

- ❑ 1 to 9
- ❑ 10 to 19
- ❑ 20 to 49
- ❑ 50 to 99
- ❑ 100 to 199
- ❑ 200 to 499
- ❑ 500 to 999
- ❑ 1,000 to 2,999
- ❑ 3,000 & more

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Machine Safety in Manufacturing

The convergence of IT–OT has left manufacturing setups vulnerable to cyber-attacks. In an exclusive interview, Pilz India discusses increased automation, the need for machine and human safety, and how industries can ensure that…

Abhijit Kulkarni,
Manager Consulting Services, Pilz India

Q What is the level of safety in Indian manufacturing and how is the safety manufacturing landscape changing over the years?

Technology is rapidly evolving, and its effect is largely visible in the automation and robotics market, effectively altering how businesses operate. While exploring these next-generation automation solutions and achieving higher productivity, increasing efficiency and reducing costs is the ulterior motive of organisations. Factories look at enabling real-time monitoring of production data, predictive maintenance solutions, optimising production processes and identifying opportunities for process improvements.

The convergence of IT and OT has left manufacturing setups vulnerable to cyber-attacks. Thus, with these advances, safety and security have become a prime challenge for machine builders, factories and plants. There is an enhanced thrust by plants and manufacturing units regarding safety and safeguarding techniques. Additionally, with higher complexity and speeds, machines demand next-generation automation solutions. The manufacturing landscape is continuously changing, with safety and security at the crux of the change.

How can factories and machine builders reduce risk when it comes to machine safety?

If machine builders are unaware of risks and hazards, they cannot fix them. Thus, the machine builder needs to identify gaps in their safety procedures in their machines at an early stage, helping them detect and eliminate potential safety risks for humans and machines. A thorough risk assessment following ISO12100 will help machine builders define, prioritize and implement necessary safety measures.

A machine builder should also follow the entire machine safety lifecycle after he successfully assesses the risks in their machines. Moreover, safety validation is the most crucial step in the safety lifecycle that checks whether the protective measures have been implemented correctly and the safety system is fully functional. Pilz India supports machine builders throughout the entire machine safety lifecycle starting from risk assessment, safety concept, safety design and safety implementation to safety validation.

How would a machine builder know that their machine is safe?

After the machine is subjected to a machine safety lifecycle of risk assessment, the machine builder is sure of having implemented the safety measures as per the applicable directives, laws and standards. With Pilz's safety systems, businesses are assured that their personnel and operations are protected from potential hazards. Our team of more than 13 certified consultants include two Certified Expert in CE Marking along with two Certified Expert in Functional Safety professionals as well who have more than ten years of hands-on experience on most complex machines. Our efforts have resulted in Pilz India being involved in various international projects.

With Pilz India's International Qualification Programme, machine builders can build up their knowledge gradually and continue training up to the required degree of qualification. A machine builder can also undergo trainings with globally recognised certifications that are offered by Pilz India in collaboration with TÜV NORD, such as becoming a Certified Machinery Safety Expert, Certified Expert in CE Marking and Certified Expert in Functional Safety. Together with the machine safety lifecycle and internationally recognized training by certified experts, machine builders can be trained in the proper safety measures thanks to Pilz India.

We are proud of the fact that, with our innovative solutions and decades of expertise, we have globally established ourselves as a complete solution provider for safety and automation technology. We ensure machine builders and factories stay safe throughout the machine lifecycle using our invaluable services.

Workplace safety has gained prominence in India. How does Pilz India help factories and manufacturing units ensure operator safety?

The continuing safety of machine operators is the top priority for all manufacturing units and factories. Moreover, manufacturing units are confronted with the challenge of taking all the necessary safety measures to ensure this safety. Construction, upgrades, manipulation of safeguards or changes to work processes can undermine the level of protection, which, if undetected, can cause considerable damage and compromise the safety of staff. The manufacturing unit also needs to gain a comprehensive understanding of the overall safety and conformity status of machinery by the current legal position and applicable standards. Thus, it needs to provide its staff with effective protection from hazardous energy sources in the form of a Lockout/Tagout (LoTo) system, which guarantees that its machines and work equipment are isolated from the energy supply.

Pilz India offers a comprehensive range of training and services for the standard-compliant analysis and optimization of safety status in the workplace. With our comprehensive solutions for factories and manufacturing setups, Pilz India ensures greater safety in the workplace.

When machine builders export machines, they need their machines to comply with various international standards. As a technology leader in the safety market, does Pilz India offer such compliance services to machine builders, helping them with hassle-free compliance?

Manufacturers, exporters and operators that wish to export their machines around the world are confronted with complex compliance and legal issues. Machine builders need a solution provider with extensive knowledge and experience to interpret the applicable directives and standards. Pilz India has been successfully supporting its customers with conformity assessment procedures for various markets and standards. We assist our customers and provide International Machinery Safety Compliance services like CE Marking, UL, NR-12 etc. for machine builders exporting machines to the international market. ☐

INDIA'S EV INDUSTRY GAINING MOMENTUM

By 2030, nearly one in three vehicles in India will be electric, and one in ten EVs sold worldwide will be in India. However, the Indian EV industry is still in its early stages. Specialised service providers can help them increase the efficiency of their production and reach the next level of technology and collaboration.

Sudhir Gurtoo,
Managing Director,
Leadec India

Dr Christoph Jaschinski,
SVP Global Business
Development, Leadec Group

Decreasing Battery Costs

The costs of a battery system accounts for the largest share of the manufacturing costs of a vehicle, up to 30%–40% of total manufacturing costs. This is a challenge for acceptance in India, where, in addition to innovation, the price of the vehicle is the most important purchase criterion. Therefore, all current forecasts show a faster spread of EVs in the two-wheeler segment than in the passenger car segment.

