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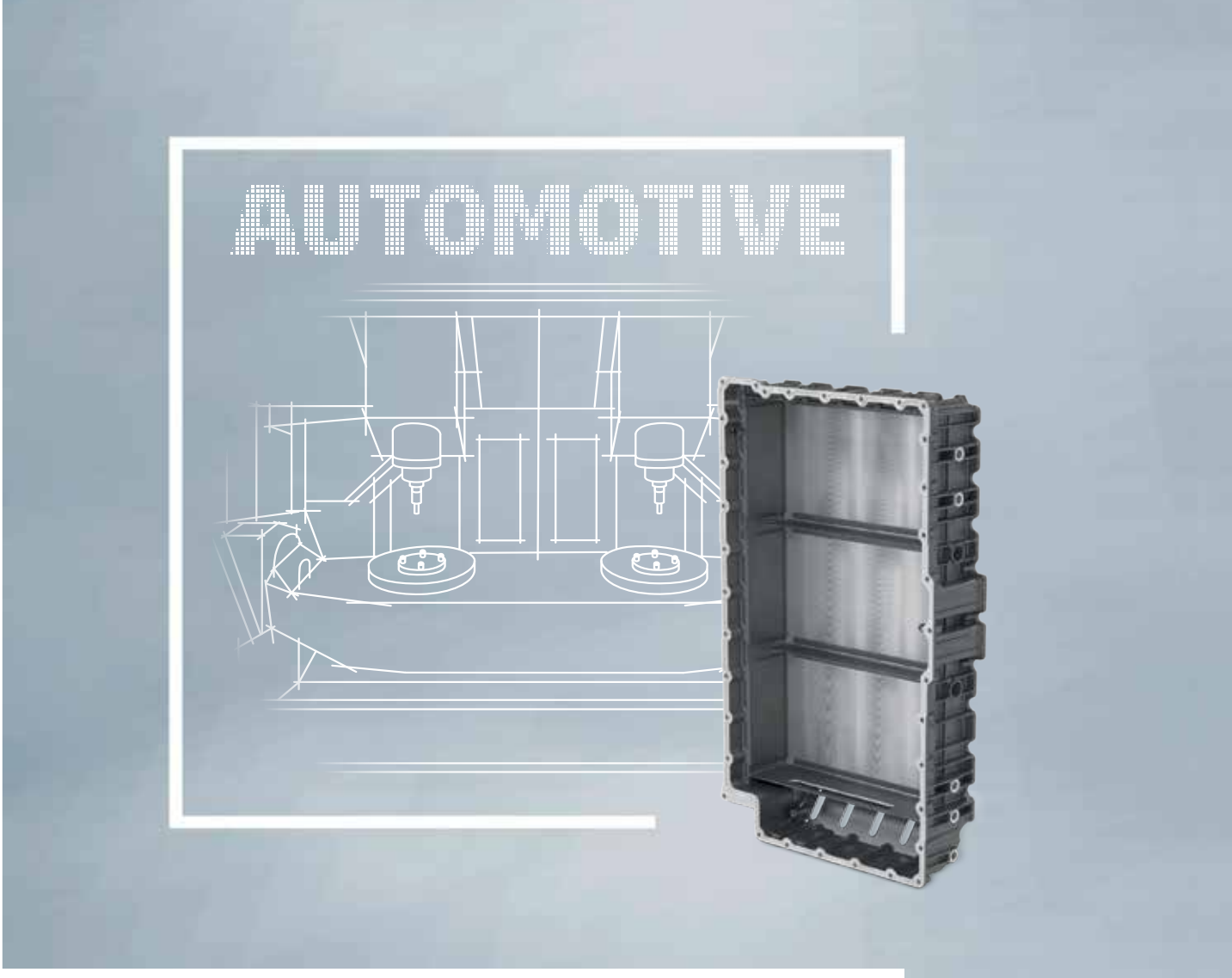

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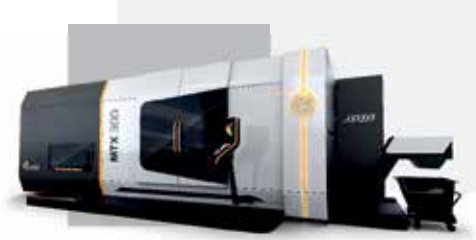

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"Innovate with pragmatic precision"

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

Navigating Industry 4.0 Challenges: Balancing Innovation and Pragmatism in Manufacturing

In the dynamic landscape of Industry 4.0, transformative innovations present opportunities for workshops to enhance productivity and pursue increased revenues. While investing in cutting-edge technology is a key consideration, it is crucial to recognise that continually chasing the latest high-tech solutions may not be the most prudent strategy in uncertain market conditions.

Our Cover Story delves into the rapidly progressing development of machine tools and cutting tools, emphasising the significant investments and secure predictions required for such advancements. In an environment of market fluctuations and uncertain business forecasts, making major investments may not always be a viable option.

The Industry Focus of this issue explores the indispensable role played by advanced Industrial Equipment in achieving sustainable packaging solutions. Our Technology Focus spotlights the latest advancements in Industrial Cleaning, specifically highlighting the critical role of Field Service Management (FSM). Another Technology Focus addresses the importance of maintaining Air Quality inside plants for optimal industrial operations. Our special feature brings attention to the role of Artificial Intelligence (AI) and Big Data in Manufacturing, examining how these technologies will continue to shape the industry for years to come.

Celebrating our 14th anniversary in November, we embark on yet another challenging and creative year. As we step into the future, our commitment remains strong. We are dedicated to bringing our readers a diverse range of topics and industries to explore, with fresh designs and engaging content that reflects the evolving landscape of the manufacturing sector. We would like to wish everybody a prosperous and a generous Happy New Year!

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Arun Bhardwaj
Editor, EM and A&D India

EV battery swapping:
The what, why and how

Battery swapping promises to jumpstart the Electric Vehicle (EV) market by alleviating range anxiety and reducing the cost of ownership. There is a growing battery swapping market from start-ups and big players from the USA as well. Here's everything you need to know about EV battery swapping.

Talk

"A technology that is reshaping the industry, one efficient swap at a time"

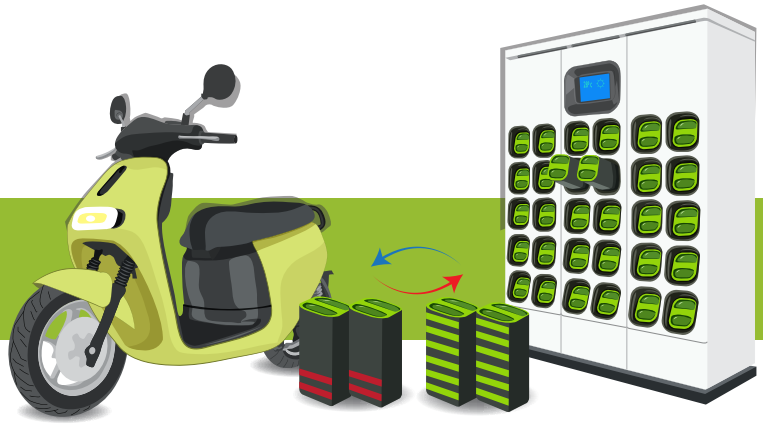
What is EV battery swapping?

EV battery swapping is a service that allows EV owners to quickly replace their depleted batteries with fully charged ones at specialised swapping stations. This technology aims to address some of the limitations of traditional EV charging, such as long charging times and limited charging infrastructure. While there are faster charger options available, it takes three to four hours to fully charge the two-wheeler and three-wheelers. With this option, customers have the option of buying an EV without a battery, they can opt for a swap subscription and load the battery into the vehicle.

Process of EV battery swapping

Here's the process for Battery Swapping:

- **Arrival at swapping station:** An EV owner drives their electric vehicle to a battery swapping station, which is equipped with automated machinery and technology to perform the battery replacement.
- **Battery identification and removal:** The swapping system identifies the vehicle and the type of battery it requires. This could involve scanning QR codes, RFID tags or other identification methods. The system's machinery automatically removes the depleted battery pack from the vehicle. This process is typically automated to ensure efficiency and safety.
- **Battery replacement:** A fully charged battery pack that is compatible with the vehicle is brought into position by the machinery. The depleted battery is replaced with the charged.
- **Battery health and authentication:** Before the replacement is finalised, the swapping system might perform quick checks to ensure the health and authenticity of the new battery, such as checking its state of charge and capacity.
- **Confirmation and payment:** Once the battery replacement is completed, the EV owner receives confirmation and payment is



processed. Payment could be a subscription-based model, pay-as-you-go or bundled within the vehicle's purchase/lease agreement.

Advantages of EV battery swapping

EV battery swapping offers advantages like:

- **Speed:** Battery swapping offers significantly faster refuelling times compared to traditional charging methods, making it more convenient for long-distance travel.
- **Reduced range anxiety:** Swapping allows EV owners to quickly get a fully charged battery, reducing concerns about running out of charge during a trip.
- **Less infrastructure dependency:** Battery swapping stations can be strategically located, reducing the need for extensive charging infrastructure across cities and highways.
- **Battery longevity:** Battery swapping can potentially extend the overall lifespan of EV batteries.
- **Flexibility:** Users have the option to choose between swapping and traditional charging, depending on their needs and circumstances.

Lithium-ion battery challenges

Lithium-ion batteries are the most common type of batteries used in EVs due to their high energy density, long lifecycle and relatively lightweight. While lithium-ion batteries can be used in battery swapping systems, there are some challenges and considerations to keep in mind:

- **Standardisation:** Lithium-ion batteries come in various sizes, shapes and capacities across different EV models. Standardising battery packs for swapping across a diverse range of vehicles can be complex.
- **Compatibility:** Ensuring that the swapping station's battery packs are compatible with a wide range of EVs requires careful design and engineering.
- **Safety concerns:** Swapping lithium-ion batteries involves handling high-voltage systems, which requires strict safety protocols to prevent hazards during the swapping process.
- **Battery health and safety concern:** Lithium-ion batteries degrade over time and with use. Swapping systems must manage battery health to ensure that swapped batteries are in good condition and have similar performance characteristics.
- **Environmental concerns:** Lithium-ion batteries have environmental impacts related to mining, production and disposal. The higher demand for batteries in a swapping system could increase these impacts.

While these challenges exist, advancements in battery technology, standardisation efforts, regulatory support and innovative engineering can potentially overcome these obstacles and make lithium-ion battery swapping more feasible and practical in the future.

EV battery swapping companies	International companies entering India	Indian companies in battery swapping
NIO (China)	Gogoro (Taiwan)	Sun Mobility
Tesla (USA)	Ola Electric (India)	GoZap EV
Gogoro (Taiwan)	Hero Electric	Tata Motors

All in all, the field of EV battery swapping is witnessing both global and Indian companies striving to enhance the convenience and accessibility of e-mobility. Internationally established players have demonstrated the potential of battery swapping, while domestic innovators are addressing India's unique challenges. ☐

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TPEM and JLR to accelerate development of TPEM's 'premium pure electric' series, 'Avinya'

Tata Passenger Electric Mobility (TPEM) and Jaguar Land Rover Plc (JLR) have entered into a Memorandum of Understanding (MoU) for the licensing of JLR's Electrified Modular Architecture (EMA) platform for a royalty fee (including electrical architecture, electric drive units, battery packs and manufacturing know-how) for the development of TPEM's 'premium pure electric' vehicle series 'Avinya' on the EMA platform. Anand Kulkarni, Chief Product Officer and Head HV Programmes, TPEM, said, "Avinya stands for 'Innovation' and represents our vision for a new paradigm in personal mobility. Being built on an architecture that is equipped with the latest advances in new-age technology, software, and artificial intelligence, Avinya will spawn a new breed of world-class EVs with global standards in efficiency and range". The 'Avinya' concept, first showcased in 2022, is an uncompromising vision of electric mobility that is engineered to provide class-leading in-cabin experience with next-generation connectivity, ADAS, performance, refinement and safety.

Honda Motor taps TSMC to ensure 'stable' supply of chips

Honda Motor will collaborate with Taiwan Semiconductor Manufacturing Company to ensure a 'stable' supply of chips. The agreement with the world's largest chipmaker follows a difficult period for Japanese automakers in which production plans were hit by severe semiconductor shortages during the coronavirus pandemic. Toshihiro Mibe, President of Honda, said, "Stable procurement of semiconductors is becoming increasingly important as the electrification and digitisation of mobility products continue". The semiconductor shortage led to the realisation of the 'need to have this new connection' with semiconductor companies, Mibe said. TSMC will be one supplier among "others included in our system", he said. The carmaker also unveiled new EV launch plans, as it aims to sell only electric or fuel-cell vehicles by 2040. Its plans are to produce at least 2 million EVs by 2030. Honda will introduce four new EV models by 2026 in Japan, its third-largest market after the US and China.

L&T Ventures into Fabless Semiconductor design

Larsen and Toubro (L&T) recently announced a significant strategic move into the fabless semiconductor chip design sector. The company has greenlit the establishment of a wholly-owned subsidiary dedicated to fabless semiconductor chip design and product ownership. The decision to invest ₹830 crore in this new subsidiary marks a pivotal shift for L&T. R Shankar Raman, L&T's Chief Financial Officer, stressed on the potential of fabless semiconductor design as a high-technology, lower-capital-intensive endeavour. This shift positions L&T to focus on R&D for fabless semiconductor chip design, potentially including the establishment of an R&D centre, which might find a home in the United States. The significance of this move lies in L&T's determination to explore the design aspect of semiconductors, where patents and intrinsic value often reside. Raman pointed out that L&T's strong brand presence and robust engineering capabilities position them favourably for this leap into the semiconductor arena. They aim to capitalise on the burgeoning semiconductor industry, where Indian talent is increasingly sought after by multinational corporations.

