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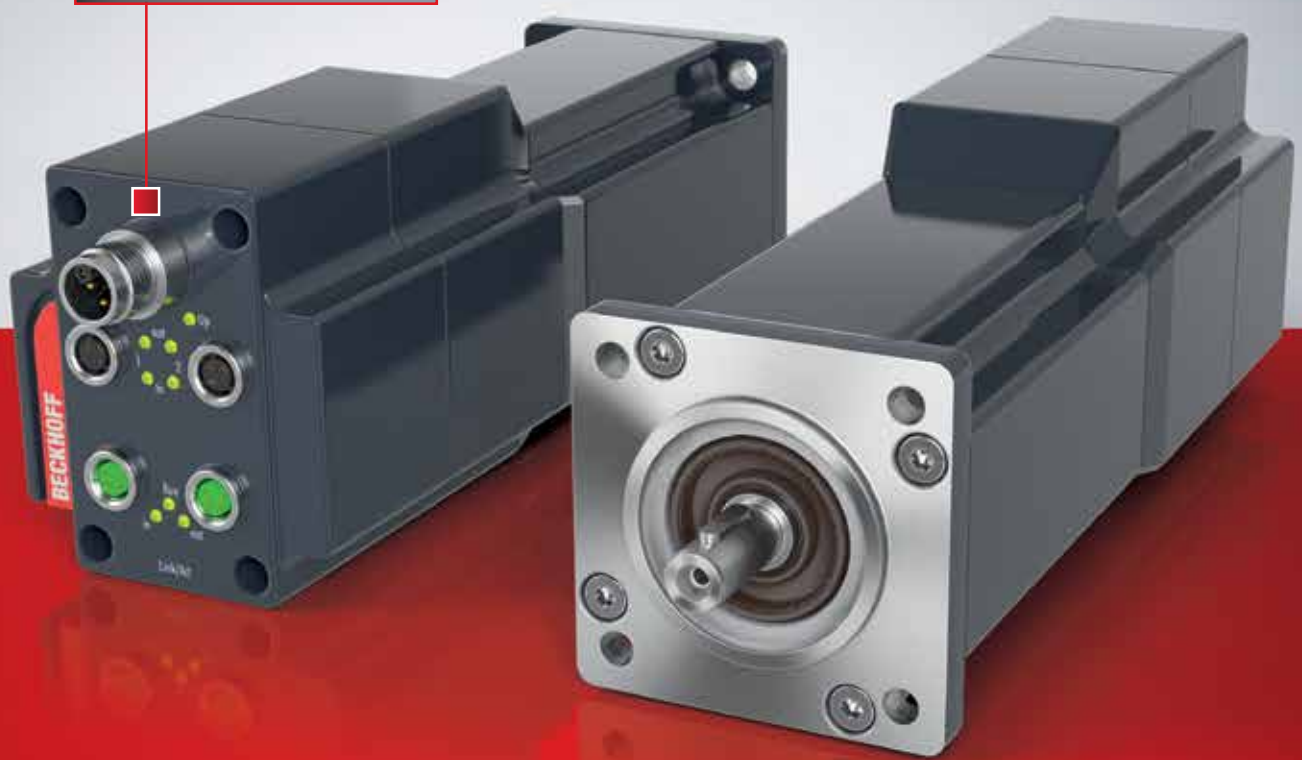

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"We are moving towards a cleaner, greener future"

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As the global industry witnesses powerful impact of human activities on the environment, sustainable technologies are emerging as a new mantra in the manufacturing industry. A recent survey by NASSCOM states that the sustainability market size for green technologies is expected to grow significantly with a CAGR of >25%, with the market size expanding to almost $45b+ by 2028.

Today, organisations have a huge responsibility and opportunity to move towards more sustainable business models, with economies now returning to excellent productivity levels. Against the backdrop of such need, our Cover Story on Green Hydrogen represents a ground-breaking and significant step towards a more sustainable future for all. This lean and clean energy source utilises abundant renewable energy and has the potential to revolutionise the way we power our lives.

This issue delves deep into the cutting-edge world of advanced technologies, showcasing the most exciting and innovative breakthroughs in E-mobility, Robotics and Industrial Automation, Automotive Lightweighting and Battery Swapping technology. From sleek and efficient electric vehicles to state-of-the-art robotic automation systems, these technologies are redefining what is possible in the manufacturing industry.

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

MANAGEMENT NOTE

"Committed to Excellence,Driven by Deadlines"

PI India, the publisher of Efficient Manufacturing (EM) and Automation & Digitisation India (A&D), has successfully implemented the earlier declared changes in our print products, including management engagements, and movements in the business circle.

In our latest issue, we are focusing on the E-Mobility sector, which has emerged as a hot topic among industry, end customers, and governments worldwide, who are targeting sustainability in the next few years. We are excited to cover the latest developments in this field and keep you updated.

As you may already know, PI India has implemented various initiatives through its digital platform (https://pi-india.in/home), which is gaining popularity across the industry. Also we have launched a new weekly video podcast series called 'Morning Bytes with Anushka', wherein industry updates are provided every Monday morning. We encourage everyone to follow this series regularly.

Additionally, we are introducing an industry leader's WhatsApp group to exchange best practices, new ideas, and technology. You can join this group by requesting access. Stay ahead of the curve with us, as we bring you the latest advancements in technology. Reach out to us for engaging articles or to explore exciting business prospects at contactus@pi-india.in or editor@pi-india.in.

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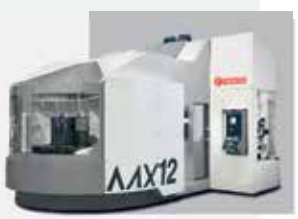

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WALTER

A tribute to the life and work of Waman Dattatreya Patwardhan

A great nuclear chemist known for his work in the Indian Space Program, Indian Nuclear and Missile Program, Waman Dattatreya Patwardhan. He was an IOFS officer and an expert in the science of explosive engineering. He pioneered advancements of nuclear and rocket science in India, which is why he is regarded as one of the most distinguished scientists in India. His expertise in nuclear physics and experimental techniques helped design and build India's first nuclear reactor, and he continued to play a key role in the programme's development, including its nuclear weapons programme.

Patwardhan was born on 30 November 1917 during the British-Indian rule in Jabalpur, Madhya Pradesh. From an early age, he developed a fascination about the science behind explosives. He graduated from Sir Parshurambhau College at the University of Bombay. After obtaining his master's degree in Physics, Patwardhan joined the Tata Institute of Fundamental Research (TIFR) in Mumbai as a research scholar. Early research by Patwardhan concentrated on nuclear physics, notably the investigation of cosmic rays. Along with constructing devices to assess the energy and characteristics of charged particles, he also worked on experimental methodologies. His studies in this area resulted in identification of numerous novel cosmic ray events.

Patwardhan was one of the scientists employed by the Defence Research and Development Organisation, where he focused heavily on disciplines of nuclear chemistry and explosives engineering. When India began its work on the Indian Nuclear Program, Patwardhan was one of the scientists recruited by Homi. J Bhabha. This was major because his expertise in nuclear physics made him an invaluable asset to the programme, and he quickly rose through the ranks. He was appointed as director of the Reactor Group at Trombay.

Patwardhan's astonishing work has left an impact in several areas where he developed a solid propellant for India's first space rocket that was launched from Thumba. His legacy in the Indian nuclear programme remains significant, and his contributions have helped shape India's position in the global nuclear arena. His work also had important implications for India's energy security, as nuclear power has become an increasingly important source of electricity in the country.

He was awarded the Padma Bhushan, India's third-highest civilian award, in 1974 for his outstanding contributions to the fields of nuclear, rocket science and his affiliation with the most prestigious institutions of science and technology, which led to a series of innovations and discoveries that altered India's course. Patwardhan continued to work in the nuclear program until his retirement in 1981. He passed away on 27 July 2007 at the age of 90. ☐

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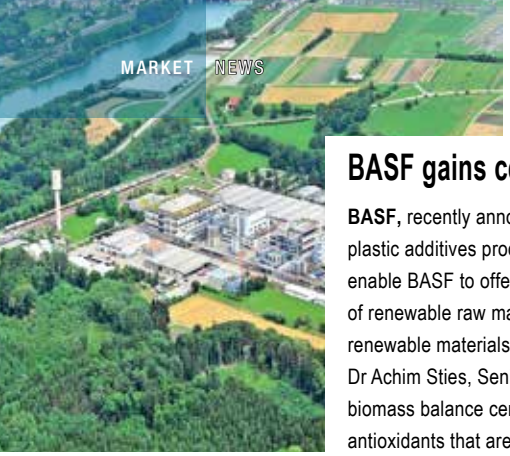

BASF gains certification to expand its offerings for plastic additives

BASF, recently announced that it has received the International Sustainability and Carbon Certification (ISCC) PLUS for certain grades of plastic additives produced at its manufacturing sites in Kaisten, Switzerland, and McIntosh, Alabama, United States. This certification will enable BASF to offer more sustainable grades of its core plastic additives with a reduced Product Carbon Footprint (PCF) through the use of renewable raw materials in a mass balance approach. An ISCC PLUS certification covers the entire value chain and ensures use of renewable materials. It is an internationally recognised certification process for the mass balance methodology.

Dr Achim Sties, Senior Vice President, Plastic Additives, BASF, said, "We are the first plastic additives supplier to offer a selected range of biomass balance certified antioxidants as an extension of our VALERAS® portfolio. Our customers now have a choice of more sustainable antioxidants that are produced using responsibly sourced and renewable materials instead of fossil resources without compromising their high functional performance."

Mitsubishi Electric India CNC partners with SolidCAM to revolutionise the manufacturing industry

Mitsubishi Electric India CNC, recently announced a partnership with SolidCAM, with the aim of establishing the brand as a one-stop solution for machine tool end-users.The major advantages of the partnership include, SolidCAM providing a complete range of machining solutions that integrate high-speed roughing and finishing for various industries, development of new solutions with Digital Twin Technologies, and new CNC functionalities resulting in faster cycle times that ultimately add value to end users. Another advantage is that the software comes with CAD and CAM application that requires no additional customisation in the CNC machines, gives a vision of long-term benefit, and assures a one-stop CNC solution for consumers with easy operations.

Addressing the partnership, Masaya Takeda, General Manager, CNC Systems, Mitsubishi Electric India, said, "The partnership will not only offer cutting-edge solutions but will also give the machine tool industry a chance to enhance training methods for appropriate usage of the technology."

Honeywell sets up a sustainability centre of excellence in Madurai

Honeywell, recently announced the inauguration of its Sustainability Centre of Excellence in Madurai, Tamil Nadu. This facility will serve as a hub for support in engineering, innovation, and collaboration on sustainability initiatives, both within the company and with partners. The centre will focus on developing sustainable methods of production, like product stewardship, an approach focusing on the management of all aspects of a product, its components, its compliance regulations, and life cycle analysis. In addition to its engineering efforts, the centre will also serve as a hub for thought leadership, training and education on sustainability, hosting workshops focused on driving sustainability in business and society. Gavin Towler, Vice President and Chief Technology Officer, Honeywell Performance Materials & Technologies (PMT) and Honeywell UOP, said, " As a hub of engineering, innovation, and collaboration, the Centre will fuel new paradigms in sustainability ranging from the development of capabilities to reduce carbon emissions to driving positive environmental impact through monitoring and reporting."

Siemens partners with Gujarat Metro Rail Corporation

Siemens, as part of a consortium along with Rail Vikas Nigam, received two separate orders from Gujarat Metro Rail Corporation Limited (GMRCL). Siemens share as part of the consortium is ₹678 crores. The orders are for Surat Metro Phase 1 (over 40 kilometres, covering 38 stations and two depots) and Ahmedabad Metro Phase 2 (over 28 kilometres, covering 23 stations and one depot). Siemens will provide project management, and rail electrification technologies, including advanced power supply and distribution systems. In addition, Siemens will also be providing advanced digital solutions such as Supervisory Control and Data Acquisition (SCADA) solutions for both metros.

Gunjan Vakharia, Head of Mobility Business, Siemens said, "Siemens is an integral part of the development of Gujarat's public transportation system through these landmark metro projects. They will play a pivotal role in enhancing the quality of life and the all-round growth of the cities and region."

UNITED GRINDING Group offers digital products

UNITED GRINDING Group, offers digital products that not only make work easier for its customers but also save time and money, like Remote Service, Service Monitor, Production, and Monitor. Remote Service offers uncomplicated and fast assistance, for example, in the event of machine downtime. By triggering a service request, customers can request quick and uncomplicated help by pressing a button. This service request can be submitted by the customer via a smartphone and corresponding Digital Solutions app or via Customer Cockpit. With a machine equipped with modern C.O.R.E. technology, this is now even possible directly on the machine. The Service Monitor relieves those responsible for maintenance by clearly displaying all the important maintenance tasks based on the current machine's operating hours. The Service Cockpit can even be used to centrally manage, monitor, and document maintenance due dates for several connected machines. Production managers can monitor the production output of the machinery at any time using the Production Monitor. Production benchmarks, such as operating and non-productive times, production quantities, and downtimes, are displayed in real-time.