However, with the new process technologies, the manufacturing costs per kWh will decrease during the next few years due to the further development of new materials and

their application technologies, irrespective of the location of the plant. The processes in battery cell production are not yet as industrialised as the assembly processes for ICEs. With new R&D centres in India and Southeast Asia, the manufacturing costs for cells will decrease, which will suit the price sensitivity of Indian customers.

Localise Car Assembly

Another possibility to reduce costs is to localise car assembly. Today, good imported electric cars are subject to high taxes. As soon as the production is localised, these barriers will become less relevant.

Ramping up production facilities for EVs and even more for cell production will therefore be a crucial factor in the transformation of the automotive industry in India. Major Indian automakers such as Tata Motors, Mahindra & Mahindra, Hyundai Motor India and Maruti have announced significant investments and are trying to make a leap. International manufacturers like Stellantis, Toyota, Audi, BMW, and others are also mulling new facilities for EV manufacturing.

Manufacturing Efficiency

In order to become cost-efficient against new competitors, Indian car manufacturers will have to reduce their manufacturing costs within the next few years. Reducing the manufacturing costs of a car by 50% means reducing the manufacturing hours by half. Electric cars are mechanically much less complex than cars with internal combustion engines. Companies like Tesla have announced that they can produce a car within 10 hours.

More automation, fewer model variants, and new production processes, especially in body construction and final assembly, are the keys to success. In order to maintain cost leadership, particularly in the small and mid-size car segments, Indian automakers will have to rebuild their factories over the next few years to remain competitive.

Industrial service companies can provide support along the journey, whether through the engineering and operation of autonomous driving transport systems, introduction of modular assembly solutions for door trims and other car components, or cloud-based IT applications for products that replace traditional hardware on the lines.

In EV factories, the following areas are particularly suitable for outsourcing:

- Pre-assembly of batteries and cooling systems.
- Partial assembly of vehicle components such as door panels.
- Maintenance and supply services
- Battery system audits and battery disposal
- Logistics and crating services
- Automation of plant systems

Safety First

Media reports of electric vehicles, especially electric scooters, catching fire in different parts of the country have raised concerns among many people: are EVs really safe? Most electric vehicle manufacturers address the risk of fire and explosion in batteries with efficient and intelligent Battery Management Systems that perform the tasks of battery cooling, heating, insulation, ventilation, etc. The certification agencies, the Automotive Research Association of India and the International Centre for Automotive Technology, do rigorous testing for overcharge, short circuit, and vibration.

For some new EV companies, the manufacturing processes have been questioned, especially by veterans from the automotive industry. The automotive industry is known for its high standards, and these should also apply to EV production. Trained professionals in the factories are also a must to guarantee safety.

There will be an increasing demand for technical service specialists in SOPs for battery and cooling system assembly as well as for battery repair end-of-line and end-of-life. Moreover, cell and battery production requires new qualifications: Instead of specialists in manufacturing technologies (e.g., welding or assembly), know-how in process technologies (e.g., mixing, dispensing, filling, degassing, and gluing) is now needed.

Battery Lifecycle

India will require approximately 800 GWh of batteries by 2030 to attain 30% EV penetration. To meet this rising demand, we need to accelerate plans to manufacture Li-ion cells within the country. Manufacturing batteries is only the first step; we have to keep the complete lifecycle in view from error analysis and repair to disposal and recycling.

So far, recycling plants are still in the pilot stage; rapid industrialisation is to be expected. Already in three years, the demand for services for the disassembly of batteries and recycling of materials will increase significantly.

Specialised service companies that are already implementing pilot plants for the dismantling of batteries or solutions for the safe storage and transport of used batteries can make an important contribution to accelerating the vertical integration of the supply chain with their special know-how.

The Next Level of Technology and Collaboration

Batteries have made great strides in recent years in terms of their development and cost through a combination of rapid technological progress and scaled-up production rates, but they still need further intelligent development. The focus is on R&D excellence, value chain integration, and flexible manufacturing. The largest lever is the improvement of cell chemistry and design. One challenge is to further optimise batteries to be able to generate more energy per gram of lithium. New electrode materials also offer the potential to improve performance. Adapting the manufacturing process holds great potential for cost savings.

In order to make rapid progress, new ways of collaboration are also emerging. In May 2022, Volkswagen and Mahindra & Mahindra announced that they had signed a partnership agreement. Mahindra intends to equip its 'Born Electric Platform' with MEB electric components such as electric motors, battery system components, and battery cells from VW. Designed as an open vehicle platform, the MEB electric platform and its components allow car manufacturers to build their portfolio of electrified vehicles, quickly and cost-effectively.

India's EV Market by 2030

The driving forces for a transformation of the market will be both the advancement of technology and its adoption by customers. The growing demand continues to pose major challenges for the industry. It starts with the planning and ramp-up of new plants, continues with the transformation of existing plants, moves on to efficient and cost-effective service models and ends with the supply chain. This is where technical service specialists are needed, with expertise in all aspects of modern factory organisation.

Time to market will be a crucial element for the players. To this end, it is important that they focus on their core competencies and outsource other activities. Manufacturing costs of battery cells and EVs will continue to fall over the next few years. Significant cost components will remain in the form of wage and maintenance costs. Even though the development of the EV market is promising, one point should not be overlooked: the relocation of production capacities for combustion engine manufacturing to India will still play an important role in the coming years.

