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VOL 14 – Issue 11 | SEPTEMBER 2023 (Monthly) | ₹ 100

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Unveiling the potential of Sodium-ion Batteries

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"A new era in sustainable energy storage"

Pioneering sustainable solutions and practices

Sustainability today has become key to ensuring business success. With the growing global demand for renewable energy, storage solutions that are energy-efficient are becoming essential in the EV industry. As the world celebrates World EV Day on September 9, heralding sustainable electromobility and electric vehicle adoption are on the rise.

In this edition, our Cover Story casts a spotlight on Sodium-ion Batteries, a groundbreaking innovation in the pursuit of sustainable EV energy solutions. Abundant, cost-effective and characterised by extended lifespans, these batteries offer grid-scale storage and bolstering stability while reducing reliance on fossil fuels. Their rapid charging capabilities position them as a compelling alternative to their lithium-ion counterparts.

This month's Industry Focus explores sustainable practises reshaping the Automotive Manufacturing sector. In technology, our Technology Focus articles illuminate Digital Manufacturing and Tool Making, showcasing how these fields embrace sustainability. Our Special Feature highlights the transformation of Construction and Mining Equipment through sustainable principles.

Efficient Manufacturing remains dedicated to sharing progressive ideas that empower manufacturing enterprises. As we navigate towards a future where sustainable development is paramount, we invite you to explore the pioneering strides manufacturing is taking towards a greener and more efficient tomorrow.

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

MANAGEMENT NOTE

The industrial landscape has experienced ongoing transformation over the past decade, and the advent of Industry 5.0 promises even swifter progress. In parallel, our own evolution as an entity within this sector is also in full swing.

Our digital voyage has now integrated an interactive comments section into our articles and stories, allowing us to effectively incorporate our readers' requirements and suggestions. Platforms like '***Sunday Musings***' by Dr Anil Lamba and the weekly podcast '***Morning Bytes***' have captured the industry's attention. Furthermore, our recent inclusion of the new column Industry Edge aims to cover interesting updates from the automotive and manufacturing industries, highlighting some of their most recent advancements and knowledge points.

In response to the enthusiastic feedback from our readers, we are excited to announce the introduction of compelling enhancements for our upcoming issues of the Flip Book magazine. These enhancements will encompass interactive video advertisements, linked articles, author profiles and more. Additionally, we are rolling out new features for our web articles, allowing readers to share their thoughts and insights by commenting on articles published on the www.pi-india.in website.

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Arun Bhardwaj
Editor, EM and A&D India

EV battery technologies and research stages

The race to meet the soaring demand for Electric Vehicles (EVs) has led battery technology to the forefront. Companies worldwide are pushing the boundaries of innovation to develop efficient, affordable and sustainable battery solutions. Here are some upcoming battery technologies discussed on account of **World EV Day** on 9 September.

Talk

"India has a significant role to play in the future of EV battery technology, given our growing automotive market and strong government support for e-mobility"

Currently, lithium-ion and lithium-iron phosphate (LFP) batteries dominate the EV landscape. Alternative battery technologies are essential for addressing the limitations and challenges of existing lithium-ion batteries, including energy density, resource availability, environmental concerns, cost, safety and performance. They offer the potential to make EVs more practical, affordable and sustainable while also serving a broader role in energy storage and the transition to clean energy sources.

Advancements in EV battery technologies

- **Solid-state batteries: A quantum leap**

Solid-state batteries have emerged as a game-changing technology in the EV industry. They promise enhanced safety, higher energy density and extended lifespan, revolutionising EV design and performance. Researchers are making significant strides in addressing challenges and bringing this transformative technology closer to mass production.

- **Exploring alternative chemistries**

While lithium-ion batteries dominate the market, this section explores the exciting landscape of alternative battery chemistries. It introduces concepts like zinc-air, sodium-ion and more. Sodium-ion batteries were developed to address critical challenges in energy storage. With sodium's abundance, they reduce resource scarcity concerns and offer cost-effective alternatives to lithium-ion batteries. They potentially lower environmental impact by reducing reliance on rare materials. Enhanced safety features are crucial for large-scale energy storage and EV applications. Compatibility with existing infrastructure streamlines adoption. Their development diversifies battery options, enhancing resilience and reducing supply chain vulnerabilities, especially in sodium-rich regions.