XTEK HighCom signs MoU with Tata Advance Systems on Indian Defence market collaboration

XTEK, announced that its HighCom Armour Solutions unit has signed a collaboration agreement with Tata Advanced Systems (TASL), to collaborate on the supply of its advanced Level III Rifle Combat Helmets (RCH) for the Indian Defence market. The advanced ballistic helmets, which stop AK-47 and other high-powered assault rifle bullets, are manufactured using patented XTclave technology. The Indian Ministry of Defence (MoD) is expected to commence a major capability enhancement programme for its soldier ballistic head protection for specialist military units in FY 2024 that will potentially see many thousands of new advanced helmets being required each year. Scott Basham, XTEK's Group CEO, said, "Working with the team at TASL to penetrate huge Indian Defence market makes tremendous sense for us, and I expect that together, we will be able to fully meet the Indian military's future requirements for new advanced ballistic head protection with our outstanding XTclave made Rifle Combat Helmets."

3M and Guardhat announce collaboration on connected safety

3M India, recently announced a collaboration with Guardhat with an aim of transferring its Safety Inspection Management (SIM) software to Guardhat. The transition is expected to be completed in mid-2023. In addition to SIM transition, the two companies will evaluate future opportunities to collaborate by combining 3M's expertise in personal protection equipment with Guardhat's leading worker-centric software platform to create connected safety opportunities that aim to keep more frontline workers safe. SIM is a cloud- and mobile-based system that simplifies compliance, improves safety, and eases work for EHS teams by digitally connecting people, places, and PPE. Via mobile apps, RFID tags, and barcodes, operations teams gain visibility into equipment status and location, training schedules, requirements, and inspection workflows to keep work moving while keeping people safe. Ray Eby, President, 3M Personal Safety Division (PSD), said, "3M and Guardhat share a common mission to help workers get the job done and get them safely back home."

BHEL and NPCIL signs MoU for collaboration for PHWR Technology based nuclear power plants

Bharat Heavy Electricals Limited (BHEL) and the state-run PSU Nuclear Power Corporation of India Limited (NPCIL), have entered into an MoU to jointly pursue business opportunities in the area of nuclear power plants based on Pressurised Heavy Water Reactor (PHWR) technology. Under the MoU, BHEL and NPCIL will jointly explore opportunities for the development of Nuclear Power Projects with a view to reducing project gestation time. Collaboration between the two major Public Sector Enterprises will pave way for early implementation of non-polluting and long-cycle Nuclear Power Projects, which will also complement the G20 theme of environmental sustainability and contribute towards a cleaner and greener future. Notably, the BHEL-supplied Steam Turbine Generator set for Unit 1 (220 MW) of NPCIL's Kaiga nuclear power plant in Karnataka created a world record of 962 days of continuous operation in December 2018, proving the best integrated performance of nuclear reactor and turbine system.

"Quality, performance, and sustainability, are the new standards manufacturing processes should adopt"

…says **Hitesh Mehta,** General Manager, Honeywell Advanced Materials, India. In an interview with Sanjay Jadhav, he talks about the role of advanced materials in the manufacturing landscape.

As per reports, advanced materials are predicted to reach a US$10 billion market in India by 2028. How is Honeywell Advanced Materials aiming to meet this growing demand?

The demand for advanced materials in India is driven by numerous end-use industries such as automotive, transportation, aerospace and defence, energy, medical, construction, etc., due to their better performance, efficiency, lower weight, sustainability, and cost-effectiveness. Nearly 60% of our R&D expenditures are directed towards developing products that help end-users reduce their environmental footprint. As India is poised to transition to a circular economy, we have observed great demand for Ultra-low Global Warming Potential (ULGWP) technologies. Our Solstice® range of refrigerants is based on Hydrofluoro olefin (HFO) chemistry and has an Ultra-low Global Warming Potential.

Can you trace the journey of advanced materials over the years and how has it shaped up the market scenario of industrial manufacturing in recent years?

Engineered materials have been in existence since the bronze age. Around 3000 years ago, metallurgists discovered that combining carbon with iron while applying intense heat created steel. Soon after, the Industrial Revolution introduced the concept of cheap mass production of higher-grade steel, which was followed by a flood of technological innovations. The innovations during this period led to the discovery of atoms and established our understanding of how materials function at an atomic level. Advancements in technology in the 20th century, along with a new understanding of atoms, laid the foundation for the creation of advanced materials. Today's technological innovations are allowing scientists to manipulate substances at an atomic level.

How do advanced materials boost performance and efficiency in the manufacturing arena?

To maintain competitiveness in emerging markets, it is imperative for manufacturing processes to achieve new standards in terms of product quality, performance, and sustainability. Materials used in product manufacturing have a direct impact on manufacturers' and revenue across industry verticals. Aligning these with customer preferences, such as better performance and lighter weight, can help manufacturers achieve product differentiation, which will not only increase market share but also offer them better pricing power.

What do you see as the future of advanced materials in industrial manufacturing, and how is Honeywell positioned to drive innovation in this area?

Many current challenges related to healthcare, energy, and transportation will benefit from improvements in materials from our ability to optimise the size, atomic structure, and production process in the future. The growing urgency to address profound environmental issues like climate change, depleting natural resources, etc. and will propel the advanced materials market to new heights. We have invested a billion dollars in research, development, and new capacity for Solstice® technology, having anticipated the need for lower-Global Warming Potential (GWP) solutions to combat climate change more than a decade ago.

"Time to scale manufacturing industries with disruptive Data Science Platform"

…says **Dr Prashant Pansare,** CEO & Founder, Rubiscape Labs. In an interview with Neha Basudkar Ghate, he explains unfolding the complexity of manufacturers with the help of efficient data science platform.

How is your company's Data Science platform used in the Indian manufacturing ecosystem?

Our platform is fast, flexible, secure, and scalable, with a user-centric design and open architecture for a revolutionary data science experience. It results in 3x faster data pipelines and a 5x lower TCO. Usually, Data Science platforms are used in the Indian manufacturing ecosystem to improve operations and outcomes. By collecting, analysing, and acting on vast amounts of data generated by manufacturing processes, companies can increase efficiency, reduce costs, and improve product quality, resulting in improved customer satisfaction and revenue.

What challenges do manufacturers face when it comes to utilising data effectively, and how does Rubiscape's address them?

When it comes to utilising data effectively, the biggest challenge that manufacturers face is the sheer volume and complexity of data generated by manufacturing processes. Rubiscape Data Science Platform addresses this challenge by providing manufacturers with a comprehensive data analytics solution, by consolidating data from various sources and applying advanced metrics.

Can you share any success stories of manufacturers who have implemented Rubiscape's platform and seen tangible results?

One of our clients, a large international automotive manufacturer, was able to reduce its production lead time by 30% after implementing Rubiscape's platform. This led to improved efficiency and cost savings for the company. Another client from the finance sector saw a 25% growth in their business after using Rubiscape's platform.

Can you tell us about any new developments and how they will benefit the manufacturing and/or automotive sectors?

Rubiscape recently launched AI-ML-powered software and an IoT Accelerator for Machine Intelligence for the manufacturing segment. The platform is designed to be highly customisable and adaptable to different industries and manufacturing processes. We are well positioned in terms of readiness, as our new version can cater to a vast range of industries, including food processing, retail, and electronics manufacturing.

How is your company working towards the growing Indian data science market in the coming years?

We plan to invest in research and development to better understand the needs and opportunities in the Indian market. Going ahead, we may also be establishing collaborations exclusively with the public and defence sectors. India has the potential to become a global talent supplier for Artificial Intelligence and is also witnessing massive investments in manufacturing, infrastructure, defence, and the public sector. This creates a huge opportunity for initiatives like Skills India, and the company is proud to be partnering with some of the leading IIT's and prominent institutions by establishing AI- DS Application Labs and Centre of Excellences'.

"Optimising manufacturing practices is essential"

...says ***Vishwanath Rao,*** Managing Director, Altair India. In an interaction with Neha Basudkar Ghate, he explains the role of modern manufacturing processes in the current Indian landscape.

Over the last decade, how has Altair India's business model evolved with time?

Altair has many firsts to its credit, being a pioneer in value-based licencing is one of them. We have always strived to provide the best returns on our customers' investments in our state-of-the-art technologies. Whether it is a token-based licencing system that gives customers easy access to our entire range of technologies without any additional investments, or it is about including allied technologies through Altair Partner Alliance again at no additional costs, make our business model one of the most unique in the market today.

Further fine-tuning our token-based licencing system into value buckets that best serve application requirements concept design, mechanical engineering, mechatronics applications, or enterprise-wide usage. Add to this an increased focus on verticalisation to support our customers' industry-specific R&D efforts, creating configurable simulation templates and embedding AI into our applications to enable our customers to reduce their time to market, provide the widest range of technologies spanning design, engineering, manufacturing, and business, are all geared to meet the changing market requirements.

How are disruptive technologies transforming the way companies innovate?

We are at the vanguard of disruptive technologies like Digital Twins, Machine Learning (ML), and Additive Manufacturing (AM) which are part of all that we do.

AI and ML are changing the way Altair's software works by enabling

engineers to use data-driven insights to optimise designs and simulations. For example, Altair's OptiStruct software uses AI to automatically generate optimised designs that are stronger, lighter, and more cost-effective. AI and ML also form the core of our one-twin approach, which leverages best of physics-based and data-based digital twins. They are also extended to business functions through our extended data analytics portfolio, with Altair RapidMiner providing solutions that span every vertical, including BFSI. Our simulation software helps engineers optimise designs for AM, reducing time and cost of the manufacturing process.

How are modern manufacturing practices helping open new horizons for the Indian engineering sector?

Modern manufacturing practices have revolutionised the Indian engineering sector by introducing new technologies, automation, and process improvements that have increased productivity, reduced costs, and improved quality. Additive Manufacturing specifically has had a significant impact by enabling new possibilities in product design, reducing waste, improving supply chain efficiency, enabling customisation, and opening up new applications in various industries.

Altair, as a technology company, has played a significant role in this sector as well, having introduced various software solutions that have helped manufacturers optimise their designs, reduce development time, and enhance product performance. Our optimisation solutions allow manufacturers to simulate and test their designs before physical prototypes are made, also considering their manufacturability. This helps them identify potential issues early in the development process and make necessary changes to improve the design, ensuring the design lends itself to manufacturability. This reduces the time and cost associated with physical testing, streamlines the development process, and helps identify the best possible design solutions based on a range of criteria, such as performance, cost, and weight.

What are the key strategic policies that have helped Altair India succeed in the Indian market? How beneficial do you think these policies are for the Indian economy?

Altair defines a global strategic roadmap, with many organisations having footprints in multiple countries, India being one of them. The concerns and challenges of product development are universal in nature—quicker time to market, cost savings, and lightweighting to name a few. The same extends to India. Specifically, in India, with the thriving culture of start-ups, insistence on 'Atmanirbharta' (self-reliance), increasing use of AI and ML in engineering, adoption of electrification driven by sustainability goals and convergence becomes the leading concept that defines the early success of R&D initiatives.

The availability of all technologies on the cloud through AltairOne further makes it ubiquitous—it is now available anywhere, anytime, under a single licensing mechanism. The continuous addition of newer technologies to meet every demand of R&D, a widening reseller network, multiple modes of accessing the technology, unified licensing, and an experienced team of Altair domain experts form the core of serving our customers in India, as we do in other countries globally.

What measures have you implemented to improve its ROI and enhance revenue and profit margins, and how have these endeavors influenced the company's overall accomplishments?

Moving to a lease-based licensing model to provide flexibility in usage upgrades to our customers under our all-in, unit-based licensing mechanism eases the adoption of technology more widely in the enterprise. The availability of data analysis solutions—Altair RapidMiner—now expands the scope of our technologies, extending to non-engineering departments as well, under the same licensing mechanism.

Increased focus on a value-based reseller network that allows more feet on the ground for better market coverage and an easy reach for support further helps meet the revenue and profit targets through reduced fixed overheads.

Can you share some of the latest simulation projects that have been able to handle the increasing complexity of machines today?

Digital Twins are revolutionising the product design process by providing real-time insights into how machines are being used. By incorporating sensor data into simulation models, it is possible to create high-fidelity replicas of physical assets in near real-time. At Altair, we have been dedicated to helping our customers build Digital Twins through our recent efforts. We have also placed a significant focus on sustainability, helping customers achieve their sustainability goals through various means such as creating lightweight designs that consume less material, improving machine efficiency to increase throughput while using less energy, and transitioning towards electrification.