Pune Gas transforms the LPG industry with the Smart LPG System

Pune Gas, with its Make in India initiative, has recently unveiled the world's first Micro LPG System designed exclusively for commercial LPG customers. Pune Gas, in collaboration with Flüssiggas-Anlagen GmbH (FAS), has introduced a 15kg/hr dry-type vaporizer equipped with advanced safety features. This LOT system (Liquid Off Take) is the world's first high-efficiency dry-type vaporizer and a true game-changer for various industries, especially for the HoReCa (Hotel, Restaurant, and Catering) industry. Jesal Sampat, Executive Director, Pune Gas, said, "The compact design, rapid setup, enhanced safety features and enabling zero residue in LPG cylinders are a testament to our dedication to delivering sustainable, intelligent solutions for our customers. This innovation is not only a solution for a local issue but also a truly global solution for a problem faced in thousands of commercial kitchens across the world. This is more than a product; it's a statement of our promise to revolutionise LPG management for businesses across India".

Siemens and Microsoft partner to drive cross-industry AI adoption

Microsoft and Siemens are deepening their partnership by bringing the benefits of generative AI to industries worldwide. As a first step, the companies are introducing Siemens Industrial Copilot, an AI-powered, jointly developed assistant aimed at improving human–machine collaboration in manufacturing. In addition, the launch of the integration between Siemens Teamcenter software for product lifecycle management and Microsoft Teams will further pave the way to enabling the industrial metaverse. It will simplify the virtual collaboration of design engineers, frontline workers, and other teams across business functions. Satya Nadella, Chairman and CEO, Microsoft, said, "With this next generation of AI, we have a unique opportunity to accelerate innovation across the entire industrial sector". Roland Busch, CEO of Siemens AG, stated, "Together with Microsoft, our shared vision is to empower customers with the adoption of generative AI. This has the potential to revolutionise the way companies design, develop, manufacture and operate. Making human–machine collaboration more widely available allows engineers to accelerate code development, increase innovation and tackle skilled labour shortages".

Terra Charge and SNM Cabs Collaborate to develop advanced EV Charging hub

Terra Charge has joined forces with SNM Cabs, to establish a dedicated EV charging hub near Pune airport. The collaboration aims to boost the adoption of Electric Vehicles (EVs) and enhance the charging infrastructure in Pune and beyond. The strategically located charging station will feature 11 efficient chargers exclusively for SNM's electric cab fleet. This infrastructural development ensures uninterrupted operations for SNM's electric vehicles, reducing downtime and improving overall operational efficiency. In addition, the two companies plan to add four more EV charging hubs in prime locations by March 2024. Akihiro Ueda, CEO, Terra Motors Charging Solution, said, "Our partnership represents a synergy between two progressive entities committed to promoting the adoption of EVs in India. By developing a charging hub near Pune airport, we will not only support SNM Cabs' EV fleet but also lay down crucial infrastructure for future growth". Sarthak Bansal, Co-founder, SNM Cabs, emphasised that enhancing the efficiency of our EV fleet through the dedicated charging hub will significantly contribute to the development of the EV ecosystem in Pune.

TVS Motor's Hosur factory starts manufacturing electric 2W for BMW

TVS Motor Company and BMW Motorrad recently announced the start of production of BMW's electric two-wheeler CE 02 at the former's manufacturing unit at Hosur, marking the expansion of the partnership between the two companies. K N Radhakrishnan, Director & CEO, TVS Motor, said, "The win-win partnership between the TVS Motor Company and BMW continues to get stronger. We have already produced five superbikes in the ICE segment as part of our association. Now in the EV segment, we have jointly designed, developed, and industrialised the first EV—BMW CE 02—together at our Hosur plant". The commencement of production of the electric scooter CE 02 is part of the enhancement of the two companies' decade-old association with the electric mobility segment. Two years ago, the partners announced that they would come out with electric 2W for urban youth globally. Markus Schramm, Head, BMW Motorrad, said, "The new electric two-wheeler CE 02 was developed with a view to target young buyers globally. The product, which is powered by an 11-kW electric motor, is positioned in the low-voltage EV market and comes with a range offer of 56 miles (about 90 km)".

Saab's becomes first foreign defence company to get Indian government's nod for 100pc FDI

Saab, a Swedish defence giant has achieved a significant milestone by becoming the first foreign company to secure 100% Foreign Direct Investment (FDI) approval for a defence project in India. Saab has been given the green light to establish a new manufacturing facility in India, which will focus on producing shoulder-fired rockets. As part of this strategic move, Saab has established a subsidiary, Saab FFV India, which will be responsible for manufacturing the latest generation of the Carl-Gustaf M4 system. This marks the first time Saab will manufacture the Carl-Gustaf M4 system outside of Sweden. The new facility is expected to be in Haryana, India. Mats Palmberg, Chairman and Managing Director, Saab India, said, "We are proud to be the first global defence company to be approved by the Indian government for 100% FDI. This is another step in Saab's commitment to 'Make in India', and we look forward to continuing our collaboration with our Indian partners and supporting the Indian armed forces with the production of Carl-Gustaf in India".

"EV's technological innovation is enhancing the overall transportation experience"

…says **Anurag Chaudhary**, Chief Executive Officer, IME Vehicles. In an interview with **Neha Basudkar Ghate**, he discusses the company's commitment to environmental sustainability and highlights the sector's potential for innovation and growth. Excerpts...

What inspired the company to enter the electric scooter segment? What inspires you to be in the business?

We entered the electric scooter business driven by a commitment to environmental sustainability. Electric scooters emit fewer pollutants than traditional vehicles, addressing air pollution concerns. Ideal for short trips, especially the 'last mile', they fill gaps in public transportation. Our goal is to offer a convenient, cost-effective solution, vital in cities grappling with traffic and parking challenges. Electric scooters, compact and agile, navigate traffic easily and fit into smaller spaces. Moreover, the sector's technological innovation enhances the overall transportation experience.

How do you look at the overall adaptability of the Indian market into the EV industry?

The Indian EV market's growing appeal results from multiple factors. To begin with, the government's proactive measures, including subsidies and incentives, propel EV integration through initiatives like the FAME scheme. The expanding middle class seeks sustainable, tech-savvy transport, making EVs an attractive option with lower operating costs. Addressing traffic congestion, smaller EVs like e-scooters offer practical urban mobility solutions. Rising consumer awareness amplifies interest, supported by an evolving charging station network. Potential job creation and technology transfer through automakers' interest in local EV manufacturing highlight industry prospects. This signifies India's substantial role in the global EV market.

How does the company balance affordability, innovation and accessibility in their e-mobility solutions?

Our goal is to offer affordable e-mobility solutions through diverse strategies, which includes enabling budget-friendly EVs. Value engineering optimises design and manufacturing without compromising quality. Introducing battery leasing reduces upfront costs, broadening accessibility. We're diversifying models across price points, prioritising user-centric design for broad appeal. Cost-sharing with automotive and tech partners fosters innovation in affordable, feature-rich electric vehicles. Lower operating and maintenance costs enhance appeal, aligning with our commitment.

In 2024, what trends do you anticipate, and how will your company gain a competitive edge by industry shifts after adapting

As we enter 2024, navigating the dynamic EV landscape demands constant adaptation. IME prioritises efficiency and cost-effectiveness in EV development, expanding charging infrastructure and exploring sustainable practices. Embracing IoT and connected vehicles, we seek to enhance user experiences and safety. Addressing sustainability and environmental regulations, IME aims to reduce its carbon footprint. Investment in energy-efficient technologies, digital transformation, resilient supply chains and a customer-centric approach underscores our commitment to evolving industry trends in 2024.

"Global drivers are expanding our international presence"

…says **Hemant K Mehta**, Chairman, Elegar Kerpen. In an interview with **Sanjay Jadhav**, he outlines Elegar Kerpen's diverse applications and ambitious plans for future expansion. Excerpts from the interview…

Could you share some insights into the journey that led to Elegar Kerpan's current position as a leading cable manufacturer?

Elegar Kerpen, formerly known as LEONI India, has transformed remarkably since 2006. In 2022–23, LEONI was acquired by Ravicab Cables and rebranded to Elegar Kerpan, a key name in the wire and cable segment in India. Today, our products are used in oil and gas, refineries, fertilizers, pharmaceuticals, Indian railways, speciality chemicals and solar power energy generation sectors. Presently, our premium offerings cater to the unique needs of diverse clientele based in varied regions globally.

What market trends or drivers that have contributed to the company's success in expanding its international presence?

The company's success stems from a mix of market-driven strategies, advanced German technology, premium materials and strong partnerships. Global drivers like urbanisation and infrastructure demand drive our growth, expanding our international presence. As a wire and cable manufacturer, we align strategically with global trends, exporting over 60% of our premium products to Asia Pacific, the Middle East, Europe and Australia. Adhering to ISO standards, our products foster global client growth. Innovation and supply chain partnerships fuel our global expansion efforts.

Could you explain how your e-beam twin-line technology sets global benchmarks in the cable manufacturing industry?

The company uses a unique French crosshead e-beam twin-line technology, which is considered to be the best in the wire and cable industry. The technology facilitates enhanced cross-linking and polymer modification for products, thereby identifying and eliminating manufacturing defects. It often does not require any additives or generate hazardous by-products. Currently, the e-beam twin-line technology is one of its kind in the country, giving us an upper hand in the wire and cable industry, which is reflected in the quality, consistency and performance of our products.

Looking ahead, are there any innovative products, technologies or market segments that you are excited about?

Elegar Kerpen aims for robust sales turnover, prioritising a 15% annual target from new products. As a top B2B manufacturer, our core sectors include oil and gas, solar and wind power, process industry and transportation. To evolve, we plan to diversify into Automotive and Defence. With a global footprint, we aspire to lead in data and energy transmission. Expanding our team in India and global markets like Europe, Australia, Asia Pacific and Africa, we're dedicated to supporting India's transportation infrastructure and renewable sector. Our commitment is to deliver innovative solutions, ensuring reliability for our diverse customer base worldwide.

…asserts **Dmitry Andreev,** VP Global Sales, Walter AG, and **Brajesh Kumar,** Managing Director, Walter India. In an interview with Neha Basudkar Ghate, on the occasion of 20 years of Walter Tools in India, they describe the significance of Engineering Kompetenz and custom machining solutions as a core aspect of their market positioning. Excerpts from the interview...

“Walter is actively penetrating multiple industry segments that are relevant for India”

Q **Walter AG is known for Engineering Kompetenz and custom machining solutions. Could you provide us with an overview of the key pillars of your current business strategy and how they align with the company’s long-term vision?**

Dmitry Andreev: The message of Engineering Kompetenz holds immense significance for us, as it truly embodies Walter’s motto and reflects our perception of our market positioning. When we talk about the most important pillars of the strategy, we rolled out our last and most valid global strategy back in 2019, which is in motion until 2025. Among the numerous pillars, I’d like to highlight a few that hold immense significance. Notably, Walter stands out as over a century old, with strong European roots that connect us to our origins and extend across the global stage. Nevertheless, one of the most important parts of our strategy currently is to

strengthen our presence outside of the European continent. Hence, we would like to be even more visible and present, resulting in more customers and bigger market shares in America and Asia. Moreover, this links directly to the importance of the Indian market. Furthermore, as the market is changing we see more and more customers, especially in the automotive sector, switching to aluminium machining, driven by the e-mobility sector. Furthermore, this motivation stems from the universal desire to decrease the weight of the automobile. Therefore, we see many lightweight materials making their way into the field, and although this isn't entirely novel, the momentum is increasing, especially for substances like aluminium.

Consequently, enhancing and fortifying our offerings in the realm of aluminium machining has become one of our strategic priorities. Walter's substantial influence within the automotive industry is also of great significance. As a part of our current strategy, we are actively penetrating some other industry segments, like aerospace, medical and mould and die, which are all relevant strategies for India. Another important thing is that we keep innovating and bringing new and innovative products every year to cater to the customer's varied needs.

Q Walter AG has a strong global presence and serves customers in over 80 countries. Could you highlight any recent merger or acquisition activities undertaken by the company to expand its footprint and enhance its product offerings?

Dmitry Andreev: Dmitry Andreev: As previously noted, our focus on aluminium as a crucial material has led us to play a more proactive role in its utilisation. This endeavour is exemplified by our recent acquisition of Frezite Metal Tooling (FMT), a Portuguese company with four decades of expertise in PCD (polycrystalline diamond) tools. This strategic move bolsters our position in the aluminium sector, enabling us to deliver the numerous benefits of these advanced tools to our customers. In essence, through the acquisition, we've gained access to 40 years of invaluable experience and production capacity in PCD, leveraging the engineering competence of our esteemed counterparts at FMT. At the moment, FMT has established its presence on the European and American continents through production units and reconditioning centres. Leveraging the capabilities of Walter, our aim is to introduce this brand to the Asian markets. We have also recently acquired relevant local players in the area of solid carbide tooling in the US Market. It's worth noting, though, that for the broader international impact and implications, especially within India, FMT holds the utmost significance.