Stay tuned for other developments in battery technology that are transforming the field…

arun.bharadwaj@pi-india.in

iCreate launches the 3rd edition of India's largest EV innovation challenge

iCreate, the International Centre for Entrepreneurship and Technology, India's premier Technology business incubator focused on innovation, launched the third edition of EVangelise '23, the flagship event from iCreate, the nation's biggest Electric Vehicle (EV) innovation challenge, on June 27 at ITC Narmada, Ahmedabad. This seven-month-long event will serve as a gathering point for key stakeholders in the EV industry, including innovators, industry leaders, investors and policymakers, with the aim of shaping the future of this rapidly expanding sector. It provides a unique platform for collaboration, innovation and growth, offering excellent opportunities for networking, knowledge exchange and forming strategic partnerships.

The launch event was graced by the presence of Jagdish Vishwakarma, Minister of State, Government of Gujarat; S J Haider, IAS, Additional Chief Secretary to Government, Industries & Mines Department and distinguished industry leaders, including Rajeev Chaba, Emeritus CEO, MG Motor India, and other known national and international dignitaries. The previous editions, EVangelise'21 and EVangelise'22, received an overwhelming response with over 2,000 applicants from 183 cities and towns across India. Out of this competitive pool, approximately 40 finalists secured substantial financial support, incubation grants, expert mentoring, rapid prototyping and testing facilities as well as invaluable industry connections. With iCreate's support, more than 28 prototypes were developed, and 10 manufacturing collaborations were initiated. The 2023 edition of EVangelise focuses on taking the game to a new level by widening the scope to many different classes of vehicles and adopting a two-fold approach:

- Scouting for the best early-stage start-ups by tapping into colleges and incubators and offering them incubation support
- Facilitating manufacturing partnerships for industry-ready start-ups and providing VC connects to start-ups already in contact with the industry to give them a boost in their entrepreneurial journey

Spanning seven months, EVangelise will transform the dreams of numerous EV innovators into reality. The boot camp kicks off in the first week of November 2023, comprising three technical evaluation rounds. Over 170 startups are expected to participate, presenting their products and innovations to a panel of experts. Based on the evaluations, approximately 15 start-ups will advance to the Finale, scheduled for December 2023.

The purpose:

- Foster the development of indigenous products and technologies within the Indian EV ecosystem
- Address real challenges within the EV industry by engaging innovators and start-ups
- Facilitate collaborations between indigenous Deep Tech start-ups and prominent Indian manufacturers to advance the EV sector
- Support ventures in raising further funds from High Net-worth Individuals (HNIs), angels and VCs for scaling up their operations.

EVangelise '23 comprises two categories:

The Idea Stage and Scale-up Stage. In the Idea Stage (TRL 4 or below), start-ups can present concepts and explore strategic partnerships with industry partners. In the Scale-up Stage (TRL 5 or above), start-ups can connect with VC firms to secure funding for growth.

Innovation themes:

- Traction Theme (Motors, Controller, Gearbox, Axles)
- Energy Theme (Batteries, Fuel Cells, Alternate Chemistries, Charging Infrastructure, Wireless Charging, Overhead Charging)
- Telematics, Intelligence & Connectivity (TIC) Theme (Artificial Intelligence, Cloud, Advanced Driver Assistance Systems, Vehicle-to-Vehicle (V2V) Communication)
- Open Theme (Accessories, Harness, Braking, Steering, Materials etc.)