How do you foresee achieving future growth and expansion while ensuring profitability and promoting business development?

Altair works with a multiple-horizon view, ensuring today's revenue goals are achieved with an eye on what the future entails and the direction that product development will need to follow to meet the challenges of tomorrow. Whether it is electrification, Digital Twins, or the increasing focus on sustainability in the coming times, we are geared up to contribute to both – defining the future and delivering upon it. ☐

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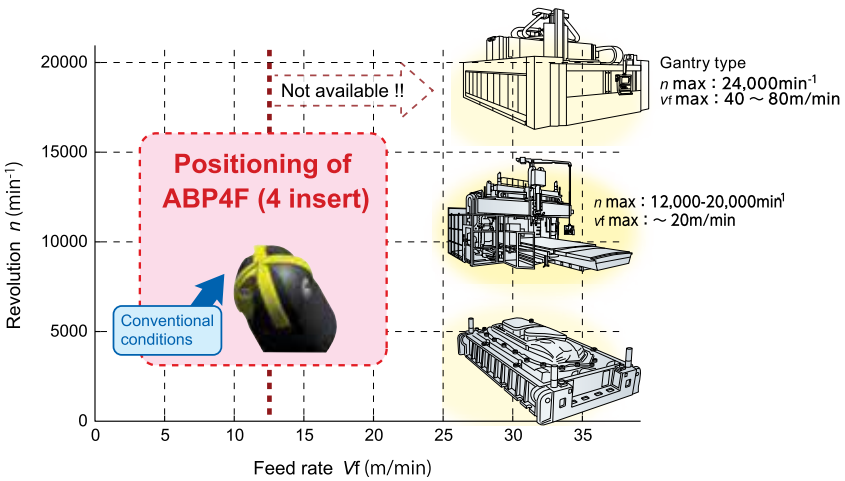
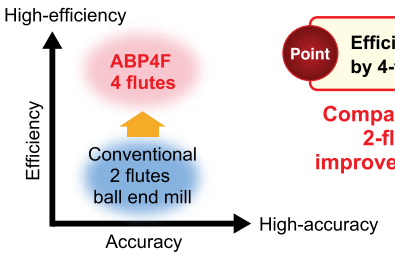
・New product: 4-flute ball end mill (ϕ20 to ϕ30) compatible with machines ranging from general-purpose manufacturing machines to the latest high-speed machines

Example of large press die for automotive parts



Processing advantage of 4-flutes end mill

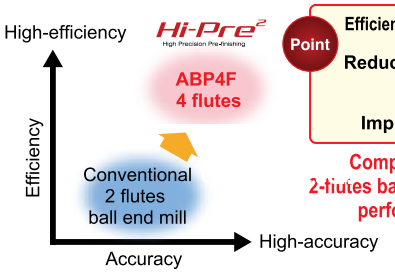
Figure Finishing



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
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Improve finishing accuracy

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

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YOUR GLOBAL CRAFTSMAN STUDIO

GREEN TECHNOLOGY

The Future of Power Generation

Green technology provides a solution, a means to a better, more viable future. It is not just about building more effective systems or lowering our ecological impact; it is about changing how we engage with our surroundings and the world. A read on…

Prem Krishna Sankar,

General Manager - Power and Gas, Lagos Free Zone

The ambitious target of decarbonising the entire planet by 2050 has prompted countries across the globe to pursue a range of transformative strategies. Among them, a pivotal approach is the decarbonisation of hydrogen production, which can generate green hydrogen and tackle the alarming contribution of hydrogen to over 2% of the world's total CO2 emissions.

As our daily routine continues to evolve, the insatiable demand for power grows with it. According to the International Energy Agency (IEA), by 2040, global energy demand is expected to surge by 25–30%, a trajectory that, in a carbon-intensive economy, would trigger a catastrophic surge in CO2 emissions, accelerating the pace of climate change. Yet, envisioning a world in 2050 where decarbonisation reigns supreme offers a ray of hope: one that is more accessible, efficient, and sustainable, and powered by clean, renewable energy sources such as green hydrogen.

UNLOCKING GREEN HYDROGEN

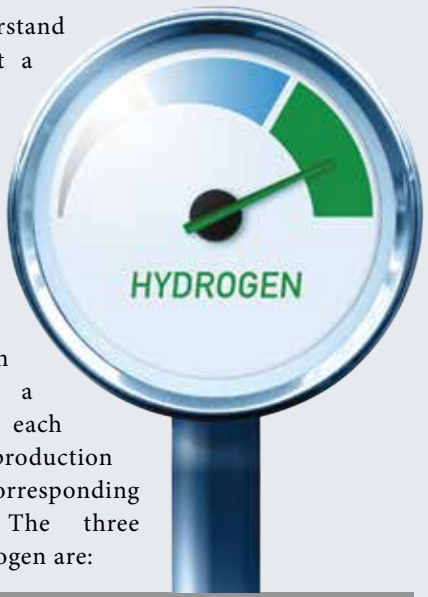
The globe is increasingly transitioning towards sustainable energy sources, and Green Hydrogen is the most recent addition to the list. Green Hydrogen is a lean and sustainable energy source produced by electrolysis utilising renewable energy sources such as the sun, wind, or hydropower. It has potential to revolutionise the way we power our lives.

Green Hydrogen is created by cleaning water and dividing it into Hydrogen and Oxygen using an electric current. The hydrogen gas is then compressed and stored until it is needed. But that's not all; another process known as Pyro-gasification can produce Green Hydrogen. It entails turning biomass or organic resources into syngas, which may subsequently be utilised to generate Green Hydrogen.

With climate change, the world desperately needs renewable energy sources that can erase the damage caused by conventional fuels. Fortunately, green technology provides a ray of hope. Energy from Green Hydrogen emits just water vapour, making it an environmentally beneficial and reusable fuel. Not just that, Green Hydrogen is distinguished by its flexibility. It can potentially be employed as a fuel in difficult-to-decarbonise sectors such as airplanes, heavy-duty transportation, and high-temperature industrial processes. It is also an excellent energy transmission and storage alternative that is simple to store and transport.

Green hydrogen technology is being hailed as a game changer in renewable energy. It serves as a reminder that the population can still affect change and a call to action for a more sustainable future. Not only developed countries are paying attention, countries such as Kenya, Morocco, and Nigeria see its potential to boost economic stability while lowering carbon emissions. During the last United Nations Climate Change Conference in Glasgow (COP26), $8.5 billion was allocated to investigate new economic prospects, including Green Hydrogen.

THE SPECTRUM OF HYDROGEN



It is crucial to understand that hydrogen is not a one-size-fits-all solution, and its production methods can vary widely, resulting in different carbon footprints. Despite its colourless appearance, hydrogen is categorised into a spectrum of colours, each denoting a specific production process and corresponding emissions profile. The three primary types of hydrogen are:

- **Grey: Produced by natural gas combustion, releasing CO2 into the atmosphere. (This method emits less CO2 than black or brown hydrogen, which is derived from different types of coal.)**
- **Blue: A low-carbon variant obtained by combusting natural gas through steam methane reforming while simultaneously capturing and storing carbon dioxide underground. For blue hydrogen to be considered 'clean,' it must ensure minimal methane leakages, high carbon capture rates, and permanent carbon storage to prevent atmospheric release.**
- **Green: An emission-free alternative generated using an electrolyser powered by renewable energy.**

GREEN TECHNOLOGY IN ACTION

The supply of hydrogen to the industrial sector has emerged as a thriving enterprise worldwide. With the demand for hydrogen increasing threefold since 1975 and continuing to rise, fossil fuels remain the primary source of its production, consuming approximately 6% of global natural gas and 2% of global coal. This reliance on traditional energy sources results in the production of nearly 830 million tonnes of carbon dioxide annually, equivalent to the combined CO2 emissions of the United Kingdom and Indonesia, causing an alarming impact on the environment.

Demand for hydrogen reached 94 million tonnes in 2021,

containing energy equal to about 2.5% of global final energy consumption, up from a pre-pandemic total of 91 metric tonnes in 2019, IEA figures show. The Agency further reveals that the demand for hydrogen reached an estimated 87 million metric tonnes (MT) in 2020 and is expected to grow to 500–680 million MT by 2050.

According to the Hydrogen Clean Energy Transition Report 2023 of the World Economic Forum, in the wake of the current energy crisis, governments are seen to increasingly pursue a future-proof strategy, investing in new natural gas and LNG infrastructure, which could in the future accommodate clean hydrogen.

If all current projects are brought online, by 2030, low-carbon hydrogen capacity could reach 16–24 MT annually, with green hydrogen from electrolysers accounting for 9–14 MT and blue hydrogen accounting for between 7–10 MT.

However, in a sector characterised by a trinity of uncertainties about future hydrogen demand, inconsistent regulatory frameworks, and a lack of available infrastructure to transport hydrogen, just 4% of new projects are under construction or have made it to a final investment decision, the IEA Global Hydrogen Review 2022 shows.

In 2022, year-on-year annual electrolyser capacity doubled to reach 8 gigawatts. If all the new projects announced by industry are brought to life, this could reach 60 gigawatts annually by 2030. And if this happens alongside the planned scale-up in manufacturing capacities, the cost of electrolysers could fall by 70% by 2030, compared with 2022 prices—similar to the dramatic price falls that helped boost wind and solar power take-up.

Amid these signs of progress, there are also words of caution. Production of clean hydrogen is not growing fast enough to meet the IEA's Net Zero Emissions by 2050 scenario.

Urgent action is required to encourage greater investment and incentives to both scale-up supplies and create demand for premium-priced low-carbon hydrogen.

The versatile nature of hydrogen has led to its increasing use in various industries, including power generation, steelmaking, cement production, electric vehicles, shipping, refrigeration, and even electricity grid stabilisation. Additionally, green hydrogen is being utilised for producing green ammonia that serves as fertiliser, cleaning product, and other chemical applications.

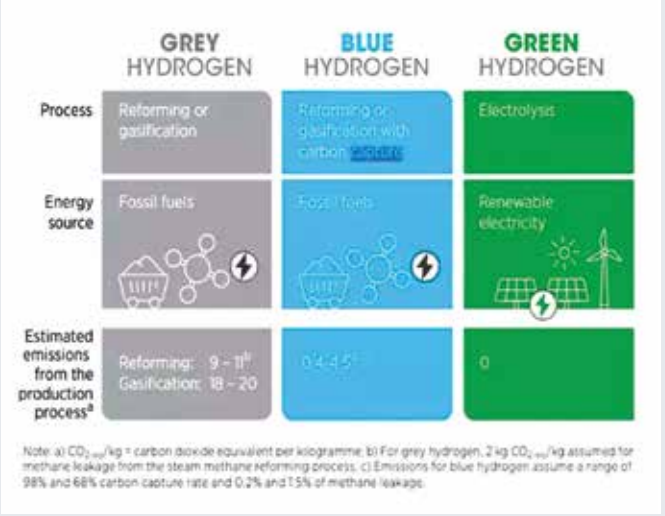
UNLOCKING NEW FRONTIERS TO PRODUCE GREEN HYDROGEN

The International Renewable Energy Agency (IRENA) has released a fresh report, titled "Geopolitics of the Energy Transformation: The Hydrogen Factor," that examines the geopolitical and economic transformations in the energy sector. The report highlights six leading nations that have taken significant strides in promoting clean hydrogen value chains by spearheading policy initiatives, technological advancements, and export infrastructure. These developments are essential to facilitating the decarbonisation of industries like steelmaking, shipping, and road haulage.

• China:

China dominates the global hydrogen market, both in consumption and production, with an annual usage of more than 24 million tonnes. However, most of its production relies on 'grey' hydrogen generated from fossil fuels such as coal. Despite this, the country has established over 30 'green' hydrogen projects that use renewable energy to produce emissions-free hydrogen since 2019.

In 2016, China released its first hydrogen roadmap, which helped to develop the world's third-largest fleet of Fuel-Cell Electric Vehicles (FCEVs) and pioneered the development of fuel-cell buses and trucks. Additionally, China's five-year economic plan recognises hydrogen as one of the six future industries. Although there is no national strategy in place yet, hydrogen has been incorporated into 16 provincial and city energy strategies.