Q With over 4,400 employees worldwide, how does Walter AG prioritise workforce management and ensure a motivated and skilled workforce?

Dmitry Andreev: We engage in various activities, and one of these activities defines this company's embodiment of Engineering Kompetenz. This principle originates from individuals, as Kompetenz is not carried by machines; rather, it resides within the minds and passions of people. Consequently, the significance of internal training programs holds immense weight. Regarding our sales training programs, there are two primary areas of focus. Firstly, competency training is paramount. To achieve this, we engage our globally distributed certified trainers, including those based in India. Given our nature as a customer-centric enterprise, we also emphasise sales training. Our unique approach is finely attuned to the demands of the metal-cutting market. Additionally, we constantly measure the pulse of the organisation. Quarterly surveys encompass our entire global workforce, extending beyond India. These surveys encompass various aspects, such as employees' sense of belonging, comprehension of our strategy, perception of communication effectiveness, satisfaction with managerial feedback and more. We utilise the insights garnered from these surveys to inform our subsequent actions.

Q With the diverse range of precision tools and specialised machining solutions offered by Walter, how do you ensure that your business model remains agile and responsive to customer needs?

Dmitry Andreev: Indeed, the inception of this process lies within the product or solution offering

itself. Our discussions have predominantly revolved around holistic solutions rather than individual products. The trajectory ahead involves further developing this range of products in alignment with the discernible requirements of our customers. Firstly, we try to get market inputs from the customers and what they are asking for. Then, we started building our product offering and have been always doing this around the customer needs. This helps us stay agile and react to the changing demands. Being a global company always presents challenges because a universal approach isn't universally applicable. As a result, we are inclined to adopt a global mindset while implementing actions on a local scale. That is why we have a very strong presence of local Walter Sales company here in India. While our inventions may hail from the headquarters, our colleagues in India are always closer to the Indian customers and know what the customers want. Hence, we grant ample autonomy to our sales subsidiaries, allowing them to tailor our local market strategies according to market conditions.

Q Over the years, there has been a significant demand for advanced cutting tools in the Indian market. What, according to you, are the major driving forces for the cutting tools industry?

Brajesh Kumar: As Our Vice President has previously touched upon the concept of Engineering Kompetenz, emphasising that Engineering Kompetenz encompasses more than just tools; it encompasses a harmonious blend of various elements. The Machining industry has seen rapid evolution during the past decade. The industry has a continuously evolving appetite for improvement which calls for challenging applications, surfaces & materials to be machined. On top of that greater precision is needed to be achieved at an ever-increasing productivity rate with rock-solid process security.

We at Walter concentrate on a holistic approach to the entire range of our clients' applications and on what they can achieve using our Specialized Process Optimization Solutions.

Technology leaders like Walter not only provide customers support in redefining the machining strategy & selecting the correct tools from our vast standard offerings but also customise tailor-made special tools which may boost productivity and lower the Cost per Component.

Our driving force has been the fact that we are not the end user, but rather the support. We are the solution providers for customers. Our customers' trust in our technological advancements for the machining requirements and services drives us.

Q How can today's highly productive manufacturing solutions address productivity improvement and cost reduction challenges in the upcoming years?

Brajesh Kumar: The new generation machines are very well-equipped with digital solutions. When we examine a typical scenario, the proliferation of digital solutions becoming more prominent becomes evident. As a part of the metal-cutting industry or the tooling industry, we are not away from that. With our multiple digital offerings, we try to make our end users, customers and partners more competitive and productive.

We are pioneers in the cutting tool industry, introducing digital tools that operate seamlessly without the need for manual intervention. Every business partner is given access to our warehouses and distribution centres. With the appropriate technology, our enterprises can facilitate the direct placement of orders and material sourcing, while also enabling accurate tracking of material location.

With these solutions, we are making procedures more productive. Similarly, various alternative approaches such as virtual engineers are being implemented, negating the necessity for the physical presence of my engineer. Diverse digital platforms exist, enabling both my customers and our business associates to input specific information, data and requirements, and promptly obtain responses. This initiative has led us to establish a platform fostering heightened productivity among individuals. ☐

Get more information on the Walter Apps: http://www.walter-tools.com/en-gb/press/media-portal/apps/overview/Pages/default.aspx

“Safety and Innovation: Pilz India’s Commitment to Automation Excellence”

…says **Sanjay Kulkarni,** Managing Director, Pilz India. In an interview with **Neha Basudkar Ghate,** he details Pilz India’s adaptive business model, emphasising its commitment to safety, diversification strategy and continuous incorporation of cutting-edge technologies in the automation technology market. Excerpts from the interview…

Q How has Pilz India adapted its business model to stay competitive and relevant in automation over the years?

» At Pilz India, since our inception, we have prioritised safety education and tailored solutions across diverse industries. Our strategy emphasises diversification, catering precisely to each client’s needs, from pharmaceuticals to heavy industries. Close collaboration and a team of certified safety experts enhance machine safety, addressing current and future trends like digitalisation and security. This commitment reflects our dedication to meeting evolving client needs, maintaining high safety standards and delivering automation excellence. Our on-going integration of cutting-edge technologies ensures competitiveness in the dynamic automation landscape.

Q What is Pilz India’s main strategic focus in automation, and how does it stand out from competitors?

» Our primary strategic focus in the automation technology sector centres on three core pillars: components, systems and services. These pillars encompass our commitment to providing innovative solutions that are safe, ecological and economical. Safety in the manufacturing sector holds immense importance, especially given India’s rapid industrial growth. At Pilz India, we approach our role as safety advocates with utmost seriousness.

We collaborate closely with manufacturing units, machine builders and factories, ensuring a seamless transition into an evolving safety landscape for

individuals and machines. What distinguishes us is our commitment to tailoring solutions to each client's unique needs, offering adaptable, scalable solutions designed with precision. Pilz goes beyond by providing comprehensive support services covering the machine's entire life cycle, including application analysis, risk assessment and CE marking. Our holistic approach ensures clients receive cutting-edge technology with guidance for safe automation. We offer a wide-ranging training program in machinery safety and automation, recognising the importance of up-to-date knowledge. Leveraging our expertise, we customise individual training programs, extending our commitment to personalised service by advising clients on their further training plans. This comprehensive approach, integrating safety, support and training, positions us uniquely in the automation technology sector.

Q What are some recent technological advancements/upgrades added to Pilz India's product portfolio?

» Over the past 75 years, Pilz has continually impressed its customers by evolving its products and solutions to meet the changing market demands. Our journey began with glass laboratory equipment and evolved into electronic timers, relays and programmable control systems. Today, we are at the forefront of Industry 4.0 and the digitisation of production, actively shaping the future of industrial automation.

Recent technological upgrades have significantly added to Pilz India's product offerings. One noteworthy advancement is MyPNOZ, a modular safety relay that offers flexible safety solutions, enhancing workplace safety. With myPNOZ, customers can create their own safety relay, even in batch sizes of one, providing a tailored safety solution for their specific needs. This innovation enhances workplace safety and allows for a high degree of customisation. We have also introduced Identification and Access Management (IAM) solutions to manage access and permissions, improving security efficiently.

Our Safety Gate Systems have also been enhanced with products like PSENmlock mini and PSENslock 2, ensuring effective guard protection. These systems monitor doors in safety fences, covers and flaps, adhering to the requirements of EN ISO 14119. When a safety gate is opened, these systems ensure that hazardous machine movements are stopped under safety standards, preventing restarting and manipulating guards.

These technological enhancements align with our commitment to providing innovative solutions that enhance safety and operational efficiency for our clients in India's dynamic industrial landscape.

Q How does Pilz India contribute to industry skill development and empower employees with emerging technologies?

» Knowledge is a fundamental aspect of our Pilz India approach, encompassing both customer and employee training. We understand the importance of staying updated on emerging technologies and industry trends for our employees' growth and to deliver top-notch service to our clients. We offer our customers a comprehensive range of training programs focused on machinery safety and automation. We believe anyone working with plant and machinery should have up-to-date information on machinery safety. Our customers have the opportunity to customise their training programs, ensuring they acquire the specific knowledge needed for their operations.

We extend our commitment to skill development by collaborating with institutions, industry associations and partners. This empowers employees to embrace the latest technologies. Leveraging our international network, we provide global-scale training, meeting standards and delivering in the local language, addressing challenges faced by automation professionals in today's interconnected world. At Pilz India, we actively engage with institutions and industry associations, conducting workshops, seminars and knowledge-sharing sessions, contributing to developing a skilled workforce and reinforcing our commitment to excellence in the automation industry.

Q Could you summarise Pilz India's role in global operations and its contribution to your international footprint?

Pilz India plays an important role in Pilz's global operations, significantly contributing to the company's international footprint. While our mission is to enhance safety and automation in India's rapidly growing industrial landscape, our impact extends beyond national borders. With our local team of industry experts, we ensure that our clients worldwide receive tailored safety and automation solutions. In addition to serving Indian clients, we leverage our expertise to meet global requirements by supporting Pilz HQ from India. We support global clients by deploying Indian experts on international projects, contributing to the company's worldwide operations and strengthening our position as a global leader in safety and automation solutions.

Our involvement in international projects has been instrumental in expanding Pilz's global presence. We actively collaborate with international consulting engineers and engage in projects within India and across the globe. This strategic expansion of our footprint allows us to provide our expertise on a global scale. ☐

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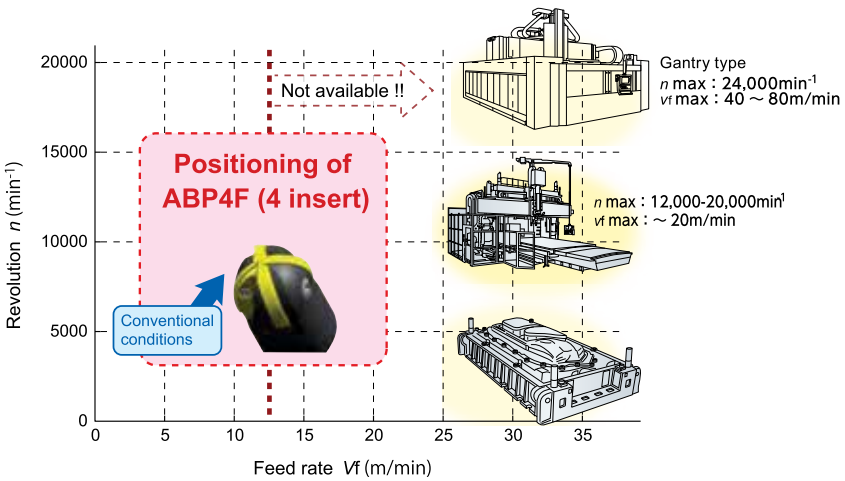
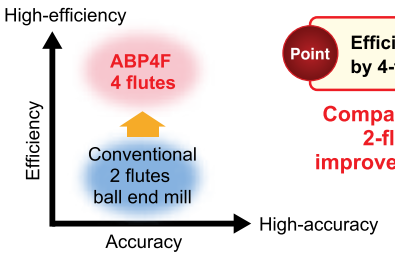
・New product: 4-flute ball end mill (ϕ20 to ϕ30) compatible with machines ranging from general-purpose manufacturing machines to the latest high-speed machines

Example of large press die for automotive parts



Processing advantage of 4-flutes end mill

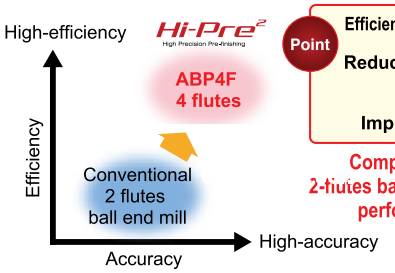
Figure Finishing



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

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

Figure Semi-Finishing



Point **Efficiency processing with small pitch**
↓
Reduce the processing load on semi-finishing
↓
Improve finishing accuracy

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

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YOUR GLOBAL CRAFTSMAN STUDIO

Efficiency Unleashed:

Mastering Machine Tools in Industry 4.0

Sunil Joshi,
President Sales,
Sandvik Coromant India

"The pace of change has never been this fast, yet it will never be this slow again"

This popular quote is often brought up when speaking about today's fast-paced technological development. Industry 4.0 is paving the way for manufacturing in transformation with ground-breaking innovations, which in turn bring opportunities to develope workshops and aim for higher revenues. However, investing in new technology is not the only way to optimise a machine tool set-up. This article explains how tool shop owners can make the most out of their machines through improved equipment utilisation, quick-change tooling and modular solutions.

In light of recent technological advances, investing in forefront technologies can at first hand appear like a given strategy for conducting a successful business. However, markets are fluctuating. To continually strive for the latest, most high-tech solutions might not be the natural way to go forward in uncertain times.

Manufacturers are expected to accelerate product development cycles to meet rapidly changing market demands—yet they are also losing hundreds of production hours to equipment downtime and unnecessary tool changes. The ability to adapt production to current and future demands in a flexible way is crucial for surviving in today's economy. Here, we take a closer look at flexible approaches to workshop machinery.

Make the most out of your machine tool set-up

Machine tool and cutting tool development is rapidly progressing. However, this can involve considerable investments, requiring time, capital and somewhat secure predictions for future demands. If the market situation and business forecasts are unsure, major investments might not be an option.

When your primary goal is to stay in cost reduction mode and to handle a temporary market downturn, a key consideration should be to investigate your current workshop, to make use of existing machines and existing capacity and, preferably, without dramatically increasing overhead costs.