Focus on Core Competencies

Manufacturers have a lot of challenges to meet. Therefore, the transformation to e-mobility also results in an increasing demand for industrial services. The main areas where industrial service specialists can support automotive manufacturers on their transformation journey are:

- Transformation of existing powertrain plants and industrialisation of new technologies, initially in module and pack assembly, later even in cell manufacturing, and vertical integration of the supply chain
- Maintenance and operational support in new technologies, especially from new line builders, are needed for fast ramp-up and operational excellence
- Automation and operation of the battery module and pack assembly, in-plant battery audit and repair services, and production logistics centres for battery packs
- Greenfield support services for new players in the Indian manufacturing market to support time-to-market readiness

The strategy of an integrated technical services portfolio from engineering to manufacturing support and maintenance services, combined with in-plant logistics and battery repair services, gives key players in the EV industry the opportunity to focus on market introduction and rapid production ramp-up. This allows them to participate disproportionately in the growth of this attractive market and achieve a pole position for future growth. ☐

Why is lightweighting essential in the passenger vehicle segment?

Part 1 article in Efficient Manufacturing May 2023 Issue explained importance and drivers of automotive light weighting. In part 2 explains some techniques like high strength steel, structural optimization, multi material concepts and future scope for weight reduction.

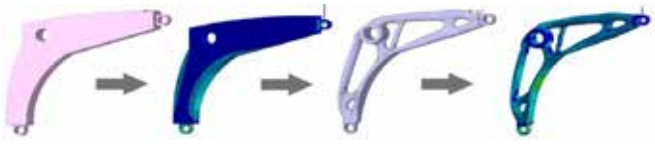
Ravi Rajhans,
Former General Manager - (Engineering Research Center), Tata Motors

Along with structural optimisation and material substitution for multi-material design, the techniques for light weighting passenger vehicles include the following:

Techniques for Lightweighting

1- Lightweighting Design (LWD) Structural Optimisation

Advancements in computer-aided analysis have opened many opportunities for front loading of testing/evaluating methods prior to or inline with design. With proper knowledge of vehicle design as well as boundary conditions, designers have optimised material utilisation effectively. A proper combination of materials can reduce vehicle weight substantially.



Component weight reduction through Topology optimisation. (Courtesy - Ansys Innovation space, courses)

Structure design optimisation involves the size, shape, and topology optimisation of a component and aims at distributing materials within a component to reduce its use as well as enhance its structural performance. This approach provides higher strength and stiffness, better crashworthiness, and vibration performance for the same material in use. Topology optimisation is a simulation-driven design

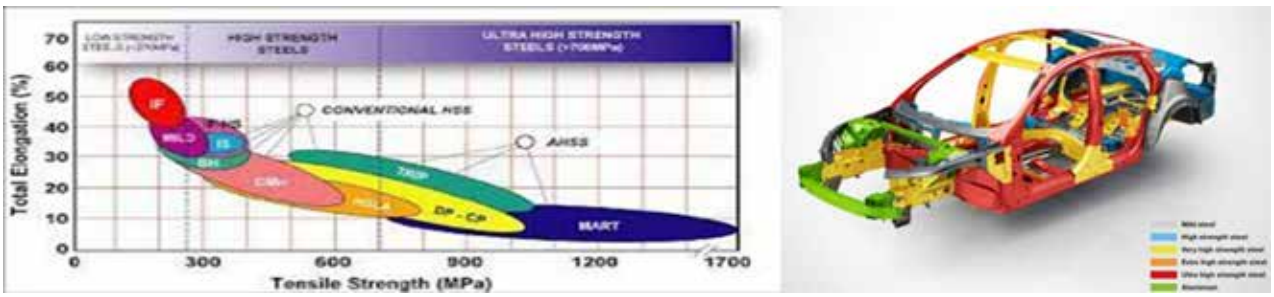
technique used to create conceptual structures. It is an incredibly powerful tool and can be used with the objective of mass reduction. Since resultant topologies are often too complex for traditional processing, additive manufacturing seems to be the key solution. Such a technique is useful for single components as well as complex structural assemblies for weight reduction. The current trend of multiple variants on a single platform to achieve desired volume breakeven has a negative impact on smaller vehicle variant lightweighting.

2- Material Substitution for Multi-material Design

In the past, automotive lightweighting was seen as a simple substitution of materials, mainly aluminium for steel (based on a lower specific gravity). The present consensus is that optimised multi-material design is the future direction. An introduction of multi-material structures with highly integrated light metal applications, using the material with the best properties for the given requirements in the right position, is required for modern transportation vehicles. Advancements in joinery techniques have made it possible and further research in this regard is in progress.

3- High-strength Material

Vehicle curb weight consists of 23%–40% body-related (BIW+ Interiors + electricals), 23%–27% Powertrain, 20%–26% suspension aggregates and 5%–7% miscellaneous. Material-wise, currently ferrous materials/steel usage is 50%–60%. Just by adding a few steel composition and thickness combinations to current vehicle production, 2%–8% weight reduction can be achieved.



BIW with Material application (car body design)
(Courtesy – IRJET Journal – HSS for automobile application & SwedeSpeed - volvo performance forum)

To solve the demand pressure of crash requirements as well as weight reduction drives, many steel manufacturing companies introduced high-strength and ultra-high-strength steel grades like duel phase and trip steels. These can be used for structural members. Higher tensile strength allows for a reduction in the thickness of the component for the same targeted performance. By using these steel grades effectively, designers can achieve 5%–15% BIW weight reduction.

In the last decade, the use of these steel grades has increased in vehicle body construction. An increase in tensile strength is useful for weight reduction; however, reduction in ductility/% elongation prior to failure has added challenges for part manufacturing. Innovations like hot forming and hydroforming have helped in this regard.