Emissions-free 'green' hydrogen is generated using renewable energy. Image: Irena

• India :

During the launch of India's National Hydrogen Mission in 2021, Prime Minister Narendra Modi stated that green hydrogen could help the country achieve energy independence by 2047, making a 'quantum leap'. As part of this initiative, policymakers are considering legislation that would require oil refineries and fertiliser plants to use a certain percentage of green hydrogen in their industrial processes. As India transitions towards renewables and reduces its reliance on imported fossil fuels, green hydrogen could be a valuable opportunity for the country, according

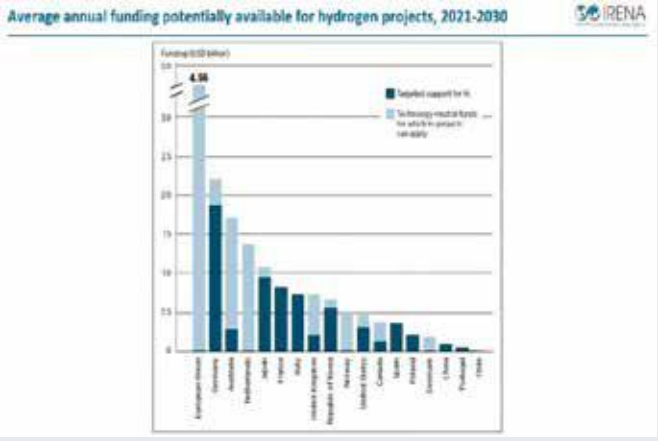
to Tim Buckley, Director of Energy Finance Studies at the Institute for Energy Economics and Financial Analysis.

• Japan:

According to the IRENA report, Japan was the first country to introduce a national hydrogen strategy in 2017, aiming to establish itself as the world's foremost 'hydrogen society' by utilising the fuel in all sectors. Due to the scarcity of natural resources necessary to produce clean hydrogen on a large scale, Japan is seeking to establish long-term supply agreements to import hydrogen from overseas. In addition to government investments totaling $670 million in hydrogen and fuel cell technologies in 2020, policymakers have set targets for mobility, including 800,000 FCEVs and 900 hydrogen refueling stations by 2030.

• The European Union

In 2020, the European Union (EU) released its national hydrogen strategy, acknowledging hydrogen as a crucial technology for accomplishing its policy objectives, particularly the European Green Deal. The EU's plan concentrates on emissions-free green hydrogen, aiming to establish 40 gigawatts of renewable hydrogen electrolyser capacity by 2030. However, with only 2.7 gigawatts of green hydrogen capacity projected to be in place by 2025, achieving this ambitious goal will be a difficult task. To support investment and large-scale implementation of clean hydrogen initiatives, the European Clean Hydrogen Alliance was launched, as the EU endeavours to lead the industry in clean hydrogen. Within the bloc, some member states are expected to emerge as significant hydrogen importers, exporters, or transit hubs.



The EU has an annual funding potential for hydrogen projects of $4.56 billion. Image: Irena

• South Korea:

South Korea aims to become a leader in the development and implementation of Fuel Cell Electric Vehicles (FCEVs) and large-scale stationary fuel cells for hydrogen power generation, as it views clean hydrogen as a key driver for economic growth and job creation. Its Green New Deal includes an ambitious target of deploying 200,000 FCEVs by 2025, which is 20 times more than in 2020.

Additionally, South Korea enacted the Economic Promotion and Safety Control of Hydrogen Act in 2020, the first law in the world to promote hydrogen vehicles, charging stations, and fuel cells. IRENA reports that the country plans to increase the use of hydrogen to provide 10% of the energy needs of its cities, counties, and towns by 2030, with a goal to reach 30% by 2040, making hydrogen its largest energy carrier by mid-century.

• United Nations:

The United States is the world's second-largest hydrogen producer and consumer, after China, accounting for 13% of global demand. States like California have been supporting the country's FCEV market growth for more than a decade through initiatives such as the Clean Vehicle Rebate Program, making the US a leader in the field until 2020.

In 2021, the Infrastructure Investment and Jobs Act was passed, providing a $9.5 billion budget to promote clean hydrogen development. This was followed by the launch of the government's Hydrogen Earthshot program, which aims to reduce the cost of clean hydrogen to $1 per kilogramme within a decade, known as the '111 goals.'

• Other Countries:

According to the report, countries like Chile in South America and African nations such as Morocco and Namibia, which were previously net energy importers, are now turning into exporters of green hydrogen that is free from emissions. On the other hand, fossil fuel exporting countries like Australia, Oman, Saudi Arabia, and the United Arab Emirates are exploring clean hydrogen as a means to diversify their economies. Similarly.

Nigeria has the largest and most prosperous economy in sub-Saharan Africa, but its power generation sector's limited growth hinders its growth. The country primarily relies on diesel to generate power, which restricts power generation to 4 to 5 Gigawatts.

The unstable national grid and other power sector planning shortfalls lead to various challenges for industries. However, the Lagos Free Zone's green technology initiative aims to promote environmental sustainability by using solar power to generate electricity and reduce dependence on fossil fuels by 2025-2030.

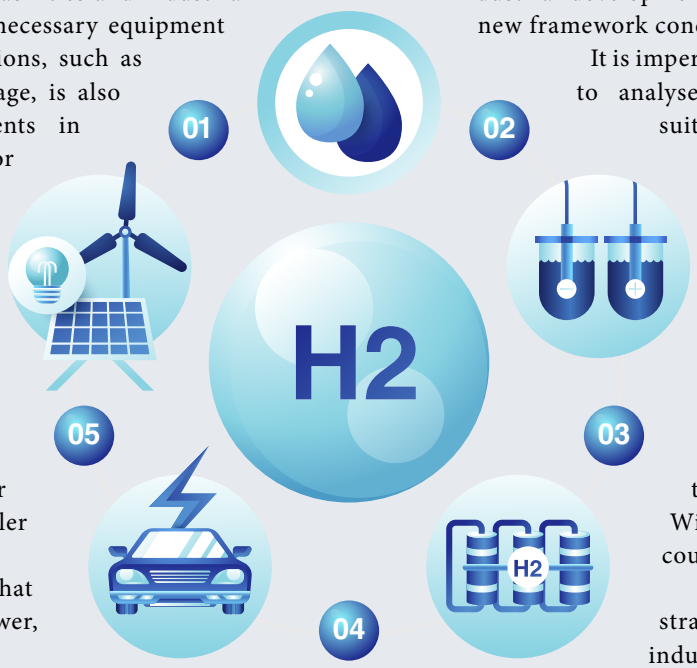
Established in 2012, Lagos Free Zone (LFZ) is an award-winning port-based industrial zone (850 hectares) in Lagos, Nigeria, with over USD 2.5 billion committed FDI projects to date. Owned and promoted by Tolaram, LFZ is strategically positioned to attract projects from the green/blue/grey hydrogen value chain.

INSIGHTS OF GLOBAL HYDROGEN POWERHOUSE

The world's hydrogen powerhouse is growing due to significant investments made by many nations in hydrogen technology as part of their shift to renewable energy. The IEA's prediction is that hydrogen may satisfy many of the world's energy demands.

According to the Industrial Analytics Forum, there are four main channels through which green hydrogen can, either directly or indirectly, spur industrial development.

Firstly, to replace fossil fuels in the power sector, a significant investment in renewable power is necessary. The demand for green hydrogen from hard-to-decarbonise economic activities will further intensify the requirement for renewable energy. Therefore, favourable locations for solar and wind farms, geothermal and hydropower projects, and the use of biomass will attract significant investment. Developing technological capabilities and industrial clusters to manufacture the necessary equipment and advance related innovations, such as smart grids and energy storage, is also crucial. Secondly, investments in electrolysers are necessary for the conversion of renewable power into green hydrogen. Although green hydrogen can be readily stored and utilised in certain industrial processes, it must be transformed into higher energy-density products like methanol or ammonia for other processes, and for simpler storage and transportation.



Furthermore, countries that can produce renewable power, green hydrogen, and its byproducts in large quantities at a low cost will become more appealing to energy-intensive sectors such as steel and chemicals. These sectors, in turn, supply raw materials to various downstream industries, including pharmaceuticals, fertilisers, and automobiles. As the pressure to reduce emissions increases, the availability of renewable energy and green hydrogen is becoming a significant factor in attracting industries. For instance, the automotive industry is already seeing a shift towards relocating aluminium parts and carbon fibre production to regions with affordable renewable power, known as the 'renewables pull.'

Finally, advanced innovation systems and Industry 4.0 technologies can assist nations in overcoming the costs and inefficiencies related to green hydrogen production and also capitalise on the expanding market for hydrogen-based technology exports. This market includes fuel cell technology, hydrogen-based steelmaking technologies, and synthetic fuels that employ various digital solutions like Big Data Analytics, Digital Twins, Sensors, Artificial Intelligence, and blockchain-based traceability systems.

TOWARDS A CLEANER ENERGY SOURCE

It is evident that green hydrogen will play a crucial role in the future global economy, and therefore, governments, industries, and other stakeholders must adjust their industrial development strategies to align with the new framework conditions.

It is imperative for societal stakeholders to analyse and determine the most suitable industrial pathway that aligns with their factor endowments, technological capabilities, and geographical advantages. However, each pathway requires a different set of investments in renewables, electrolysers, grids, ports, and pipelines, generating uncertainty about transport options and costs. With an increasing number of countries developing green hydrogen roadmaps and strategies, it is crucial for most industrialised countries to secure the import of green hydrogen, decarbonise their industries, shield them from unfair competition, and exploit early mover advantages. Developing countries with abundant renewable energy resources can leverage green hydrogen as a promising export option. In light of the growing adoption of green hydrogen globally, all countries must proactively adapt their industrial strategies to ensure they are not left behind. Green hydrogen is undoubtedly here to stay and will be a key driver of the future global economy. ☐

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E-mobility in India: The road ahead

The future of the EV industry in India looks bright, with potential to create millions of jobs and contribute towards the country's Green-India goal. With right policies, infrastructure, and investments, EV industry can redefine the transportation and logistics sector and lead the way towards a cleaner and sustainable future.

Visakh Sasikumar,
Co-founder & CEO,
Fyn Mobility

Electric Vehicles (EVs) are the future of transportation, and India is no exception. The Indian EV industry has seen tremendous growth in recent years, with record-breaking sales in the two-wheeler, three-wheeler, and four-wheeler segments. This growth has been facilitated by significant investment in EV manufacturing, infrastructure, research, and development.

Financing for EVs has also increased, with lenders showing more confidence in the quality and performance of these vehicles. Furthermore, the commercial sector has witnessed record levels of adoption of electric three-wheelers as customers find comfort in their reliability and cost-effectiveness for last-mile deliveries.

Growth of the EV market

The rapid growth and adoption of EVs have led to the creation of excellent employment opportunities, with the industry expected to employ 60 million people directly and indirectly by 2030. The Global Electric Mobility Market is predicted to reach $2.7 trillion by 2030, with a significant portion of this attributed to the logistics sector's mass adoption of EVs.

The Indian government's initiatives to promote EV adoption, such as FAME 1 and 2, tax incentives, and subsidies on charging infrastructure development, have led to emergence of multiple new players in the market offering innovative solutions for last-mile logistics and transportation. Public-private partnerships and startups will lead to a more robust charging infrastructure in major cities, with fast chargers being the primary focus to optimise EV usage and reduce fuel and operational costs even further. Battery swapping and EV service stations will also increase as businesses shape the EV ecosystem.

Challenges faced

- **Development of rare-earth-free technologies:** With this, the proper disposal of end-of-life batteries is crucial to ensuring long-term success of the EV industry. The

introduction of new technologies, such as sodium-ion batteries and motors without rare earth materials, will bring some relief in terms of lead time and cost. However, semiconductors might still pose a challenge, as they are still being set up and evolving in India.

• **Need for charging and parking infrastructure:** This is important to cater to growing need for EVs. As of January 23, 2023, India has around 5,254 public EV charging stations serving 20.65 lakh EVs, which means there is one public charging station available for every 393 electric vehicles. To promote growth of the EV industry, the government should invest more in EV infrastructure and incentivise more private players to join the market.

• **Battery safety:** In the upcoming year, battery safety will improve due to advancements in design, manufacturing technology, and the implementation of smart Battery Management Systems (BMS). Additionally, the market may witness emergence of novel battery technologies such as Sodium Ion batteries. Integration of the Internet of Things (IoT) and other technologies will also be a prominent trend, enhancing decision-making for businesses using EV fleets, and making them smarter and more efficient operations.

• **E-waste:** EV batteries have a limited lifespan and need to be disposed off properly to prevent environmental harm. The government has introduced Battery Waste Management Rules, 2020, which require EV manufacturers to set up collection points and ensure their proper disposal. This will help create a circular economy for EV batteries and reduce negative impact of e-waste on the environment.

• **Need for skilled manpower:** This is required to support the given sector as well. We need more people who understand the technology behind EVs and their maintenance. Another factor to keep in mind is training of drivers who eventually drive these vehicles. They need to be educated on how to efficiently operate and care for vehicles they would ride regularly. This will help reduce early breakdowns, and maintenance costs and lead to a more sustainable and long life for EV fleets.