Cash prizes:

TRL < 5 Innovation Category (in each theme)

- First Prize: ₹ 3 lakh
- Second Prize: ₹ 2 lakh
- Third Prize: ₹ 1 lakh

TRL ≥ 5 Innovation Category (across all themes)

- First Prize: ₹ 10 lakh
- Second Prize: ₹ 7 lakh
- Third Prize: ₹ 5 lakh

Avinash Punekar, CEO, iCreate

"EVangelise '23 is a testament to our commitment to actively contribute to India's journey towards developing energy-efficient and sustainable mobility. With the continued support of the government and our valued partners, we are confident that EVangelise '23 will open unparalleled opportunities for our EV startups and innovators. The EV Center of Excellence at iCreate provides a collaborative environment that is wholly dedicated to nurturing the expansion of entrepreneurial talent in partnership with leading industry players and mentors. Together, we will pave the way for a brighter and healthier future through electric mobility across the length and breadth of India".

iCreate's RISC-V Contest fuels EV innovation in India

iCreate, as part of EVangelise '23, is hosting the RISC-V Contest, inviting start-ups, businesses, students and tech enthusiasts to create EV solutions using RISC-V architecture-based platforms like Shakti, VEGA, iCreate's SoC42 and others. The RISC-V Contest will feature up to 10 finalists competing for a cash prize of ₹ 1 lakh. RISC-V architecture offers versatile applications in EV system components, including:

- **Battery safety and management:**
  - Charging process management
  - Power flow monitoring
  - Battery management
  - Battery status monitoring (SoH, SoC etc.)
  - On-board charging systems
- **Telematics with GPS and NavIC:**
  - Vehicle-to-vehicle communication
  - Vehicle diagnostics and software updates
  - Seamless connectivity
  - Communication modules for various network protocols
  - Vehicle-to-Grid (V2G) Communication
  - Vehicle navigation and tracking
- **Motor controller technologies:**
  - Real-time control tasks
  - Motor control
  - Load condition analysis
  - Energy flow control
- **Vehicle instrument cluster:**
  - Sensor data processing
  - Vehicle diagnostics
  - User interfaces

The contest also encourages using the indigenously developed VEGA and SHAKTI (RISC-V architecture-based) projects.

iCreate's SoC42

To reduce reliance on imported chips and promote IP development in India, iCreate has developed a 'System on Chip' (SoC) capable of replacing a motor controller, vehicle control unit and battery thermal management system within a compact QFN chip.

3rd EDITION EVANGELISE 23
Electric Vehicle Innovation Challenge

Star Engineers' STAREQ and Vaakulab Technologies forge a pioneering partnership in EV component manufacturing

Star Engineers, renowned for revolutionising electronic component manufacturing in the automotive two and three-wheeler sector and non-automotive segments for three decades, proudly presents STAREQ. This new venture is dedicated to serving the emerging EV landscape. STAREQ raises the bar with an unwavering commitment to quality and precision in an ever-evolving industry. Driven by innovation, it emerges as a leader in ingenuity and execution. STAREQ proudly announces a strategic partnership with Vaakulab Technologies, an Indian start-up excelling in Battery Management Systems (BMS) for Lithium-ion Batteries. With over five years of R&D experience, Vaakulab's BMS solutions are trusted by 85+ battery companies, covering over 1,000,000 kilometres in EVs and 1,200,000 hours in Energy Storage Systems. This groundbreaking alliance merges StarEQ's manufacturing expertise with Vaakulab's cutting-edge BMS technology, promising a new era of advantages for customers. Divya Ramraika, MD, StarEQ, said, "Our partnership with Vaakulab Technologies redefines EV component manufacturing standards".

Beyond the present venture, StarEQ and Vaakulab are committed to pushing boundaries, innovating and developing advanced EV products for the global market. This partnership transforms the EV component manufacturing landscape, driving progress and sustainability in a rapidly changing world. The expertise of these industry leaders promises to revolutionise EVs and redefine industry standards.

- **About StarEQ:** StarEQ, a group company of Star Engineers, builds upon a rich legacy of innovation and excellence. With an extensive history in electronic component manufacturing, the company is poised to transform the EV component landscape through cutting-edge technology and unwavering quality.

- **About Vaakulab Technologies:** Vaakulab Technologies is an Indian startup with a robust history in Battery Management Systems (BMS) for Lithium-ion Batteries. With a focus on indigenous manufacturing and research-driven solutions, Vaakulab Technologies has emerged as a frontrunner in the EV technology arena.

Atlas Copco expands manufacturing in India with a new factory in Pune

Atlas Copco Group has begun construction of its new manufacturing facility in Talegaon, Pune. Atlas Copco's new state-of-the-art air and gas compressor system factory in Talegaon will manufacture systems for the local market and also for export. It encompasses a manufacturing plant and office building spanning a total of approximately 270,000 sq ft and the investment planned is MINR 1400 (about MEUR 15.0). The new facility is planned to be completed by Q2, 2024. It is expected to generate additional employment for over 200 people and add production capacity.