Productivity is another consideration. Often, we put our focus on achieving maximum metal-cutting efficiency. The metal removal rate is one way of measuring efficiency when producing parts. However, what can be an even more important aspect to consider is machine utilisation. In an average machine shop, only 50% of a machine's in-use time is used for machining. Breakdowns, changeovers and maintenance consume the remaining 50%.

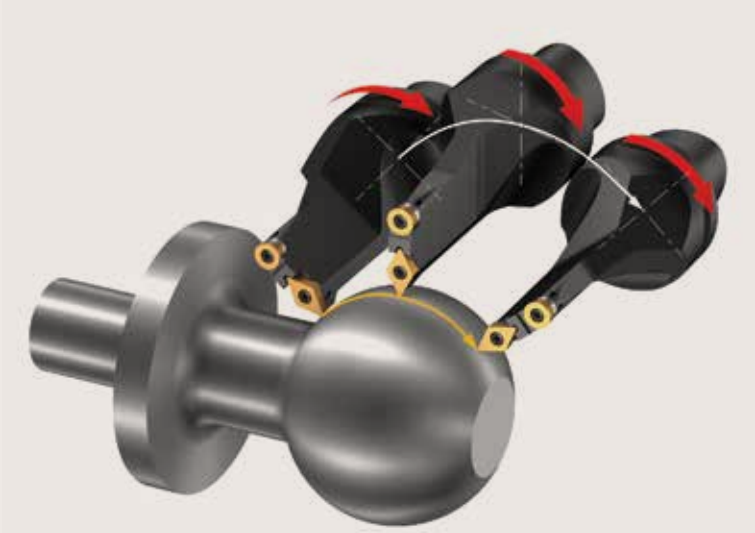
The quest for customisation

Demand for customisation is a crucial factor in the need for frequent tooling changes. Customers are seeking more flexibility in design, often requiring engineered, non-standard options that are not straight out of a catalogue. In vehicle parts manufacturing, for example, the rise in electric vehicles has amped up the need for custom steering parts. As the electric vehicle market is far from standardised,

particularly concerning chassis design and battery placement, suppliers with bespoke manufacturing capabilities have a competitive advantage.

Similarly, batch sizes have shrunk, with smaller production runs becoming more commonplace in workshops. To put things into context, Sandvik Coromant's machine tool factory in Gimo, Sweden, had an average batch size of 102 pieces/order in 2004. By the end of 2019, however, the average batch size was just 25 pieces/order.

Smaller batches inevitably result in additional machine setups and changeovers, which may lead to bottlenecks in many workshops. What was once considered a time killer, such as removing the chips, setting the tool and measuring the component, is now considered a business killer when the queues of complex, small-batch orders begin to accumulate. Designs are also becoming more complex. As a result, workshops now need machines and machine tools that can do more, with greater flexibility to support the machining of a variety of components regardless of production volume.



Machine utilisation in focus

Increasing machine utilisation is a cost-effective way to boost productivity and make use of the capacity already available. This should be measured as a percentage of the time that the machine is producing components. Pushing up active machining time by only a few percentage points makes a big difference.

Increased machine utilisation can be attained by working actively with typical time killers often appearing in a common workshop related to these areas: batch set-up, measuring the component in the machine, tool setting, coolant pipe setting, changing worn tools, chip removal around tools and workpieces or blocked conveyors and component change-over.

Before implementing any new tooling solutions, it is imperative to take the time to measure and assess current process performance. Allowing a closer look at individual manufacturing steps, careful evaluation means the manufacturer can identify exactly where in the plant would benefit most from an investment.

If changeover time has not previously been monitored, it is an ideal metric to begin with. Often overlooked in manual and semi-automated manufacturing environments, individual changeover times can seem insignificant on their own but can quickly add up to substantial productivity losses. Even plants that do monitor changeover times don't always keep accurate records, with much of the focus often placed on the actual machining time.

Evaluating the production process can also help to identify potential areas for immediate optimisation before any financial outlay into new equipment. For example, can production runs be planned more efficiently to minimise tool changeovers? Grouping product batches according to the required tooling solution for machining can be a simple and relatively easy-to-implement approach to maximising efficiency. While this approach certainly will not work for every plant, particularly those that work to strict production deadlines and pathways, grouping even a handful of batches can still offer considerable time savings across an extended period.

Once the key areas for improvement have been identified, the next step is to choose the approach. Quick change and modular tooling systems are just two approaches that can both be used to greatly increase machine utilisation.

Quick change tooling solutions

A quick-change solution can reduce time spent on measuring, set-up and tool change, allowing for drastically improved machine utilisation. Coolant delivery helps to further maximise productivity. There are several benefits of quick change that support keeping the green light on, including reducing batch change-over time. Changing time from one style of tool to another is dramatically reduced using quick change. Up to ten minutes can be saved in one typical turning operation.

Increasing the number of tool positions with double tool holders can also help. Turning centres with driven tool holders often have limited space. Using double clamping units allows either sister tooling or an increased variety of tools, thereby reducing the tool change requirement for a wider range of components. Double clamping units can be used when the machine has a Y-axis, half turret or sub-spindle.

Notably, the Y-axis method makes use of the Y-axis, and all three axes are used simultaneously when machining. The tool rotates around its centre, the insert is placed for machining in the Y–Z plane and the milling spindle axis interpolates during turning. This way, intricate shapes can be machined with a single tool.

Y-axis turning offers numerous benefits. The possibility to machine several features with only one tool reduces cycle time. The fact that no tool changes are required also minimises the risk of 'blend points' or irregularities between adjacent machined surfaces. Main cutting forces are directed into the machine spindle, improving stability and reducing the risk of vibrations. To improve surface finish, wiper inserts are designed with a wiper edge that is situated where the straight edge meets the corner radius.

The method also helps keep chip thickness at a constant, whether turning with a constant cut depth or turning contours in the workpiece. Because the width of chips does not change, the risk of chip jamming is significantly decreased. Not only does this allow for more reliable machining operations, but knowing turning can take place without any mishaps could allow manufacturers to step away from their machines and have them run without supervision.

There is also the potential to reduce downtime when changing worn-out tools. Every time a solid carbide tool with a driven tool holder is changed the tool offset needs to be re-calibrated. With indexable mills and drills, multiple inserts need to be changed. Using a sister tool and changing the cutter outside the machine is much quicker. For static tool holders, being able to remove the tool ensures improved maintenance of the tool, correct mounting and no unexpected stops due to needs for spare part purchases.

The final advantage is improving the speed of production start-up. By eliminating the 'first-test component' or 'measuring cuts', scrap is reduced and the production rate increases. Over a year, the use of quick change will result in significantly higher component production and reduced scrap.

Besides a significant increase in machine utilisation, quick change also brings many benefits for the operator, such as user-friendliness and a more ergonomic working environment. For example, changing tools outside the machine reduces accidents, errors and searching for dropped parts.

Turn flexible, go modular

Another strategy for keeping your machines running is modular solutions. A modular system offers a large variety of tool assemblies with different characteristics, decreasing the need for costly, customised tools with long delivery times. Modular tooling helps to avoid spending on separate tools for each machine, component and feature. Even a relatively small inventory of standard tools can be used to build a huge number of combinations, allowing common tooling systems to be used throughout the factory regardless of the machine interface. All machine types, including turning centres, multi-task machines and machining centres can benefit from what modular design has to offer.

The main benefits that modular tooling systems bring are flexibility, reduced tool inventory and multiple tooling combinations, all contributing to increased machine utilisation. For machining applications that require tooling of different gauge lengths, for example, modular extensions can be easily added or removed. Furthermore, the ability to maintain continuous production for a long period provides the flexibility needed to make your workshop better equipped to handle changing market conditions.

Modular designs can also help protect against unexpected downtime as a result of machine failure. In the scenario where a tool wears out unexpectedly, for example, modular tools can be combined to quickly form a replacement. This ensures that the machinery can operate as normal, minimising downtime and any subsequent knock-on effects on other areas of production.

To achieve component modularity, a common connection design style is used within these components. The coupling's shape is constructed to provide stability and strength, with non-slip transmission of torque and resistance to bending while in use. A strong, durable connection is essential for the tool to retain its rigidity and accuracy when cutting.

These requirements must all be met while ensuring that individual pieces are still easy enough to exchange to facilitate quick changeovers.

When considering which modular tool system to adopt, several considerations need to be made. Firstly what is the reclamping precision offered by the tool system manufacturer? While some systems can operate with a tolerance of just a few microns, this is not the case for all. It is imperative to ensure that the precision offered by the tooling system falls within the product requirements to maintain build quality and accuracy.

Another consideration to make is the available tool catalogue. Does the tool manufacturer offer a sufficient range of components to meet the variety of machining demands? Identifying the specific tooling configurations required can help narrow down which modular system is most suitable for your manufacturing plant. Digital transformation and automation technologies can help manufacturers further unlock the benefits of this new tooling approach. Therefore, finding a manufacturer that offers both the physical tools and complementary software ensures full compatibility, making it easier than ever to monitor, record and improve plant processes.

With the freedom and flexibility offered by modular machining tools, time savings and benefit to production capacity, modular tools have a relatively quick ROI. Four applications where modularity has proven to be extra valuable include reaching difficult-to-access features, stability in vibration-prone operations, small or varying production and extra clearance when machining large components.

While it is certainly true that the 'pace of change has never been this fast', various strategic approaches emerge to ensure adaptability and bolster financial gains in a continuously evolving market landscape. Enhancing machine utilisation, reducing changeover time and investigation into modular systems all contribute significantly to increasing the flexibility of machine shops. ☐

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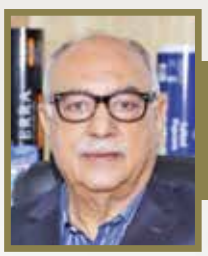
Advancing sustainable packaging through optimised **Industrial Equipment**

Industrial equipment is at the forefront of enabling eco-friendly packaging in the ever-evolving landscape of sustainability. This article explores the essential role played by advanced industrial equipment in achieving sustainable packaging solutions, from precision printing and efficient forming to recycling and energy-saving practices.



Arun Anand,
President, GLS Films

In the world of sustainable packaging, material selection is of paramount importance. Cutting-edge industrial equipment for material procurement, processing and conversion plays a pivotal role. For instance, advanced extrusion equipment enables the production of thinner yet robust films, reducing material consumption while maintaining product integrity. In recent years, the industry has embraced innovative materials such as biodegradable polymers, recyclable plastics and compostable packaging. These choices are influenced by the capabilities of industrial equipment to process them efficiently. Precise control of material thickness, a practice known as lightweighting, is becoming more prevalent thanks to state-of-the-art machinery.

Printing and coating equipment

Visual appeal is a key factor in packaging, and advanced industrial printing and coating equipment are essential in achieving it. These machines ensure precision, minimise ink wastage and enhance print quality. Furthermore, the use of UV-curable inks and coatings provides a more sustainable alternative, emitting fewer Volatile Organic Compounds (VOCs) and requiring less energy for curing.

Incorporating digital printing technologies has been a substantial transformative development, allowing for shorter print runs and customisation and reducing waste associated with obsolete packaging designs. The efficiency and precision of industrial printing equipment are instrumental in adopting and scaling these digital technologies.

Packaging, forming and sealing

Efficiency in packaging forming and sealing equipment is vital to sustainable packaging solutions. Machines such as Form-Fill-Seal (FFS) play a central role in creating packaging. These machines must operate efficiently to reduce material waste and energy consumption, all while ensuring precise packaging design and sealing mechanisms. In this scenario smart automation and real-time monitoring further enhance sustainability.

Sustainable packaging involves designs that minimise empty space, use less material and optimise the use of resources throughout the product's lifecycle. Industrial equipment, such as advanced FFS machines, is central to bringing these designs to life and meeting sustainability goals.

Recycling and waste management

Recycling and waste management are critical aspects of achieving sustainability in the packaging industry. Packaging materials, whether plastic, paper or metal, need to be efficiently collected, sorted and processed for recycling. Industrial equipment specialising in these tasks is pivotal in making this process sustainable.

Sorting and processing machinery have seen significant advancements in recent years, with automated systems improving waste separation and increasing the recovery of valuable resources from discarded packaging materials. These systems rely on cutting-edge technology and the precision of industrial equipment to enhance their efficiency.

Energy-efficient practices

Efficiency in manufacturing operations is vital to minimising the environmental footprint, transcending material choices and equipment. To this end, manufacturers should consider the implementation of energy-efficient practices. Synchronising industrial equipment is a key element of energy-efficient practices in manufacturing. When machinery operates in a coordinated and synchronised manner, it reduces idle time, which can lead to energy wastage. Automated systems are instrumental in optimising the production flow, ensuring that each machine operates with precision according to the requirements of the manufacturing process. Synchronisation not only conserves energy but also enhances the overall efficiency of manufacturing operations.

Incorporating Variable Speed Drives (VSDs) into industrial equipment allows for the adjustment of motor speed based on specific process requirements. This adaptability results in energy savings and reduces wear and tear on equipment, extending its operational lifespan. Energy recovery systems represent another advancement. Modern industrial equipment is equipped with these systems to capture and repurpose excess energy generated during certain processes. This reclaimed energy can be redirected to power other equipment or reduce overall electricity demand.

Energy-efficient LED lighting in manufacturing facilities is another consideration. It reduces electricity consumption and provides superior illumination for workers. Intelligent lighting systems can automatically adjust light levels based on occupancy and natural light conditions.