4- Other non-ferrous Materials

The use of non-ferrous materials like aluminium grades is a common alternative to steel-like closures and dashboard/cockpit structures. Its lower specific gravity helps to achieve weight reduction. Many of these innovations came from aviation manufacturing. Aluminium thin wall castings provide new avenues for weight reduction.

The full aluminium body was explored by a few manufacturers as a substitute to steel in early 2000; however, due to its cost, investments and higher cycle time for production, it has not succeeded in replacing the steel structure. However, the use of aluminium parts along with steel bodies is successfully used by many manufacturers. Even though magnesium has almost 50% weight reduction possibilities, due to cost penalties it has not penetrated automotive parts.

5- Composite Materials

Composite materials for the full body were always an area of interest for designers concerned with light-weighting. Composite materials have a vast variety of material combinations and manufacturing processes. Many cars have been designed and successfully manufactured using composite materials, specially resin embedded carbon fibre. It provides a great opportunity to build complex shapes. Such materials have high curing time and high cycle time and hence are restricted to low-volume production cars. They have low investment and lighter applications but are difficult for mass production and repair. Many of these materials also have restrictions for recyclability which is the

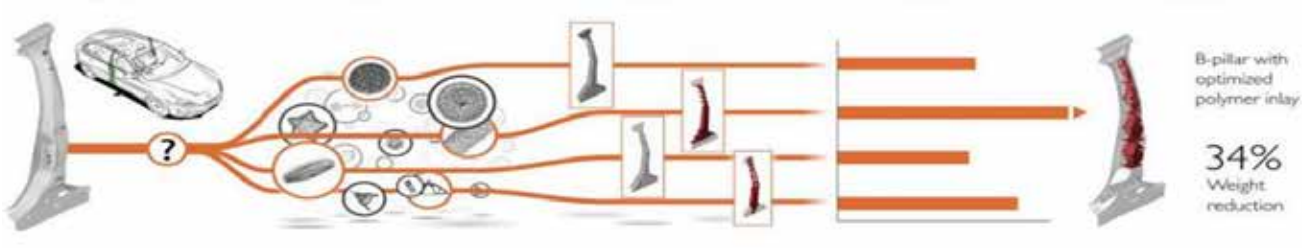
recent demand for environmental protection. Even though composite materials have not succeeded in full BIW, they are preferred by designers and manufacturers for their light weights, attractive colours, and low cost for many aggregates e.g. car interiors, external claddings, closures and many suspension/power train dressing parts use composite/ plastic materials.

6- Manufacturing Innovations

Manufacturing technology innovations in the recent past have provided many avenues for automobile lightweighting. A few high-pressure thin wall castings for power train parts are tailor-welded blanks for avoiding superimposed thicknesses, injected acoustic and structural foams to improve acoustic/structural performance, adhesive bonding for multi-material joinery, roller hemming for hem edge reduction, coated steels for the reduction in anticorrosion post-treatments and back hardened steel to improve dent resistance with lower thickness.

Future

Biomimicry is the future, which includes innovations inspired by nature. It explores the strategies found in nature and adapts these biological models, systems, and elements to solve engineering problems. Bio-inspired concepts are increasingly used to design both vehicles and the materials used for vehicles e.g. cellular foams represent a bio-inspired material that has received increased attention for vehicle crashworthiness due to their lightweighting and excellent energy absorption capabilities that allow for significant weight reductions without compromising the structural safety aspects.



Taking reference from Nature for light weighting (Courtesy - Bionic Design , CompositesWorld)

Towards Modern Mobility and Transportation

The automotive lightweighting strategy is becoming the mature growth trend, driven by sustainability, cost and performance. It is creating an enormous demand for modern lightweighting materials and advance design concepts. The lightweighting strategy is growing as a part of the circular economy and is the solution for both modern mobility. Its objectives are not exclusively focused on the reduction of weight but also cover other aspects such as structural efficiency as well as economic and environmental impacts. It appears that the emergence of electric vehicles creates even more pressure on lightweighting.

Lightweighting design, combined with the use of advanced lightweight materials, leads to structural optimisation, maximum weight reduction and fulfilment of required performance and safety standards. Manufacturability is still an important limitation to the design of lightweight structures; however, with progress in additive manufacturing, this constraint will gradually be eliminated.

Designers also need to challenge vehicle design, shape, configuration and material usage based on new trends of shared mobility and pattern of usage. In the future, customers may not like to own a single vehicle but to rent/own a vehicle based on his/her usage requirements. This needs to be reflected or solved through design and manufacturing innovations. Earlier innovations like the K car, quadracycle categories will be revisited with technological advancement. Advanced analytical tools along with biomimicry references can provide many breakthrough-innovative ideas for automobile light weighting in the near future. ☐