• **Constant need for more innovation:** This will help optimise the use and deployment of EVs in the commercial sector. In 2022, the Indian EV ecosystem witnessed innovative partnerships between EV startups, battery and component manufacturers, and Original Equipment Manufacturers (OEMs). One such partnership allows us to now charge our commercial three-wheelers in just 15 minutes.

This is a great win for the logistics sector, which works around the clock and can benefit from the time saved on charging of such EVs, which would ideally be around four to five hours. These partnerships will not only contribute towards our collective Green-India goal, reduce fuel consumption, and promote sustainability, but also allow businesses to open new operational windows with the same number of vehicles in their fleets.

• **Technology-based platform:** This will bring all stakeholders together, including EV manufacturers, battery manufacturers, driver onboarding vendors, service operators, and businesses. This will help track demand, supply, real-time operations metrics, driver performances, and more. With aid of technology and a platform that integrates the entire EV ecosystem, India's logistics industry can evolve into a sustainable ecosystem that is here to stay.

Revolutionising the logistic sector

The EV industry in India has shown significant growth and promise, driven by government initiatives, technological advancements, and investment. Adoption of EVs in the logistics sector is set to revolutionise last-mile deliveries, bring down operational costs, and reduce carbon emissions. The emergence of new battery technologies and integration of IoT and other technologies will further enhance the efficiency and sustainability of EV fleets.

With growing need, the Indian EV space will witness a lot of new product launches in passenger as well as commercial segments. We believe that 2023 will see significant adoption of EVs in Tier 2 and Tier 3 cities. B2B logistics will be the frontrunner in gaining trust of public as EV utilisation increases. There will be consolidation happening in the EV industry with a lot of mergers and JVs. While 2022 was the curtain raiser for the EV ecosystem and setting up foundation, 2023 will be the year of creating, building and scaling this EV ecosystem. ☐

How are robots making manufacturing smarter?

Recent global changes have become a catalyst for digital transformation in the manufacturing industry, and India is no exception. The first part of the article explains usage of Autonomous Mobile Robots (AMRs) which helps to advance competitiveness while adding improved flexibility and resilience to processes.

Phanindra Karody,

Head of Bangalore Plant, Continental Automotive India

Automation eradicates numerous laborious steps involved in manual processes, reduces needless costs, and improves quality of outcomes as well. As a technology company, we believe that smarter machines are not an option but a necessity to be competitive in the modern world.

Smart manufacturing technology in everyday operations is radically altering the manufacturing sector. With ever-changing customer demands of today, coupled with evolving technologies, industries must become accustomed to smart manufacturing. With the aim of increasing efficiency, speed, and overall performance, there has been a marked increase in use of control systems, computers, and information technology in handling various processes and machinery in different industries. About 43% of manufacturers already use robotic process automation, while a further 43% have plans to deploy RPA initiatives.

Manufacturing automation to optimise production

Manufacturers across industries now prefer automation to boost productivity, improve quality, and efficiently manage manpower. By means of advanced technology like

robotics, vision, software, manufacturing automation can streamline and optimise production processes. From using high-speed cameras and AI to find errors in products, to using autonomous robotics to handle parts and products in strategic areas, manufacturing automation can take many forms.

Each machine/industrial equipment can be embedded/connected with sensors, which will typically generate relevant data. This can be transferred to cloud/software systems through data communication. Companies can draw significant conclusions and do predictive maintenance with this. Investing in automation, be it a single robot or even a fully automated production line, is something that all manufacturing companies must do now. Some aspects that are already changing with automation in manufacturing include continuous motion, where tooling and vision work increase cycle rates to higher speeds, which results in reduced downtime, boosted cycle rates, and increased throughput. Advanced automated production lines produce a lot of data. Manufacturers can analyse that data and make strategic planning decisions on production lines with Internet of Things (IoT). Tracking trends and finding problems are all possible with automation.

Manufacturers can use advanced vision applications and product-quality data to find faulty parts or problem areas. Moving away from hardware sensors, inspection processes can be enhanced with high-speed cameras or 3D imaging. The data can also be used to reduce waste and errors and improve processes.

Use of robotics

Utilising robotics to substitute for work otherwise done by humans is only one aspect of automation. Robotic arms can be used for pick-and-place tasks also for material handling. This will help complete them not only faster but also more efficiently than with human employees. The usage of robotics in industries can improve repeated, high-volume processes like heavy lifting and placement of parts.

Robotics can be used in two ways, it can be automated to do the same job the same way each time or programmed to be flexible with progressive technology.

Application of robotics

As mentioned, manufacturers use robots for mainly two types of applications, that is repetitive and adaptive, or flexible.

Robotics can be used to automate repetitive, basic tasks, including material handling and assembly, faster while improving repeatability and quality. Thus, material handling, material removal, material dispensing, pick-and-place, palletisation and de-palletising, welding, and assembly are some common use cases of repetitive automation.

With the advancement of robotics and automation, automated robots are now even more flexible and adaptive. Robots, paired with other technologies, can adapt to diverse parts and products with limited shutdown and reprogramming time. Flexible automation can be paired

Smart manufacturing technology in everyday operations is radically altering the manufacturing sector

with remote monitoring/programming choices so they can be viewed, and edits can be made off-site.

This is where the cobots, or collaborative robots, come in. They make it possible for operators to safely work in close proximities. Mundane tasks previously done by operators are now being handled by Cobots, making it possible to optimise workforces in manufacturing companies.

As a technology company, we have always believed in the power that technology has. The advent of Robotic Process Automation (RPA) has always been a key milestone for the manufacturing industry. RPA allows manufacturers to streamline operations and reduce complexity of managerial processes, thus creating a more agile system. We have implemented various Industry 4.0 practices at our plants, including a certain amount of automation across multiple levels.

Globally, we have implemented AI/ML and robotics on various levels at our plants. While robotics helps in taking care of repetitive tasks, insights from AI and ML help in smart maintenance, quality improvement, market adoption, and better product development.

In our Bangalore plant, robotic arms undertake repetitive mechanical tasks, Automated Guided Vehicle (AGV) are used for material movement on the shop floors, and Cobots, are designed to work alongside and together with humans and make work more exciting and versatile.

Creating an impact with cobots

Thanks to advances in sensor, vision technology and increased computing power, cobots can safely work with people in a shared work environment. Cobots at our Bengaluru plant perform tasks such as handling and validating printed circuit board components without compromising on precision and accuracy. Cobots have allowed a reduction in transition times (from approx. 40 to 20 minutes) compared to manual work, helping to achieve higher efficiency in production.

On the shop floor, we use technologies like E-Jidoka, Augmented Reality (AR) for remote assistance and problem-solving, AI for facial detection of quality inspectors, and more. In our warehouse, we use E-Kanban, automatic replenishment, and AGVs. A low-cost automation concept called Chaku-Chaku has also been adopted to help us improve efficiency of our production lines.

We are also using IoT-enabled sensors and devices for predictive maintenance. We have over 1,600 cobots in our plants across the globe and more than 200 Automated Guided Vehicles (autonomous driverless transport systems) that automatically provide material to the workplace. ☐

To be continued in the next issue

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- ❑ 01. Corporate / General Management
- ❑ 02. Director, Supervisor
- ❑ 03. Group Leader, Project Leader
- ❑ 04. Manager, Specialist
- ❑ 05. Engineer, Technocrat
- ❑ 06. Other

2. Select a title that describes your principle job function

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

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

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

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

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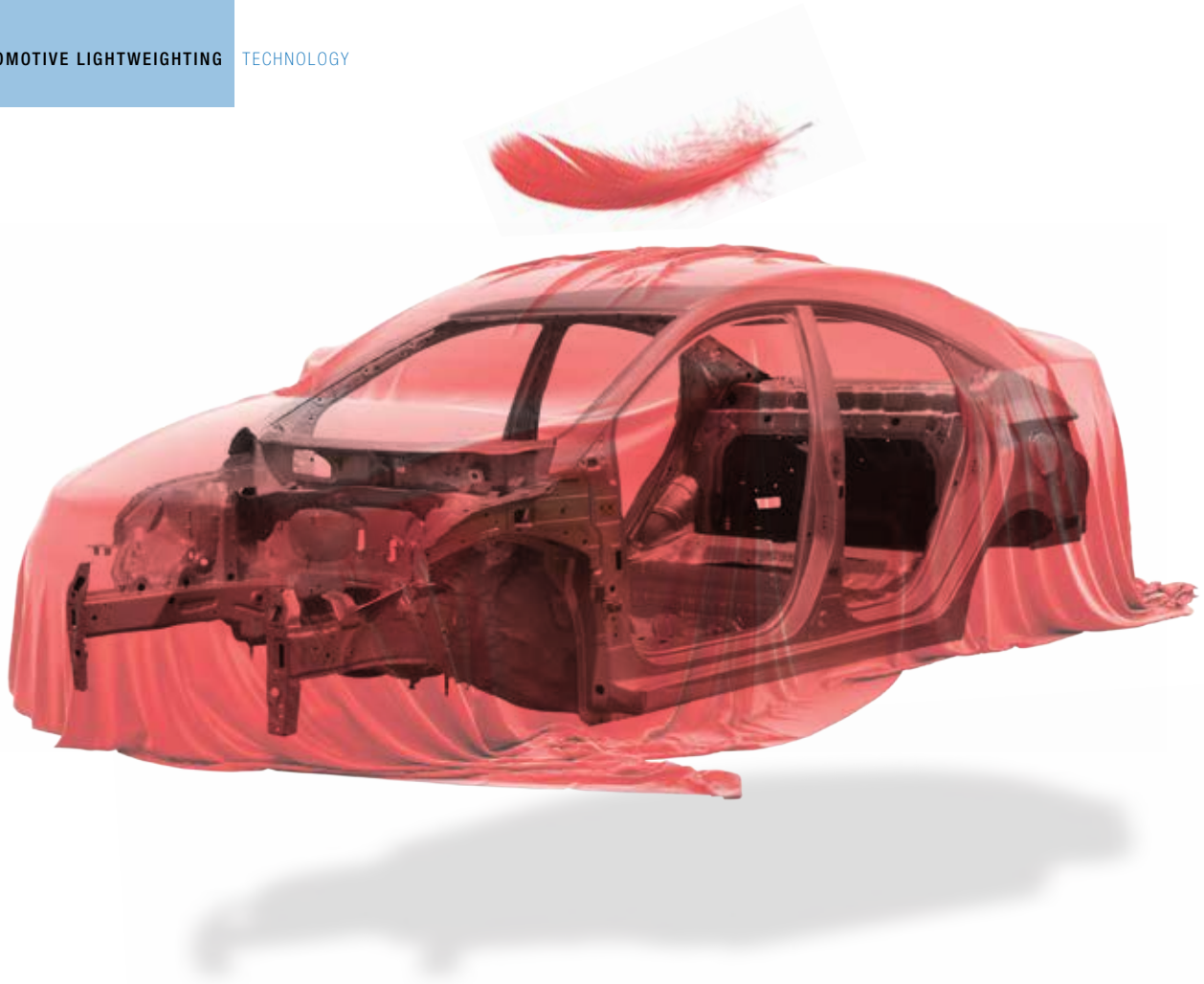

The auto sector ranges from two wheelers to heavy-duty trucks. The design of each type of vehicle requires different criteria to be considered, and the criteria for lightweighting change with vehicle category.
The first part of the article focuses on the factors that contribute to lightweight in the automotive sector.

Why is lightweighting essential in the passenger vehicle segment?

Ravi Rajhans,

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

Passenger car weight is always a great concern for car manufacturers. The weight of a car impacts cost, fuel refilling frequency, insurance premiums, and many more issues. Typically, car weight is measured as curb weight, which includes car aggregate weight with fuel and liquids, whereas the gross weight of the car includes passenger and luggage weight along with curb weight.

Typically, a subcompact to a large hatchback car weighs 700–1200 kg, whereas a midsize to large sedan weighs 1500–2000 kg. From compact SUVs to large SUVs, 7-seater MPVs' weight ranges from 1400 – 2700 kg. The weight variation is due to variations in aggregate size and capacity.

This means that for travelling from Point A to Point B, which is the basic purpose of a passenger car, 10 times heavier object is designed with ref to driver weight. Surprisingly, with time, this weight has escalated.