Data-driven optimisation

Incorporating data-driven optimisation into industrial equipment represents a significant step toward sustainability. The collection and analysis of data from manufacturing processes can unveil opportunities for improvement. Leveraging real-time data, manufacturers can identify and rectify inefficiencies, reduce waste and lower energy consumption. Advanced sensors and control systems are critical components in this endeavour, providing insights into equipment performance and assisting in predicting maintenance needs, thereby reducing downtime and the risk of unexpected breakdowns.

Collaboration and standards

Achieving sustainability in the packaging industry necessitates collaboration between manufacturers, suppliers and customers. Open lines of communication and partnerships can result in shared knowledge, innovations and best practices to minimise the industry's environmental impact. Furthermore, the adoption of industry-specific standards and certifications can guide companies in their sustainability efforts. These standards provide a framework for assessing and enhancing the environmental impact of industrial equipment and processes.

Conclusion

In conclusion, industrial equipment plays a crucial role in the pursuit of sustainable packaging solutions. Through the careful selection of materials, the embrace of energy-efficient practices and data-driven optimisation, manufacturers can reduce their environmental footprint while meeting the increasing demand for eco-friendly packaging. ☐

India's self-reliance in auto components

With the Centre's significant move in this direction with initiatives like Make in India and Atmanirbhar Bharat, the manufacturing sector received a great boost despite global headwinds, resulting in revenue generation and countless employment opportunities.

Dr Amitabh Saran,
Founder and CEO,
Altigreen Propulsion Labs

The world acknowledges the Indian economy as a global bright spot. The reasons behind this are many, but a key contributing factor is the Indian Government's major push for domestic manufacturing to achieve self-reliance or to make the country Atmanirbhar, (self-reliant). With the Centre's significant move in this direction with initiatives like Make in India and Atmanirbhar Bharat, the manufacturing sector received a great boost despite global headwinds, resulting in revenue generation and employment opportunities. The auto sector has become one of the biggest beneficiaries of the conducive business environment, so much so that India surpassed Japan in new auto sales to become the world's third-largest auto-component market in 2022.

In recent years, India's auto sector has pivoted its focus towards becoming self-reliant in terms of manufacturing by coming up with indigenous products and reducing its dependence on imports, especially from China. While achieving self-reliance in auto manufacturing is the right direction for the industry, to be able to do so, it is critical to ramp up domestic auto component manufacturing to come up with completely Indian-origin products. Moreover, it is the most opportune time to take steps in this direction as the Indian auto market is thriving, and the industry is expected to register a sales volume growth of 7%–9% in FY24, building on FY23's robust momentum. To ensure that the rising demand is met locally, it becomes important to focus more on the auto components industry and domestic manufacturing in India.

Notably, the auto components industry in this country is brimming with opportunities. Thanks to the Centre's massive push to promote local manufacturing, create a conducive business environment and bolster India's image as a great investment destination with government-aided schemes, the industry registered a turnover of ₹4.2 trillion in FY22, at a growth rate of 23%. Among the major items that were mostly exported during this period were drive transmission and steering, engine components, body, chassis, suspension and brakes, as per an industry report.

Government initiatives as major growth drivers

The Indian government has taken many crucial decisions to turn the country into a global manufacturing hub. The Production-Linked Incentive (PLI) and Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) schemes are two major examples that show the success of the government's efforts in not just incentivising domestic manufacturing of Electric Vehicles (EVs) and components but also significantly reducing India's dependence on China for imports. The results are already visible, as the data suggests; the country's auto exports recorded an increase of 35.9% in FY22.

Thus, promoting domestic auto-component manufacturing can unlock many economic opportunities. This can reduce dependence on imports, leading to revenue and job creation. Creating

a robust auto-component industry can further strengthen the overall automotive sector, enhance India's global competitiveness and build a vibrant business ecosystem. The SBI's research suggests that India can reduce its dependence on China for imports to the extent of 10% and add around US$6 billion to its GDP over time.

New opportunities through EV

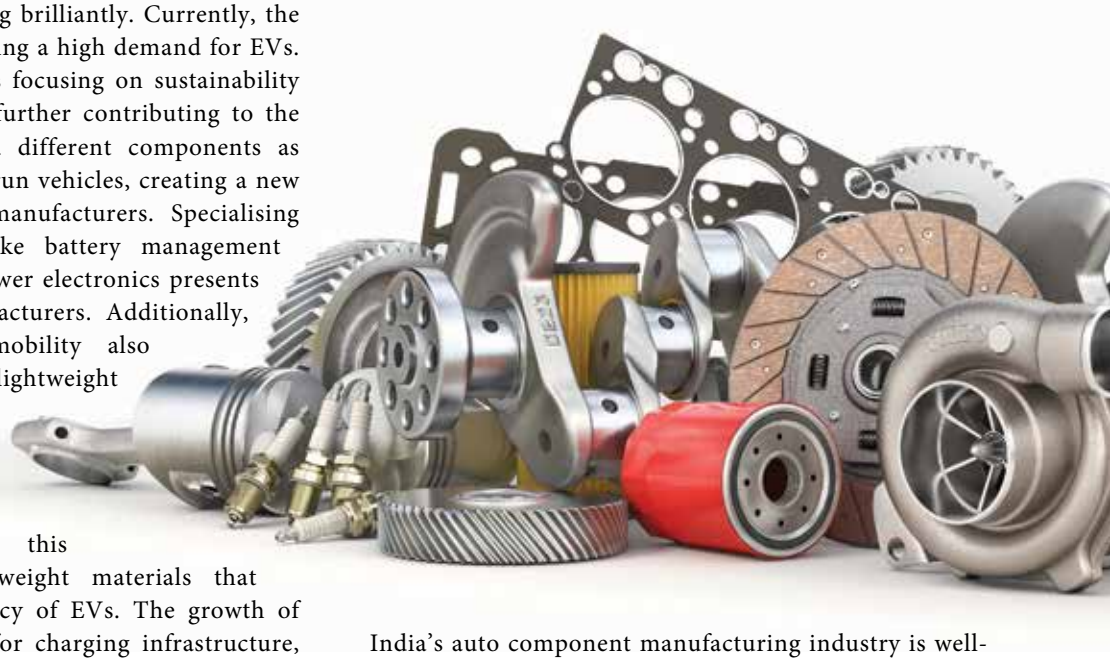
When it comes to manufacturing, India has a competitive edge for multiple reasons. Despite global disruptions, the country's economy is performing brilliantly. Currently, the Indian auto market is experiencing a high demand for EVs. Additionally, the government is focusing on sustainability and decarbonisation, which is further contributing to the EV sector's growth. EVs need different components as compared to conventional fuel-run vehicles, creating a new market for auto component manufacturers. Specialising in crucial EV components like battery management systems, electric motors and power electronics presents a great opportunity for manufacturers. Additionally, the transition to electric mobility also increases the demand for lightweight materials such as aluminium, high-strength steel, composites and others.

The auto component manufacturers can utilise this opportunity to develop lightweight materials that enhance the range and efficiency of EVs. The growth of EVs also propels the demand for charging infrastructure, requiring the production of components like charging stations, cables and connectors. Leveraging their expertise in electrical systems and power electronics, auto component manufacturers can tap into this market, further driving industry growth.

The EV shift presents an excellent opportunity for Indian companies to establish themselves as global EV component manufacturers. Furthermore, government policies such as PLI aim to boost the auto sector to attract investments specifically in advanced automotive technologies and electric mobility. These initiatives are creating a favourable investment climate, making the auto component industry an appealing destination for both domestic and foreign investors.

Addressing current challenges

To realise the full potential of domestic auto component manufacturing, there is a need to address certain challenges that the industry currently faces. The most prominent one is to enhance efficiency, productivity and quality in manufacturing by upgrading to the latest technologies. To be able to achieve global competitiveness, the industry needs to invest more in manufacturing technologies such as robotics, Artificial Intelligence, data analytics and the Internet of Things, among others. This can greatly assist in streamlining production processes, reducing costs and waste and achieving higher efficiency and quality enhancement. The need is also to promote research and development with increased collaboration between the industry and academia to come up with new materials or products that can improve the performance and sustainability of the vehicles.



India's auto component manufacturing industry is well-poised to contribute to its growing economy in myriad ways. All the factors are in its favour, and collaborative efforts, coupled with the right policy support, a focus on technology, research and development and the creation of investment avenues can pivot this critical industry towards a growth path. Additionally, the Indian EV market is growing at a rapid pace, and demand is set to grow exponentially in the coming period. This further makes the current period an opportune time for auto component makers to leverage the possibilities that exist and benefit immensely from them.

At a time when global disruptions have caused a slowdown in global trade, achieving self-reliance in auto component manufacturing reduces reliance on imports, enhancing a country's self-sufficiency. By producing necessary components domestically, the industry decreases its dependence on foreign suppliers and improves the trade balance. This increased self-sufficiency contributes to economic stability and resilience. For all these reasons, India's auto-component industry has a pivotal role in creating a vibrant and competitive automotive sector and contributing to the US$5 trillion economic dream. ☐

Revolutionising industrial cleaning: A technological approach

While the significance of clean and well-maintained facilities cannot be overstated, the processes involved have seen a remarkable transformation in recent years, thanks to technology. This article delves into the technological advancements into industrial cleaning, focusing on the critical role of Field Service Management (FSM) in this context.

Shashank Tiwari,
Head of Growth, FieldWeb

Industrial cleaning holds a pivotal role across diverse sectors, upholding the standards of safety and operational efficiency. The value of well-maintained facilities cannot be emphasised enough, and recent years have witnessed a substantial transformation in the methodologies, largely attributed to technological advancements. Through its exploration, this article examines the sweeping changes technology has ushered into the industry, optimising cleaning procedures and fostering environmentally responsible practices. In this context, FSM emerges as a critical element, enhancing co-ordination and resource management, ultimately promoting a cleaner and more sustainable future for industrial facilities.

Challenges in industrial cleaning

Industrial cleaning entails a unique set of challenges:

- **Safety and health compliance:** Ensuring the safety and health of workers during industrial cleaning processes is paramount. Dealing with hazardous materials, confined spaces and the use of heavy machinery introduces risks.
- **Environmental impact:** Industrial cleaning often involves the use of chemicals and substantial water resources, leading to environmental concerns. Mitigating the environmental footprint of cleaning operations is essential, considering increasing regulations and the need for sustainable practices.
- **Efficiency and productivity:** Keeping cleaning operations efficient and productive can be challenging, especially in large industrial facilities. Effective scheduling, resource management and task optimisation are vital to prevent productivity losses.
- **Complex surfaces and equipment:** Industrial environments typically feature intricate machinery and structures. Cleaning these complex surfaces efficiently requires specialised equipment and expertise, making it a challenge to maintain cleanliness.
- **Cost management:** Managing the costs of industrial cleaning, including labour, equipment maintenance and supplies, while delivering high-quality services can be a significant challenge. Cost-effectiveness and avoiding overruns are essential.
- **Maintenance scheduling:** Determining the optimal cleaning frequency and scheduling maintenance tasks can be difficult. Over-cleaning can lead to excessive costs, while under-cleaning can impact overall operations and safety.

The role of technology

Technology is driving significant changes in industrial cleaning, helping to overcome these challenges:

- **Automation and robotics:** Automation and robotics have transformed industrial cleaning processes. Robots can navigate complex environments, deploy targeted cleaning techniques and ensure consistency and efficiency.
- **IoT for real-time monitoring:** IoT sensors and devices provide real-time monitoring capabilities, helping in data collection and predictive maintenance, leading to efficient cleaning operations.
- **Data-driven decision-making:** Data analytics helps in understanding cleaning patterns and optimising resource allocation.

- **Task scheduling:** Advanced scheduling algorithms consider factors like equipment availability, facility downtime and environmental conditions. This optimises the timing of cleaning operations.
- **Compliance management:** Technology helps in tracking regulatory compliance by documenting cleaning processes, safety measures and waste disposal. It ensures adherence to industry standards.
- **Supply chain management:** Technology streamlines the procurement of cleaning supplies and equipment. It ensures that the right products are available when needed, preventing disruptions in cleaning operations.
- **Inventory control:** RFID and barcode technologies are used to monitor and control cleaning supplies and equipment inventory. This minimises waste and prevents shortages.
- **Customer interaction:** Mobile apps and customer portals enable real-time communication between cleaning service providers and clients. Clients can

request services, monitor progress and provide feedback conveniently.

- **Sustainability initiatives:** Technology plays a significant role in promoting sustainable cleaning practices. Industrial cleaning companies are adopting eco-friendly solutions, such as environmentally safe cleaning agents and green cleaning practices. E-learning platforms and VR simulations offer effective training for cleaning staff. They can learn about the operation of complex machinery and safety protocols through immersive experiences.
- **Quality control:** Technology enables real-time quality checks, reducing errors and ensuring consistent service quality across different cleaning teams.

Advancements in cleaning solutions

Recent advancements in cleaning solutions have had a significant impact:

- **Eco-friendly detergents:** Environment-friendly cleaning agents have gained prominence, reducing the environmental impact of cleaning processes.
- **Nanotechnology and biotechnology:** Innovative cleaning solutions leverage nanotechnology and biotechnology for more effective and sustainable cleaning.
- **Green cleaning practices:** The industry is moving towards eco-conscious cleaning practices, driven by consumer demand and sustainability goals. Robotics, autonomous robots and automation technologies have become the backbone of modern industrial cleaning. The use of autonomous cleaning robots has led to significant efficiency gains, reducing cleaning time by upto 30% and resource requirements. Furthermore, robots can operate 24/7, reducing labour costs by as much as 50% and the need for chemicals in cleaning by up to 20%.