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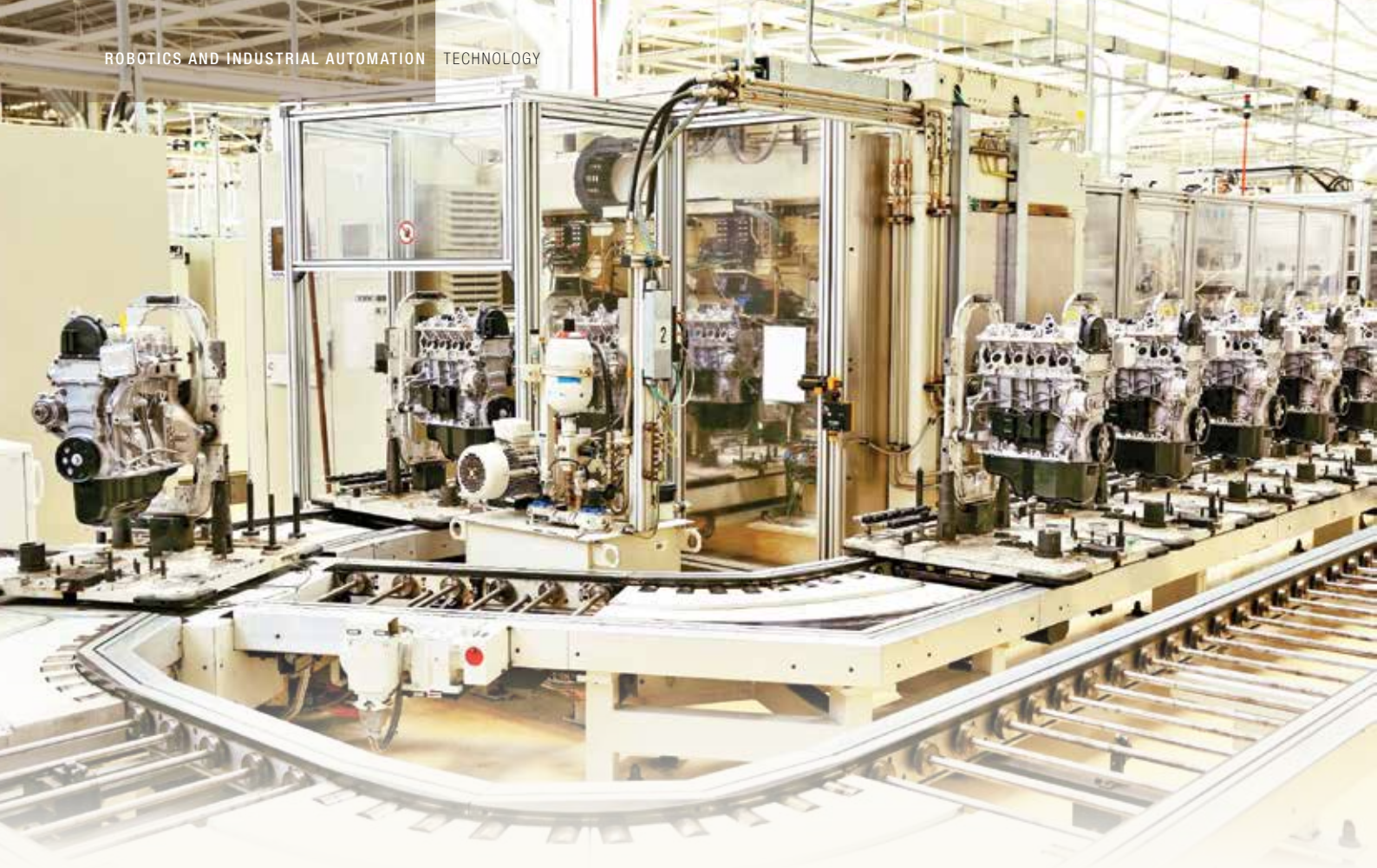

Making Manufacturing Efficient and Qualitative

Companies are rapidly reaching business excellence due to automation solutions like robotic process automation and big data analysis. EM elaborates on automation tech that is driving the industry forward in this continuation from EM May's 'How are robots making manufacturing smarter?'

Phanindra Karody,
Head of Bangalore Plant,
Continental Automotive India

Connectivity, along with Artificial Intelligence and Machine Learning, has helped make our supply chain smarter. Automatic replenishment, big data analytics, TOMS (Transport Order Management Systems), GPS-enabled vehicles (outbound logistics) across all plants, cloud services etc. have helped make SCM processes more effective.

With a worldwide network of Industry 4.0 centres of excellence to create platforms for the exchange of knowledge and prepare the broad application of new manufacturing technologies, we are on the path to establish a smart factory by employing big data applications, Cobots, automated guided vehicles (AGVs), AI, and AR/VR applications.

Lean Manufacturing with AMRs

Just-in-Time (JIT) processes or lean manufacturing emphasises producing the exact amount of goods precisely when the customer requires them, aiming to maximise cost efficiency and reduce waste within the warehouse. This requires raw materials to arrive at the exact stage of production in which they are required. It is tough to simulate a JIT manufacturing environment with Automated Guided Vehicles (AGVs) being used in a way that each robot completes a simple, monotonous task because there is a need for dynamic routes and agility.

To make the most of JIT strategies using automation, Autonomous Mobile Robots (AMRs) can be deployed. This will keep production lines moving and allow efficient lean manufacturing practices time-efficient. To improve the efficiency of materials and assembly processes, AMR programmes can be built around JIT schedules. To reduce the time spent by employees transporting items, AMRs can transport things around the manufacturing facility. Employees can then be redirected to accomplish more complex tasks that machines cannot attend to, reducing waiting times and accomplishing processes faster. Thus, factories can apply ideal JIT strategies and reshape material handling altogether, utilising all resources in the best manner.

How is Technology Paving the Way?

Along with AMRs and JIT strategies, manufacturing facilities can attain top proficiency with Pick-to-Light (PTL) systems or Warehouse Management Systems (WMS) and Warehouse Control Systems that require minimal human intervention. One can customise AMRs with exclusive features to match them and help operators increase overall competency and material-picking accuracy.

A semi-automated solution that makes quick advances in pick-rate productivity, accuracy, labour costs, and throughput is the light-directed system. PTL systems use light modules that direct to the exact product and quantities required for a job. This removes the need to manually cross items off a list and helps when the volumes are high.

Warehouse Execution Systems (WES) like WMS and WCS aid in completing operations by leveraging real-time inputs from all automation technologies. Enhanced operational visibility is extremely beneficial for JIT operations. Moreover, robotic process automation can reduce operational costs by up to 40% in the manufacturing industry. It also gives increased control over processes, optimised employee performance, significantly lowers downtime, and increases quality.