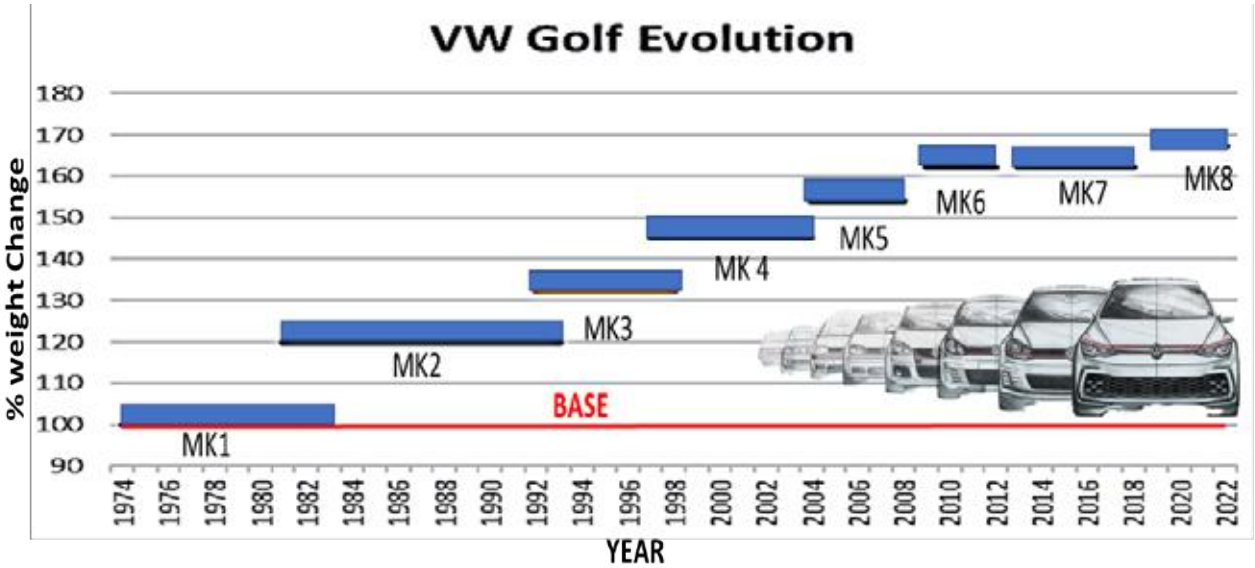

Fig 1. Platform Evolution and weight change.
(Courtesy – History of VW Golf by MicksGarage, Pinterest)

Reasons for weight increases

• **Vehicle size:** Most of the vehicles have increased in size from their predecessors as the definition of comfort has changed. Ergonomic studies have changed many aspects related to passenger posture, ingress/egress openings, and dynamic space per person. Volkswagen Golf introduced in 1974 to the recent Volkswagen Polo, the overall length of the vehicle has increased by approximately 12% and overall volume by approximately 40%. (refer Fig 1)

• **Engine power and speed:** In the last 40 years, engine power demand has increased due to better road infrastructure, and customer demand for higher speed to reduce travel time. Distance travelled by an individual has increased. Engine power demand increased by almost 70% - 100% for similar vehicles in the last 40 years.

• **Vehicle robustness:** Increased speed and vehicle size have an adverse effect on vehicle structure as well as on many aggregates like suspensions, tyres, brakes, etc,. The customer's definition of robustness also has changed from 'time to fail to better safety', and better NVH (Noise-Vibration – Harshness). Designers have increased the car's structural integrity as well as its stiffness targets by 100% - 150% compared to base models designed during the 1970s.

• **Regulations:** Increased speed resulted in an increased accident fatality rate; hence, in the last 40 years, demand for structural integrity through crash-worthiness targets has increased. Specifications of Insurance ratings of cars are based on the safety of the car for injury fatality beyond the regulatory passing limit. This has a direct impact on insurance premiums.

• **Customer prosperity:** The affordability of customers is also one selling factor, and manufacturers are providing many more features for comfort/convenience to attract customers in the competitive market, e.g., power seats, navigation, etc. Many of these features result in adding weight to the vehicle. The ratio of single-person weight being carried to curb weight has increased from 10 to 16 in the last 40 years. For fully loaded cars this ratio has increased from 3 to 6. This has a huge impact on the environment; hence, there is pressure from regulatory agencies as well as from customers to control or reduce the vehicle weight.

Drivers for lightweighting

• **Fuel Consumption:** Petroleum fuel is a scarce commodity whose price is continuously increasing. Designing fuel-efficient power trains, and reducing in aerodynamic losses is the subject of research for automakers. Reduction of vehicle weight to increase the distance travelled per unit of energy consumed (fuel or electricity) is another way of tackling this issue. According to research commissioned by the US Department of Energy (DoE), a reduction of the weight of an ICE vehicle by 10% will lead to a 6 to 8% rise in fuel economy.

• **Emission Regulations:** Burning so much fuel and emitting hazardous gases into the atmosphere has attracted the attention of environmental experts and regulatory authorities. They have started imposing tighter targets on emission residuals. For resolving emission target requirements, vehicle manufacturers are using alternative energy sources, e.g., hybrid power technologies, fully electric vehicles, and fuel cell vehicles, which have the potential to decrease environmental impact.

However, with current technologies, the electric/hybrid vehicles are approx. 150 to 300 kg heavier compared to its IC engine counterpart vehicle. Similarly, for ICE vehicles, a weight reduction of 10 kg reduces emissions by approximately 1 gram of CO^2 per kilometre driven.

• **Competitive Pressure:** A new trend of shared mobility has reduced individual car owners' sales. Similarly, post-pandemic income stability has decreased which affected adversely on new car buyers or increased the time to replace current vehicles. Reduced sales result in underutilisation of capacities, and optimisation of resources is an essential factor for survival – lightweighting or reducing material used to produce a vehicle can be a boon. Additionally, increased fuel economy/range increase (for EVs) is an attractive selling feature.

To be continued in the next issue...

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Ensuring Safe Access Management

This article explains how Pilz India provides safe and secure automation solutions to make manufacturing setups and shop floors more digital, connected, flexible, efficient, safe and secure.

Manufacturing setups have primarily deployed robots in various processes on the shop floor to reduce human effort and improve productivity, throughput, and product quality. However, in recent times, digitalisation and the Industry 4.0 revolution have driven increased adoption of automation and robotics on shop floor.

Additionally, another area where global organisations are increasingly adopting robots is the warehouse and intralogistics sector. Collaborative robots have further contributed to increased adoption of robots in shop floor operations. The revenue is expected to grow at an annual CAGR of over 15% until 2027.

Addressing safety concerns

The rise of automation and robotics, owing to demands of manufacturing setups becoming increasingly digitalised, has increased safety concerns on the shop floor. There are reports of crushing, trapping, impact, or collision accidents caused by malfunctioning robots. Furthermore, digitalised operations have led to convergence of Information Technology (IT) and Operational Technology (OT), and the shop floor has become a playground for hackers.

Cyber threats and attacks have drastically intensified since the pandemic, with cybercrime rising by 600%. Pilz India provides safe and secure automation solutions and services to make manufacturing setups and shop floors more digital, connected, flexible, efficient, safe, and secure.

Need for safe access to automation systems

Machine malfunctions result in harm to operators, similarly, human errors result in harm to machines and robots, which eventually results in machine malfunctions. Thus, it is necessary to protect the machine and robot from unauthorised access. Machines and robots on the shop floor are designed to operate 24/7 to cater to rising consumer demands. However, apart from usual operating conditions, the machines and robots could be in a breakdown, maintenance, or changeover conditions.

Additionally, these systems, during setup and commissioning phases too, need to be operated safely, as many accidents are witnessed under these conditions. Today, machines and robots are designed to adapt to the changing manufacturing scenario, with multiple products manufactured on a single machine.

This is possible by changing the software configuration via HMI and changing attachments. In the automotive industry, an oil-filling machine will be able to fill different variants of oil on different engines. Similarly, a robotic cutting and grinding machine for parts would need various changes to the tool and software configuration. This would simply need an easy recipe handling system on controllers and HMI for a seamless changeover. The tool changes might also need some operator intervention.

Thus, it is essential that only experienced and trained operators or line managers access such zones in a controlled and safe environments. These changeover operations, if not done by authorised personnel, might cause accidents that could before cause harm to humans and machines. Thus, holistic identity and access management systems in manufacturing setups and shop floors have become increasingly vital.

Safeguarding robots with safety gates

Robots bound by fences or safeguards are common on manufacturing shop floors to safeguard humans during robot and machine operations. These safeguards have doors to enable access for handling various operations, such as tool changeover and maintenance.

These doors need to be equipped with appropriate safety mechanisms for safe operations. With robot operations, there should not be direct access to the robot while the machine and robot are moving, ensuring ultimate human protection. The operator needs to stop robot and machine operations before the safety door can be opened and any maintenance activity can be undertaken. Moreover, operators need to ensure proper LockOut-TagOut (LOTO) before entering the safeguard.

Thus, safety gate systems for guard protection, safety gates, position monitoring through safety switches, and light curtains for safe intervention in production processes are essential safety elements that safeguard operators from injury. Pilz India offers a complete safe control, relay, and sensor portfolio that enables safe automation efficiently and economically. Pilz safety gate systems such as PSENmech with guard locking, PSENslock, PSENmlock, and PSENsgate are used for guard protection to monitor doors in safety fences, covers, and flaps. These devices meet EN ISO 14119 requirements. Pilz safety light curtains, PSENopt and PSENopt II, enable machines to protect staff and capital goods, enabling optimum access protection.

Protecting valuable data from unauthorised access

Many accidents are caused by unauthorised personnels entering forbidden areas and making changes or maintenance. These events can be avoided by having an access management system in place. With identification and Access Management, Pilz offers a wide range of products and softwares, as well as tailor-made solutions for Access Management challenges faced by manufacturing setups. The company offers safety and security functions in one system, with operating mode selection and access permission system PITmode that controls access permissions to machines and robots.

Pilz prevents shop floor operators from incorrect operation, and tampering, thereby protecting humans, machines, and robots. The company helps manufacturing units organise machine access and employee permissions, from simple authentication to complex access management, from functionally safe operating mode selection to electronic maintenance safeguarding. Furthermore, these devices and solutions also protect valuable plant data from unauthorised access by hackers.

Transponder keys with RFID technology are available in freely writable versions as well as with fixed, stored permissions. The options range from simple enablement and user authentication to a complex permission matrix and company-specific coding. Thus, operators cannot access tool changes or maintenance features, whereas these rights are reserved for the production in charge and the maintenance manager.

Access management

Manufacturing units can guarantee safe and secure machine operation with a defined access management mechanism. Some PIT mode devices offer integration with the OPC UA standard, which increases security of communication between server and client. It expands connection options to other manufacturers' systems using OPC UA, thereby promising greater security and usability for access permission. These reader keys are available in multiple colours to help a factory determine different machine types, functions, zones, or operating modes.

The PIT mode device for operating mode selection and access permission systems enables functional, safe operating mode switching through self-monitoring up to PL d. It offers company-specific coding, resulting in tamper-proof operations.

The PIT reader and transponder can be configured via an integrated web server and pre-installed with group-based permission management. With integrated user management, these devices are an essential element needed for a manufacturing unit's safe and secure operation.

Partner for safe automation solutions

With innovative solutions and decades of expertise, Pilz is globally recognised as a complete solution provider for safety and automation technology. Safe automation solutions from Pilz enable manufacturing units to become more digital, connected, flexible, efficient, safe, and secure. The company is a reliable partner for the safe automation issues of tomorrow, making the world more digital, connected, flexible, efficient, safe, and secure with its solutions. Pilz is an innovative company with a seven-decade history of shaping the course of industrial automation and is actively involved in over 50 standards committees worldwide.

Pilz India has been a leader in providing safe automation solutions to Indian manufacturers since 2011. The company enables manufacturing units to overcome complex safety applications with ease thanks to a team of certified machine safety experts that cater to various applications, training, and consulting projects. With a well-established nationwide network of certified experts, Pilz India caters to the safe and secure automation needs of manufacturing units. □

Courtesy Pilz India

Trends in deburring and precision surfaces

In almost all branches of the industry, part-specific surface finishes have a major impact on product quality. Accordingly, rising demands are being placed on cleanliness and the absence of burrs, as well as on design, surface finish. Thanks to innovative and optimised solutions, these requirements can be met reliably, reproducibly and cost-effectively.

Recurring themes can be seen in almost all sectors of the industry including transformation processes, changes in manufacturing technologies, new and improved materials, the trend towards automated, digitised production processes, as well as stricter climate protection targets and regulatory requirements. All these pose new and different challenges for companies.

On one hand, they necessitate further development or adaptation of key expertise and processes, and on the other hand, technology-based diversification, for example, into segments beyond the existing market. As varied as the requirements may be, production steps such as deburring, cleaning, and surface finishing play a decisive role when it comes to quality.

Mobility: adapted production processes for new drives

Electromobility is catching on fast, car manufacturers and suppliers are expanding their capacities accordingly. This presents challenges both in production of components for electric motors and for battery modules. For example, drive shafts, housing parts, and gears are designed with complex geometries. In some cases, these components also have drilled holes with intersections. At the same time, parts are often designed with the lowest possible material thicknesses to save mass and thus extend their range. This calls for optimally adapted solutions for deburring and surface finishing to meet high requirements for burr-free and precision surfaces, as well as for throughput and cost-effectiveness. Depending on the component and task, manufacturers of deburring and high-precision surface finishing equipment offer both new and improved systems and processes.