The role of FSM in industrial cleaning

FSM has emerged as a game-changer in the field of industrial cleaning. Its multi-faceted role can be best understood by breaking it down into several key aspects:

- **Resource optimisation:** FSM solutions utilise algorithms and real-time data to ensure that the right technician, with the appropriate skill set and equipment, is dispatched to a specific cleaning task. This not only enhances the efficiency of the cleaning process but also minimises costs by reducing idle time and optimising resource utilisation.
- **Task scheduling and dispatch:** FSM systems prioritise tasks based on factors like urgency, location and the skills required. This leads to the quick assignment of tasks to available technicians, making sure that critical cleaning needs are met promptly.
- **Real-time task tracking:** FSM systems provide real-time visibility into cleaning tasks. Supervisors and managers can monitor the progress of each task, track the location of field technicians and receive notifications of completed or delayed tasks.
- **Data analytics and reporting:** FSM software collects and analyses data related to cleaning operations. This data-driven approach aids in understanding cleaning patterns, identifying areas where improvements are needed and optimising resource allocation.
- **Customer interaction:** FSM solutions often include customer interaction features, enabling clients to submit cleaning requests or report issues through web portals or mobile apps. FSM can be integrated with Internet of Things (IoT) devices and sensors. This allows for real-time monitoring of equipment and facilities, ensuring they are cleaned when needed.
- **Compliance and documentation:** FSM helps industrial cleaning companies maintain compliance with industry standards and regulations. It allows for the tracking of cleaning procedures, reporting on compliance efforts and ensuring that critical areas are cleaned as per guidelines.
- **Feedback and improvement:** FSM facilitates feedback collection from customers and technicians. Customers can provide ratings and reviews, while technicians can report issues or suggest improvements.

In conclusion, FSM plays a pivotal role in revolutionising industrial cleaning by enhancing operational efficiency, promoting sustainability, improving compliance and enabling a more transparent and responsive approach to cleaning services. ☐

Amplifying India's pharmaceutical supremacy internationally

India has firmly established itself as a global pharmaceutical powerhouse over the years. Therefore, we must preserve the highest quality for one of the most indispensable components of pharmaceutical packaging—compressed air. Here is an article answering the what, how and why of compressed air.

Deepak Pahwa,
Director, Delair

Our pharmaceutical industry has grown by leaps and bounds, evolving into a robust sector that supplies high-quality medicines and vaccines to countries across the globe. In FY23, the Indian pharmaceutical market experienced year-on-year growth of nearly 5%, reaching a total of $49.78 billion. While exports showed a modest 3% increase, the domestic market saw a substantial 7% year-on-year rise. Moreover, according to a report from CareEdge Ratings, the sector is projected to reach $57 billion by FY25.

Applications of compressed air

As the nation continues to enhance its position on the international pharmaceutical stage, it becomes imperative to focus on the often-overlooked yet vital aspect of pharmaceutical manufacturing—compressed air quality. Compressed air is often referred to as the 'fourth utility' in the pharmaceutical manufacturing process, alongside electricity, water and steam. It is an indispensable component that plays multiple roles in end-to-end pharmaceutical production, from processing to manufacturing to packaging. Some of these roles include:

- **Pneumatic application:** Pharmaceutical operations involve a myriad of intricate pneumatic processes, such as tablet and capsule manufacturing, ensuring the desired features for tablets and ingredients and safeguarding products from contamination. Compressed air is the lifeblood that courses through these processes, enabling the creation of high-quality pharmaceuticals that meet rigorous international standards.

- **Machines and tools:** Compressed air is used to power various tools and equipment, such as automatic packaging machinery, sealing equipment, capsule and powder filling machines, blister pack machines, tablet press and coating machines, drying containers and vacuum cleaning systems. Any contaminants in the compressed air can lead to product defects and contamination, jeopardising the quality and safety of pharmaceutical products.

- **Clean room operations:** In clean rooms, where sterility is paramount, compressed air provides the necessary pressure for laminar flow hoods and isolators. Contaminated air can compromise the entire clean room environment, potentially causing costly production delays and product recalls.

- **Quality control:** Analytical instruments and lab equipment rely on clean, dry and oil-free compressed air for accurate testing and quality control. Even minute traces of impurities in compressed air can affect the results and consequently, product quality.

- **Product contact:** In some cases, compressed air comes into direct contact with pharmaceutical products during the manufacturing process. Any contaminants in the compressed air can lead to contamination of the final product.

Effects of moisture contamination

Moisture is a persistent challenge in the pharmaceutical industry, as it can affect both product quality and machinery. It can be especially deteriorating if even a miniscule amount finds its way into the 'compressed air line'. It is the backbone that supplies all the essential components with compressed air supply. Its cumulative effects inevitably lead to not only a shorter shelf life for pharmaceutical products but also be responsible for making them ineffective, even counter-active. The consequences of moisture contamination include:

- **Product deterioration:** Moisture can lead to issues such as tablet disintegration, lumping, caking, uneven coating and decomposition of formulations. For hygroscopic pharmaceutical products, even minimal moisture presence can cause physical, microbiological, enzymatic and biochemical deterioration.

- **Tablet compression:** The pernicious impact of moisture is most evident in tablet compression. During this process, powdered materials are compacted into capsules or tablets under high pressure. Excess humidity not only causes tablets to crumble but also initiates drug decomposition, diminishing their medicinal efficacy. Even during tablet coating, inadequate moisture control can lead to rough, translucent coatings that fail to meet quality standards.

- **Microbial growth:** Excessive moisture fosters the growth of harmful microorganisms. Airborne mould, mildew and fungi find a fertile breeding ground in the presence of suitable temperature and humidity conditions. Microbial growth accelerates material decomposition, weakening the integrity of the product.

- **Packaging concerns:** It is imperative to recognise that moisture's detrimental impact extends beyond the manufacturing stage to packaging. Therefore, addressing moisture-related issues must be a priority at every stage of the product cycle from production to packaging.

Effects on tools

Moisture does not spare pneumatic tools and machines either. High humidity levels lead to corrosion in pipelines, cylinders and other components, resulting in equipment malfunctions. The sluggish and inconsistent performance of pneumatic valves and cylinders can be attributed to excess moisture. When moisture freezes in cold weather, it exacerbates these issues, leading to increased downtime and maintenance costs for companies.

To safeguard consumers and produce cost-effective, safe drugs, manufacturers must ensure that compressed air is free from contaminants, such as water/moisture, dust particles, oil and solid impurities. Moisture, in particular, must be eliminated to prevent these destructive consequences. To achieve the highest standards of compressed air quality, it is imperative to install efficient compressed air dryers in the manufacturing and packaging units across various pharmaceutical processes. It is imperative that air dryers avoid the ill effects of moisture, helping efficiency and production.

For processes necessitating a pressure dew point between 3°C and 4°C, refrigeration dryers are employed. These dryers cool the air to nearly freezing temperatures, effectively eliminating moisture. Conversely, when exceptionally dry air with an atmospheric dew point of (−40)°C to (−60)°C is required, adsorption or desiccant drying is applied. This method employs the principle of heatless regeneration, deploying desiccants to adsorb and desorb water vapours. It leverages the pressure swing principle and purges air to rejuvenate the desiccant bed.

In essence, compressed air-drying systems serve as the crucial framework ensuring compliance with pharmaceutical air quality standards. They play a pivotal role in eliminating any form of contaminants present in compressed air, not only contributing to the production of high-quality finished products but also ensuring the optimal performance of pneumatic machinery. This not only adds value to a company's revenue but also upholds the industry's reputation for quality and compliance with stringent standards, including those set by the Food and Drug Administration. As India continues to strive for pharmaceutical supremacy on the international stage, the role of quality compressed air in maintaining product excellence cannot be overstated. Hence, industry players must ensure that the concerns stated are resolved. ☐

Fig. 1 – A LOGIQ-3-CHAM drill with an exchangeable carbide head has 3 flutes.

Tools for **sustainable machining**

Exploring the transformative impact of sustainable cutting tools on manufacturing efficiency, environmental impact and the pursuit of a greener future.

The term 'sustainability' has become increasingly popular in recent years. It is frequently seen in headlines, featured in forms of news media, scientific research, and practical seminars. Is the word sustainability merely a trending word or the question of the hour?

The emphasis on sustainability stems from global growing awareness intended for critical environmental issues and climate change, largely caused by human activity. The focus on sustainability reflects our deep commitment to the principles of securing a better future for the planet and generations to come.

Sustainability as a Driving Force

Consequently, sustainability has gained prominence in various fields, ranging from everyday life and business to transportation, urban planning and manufacturing. Manufacturing should unquestionably be sustainable. Today, there is widespread recognition and agreement regarding the correctness of this statement. Manufacturing processes use natural resources, consume energy, create waste and pollute the environment. We can mitigate the negative environmental impact only by adopting sustainable production technologies.

Machining remains a primary method for producing parts of machines and mechanisms. Therefore, the question of how to make machining sustainable is relevant more than ever. A cutting tool contacts the machined workpiece directly and shapes it to its required form, removing the rest of the unnecessary material in the form of metal chips. Can a cutting tool be a key factor for improving sustainability? The answer to the above question is undoubtedly a resounding, yes!

Despite its smaller size in comparison to other elements of a technological system, the machine or workholding fixture called the cutting tool can play a pivotal role in achieving sustainable manufacturing practices. The cutting action involved in material removal during machining is an energy-intensive process. However, the cutting tool is designed to be energy-efficient and, therefore, can significantly reduce energy consumption.

The cutting tool revolution

The impact of key tool characteristics cannot be underestimated. Advanced cutting geometries minimise cutting forces while anti-vibration designs mitigate chatter, which causes force oscillation. Progressive coatings enhance lubricity, diminishing friction, and efficient cooling methods effectively reduce heat generation. Collectively, these tool elements substantially reduce the environmental impact of machining operations.

In many instances, a cutting tool can hinder productivity growth, limiting the full realisation and capabilities of modern machines. Therefore, tools that guarantee higher productivity play a crucial role in reducing cutting time, machine power consumption, and Greenhouse Gas (GHG) emissions. Reliable, long-lasting cutting tools that enhance tool life, reduce the frequency of tool replacements, or insert indexing. This diminishes machine downtime associated with tool changes, ultimately improving overall manufacturing efficiency.

In addition, utilising cutting tools that provide a better surface finish can eliminate the need for finish machining operations, thereby decreasing the machining allowance or material stock to be removed. As a result, a dual effect is achieved reducing both machining time and material waste.

Hence, the term 'sustainable cutting tool' is not merely a passing trend but a vital concept that is progressively embraced and integrated as a fundamental principle of sustainable manufacturing. Ultimately, the main parameter to analyse a tool is its performance. However, the component of tool sustainability has become a contemporary factor of paramount importance. Understanding the various aspects of how cutting tools impact sustainability largely shapes the requirements for modern tools and guides their development.

Case study: ISCAR's machining sustainability

A brief review of select ISCAR products helps us to understand this profoundly. The design concept of tools with replaceable cutting parts significantly contributes to the sustainable utilisation of cutting material.

ISCAR's tool systems with exchangeable carbide heads, such as MULTI-MASTER and SUMOCHAM, provide a good example of this concept by allowing the rational use of cemented carbides. In addition to the traditional approach of saving cutting material, the mentioned systems offer further advantages related to sustainability. Both the MULTI-MASTER and SUMOCHAM families feature high repeatability, which allows for the realisation of the NO-SETUP-TIME principle. This means that replacing a worn head does not require additional setup operations to adjust tool parameters. As a result, machine downtime is significantly reduced.

LOGIQ-3-CHAM represents the next step in the development of drilling tools with exchangeable heads, based on the features of its predecessor, the SUMOCHAM drilling line. One notable parameter that sets LOGIQ-3-CHAM apart from the other drilling systems is its three flutes **(Fig. 1)**, as opposed to the traditional two. This change enables increased feed and speed of up to 50%. Alongside improved productivity, this new

design also brings sustainability advantages by reducing energy consumption and GHG emissions. Drilling 16-mm diameter holes with an 80-mm depth in a part made from low alloy steel exemplifies these features well. With a tool life of 500 holes, when compared to a competitor's drill with a replaceable two-flute head, the use of ISCAR's LOGIQ-3-CHAM tool results in a 26% decrease in cycle time and a 19% decrease in energy consumption. Consequently, CO_2 emission is reduced by 19%.

Fig. 2 – In boring, using anti-vibration bars improves performance and reduces power consumption.

The anti-vibration design of cutting tools plays an essential role in reducing power consumption, extending tool life, and improving the surface finish of the generated surface. ISCAR has developed vibration-damping solutions that use various principles. These include vibration damping through specially designed mechanisms, such as in boring bars **(Fig. 2)**, as well as the development of specific chatter-resistant cutting geometries. The geometry incorporates variable helix and unequal angular pitch in multi-flute solid carbide endmills and heads, along with a serrated cutting edge for effective chip splitting action in indexable inserts **(Fig. 3)**. Additionally, these tools and inserts ensure better chip handling, which enhances the performance of machining operations. The smart design of the pocket reducer allows mounting smaller size inserts, which provides the option of extending the use of existing tool bodies instead of purchasing new ones. This not only reduces the waste of raw materials but also helps decrease GHG emissions.