Automation products and softwares supporting the manufacturing process

Better Productivity, Accuracy, Repeatability and Quality

Robotics and automation in manufacturing can improve. Connecting machines with networking and data-driven decision-making is improving businesses at large, helping companies make better planning decisions. With the world transforming from Industry 4.0 to Industry 5.0, these technological developments stand critical, indicating the gigantic changes they will make to manufacturing as a whole. AMRs, and advanced software like WMSs and PTL can solve vital manufacturing and facility-related issues, considering the global labour shortage and sustainability initiatives being undertaken, considering the labour shortages that we are facing globally and sustainability initiatives that are being undertaken.

Cybersecurity and Upskilling

Any technology that includes connectivity is vulnerable to data theft, attacks on Industrial Control Systems and security breaches at various levels. When companies adopt automation, securing the data used at stages such as end-of-line stations and test stations are even more crucial. At the manufacturing unit level of standardising, cybersecurity systems are key. Accordingly, employees need to be upskilled/reskilled to ensure that they learn the complex, automated processes being used as well. This will save time, reduce errors and ensure smoother operation.

Futuristic Approach

Automation in the manufacturing industry has an extensive history that began during the industrial revolution. The manufacturing sector has constantly been driven by automation and technological advances, and they have been the pioneers to embrace the latest technologies. For manufacturers, the implementation of automation and robotics is an essential part of standing apart from competitors and becoming a market leader.

However, using robotics in all aspects of a production line is not feasible for all manufacturing companies. There is no one-size-fits-all strategy, as it largely depends on the problem and available solutions. If the production volume is low, robotics may not be the answer. It is crucial to work with the right integrator to ensure that robotics makes manufacturing efficient and qualitative.

Be it revolutionising the technology of digital twins, robotics or predictive maintenance, automation experts today are helping manufacturers produce more, increase quality and reduce cost. Across many processes and levels, automation is about to become an industry standard for the future.

The automotive industry is no exception. Intelligent machines and software propose a futuristic approach to handling the augmented warehouse density and volume in manufacturing companies. Indeed, the benefits of automation outweigh all initial investments and plan on revolutionising industry practices. ☐

Machine Safety Tailor-Made!

Safety functions are gradually shifting from the hardware end to software. Let's dive into possible solutions for this shift with OEM-specific software…

Tobias Thiesmann,
System and Solutions Manager, Schmersal Group

As such, it makes sense for machine builders to work with their safety systems' suppliers early on while developing new products. Additionally, there are particular benefits to be gained from the use of Original Equipment Manufacturer-specific (OEM) software.

Development objectives in the project planning of protective devices include seamless integration of safety functions into the process, transparency with regard to operating states and minimised installation effort as well as maximum connectivity. The shifting of many safety functions from the hardware to the software, coupled with the use of electronic safety switchgear devices and safety controllers, creates the boundary conditions needed to achieve these objectives.

Individual and not Catalogued

In the event that the particular requirements of an application go beyond the mainstream (and not only then), a customer-specific adaptation of the safety functions can help in optimising the interaction of machine safety and production processes. Schmersal has established a solution path for this, with individual software modules for both programmable safety controllers and parametrizable small safety controllers, as these can be supplied to work with customer-specific software. These customer-specific safety solutions are developed and planned by a project team at Schmersal operating in the *'Systems and Solutions'* division. Here are some real-life examples:

Compact Controller replaces 13 Relay Modules

A company that manufactures food-processing machines and had developed a new series of machines consulted Schmersal with the hope of optimising and consolidating the selection of safety-related 'hardware' for the monitoring of several guard doors and flaps on a cutting system. The challenge was to standardise the thirteen different types of safety evaluations that had been installed in the machine manufacturer's varied product series, while the trigger was a mixture of availability requirements, exacerbated by safety standards and discontinuations on the part of manufacturers.

Working with Schmersal, the functions of these thirteen different safety modules were combined into a single device — the *'Protect Select'* compact safety controller, or more specifically, the OEM version supplemented by customer-specific software modules. With this, a single version of the compact controller can now be used in all product series with no limitation on functionality. As part of the project, the safety parameters were determined and all machine-safety requirements were taken into consideration. Thus, with this plan of action, the company was able to ensure that users can now enjoy improvements, such as better diagnostic options, in the event of errors and irregularities.

Fig. 1: Protect PSC1 programmable safety controllers safety solutions, with customer-specific software if requested.

Customer-specific Standstill Monitoring

A manufacturer of bread-slicing machines for supermarkets was looking for a solution associated with the standstill monitoring of the slicing device, protective guard interlock, sensor monitoring of the protective guard and emergency stop. In competition between multiple suppliers, Schmersal was also able to stand out with its *'Protect Select'* compact safety controller concept in the OEM version. The concept, with customer-specific software, takes all of the machine manufacturer's individual requirements into consideration. The controller can be used universally for multiple series, enables comprehensive diagnostic functions and, when compared to conventional standstill monitoring, offers considerable cost benefit.

Installation of Safety Switchgear

There are also benefits when it comes to the installation and integration of customised safety switchgear in the field, as the third example demonstrates: A manufacturer of packaging machines monitors the guard doors of a series of machines using inter alia, solenoid interlocks (AZM 300), safety sensors (RSS 260), command devices and an emergency stop. Schmersal's Application Engineering division suggested connecting these (safety) switchgear devices via a '*Safety Fieldbox*', enabling field connections of up to eight safety switchgear devices of different types. Both the safety-related and operational signals are captured and connected to higher-level controllers via Profinet/Profisafe. In the future, users will also have access to versions with connection to Ethernet/IP, CIP Safety and Ethercat FSoE. This will give machine builders the benefit of simplified installation and users benefits such as quick diagnosis in the event of an error.