These include, for example, developments in the field of vibratory finishing as well as laser and ECM technologies. Both laser and Electrochemical Metal Machining (ECM) or Precision Electrochemical Machining (PECM) also enable shapes such as bores to be created without burrs.

Reduce consumption, improve performance

In combustion technology, although new developments for passenger cars are no longer on list of priorities for vehicle manufacturers, work is continuing to further improve existing units and engines. The aim is to reduce consumption, emissions and optimise performance at the same time. To achieve this, some of the tasks set include increasing fatigue strength by means of smooth edges, radii, and transitions, as well as by improving surface finish of components of the same or smaller size and with more complex geometries.

Likewise, components such as connecting rods must be lubricated more effectively by adding holes, the structure of injection valves must be optimised; and fuel combustion must be improved by modifying design of the nozzle holes. Corresponding results can be achieved using solutions from deburring technology, precision, and burr-free machining.

Medical engineering: surfaces move more into focus

One reason for this is the European Medical Device Regulation (MDR), which is causing manufacturers to take a closer look at the surface quality of their medical products. Another reason is that medical devices are becoming smarter and more complex.

In addition to cytotoxicity and bioburden, for the first

time, new MDR for sterile products now also addresses residues from manufacturing processes, such as particles that can be released by the product. This also applies to the process of deburring. The aim is to prevent, for example, a grinding burr from a cannula or other instrument, or a manufacturing residue on a pedicle screw or implant from entering a patient's body and causing damage. For these tasks, new and optimised solutions such as ultrasonic deburring make it possible to carry out deburring and cleaning operations efficiently, reliably, and in a manner that can be validated in accordance with regulatory requirements.

Specifically engineered material and surface properties can help improve the function of a product. These include functionalised surfaces that, for example, improve and accelerate osseointegration of implants or prevent germ growth. One way of achieving this is to use miniaturised structures in the micro- and nanometer range, which are applied to the surface by laser structuring or ultra-precision machining, for example.

Efficient deburring and cleaning: a must in all industrial sectors

It is not only in automotive and supplier industries that the medical device sector applications and processes need to be reviewed and adapted. Demands on surface quality have also changed and increased in the machinery and equipment industry, in measurement, precision, sensor technology, in the tool and mould making industry, in energy and environmental technology, as well as in manufacturing equipment for the semiconductor industry.

Irrespective of whether the quality of subsequent processes such as coating, bonding, laser welding, and assembly or flawless product function is to be ensured, strict specifications governing the technical cleanliness of components are now a matter of course in virtually all branches of industry. To meet these specifications, reliable deburring is a must. Depending on required cleanliness, even ultra-fine burrs in the submicrometer range must be removed. For this purpose, the industry offers, among other things, innovative system concepts that enable reliable deburring and cleaning in a single process.

Another aspect that is gaining importance in an increasing number of industries is functionalised surfaces. Whether it is a specific degree of roughness or a defined structure that is required, an appropriate machining process using the most suitable technology is indispensable. To select the right technology, continuous and careful monitoring of the market and various technologies is a decisive factor.

Automation: tailored to requirements

Automating deburring and surface finishing processes is key to meeting high demands for precision, reproducibility, throughput, and efficiency. Among main aspects to be considered are the simplicity and sustainability of the automation concept. These include, for example, number of products for which it can be used, capability to quickly integrate new products, and the degree of effort involved for in-house maintenance staff. Consequently, the automation concept is ideally based on specifications that consider company-specific workflow as well as lifecycles of the manufactured products. □

Courtesy: Doris Schulz, Guest Contributor

image courtesy: Stoba Sondermaschinen

Laser technology opens up new perspectives and fields of application in both deburring and surface finishing, e.g. microstructuring

ALL IMAGE COURTESY: shutterstock

Adopting battery swapping for E-mobility

Electric vehicles are becoming popular in today's world, particularly with growing use case in the commercial vehicle space. Many industry manufacturers and solution providers are working on measures to make electric vehicles more affordable, easy to charge and cost-effective to operate. Battery swapping is one such technology that provides all these benefits to fleet operators.

Vikas Aggarwal,
Founder & MD,
Ipower Batteries

As the name implies, battery swapping technology is a method by which a user can swap a battery to keep the vehicle running. A swapping station installed in a specific location consists of multiple batteries that are constantly charged. An EV user can find a swapping station, replace the depleted battery with a charged one, charge the empty battery, and drive to work. Battery swapping technology has expanded the options available to fleet owners who want to keep their vehicles running without having to worry about charging time.

EV users use battery swapping to replace discharged batteries with charged ones at swap stations. It aids in the resolution of the problem of charging station installation while also reducing driver range anxiety. Also battery leasing can help EV owners save money on the cost of buying a battery. It takes the least amount of time and infrastructure to charge at a battery station, which could take hours.

Emerging business models

By decoupling cost of the battery from the vehicle itself, battery swapping promotes new business models. We are seeing the emergence of Battery as a Service (BaaS) business models and separate battery asset management companies in the industry. Consumers can benefit from swapping as well. EV batteries lose range over time, but users can easily upgrade to the latest battery technologies with a swap system, provided

their BMS is compatible.

The technology will almost certainly be a critical enabler of electrification, not only in automobiles, but also in micromobility, rideshare fleets, autonomous vehicles, and heavy-duty commercial fleets. It may also be one of the most cost-effective ways to construct large stationary energy storage systems required to support the world's growing renewable energy supplies.

How is battery swapping impacting the EV industry?

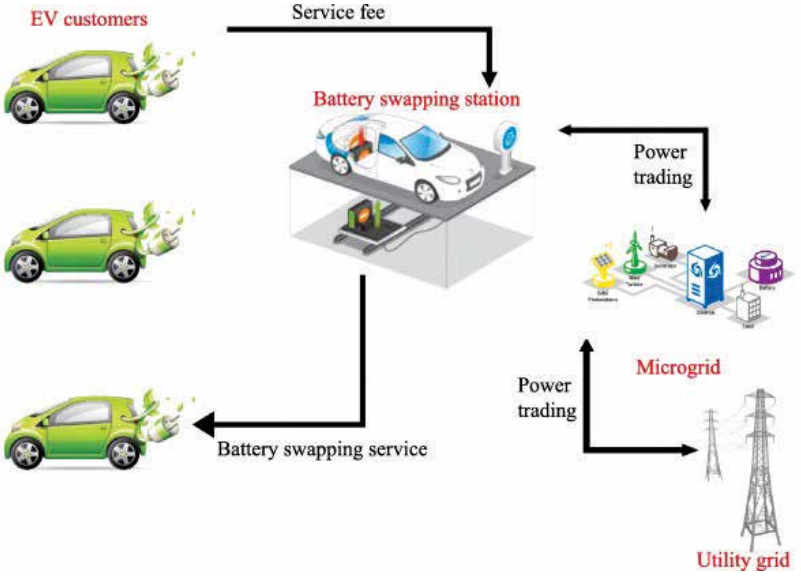
The cost of the battery currently accounts for 40–70% of the initial cost of an electric vehicle. If these batteries are decoupled and sold separately, upfront cost can be shifted to the energy operator's network, thereby shifting cost of ownership to operations. Battery swapping and interoperability can play an important role in this because they help build the supply chain network to boost EV adoption, which will result in a faster transition.

Technology transition and mobility as a function are two agendas for modern mobility solutions. We need an aggressive target for battery swapping with a proper roadmap to help change this ecosystem. As we move forward with battery swapping, we will need to address the user mindset, battery safety responsibility, data security, and IT theft as batteries have IoT devices connected to them.

In the BaaS ecosystem, the EV owner does not buy battery with the EV but rather leases it as a separate component. To enable this model, a lease agreement between the EV owner and BaaS operator is typically required. The agreement may include terms regarding cost per use, battery handling conditions, warranties and indemnities in the event of a malfunction, a security deposit, and termination.

by the consumer. Under BaaS, the manufacturer is liable for any manufacturing flaws in the battery. Similarly, any battery modifications, independent warranties, failure to exercise reasonable care in battery installation, and so on could be attributed to the BaaS operator. Separately, EV manufacturers could be held liable for any manufacturing flaws in the EVs, excluding the battery. As a result, each party in this ecosystem may be held accountable to the extent of their role and representation.

The interoperability standards will almost certainly be based on existing EV battery technologies. These could be patent-protected inventions that pave way for more standard-essential patents in the EV battery and charging space. Although some EV manufacturers, such as Toyota and Tesla, have recently announced royalty-free access to EV-related patents, most manufacturers are still wary of technology licencing to maintain market exclusivity. Refusal to licence standards-related patents in a fair, reasonable, and non-discriminatory manner may result in litigation.



What is required today?

While this leasing model appears to be effective on paper, consumers may be wary of it. Vehicle owners today are confident that they have complete control over their vehicles and their components. Changing this mindset to encourage people to lease an essential component of their vehicle may take time because consumers might be unsure of quality standards of a leased battery, how it may impact their vehicle's performance, safety concerns, and so on. To build trust, BaaS providers must ensure that high-quality services are provided.

The 2019 Consumer Protection Act assigns responsibility to the manufacturer, seller, and service provider. The entity directly responsible for causing the damage is held accountable

Integration of technology such as IoT, Telematics, M2M, and others is required to facilitate BaaS and provide information on location, battery inventory details, and so on. To provide personalised and instantaneous services, mass-scale data collection such as GPS location, energy consumption mapping, frequency of service availed, and so on would be required. As a result, all stakeholders in the ecosystem must agree on clear terms for customer data ownership and sharing.

Framework for the mobility sector

Guidelines for use of geospatial data and maps were introduced in 2021. The guidelines largely de-regulate the geospatial data sector, but they impose some restrictions on

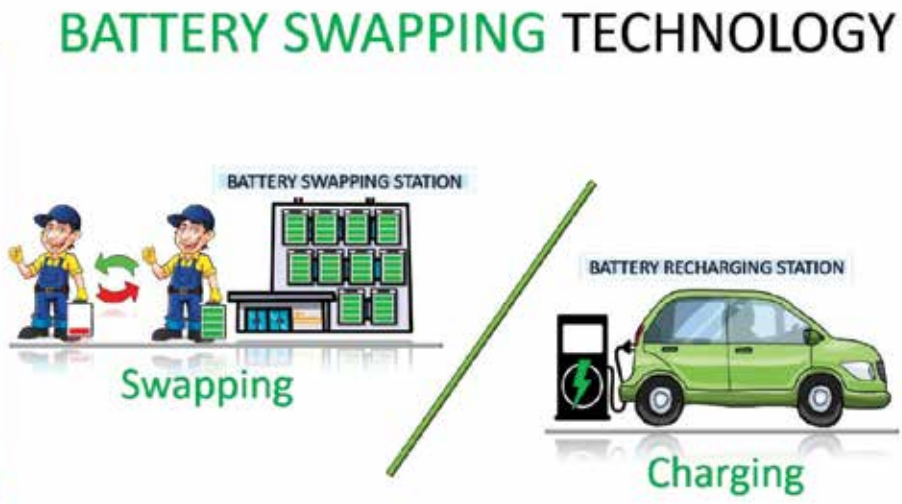
foreign entities as well as foreign-owned and controlled Indian entities. As a result, service providers who rely on such data must ensure compliance with the guidelines.

Furthermore, the proposed Data Protection Bill 2021, which seeks to regulate collection, processing, storage, and transfers of personal and non-personal data, is set to usher in a watershed change in India's data privacy regime. If passed in its current form, this law could have a significant impact on the mobility sector, including BaaS operations.

Swapping ecosystem with a balance

Battery swapping policies should strike a balance between standardisation and encouraging innovation in swapping infrastructure. This should also allow for more equitable growth of different technologies, solutions, and business models. The policy must provide flexibility to various stakeholders, such as manufacturers, industry players, and state governments, for them to develop battery-swapping ecosystem development strategies that are best suited to meet the needs of this sector.

Standardisation should always begin with determining which aspects can and cannot be standardised. Battery swapping has the potential to shift from a Business-to-Business (B2B) activity to a Business-to-Consumer (B2C) transaction. This also leads to greater ease of use and access, as well as a wider range of options for EV users. The standardisation of EVs is a time-consuming process that requires cooperation from various battery and vehicle manufacturers.



Contributing to the EV ecosystem

After everything, including policies, users' perspectives, energy consumption, and battery swapping, it will come down to battery manufacturers, as they will have to follow a standard protocol in designing and manufacturing the battery. From cells to body material to connectors, everything will be standardised by the government.