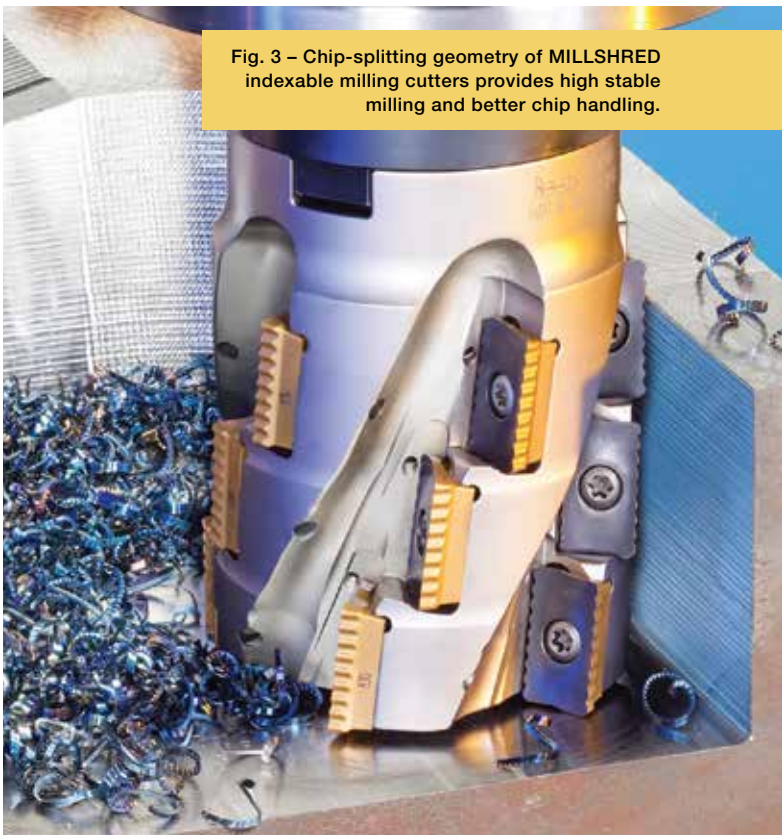


Fig. 3 – Chip-splitting geometry of MILLSHRED indexable milling cutters provides high stable milling and better chip handling.

Additive Manufacturing (AM) has introduced new sustainability features in tool design. Firstly, AM technologies enable the production of a tool body that closely resembles its final shape, minimising the need for finish machining and significantly reducing tool material consumption. Additionally, these technologies make it easier to create inner coolant channels in an optimal manner, improving the coolant flow through the tool body to the cutting zone.

Towards a Greener Future

The examples featured in this article illustrate how energy- and material-efficient, durable cutting tools can have a significant impact on technological sustainability. Such tools not only help reduce energy consumption and waste, but also contribute to cost savings and environmental stewardship. ☐

Courtesy: **ISCAR India**

The industrial metaverse will transform the way you work

Highly-optimised businesses are able to function seamlessly amid the physical and virtual worlds. This article delves into how new-age technologies can help build an industrial metaverse that will aid industry processes.

Simon Bennett,
Global Head of Research, AVEVA

We are living amid times of great change. Global factors such as political unrest, economic inflation and the ongoing war in Ukraine are stoking market volatility. What's more, these pressing factors are playing out against the stark backdrop of climate change. The global effort to reduce carbon emissions is making progress, but continuous pressure must be applied in order to meet challenging targets in line with the Paris Agreement.

Fresh from COP27 Sharm el-Sheikh, Egypt, the message from business and civil society leaders is clear. If we are to deliver on the objectives of the Paris Agreement and limit global warming to 1.5°C above pre-industrial levels, it is time for action. We need to work collaboratively and relentlessly to halve global emissions by 2030, and many companies are rapidly diversifying their energy portfolios, divesting their higher-carbon-emitting businesses and transitioning to greener power supplies. To

add complexity to the challenge, however, most nations do not yet have an energy mix which can rely solely on renewable energy sources. As such, traditional fossil burning techniques are still necessary to plug the energy shortfall. Global businesses are now working overtime to develop sustainability strategies that promote the right balance of future investments and existing profit targets.

Organisations like AVEVA believe that one of the key drivers of a successful, sustainability strategy is a strong and committed digitisation strategy. Those organisations who heavily fund their move to a completely digital business are creating a strategic differentiator; they are able to deliver their services more efficiently and with greater insight into their business operations. At the heart of a mature digitisation strategy lies the Digital Twin—a connected data ecosystem that allows the business to have a single source of the truth.

The creation and delivery of a digital twin is no small feat. A digital twin is a virtual representation of a real-world physical system that connects real-time data sources, models and analytics from across the asset lifecycle in one single place. AVEVA customers who have successfully executed their Digital Twin projects will attest to the huge benefits and positive change that a fully digitised business can offer.

One example is the state-owned Abu Dhabi National Oil Company (ADNOC). The energy giant's colossal industrial operations are powered and guided the Panorama Digital Command Centre—a fully integrated, real-time data visualisation platform that helps gain insights, unlock efficiencies and identify new pathways to optimise operations. AVEVA's technologies form the foundation of the display, enabling integration across various systems and providing actionable insights. The Panorama centre features a 50-metre-long screen, which curves to fit seamlessly with the wall and covers its height from floor to ceiling, giving ADNOC a single, national view of their oil and gas assets and production.

Step into the Industrial Metaverse

Taking one more step into the future, we believe that the Industrial Metaverse is primed to add powerful sustainability benefits to the digital twin. However, what is an Industrial Metaverse?

The Industrial Metaverse is a virtual space that all employees can use to conduct their business and technical meetings. The Industrial Metaverse does not require a headset, can be used by a mouse and keyboard and offers access to live SCADA data, up-to-date engineering data and 3D operating environments. In short, the Industrial Metaverse is a virtual version of your actual operating assets with real-time streamed data which you can jump into with colleagues to investigate, discuss and manage tasking—all based on your digital twin.

Powerful digital sustainability benefits

The Industrial Metaverse provides immersive access to expertise from across your business and supply chain. This means you decrease the CO2 emissions generated by excessive travel, increase the speed of your business decision-making and reduce virtual safety incidents.

In the coming years, as the world's businesses look to radically decarbonise, digital solutions will be the catalyst for securing new sustainability wins. Smart companies will place their digitisation strategies at the core of their business to prime themselves for a sustainable future driven by smart decision-making and intelligent data.

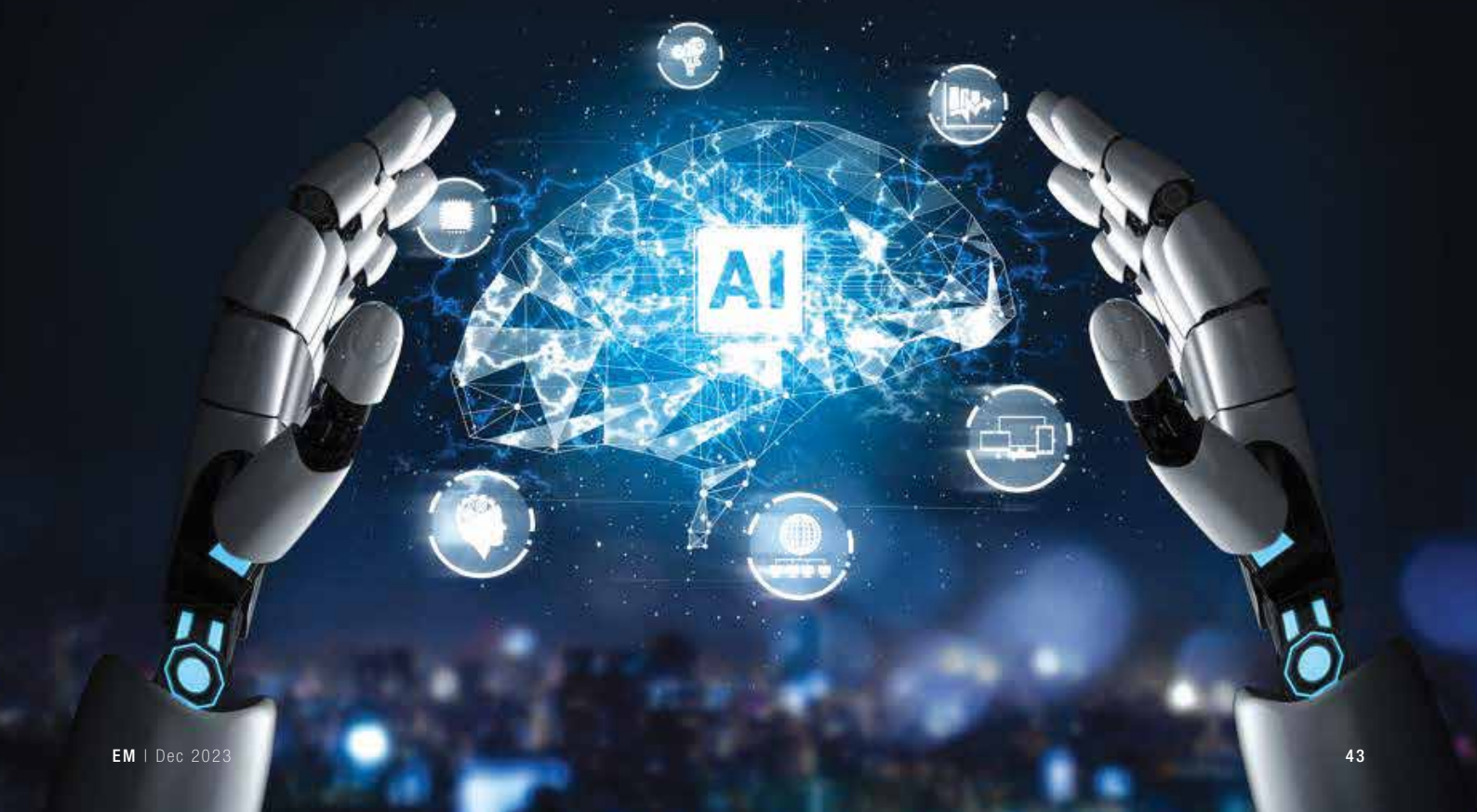
Moreover, we see great opportunities for more sustainable designs, reduced steel and concrete consumption and more automation for plant operations based on collaboration within virtual spaces. The Industrial Metaverse promotes democratisation of access to the digital twin, respects your enterprise access rights and can level-up the value of information.

Being immersed in the Industrial Metaverse will be the equivalent of being on-site, where you will be able to work with colleagues and suppliers from around the world, interacting with the company assets, share the same information in real time and enjoy a level of collaboration that closely maps face-to-face interactions. The digital twin project is ultimately an information-centric endeavour focused on data alignment, cleaning and preparation. Utilising the digital twin within the Industrial Metaverse will powerfully connect the most important resource of all: our people. ☐

An efficient pursuit towards analytics

The size of the global market for big data in the manufacturing sector was estimated at $576.47 billion in 2021. It is expected to increase from $731.13 billion to $4617.78 billion from 2022 to 2030 at a 26.7% CAGR. This article explores how Big Data, and the AI that helps categorise it, will be applicable in the manufacturing industry for years to come.

Ganesh Savardekar,
CEO,
Advent Biztech Solutions



The use of Industrial Internet of Things (IIoT) and smart factories generates enormous amounts of data every day that needs to be monitored, analysed and classified. Thus, Artificial Intelligence (AI) and Big Data analytics have various potential applications in manufacturing. Manufacturers are increasingly using AI solutions like deep learning neural networks and Machine Learning (ML) to better evaluate data and make decisions.

Applications of AI and Big Data in manufacturing:

• Predictive Maintenance

- **Preventing breakdowns:** AI and Big Data are revolutionising maintenance strategies in manufacturing by enabling predictive maintenance.
- **ML algorithms:** ML algorithms process this data to identify patterns that precede equipment failures.
- **Optimising machinery:** Manufacturers can then schedule maintenance activities proactively, which reduces downtime and minimises production disruptions.

• Quality control:

- **Enhancing product quality:** AI and Big Data play a vital role in quality control by ensuring that products meet stringent quality standards.
- **Real-time monitoring:** AI algorithms process this data in real-time, identifying defects, irregularities or deviations from quality benchmarks.
- **Reducing defects:** By identifying and removing subpar products early in the manufacturing process, manufacturers can significantly reduce the number of defects that reach the final product stage.

• Supply chain optimsation:

- **Demand forecasting:** AI and Big Data aid in predicting customer demand with greater accuracy. By analysing historical sales data, market trends and various external factors, manufacturers can develop more precise demand forecasts.
- **Inventory management:** With better demand forecasting, manufacturers can optimise their inventory levels. This means they can maintain the right amount of raw materials and finished products in stock, reducing carrying costs and minimising the risk of overstock or stockouts.
- **Efficient distribution:** AI algorithms can also optimise distribution and logistics by determining the most efficient routes and transportation modes. This not only reduces shipping costs but also minimises delivery times, improving customer satisfaction.