Fig. 2: Protect Select small safety controller, ordered with customer-specific programming.

Material Shortage Crisis

The '*Systems and Solutions*' project team has been given a new task in recent months, brought about by the ongoing shortage of electronic components. At Schmersal, this shortage has meant that, at certain times, it has been impossible to produce the latest generations of electronic safety switchgear, particularly in the quantities the market requires. Their task is to search for alternative solutions that require as few changes as possible from the machine builder's perspective, while offering full functionality from the user's perspective. This can be properly managed with just a little engineering effort and a careful analysis of the needs particularly, as some identical switches operating to a different principle remain available. For example, for RSS16 safety sensors with failsafe RFID technology (and a microcontroller), alternatives include the BNS16 magnetic safety sensor and the AZ16 electromechanical safety switch, both without a microcontroller. In some cases, however, you will perform safety calculations to determine which solution is actually appropriate, only to then find out that sadly, not all features that you need can be realised like for like.

As the examples demonstrate, early cooperation with a safety systems expert can be beneficial when it comes to designing new machine series or optimising existing machine series. This applies when the use of customised (safety) software is being tested. ☐

Precision Motion Control

Aerotech's latest additions include new servo motor drives with integrated motion controllers and several advanced features. Recent developments in the Automation1 motion control platform include:

New servo motor drives with integrated motion controllers

- *Servo Drives with Integrated Motion Controllers.* Two new servo motor drives feature-integrated motion controllers that can command 12 axes at 20 kHz over the glass optical fibre HyperWire motion bus
- *Automation1 MachineApps HMI Builder for Windows PCs.* With MachineApps, machine and system builders can create machine HMIs for each Automation1 motion controller.
- *Gantry Configuration Support.* Automation1 motion control platform makes it easier to configure cartesian direct-drive gantries.
- *Improved Controller Features.* Automation1 drive-based controllers can be set up to use an analogue input to control the velocity or current command of a drive.
- *Earlier Access to Features.* Aerotech continues to release beta features to the market to provide an early look and receive feedback from customers.

Aerotech | New Delhi

Punch Grinding Application

ANCA recently launched the ANCA TX7 Linear and TXcell Linear for punch manufacturers around the world. TX7 Linear or Txcell Linear needs to be kitted up with the right tools and accessories, which ANCA has developed to explicitly meet the following needs of the punch grinding application:

TX7 Linear or Txcell Linear

- iPunch, dedicated punch programming software, gives you flexibility on punch geometry, grinding process parameters.
- Rotary wheel dresser units supported by ANCA dressing software delivering in-process dressing.
- Auto-adjusting coolant nozzles that change position as the wheel diameter reduces.

The TX7 Linear is a 5-axis grinding machine, compared to the 3-axis grinder more traditionally used for punch manufacture. Having these extra degrees of freedom on your grinding machine translates to greater freedom in what applications you can put through it. Similarly, TXcell Linear, with its offering of nine up to 24-wheel packs, can now do all these operations in a single set-up, something that was on a standard punch grinding machine.

ANCA | Bangalore

Ideal Heat Pump Systems

Danfoss recently expanded its Z-design range of Micro Plate Heat Exchangers with a new addition to the range, the C262L-EZD, which is a dual-circuit evaporator ideal for scroll chillers. These robust and reliable units extend the range's capability, with cooling capacities now covering up to 300 kW in single circuits and up to 800 kW in dual circuits. This multi-refrigerant range is optimised for R32/R454B/R410A, giving manufacturers greater choice when looking to reduce GWP. As the entire portfolio is also R290 compatible, they are an ideal choice for heat pump systems. The Z-design evaporator in an R410A AC system saves around area of heat transfer at the same evaporating temperature with the same heat transfer capacity compared to the legacy fishbone design. The Z-pattern results in a 21% lower hold-up volume, which allows for a significant reduction in refrigerant charge. The design also greatly reduces pressure loss on the waterside, with impressive performance when under part load for higher system seasonal performance.

Z-design range of Micro Plate Heat Exchangers

Danfoss | Chennai

Precision Tooling to Provide Increased Material Savings

Guill Tool recently announced the availability of its Spiderless Pipe Die, a new offering utilising precision tooling to provide increased material savings compared to conventional basket dies for pipe extrusions. Used by tube and pipe producers for larger diameter capabilities, this new pipe die is capable of providing a finished extrusion with OD from 2"–15", offered in 4140 steel or stainless with heat treating. The product design differentiates itself from a basket die with its focus on precision tooling gained from decades of experience in medical tubing, flow analysis and Guill's ISO 9001 and AS9100 (Aerospace) quality systems. In general, the cost of the polymer material can range from 50% to 70% of the total cost of producing polymer pipes. The cost of other materials such as additives, fillers and reinforcements as well as the cost of energy, labor, equipment and overhead also contribute to the total production cost. However, now, the product is available to meet its customers' needs as t all factors needed to remain competitive in pipe production have been considered.

Spiderless Pipe Die

Guill Tool | USA

New Wastewater Impeller Combines Efficiency and Reliability

KSB Group has developed a new radial multi-vane D-max impeller in open design, which is a further expansion of its range of pumps suitable for handling untreated wastewater. The D-max impeller serves to handle fluids containing solid substances, long fibres, coarse solids, and entrapped gas or air. It is therefore very suitable for handling untreated wastewater, combined sewage, recirculated, and heated sludge, as well as activated, raw and digested sludge with a solids content of up to 8%. This impeller type is also suitable for transporting fluids with a high viscosity. At ~84%, the new impeller's best efficiency can be compared with the performance of closed multi-channel impellers. The free passage is at least 76 mm, which meets the requirements of many local plant operators. KSB's hydraulic experts employed the Computational Fluid Dynamics method to obtain detailed knowledge about the complex flow processes inside the pumps using computer-aided simulations.