With the battery-swapping market scenario, EV manufacturers and stakeholders should facilitate the phased development of a swapping ecosystem and its infrastructure, which is linked to EV market's maturity. The battery policy should be targeted, identifying priority vehicle segments and enabling rapid adoption of EV battery-swapping solutions in those segments where battery swapping is most valuable.

The improved battery-swapping infrastructure will not only increase ordinary users' confidence in moving faster and adopting EVs, but it will also alleviate range anxiety. It will also contribute to the country's EV ecosystem by facilitating standardisation of EV batteries. The government is also addressing critical issues such as how customers can access current EV subsidies, range per charge criteria, and GST for EV-related swapping services. Moreover, the government is taking several encouraging steps towards interoperability standards. The battery swapping infrastructure should provide clarity on status of battery swapping as a delicensed activity. The policy should identify and contact the issuing authority if a trade licence is required. ☐

Micros with maximum tool life and process reliability

Walter DB131 and DB133 Supreme micro drills

Walter, presents the new DB131 and DB133 Supreme solid carbide drills. When used in combination with DB131 Supreme fully coated micro pilot drill, DB133 Supreme deep-hole drill in particular delivers impressive surface quality, tool life, and process reliability. Specialist flute geometries are designed to optimise chip breaking to ensure that chips are kept short and therefore easy to remove. And in a wide range of materials too – for universal application.

The market for micro drills keeps growing. This is largely driven by the increasing desire for ever-smaller technology as well as intricate components, such as those used in medical technology, watchmaking, the food industry, or mechanical engineering. Premium manufacturers such as Walter are responding to this trend by constantly expanding their range of cutting tools.

Another integral factor in the solid carbide drill's performance, besides the geometry, is that the point angle and diameter tolerances (p7/h7) of both drills are tailored to one another so that the pilot drill can deliver the best possible results for the deep-hole drill. New Walter-developed processes, such as those for rounding the main cutting edges, increase the tool's precision. This is particularly important in mould and die making, for instance, where fine-tempering channels often have to be inserted close to the surface. After all, lateral "wandering" here (far more commonplace with HSS drills than with solid carbide drills) can result in extensive damage to the component; what's more, they drill around six times faster than a gun drill, for instance. Both the DB131 Supreme and the DB133 Supreme are suitable for reconditioning. The solid carbide drills are available in diameters starting at 2 mm; Walter can also offer intermediate sizes for delivery within no more than three weeks via its Walter Xpress service.

Walter Tools India | Pune

Cameras, lenses, and illumination for a complete control-integrated vision solution

Beckhoff Vision hardware

Beckhoff, recently introduced the comprehensive Vision hardware portfolio, which is a product area of TwinCAT Vision launched in 2017. Beckhoff Vision offers machine builders and end users a complete image processing system that covers all the necessary components, from software to illumination. Seamlessly integrated into EtherCAT-based control technology, it opens up significant competitive advantages for users, including highly accurate synchronisation with all machine processes, reduced engineering and hardware costs, and simplified commissioning and support. In addition to the TwinCAT Vision software, the Vision portfolio also includes:

- **Cameras:** The area-scan cameras generate high-quality image data using colour and monochrome CMOS sensors with up to 24 megapixel resolution and 3.45 µm and 2.74 µm pixel pitch, in addition to offering transfer rates of 2.5 Gbit/s.
- **Lenses:** The robust, industrial C-mount lenses ensure easy handling and high availability while also offering a VIS and NIR AR coating, up to 2 µm resolution, and image circles of 11 mm (2/3") and 19.3, mm (1.2") respectively.
- **Illumination:** The multicolor LED illumination in three designs—area, ring, and bar illumination—produces constant illumination conditions for consistently high-quality images. It also creates the best possible contrast between the inspection feature and its surroundings, even in spectrally adjustable pulse mode. Complete units consisting of a camera, illumination devices, and focusable lenses are also available With Beckhoff Vision, real-time image processing can be easily integrated into both new and existing control environments, as well as optimally synchronised with all machine and plant processes. Here, the previously strict separation between vision and automation technology is further eliminated through system integration in all environments. At the same time, Beckhoff Vision components impress with their robust, attractive design as well as their high scalability and long-term availability.

Beckhoff | Pune

One milling cutter, full flexibility for all milling operations

LMT Tools, recently introduced the new EASY product series, EASYMill, a solid carbide milling cutter for the process-reliable machining of steel (e.g., case-hardened steels) and stainless steel materials (CrNi steels).

EASYMill

LMT Tools expands its assortment with universally applicable plug-and-play tools that are characterised by maximum efficiency, great flexibility in application, and ease of handling, and enable a significant reduction in process costs with optimum performance. The EASYMill features high stability as well as smooth milling operations with very good surface quality. Geometry and coating have been specially adapted to the machining of low-alloy steels and austenitic materials and enable particularly flexible use. All common milling operations can be covered with just one tool, whether roughing, finishing, slot milling, ramping, pocket milling, or helical plunging. The unequal helix pitch and positive cutting-edge design reduce cutting pressure and cutting forces, resulting in a significant reduction in vibration. This also makes the EASYMill ideally suited for use on turning/milling machines. The adapted, sharp cutting edge ensures low buildup and guarantees smooth chip evacuation.

LMT Tools India | Pune

Wi-Fi® technology for connected IoT applications

Texas Instruments recently introduced a new SimpleLink™ family of Wi-Fi 6 companion Integrated Circuits (ICs) to help designers implement highly reliable, secure, and efficient Wi-Fi connections at an affordable price for applications that operate in high-density or high-temperature environments up to 105ºC. The first products in TI's new CC33xx family include devices for Wi-Fi 6 only or for Wi-Fi 6 and Bluetooth Low Energy 5.3 connectivity in a single IC. When attached to a Microcontroller (MCU) or processor, the CC33xx devices enable a secure Internet of Things (IoT) connection with reliable Radio-Frequency (RF) performance in broad industrial markets. Kevin Robinson, CEO, Wi-Fi Alliance , said, "The adoption of Wi-Fi 6 and Wi-Fi 6E is accelerating, with 2.5 billion Wi-Fi 6 devices expected to ship worldwide in 2023. Today's Wi-Fi is well suited to address a variety of industrial IoT applications, and innovation is helping expand number of applications, such as electric vehicle charging systems, smart metres, and smart appliances, that can rely on Wi-Fi to deliver reliable, consistent, and efficient connectivity in the IoT market."

SimpleLink™

Texas Instruments | Dallas

Online tool for polymer coating

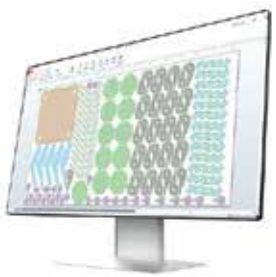
Igus, recently introduced iglidur coating materials that can be used to protect particularly heavily used components from wear. The lubrication-free, plastic-based powder coatings serve as a friction-optimised surface for electrically conductive components, enabling customers to greatly extend their components' service life. The latest addition is the iglidur coating designer, which helps users get their individual components coated in three simple steps. First, a CAD model is loaded into the online tool (file formats .stp, .step or .stl are supported), then the coating material is selected from six different iglidur coating powders that can be directly compared in the tool. In the end, the layer thickness is specified - and the tool does the rest automatically, including calculating the price and delivery time. The final component appearance after the coating is also displayed immediately. The user can download the associated data sheet by clicking on it. In the last step, the user can query the shopping cart, and forward it to the responsible purchaser or other parties involved in the design or procurement process or order immediately.

iglidur coating materials

igus (India) | Bengaluru

Nesting software subscriptions designed for the waterjet cutting market.

Hypertherm, Associates recently announced the release of ProNest® LT 2023 version 15.1 nesting software, which is now available on a low-cost subscription basis for the waterjet cutting market. ProNest LT OMAX® is specifically designed for OMAX waterjet machines. Because both ProNest LT and OMAX are part of the Hypertherm Associates family of brands, whose tier was created in close collaboration with OMAX engineers to ensure optimal outcomes. It supports conventional, straight cutting for OMAX machine models including OptiMAX®, OMAX, MAXIEM®, and GlobalMAX® . ProNest LT Waterjet Plus is a more comprehensive subscription tier. It supports conventional and straight cutting for virtually any waterjet brand, plus plasma and oxyfuel cutting, all in one package. Tom Stillwell, Product Marketing Manager, Hypertherm Associates Software Group, explained, "With the price of raw materials rising, ProNest LT uses advanced, true shape nesting algorithms to help waterjet fabricators and manufacturers improve efficiency, get the most out of their material, and lower costs."



ProNest® LT 2023 version 15.1 nesting software

Hypertherm | USA

Highlights – June 2023

» **Autocomponent Manufacturing**
India's auto component industry is an important sector driving macroeconomic growth and employment. The industry comprises players of all sizes, from large corporations to micro entities, spread across clusters throughout the country. The article will talk about the remarkable growth in demand for the auto components industry globally

» **VR/AR Support Touchless Service Model**
In the industrial sector, Virtual Reality (VR) and Augmented Reality (AR) technology can support a touchless service model by giving employees hands-free access to crucial data, resources, and instructions. The column will focus on different ways in which VR/AR can enable a touchless support model.

» **Rapid Prototyping/ Additive Manufacturing**
Rapid prototyping is the process of quickly creating a physical model or prototype of a product, part, or component. Additive manufacturing, also known as 3D printing, is the process of building parts and components by adding layers of material on top of each other. Both the technologies are becoming more common in the manufacturing sector as it enables businesses to rapidly and affordably test and improve new designs. The article will highlight the futuristic processes in a manufacturing setup.

» **Industrial Safety**
Manufacturing workers frequently come into contact with different risks, such as machinery, chemicals, and heavy equipment, so industrial safety is a major concern. Preventing workplace mishaps, fatalities, and injuries while also ensuring employees' health and wellbeing are key objectives of industrial safety sector. Industrial safety in the manufacturing sector necessitates a thorough and proactive strategy that puts workers' health and safety first. The section will discuss some key aspects of industrial safety in the manufacturing industry.

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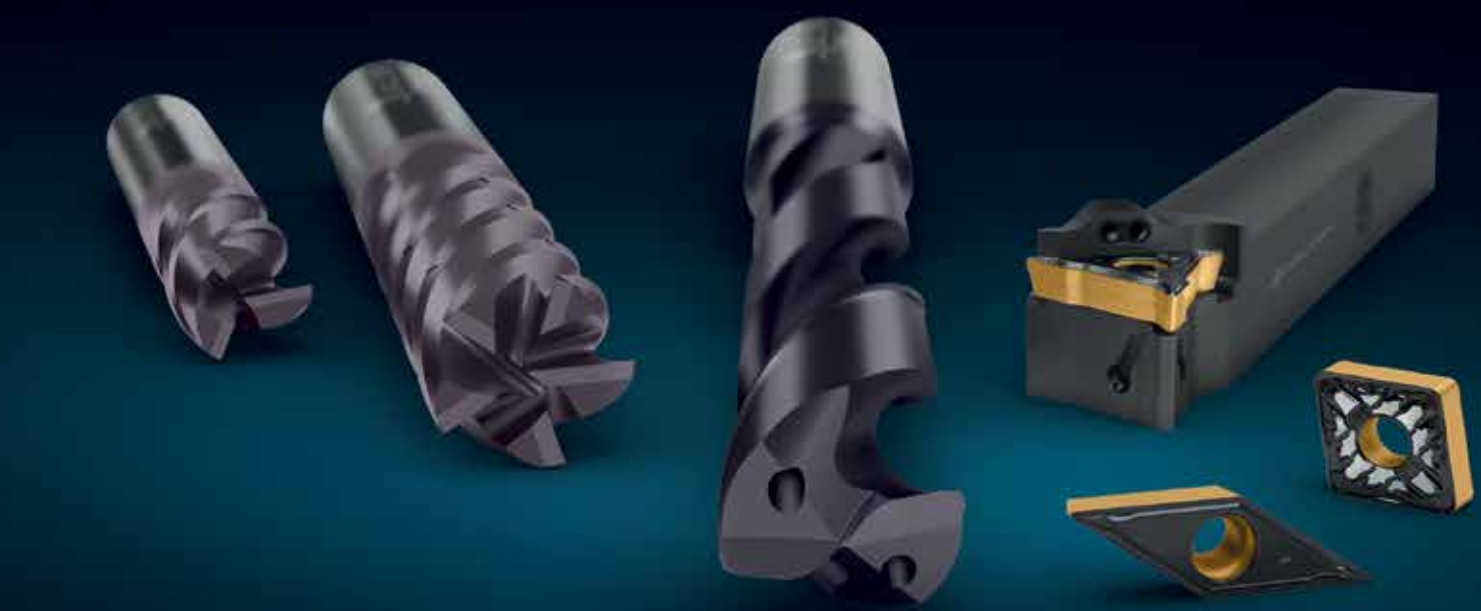

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