Data collection and processing:

• Importance of data collection

Data collection in manufacturing is crucial because it provides the foundation for informed decision-making. By gathering data from various sources, such as sensors on machinery, production logs, supply chain information and

even external data like weather conditions or market trends, manufacturers gain a holistic view of their operations. This data enables them to identify trends, anomalies and areas for improvement. Without comprehensive data collection, it is challenging to optimise processes, predict maintenance needs or enhance product quality. Data processing in manufacturing involves various techniques and technologies, including:

- **Data pre-processing:** Cleaning and transforming raw data to remove noise and inconsistencies.
- **Descriptive analytics:** Summarising and visualising data for easy interpretation.
- **Predictive analytics:** Using algorithms to make forecasts and identify patterns.
- **Prescriptive analytics:** Recommending actions based on data analysis.
- **Real-time processing:** Handling data in real-time to enable immediate responses.

These techniques help extract actionable insights from the collected data, enabling manufacturers to make data-driven decisions and improvements.

• AI algorithms and ML

AI algorithms and machine learning are essential in analysing manufacturing data. They can:

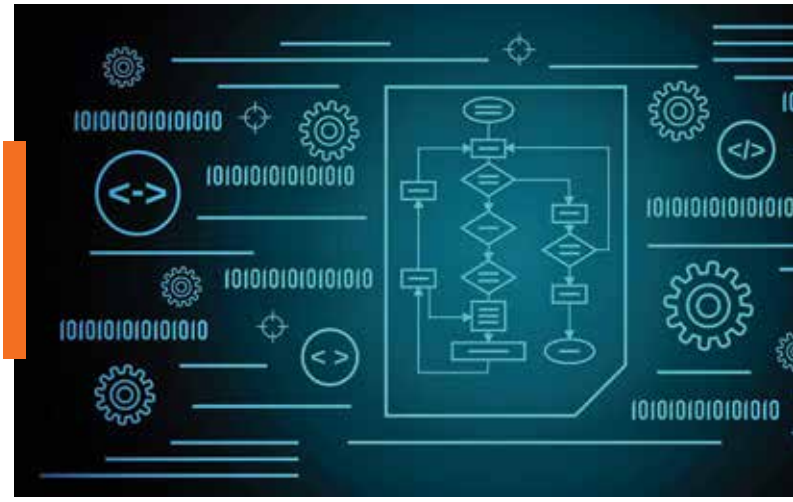
- Detect patterns and anomalies that humans might miss.
- Predict equipment failures, quality issues or demand fluctuations.
- Optimise manufacturing processes by adjusting parameters in real-time.
- Automate decision-making, such as reordering supplies based on demand forecasts.

These algorithms make sense of the vast amount of data generated in manufacturing, allowing for more efficient and precise operations. Manufacturers often customise AI algorithms for their specific processes. This involves training ML models with historical data unique to their operations. Customisation ensures that the algorithms are highly accurate and relevant to the manufacturing environment.

• Data security and privacy:

In manufacturing, data security and privacy are paramount. Manufacturers deal with sensitive information, including proprietary designs, customer data and operational data. Concerns include data breaches, intellectual property theft and regulatory compliance. To protect sensitive manufacturing data, manufacturers can implement the following measures and best practices:

- **Data encryption:** Encrypt data both in transit and at rest to prevent unauthorised access.
- **Access controls:** Limit data access to authorised personnel and implement role-based permissions.
- **Regular audits:** Conduct security audits to identify vulnerabilities and threats.
- **Compliance with regulations:** Follow industry-specific data protection standards and regulations.
- **Employee training:** Educate employees on data security and privacy best practices.



• Challenges and considerations

Implementing AI and Big Data in manufacturing can pose several challenges. They are:

- **Cost:** The initial investment in technology and infrastructure can be significant.
- **Workforce training:** Employees need to adapt to new tools and processes.
- **Cultural adoption:** Encouraging a data-driven culture and overcoming resistance to change can be tough.
- **Data quality:** Ensuring data accuracy and reliability is essential for meaningful insights.
- **Integration:** Compatibility with existing systems and machinery can be complex.

The integration of the IoT is set to increase, providing real-time data collection that can enhance decision-making. Advanced robotics and automation will become more prevalent, not only boosting productivity but also improving safety.

AI-driven decision-making will play a more significant role in optimising various processes, from supply chain management to production. Sustainability initiatives will leverage data to minimise environmental impact and resource usage. These trends underscore the continuous drive towards innovation and adaptation within the manufacturing industry as AI and Big Data continue to revolutionise the sector. ☐

Valves to enhance product safety

Alfa Laval recently unveiled two new hygienic valves, the Alfa Laval Unique Mixproof CIP and Unique Mixproof Process, extending its hygienic double-seat valve range to meet market demands. With the introduction of these two innovative mixproof valves, manufacturers concerned about product integrity now have a cost-effective way to enhance product safety while boosting process efficiency and sustainability. These two newcomers are built on proven performance yet refined for purpose. The Unique Mixproof CIP is a double-seat valve that safely and efficiently manages the flow of cleaning media during Cleaning-In-Place (CIP). The Unique Mixproof Process, a compact version of proven Alfa Laval double-seat valves, is configurable and available in various sizes to meet manufacturers' fundamental hygienic processing requirements. Both are capable of simultaneously routing two different fluids without the risk of cross-contamination, thereby contributing to more uptime and reducing the total cost of ownership. The valves help manufacturers adapt to changing process requirements.

Unique Mixproof CIP and Unique Mixproof Process Valves

Alfa Laval India | Pune

Bipolar plates to produce hydrogen fuel

Dana Incorporated recently announced the development of metallic bipolar plates specifically engineered to maximise the performance and accelerate the commercialisation of Proton Exchange Membrane (PEM) electrolysers used to produce hydrogen fuel. Dana's integrated bipolar plates are made of steel or titanium, with various coating options used as surface treatments for the active area. They also improve stack efficiency through better flow field design and reduced electrical losses, and they feature integrated moulded sealing to prevent permeability at operating pressures of up to 50 bar.

Metallic bipolar plates

The features are: In-house expertise and quality control, Testing base material for formability, material composition and electrochemical stability, Product analysis: High-precision dimensional measurements, functional analysis (pressure film and force-deflection curves) and in-situ stack tests, Post-mortem analysis of bipolar plates, Membrane Electrode Assembly (MEA) and gaskets. Computer-Aided Design (CAD): Integrated product design to meet customer needs, transfer of customer specifications into metal bipolar plate technology, high-precision, high-speed stamping.

Dana India | Pune

Environmentally productive swing loader

Mecalac recently added to its 100% electric machines by introducing the new eS1000 Swing Loader into its eSeries range. The design of the new 1000-litre electric model is based on the diesel-powered AS1000, but in addition to running with zero emissions, the eS1000 causes less noise and vibration disturbances, making it possible to use the new swing loader indoors and in sensitive environments. The loader also has reduced cycle times, maintenance costs and accident risks. Built with stability in mind, the new swing loader can lift a load and turn it 180° once the real axle is locked without any loss of balance, even with the wheels fully steered. The eSeries range also includes the eS1000 and the e12, the first 11-tonne electric excavator introduced by Mecalac in 2022. The eS1000's stability in all positions and on all terrains will transform the logistics of construction sites.

eS1000 Swing Loader

Mecalac | France

Heater controller for emissions regulations

Eaton recently announced it has reached the first agreement to supply its new 48-volt programmable aftertreatment heater controller for electrically heated catalysts to a global commercial vehicle manufacturer. Rapidly warming up the diesel exhaust aftertreatment catalyst and keeping it warm during low engine load operation is essential for optimal performance to reduce harmful Nitrogen Oxide (NOx) exhaust emissions. The air-cooled electric catalyst heater controller is part of Eaton's broader 48-volt electrical system portfolio, which contains several technologies that allow manufacturers to integrate 48-volt architectures in next-generation vehicles. The controller is designed to receive power commands from the aftertreatment system and provide soft-start and stop capabilities for assisting in maintaining system voltage control and diagnostic feedback on the heater element. This technology comes at a time when vehicle manufacturers are facing tightening emissions standards around the globe.

48-volt programmable aftertreatment heater controller

Eaton | Pune

Electric wire rope to lift loads safely and reliably

Verlinde recently introduced the EUROBLOC VT electric wire rope fixed hoist mounted for a 3.2-t load. The electric wire rope hoist embodies Verlinde's know-how with its design, which alone is protected by 13 patents. The fixed models are perfectly integrated into the custom-made lifts installed by Construction Vinicole Murisaltienne. They do not have a carriage and are used for applications where horizontal movement is not required. The hoists are equipped with an IP55 lifting motor with two speeds, a low speed of 1.1-m/min and a high speed of 6.3-m/min, for a 6-m load lifting height to 9.5-m. The loads are thus lifted in total safety and with precision. These parameters are essential for the handling of prestigious wines. The hoists are easy to maintain; the disc brake does not require any maintenance, and the motor is designed to facilitate interventions. The hoists are equipped with an hour metre, which makes it possible to plan maintenance operations according to the duration of use.

EUROBLOC VT electric wire rope

Verlinde | France

Connectors that ensure safety and reliability in medical devices

Fischer Connectors has released new First Mate Last Break connectors in its low-voltage multipole Fischer Core Series, to offer outstanding levels of electrical safety, mechanical reliability, and ease of use for operators of medical devices in compliance with IEC 60601-1. The connectors are available in two sizes ('size 104' with a 15-mm diameter plug and 'size 1031' with a 13-mm diameter plug) and three mixed low-voltage configurations (one with 12 contacts, two with 14 contacts). The longer 'FMLB' contact for ground is shown in red. The First Mate Last Break (FMLB) ensures the permanent ground presence of an electrical system through a longer pin in the plug that 'mates first and breaks last' with the system's receptacle to avoid risky electrical safety conditions. The connectors are IP68 sealed, resist autoclave sterilisation and corrosion (1,000 hours of salt mist, 5% salt solution, 35°C), offer long-lasting lifecycles with 10,000 mating cycles, and their rugged keying and locking systems ensure safe connections at all times.

First Mate Last Break connectors

Fischer Connectors | Switzerland

Synchronous motors pioneering in saving CO_2 and material

Nord Drivesystems recently released the IE5+ permanent magnet synchronous motor, which significantly exceeds the highest efficiency class IE5. The especially compact and energy-efficient motor offers a constant high efficiency of up to 93% and more over a wide torque range and thus also develops optimal energy performance in partial load and partial speed ranges. The IE5+ motor saves energy and emissions. In comparison to a conventional IE3 asynchronous motor, an IE5+ synchronous motor reduces emissions by around 0.15t CO_2 per year. This applies to one single motor. In large systems (e.g., in intralogistics with hundreds or even thousands of drives) this adds up to an impressive total saving. This model calculation is based on the following assumptions: IE3 asynchronous motor with 0.75 kW, 83% motor efficiency, and helical bevel gear unit, IE5+ synchronous motor with 0.75 kW, 93% motor efficiency and helical bevel gear unit, also it operates16 operating hours per day, which corresponds to 4,000 operating hours per year.

NORD-IE5plus-Synchronmotor

Nord Drivesystems | Pune

Compact wheel loaders offer standard ride control capabilities

John Deere expands its Performance Tiering offerings with the shift from L-Series to P-Tier for the 244, 324 and 344 Compact Wheel Loader models. The new P-Tier compact wheel loaders will carry over all L-Series features and will introduce new productivity-enhancing qualities, including standard ride control in base models and optional factory-installed features, including an auto-reversing fan option. Additional optional features include attachment assist controls, which include integrated electrical (three-pin) controls for attachments and combined creep control and throttle lock. Ideal for customers moving materials over long distances or on hard surfaces, ride control cushions boom movements during transport, acting like a shock absorber to help minimise material spillage. Increasing operator comfort and productivity, this feature is applied with the flip of a switch in the cab and can be set to automatically engage and disengage at a predetermined speed.

P-Tier machines

John Deere | Pune

Highlights: January 2024

» Metal Forming Technology

The Metal Forming market is a cornerstone of discrete manufacturing, shaping raw materials into diverse components for various industries. Advanced techniques such as precision stamping and hydroforming have elevated the efficiency and accuracy of metal forming processes. In our upcoming section, we will explore the dynamics of the Metal Forming industry, delving into the latest market trends and technological innovations that are driving efficiency and quality in metal shaping.

» Supply Chain Management/ Logistics

Efficient supply chain management is crucial for seamless manufacturing operations, and technological advancements are playing a pivotal role in optimising logistics processes. From blockchain for transparent traceability to AI-driven demand forecasting, this section will highlight the cutting-edge technologies transforming supply chain management.

» Tool Making

Tool making is the bedrock of precision manufacturing, and technological advancements in this field are driving innovation in various industries. From CNC machining for intricate tool designs to the use of advanced materials for durability, our upcoming section will shed light on the latest developments in tool-making technologies. Readers can anticipate a comprehensive overview of the tools that are shaping the future of manufacturing processes.

» Green Manufacturing

Green Manufacturing practices are at the forefront of industry efforts to promote sustainability and reduce environmental impact. From energy-efficient production methods to the adoption of eco-friendly materials, this special feature will showcase how manufacturers are integrating green practices into their operations. In this section, readers will gain valuable insights into the technologies and initiatives that are steering the manufacturing industry toward a more sustainable and environmentally conscious future.

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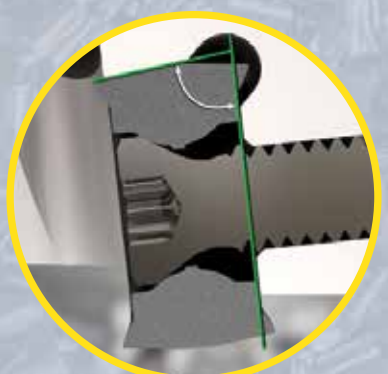

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