D-max impeller

KSB | Pune

Easy Detection

Leuze recently introduced the new *IVS 108: Easy object detection* and IVS *1048i / DCR 1048i: Diverse functions,* sensors of the Simple Vision series, which convince with their flexible usability and easy handling suitable for detecting the presence of objects. Devices of the IVS 1048i and DCR 1048i series additionally perform counting and measuring tasks or read codes. The compact devices are just as easy to use as optoelectronic sensors but are almost as powerful as camera systems.

Leuze's Simple Vision sensors

IVS 108: *Easy object detection.* The IVS 108 detects present or absent objects. The IVS 108 is ideal for transport, sorting, and conveyor systems. Moreover, the sensor is the perfect choice for quality control tasks and the automatic assembly of mechanical or electronic parts.

IVS 1048i / DCR 1048i: *Diverse functions.* The IVS 1048i is a high-performance all-rounder. Users can choose between six models with two different resolutions. Depending on the model, the functions of the IVS 1048i range from object detection and measuring tasks to integrated bar code reading.

Leuze | Bnagalore

Speed Compressors for Vehicles Powered with Fuel Cell Technology

Liebherr has recently entered into a strategic collaboration with ZF to develop new high-speed compressors for medium size, heavy-duty and long-haul hydrogen fuel cell-powered vehicles. Liebherr's technology is eco-friendly. Its high-speed compressors are driven by an electrical motor and feature air bearings, which means that they do not require any lubrication. Thus, the compressors do supply clean, compressed air to the fuel cell stack, not adding any pollution to the membrane. Such technology is an enabler for the deployment of fuel cell propulsion systems with only emissions of water and heat, which aids in the movement for more environmentally friendly transportation. The giants will jointly develop and produce new high-speed compressors in different power classes for the application in various-sized vehicles powered with fuel cell technology. ZF is planning to offer the compressor platform concept to the automotive market. Additionally, they will jointly develop the design of compact and reliable compressors with dedicated power electronics.

Compressor – © ZF

Liebherr | Navi Mumbai

Cost Effective Solutions for Long-range Wireless Applications

Mouser Electronics recently introduced the Connected Development XCVR SX126x Development Board and Reference Design, which incorporates a Semtech SX126x LoRa® Sub-GHz Radio Transceiver, creating a cost-effective and compact development solution for diverse, long-range wireless applications. The 915MHz XCVR boards offer a pre-tested reference design and PCB layout for RF optimisation. Compatible with Nordic Semiconductor's nRF52840 SoC and Silicon Labs' BG21 BLE SoC, the XCVR development board and reference design include all necessary radio design files and hands-on engineering support to ensure successful deployment. The Connected Development XCVR SX126x Development Board and Reference Design are also offered with the Smart Home™ LLCC68 RF Transceiver.

XCVR SX126x Development Board

Features

- LoRa® and FSK modem
- 170dB maximum link budget for SX1262
- +22dBm or +15dBm high-efficiency PA
- Low RX current of 4.6Ma

Mouser Electronics | Bangalore

Highlights – July 2023

» **5G in Manufacturing**
In the upcoming edition, Team EM features various articles on the advent and rise of 5G technology. 5G technologies provide the necessary network characteristics for manufacturing. Low latency and high reliability are important to support critical applications. High bandwidth and connection density secure ubiquitous connectivity, which are requirements that manufacturers currently rely on infixed-line networks. The introduction of 5G technology will aid higher flexibility, lower cost, and shorter lead times for factory floor production reconfiguration and

» **Lean Manufacturing**
The term lean manufacturing refers to applications of lean practices, principles and tools that are used for development and manufacturing of physical products. Many manufacturers use lean manufacturing principles to eliminate waste, optimize processes, cut costs, boost innovation and reduce time to market in a fast-paced and ever-changing global marketplace. This section aims to elaborate on how lean manufacturing plays a major role in the development of physical products.

» **Laser/Plasma cutting**
Both laser and plasma technologies are thermal processes commonly used in industrial settings to cut materials. The main difference between the two lies in the source of the technology and their cutting power; laser cutters use a narrow and intense ray of light to cut through materials, whereas plasma cutters use a device for generating a directed flow of plasma for cutting. This section will thusly cover the the importance of laser/plasma cutting in industrial settings.

» **Challenges of MSME**
Micro, Small and Medium Enterprises form a majority of the Indian economy and help economic growth and employment generation. MSMEs in India suffer from the problems of financial assistance, lack of business expertise and technological obsolescence. The current economic climate is not ideal for small businesses, despite the government's efforts to keep them afloat with stimulus funds. However, with the right steps, research indicates that MSMEs can dominate world economy like they have been for so long. Through this section, EM aims to shed light on MSMEs and their challenges as a crucial part of the industrial sector.

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Seamless and Reliable Network Connectivity by LAPP

In today's Digital world where industries are creating, transferring and analysing more data than ever, there's greater need for seamless and reliable network connectivity. Driving Industry 4.0 are technologies like IIoT, Cloud Computing, Big Data and Artificial Intelligence which require multiple devices to be connected and intelligent communication in harsh industrial environments.

Data is the lifeblood of Industry 4.0, hence fast and reliable data transmission is important to make critical data driven decisions. LAPP, a leader in cable and connection technology offers comprehensive Industrial Communication solutions which are customised for Factory, Process and Building Automation.

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