Philippe Ernens, President, Oil-free Air division, Atlas Copco, commented on the announcement of the new facility stating that, "We invest further in capacity in India to cater to the growing demand of the Indian and export markets. This expansion project is part of our strategy to remain first in mind and first in choice for our customers. It will enable us to reach new customers and markets and improve lead times to customers".

Marcelo Kabilio, Vice President, Operations, Atlas Copco India, said, "Our passionate teams involved in designing and making these innovative products at this new factory will help support our customers' productivity and sustainability goals". At the Talegaon facility, approximately 80% of the energy will be procured from solar panels, and three-fourths of the water consumed will be derived from rainwater harvesting. The construction will be in line with the LEED (Leadership in Environmental Energy and Design) concept.

"India is witnessing a substantial increase in renewable energy capacity"

… says **Abhay Adya,** Business Head, Renewables, Zetwerk. In an interview with Sanjay Jadhav, he discusses the renewable energy sector and its recent developments. Excerpts from the interview…

As the Business Head, Renewables, could you share with us the current market trends in the renewable energy sector? How do you see this industry evolving?

India's renewable energy sector has been making impressive progress in recent years, propelled by favourable government policies, declining costs of renewable technologies and a growing emphasis on sustainability. Key market trends in the sector include a rapid expansion of capacity, with India witnessing a substantial increase in renewable energy capacity, particularly in solar and wind power. The government has set ambitious targets of achieving 175 gigawatts (GW) of renewable energy capacity by 2022, followed by a further target of 450 GW by 2030, leading to a surge in project installations nationwide.

Zetwerk has been a key player in the contract manufacturing industry, particularly in renewables. Can you tell us about Zetwerk's plans of growth in this sector?

Zetwerk has established a robust network with MSMEs. By leveraging Zetwerk's involvement, MSMEs gain access to cost-effective raw materials through our advantageous volume purchasing. This enables SMEs to focus on their core competency of manufacturing. Moreover, our team of qualified professionals can be deployed to their factories when necessary, ensuring the highest quality standards for their products. Consequently, we are exceptionally positioned to serve as the supply chain management partners for large corporations, acting as their primary point of contact for all project requirements.

What are some of the key factors that have led to the renewables industry's growth, and how has Zetwerk capitalised on these opportunities?

Zetwerk has successfully positioned itself as a key player in the renewable energy sector, leveraging the momentum created by these influential factors. The company's involvement spans commissioning renewable energy solutions, supply chain management, managing inventory, operations and maintenance. Overall, Zetwerk has positioned itself strategically within the renewable energy industry, capitalising on the prevailing market dynamics and carving out a prominent role in multiple aspects of the value chain.

Looking ahead, what are Zetwerk's plans and goals in the renewables sector? Are there any new technologies or innovations that you are exploring to stay at the forefront of the industry?

As the renewable energy sector continues to evolve, companies like Zetwerk are proactively exploring various areas of focus and emerging technologies to maintain their position at the forefront of the industry, like continued cost reduction, energy storage technologies, hydrogen technologies and technological developments like data analysis, digitalisation and AI. Zetwerk remains committed to embracing advancements and emerging technologies, ensuring that it remains at the forefront of the renewable energy sector. By continuously pushing boundaries and pursuing innovative solutions, Zetwerk aims to drive the transition towards a cleaner and more sustainable energy future.

"Government policies and incentives drive commercial EV transition"

…says **Poorvak Kapoor,** VP, Technology, Euler Motors. In an interview with Neha Basudkar Ghate, he discusses various aspects of the company's technological innovation and ambitions in the commercial Electric Vehicle sector in India. Excerpts from the interview…

Euler Motors has been recognised for its technological innovation. Can you tell us about the key technological advancements that set your EVs apart?

Euler's EV technology has already set impressive industry benchmarks, aiming to deliver higher earnings and lower operational costs for Indian customers. Some notable features include a liquid-cooled battery pack and advanced components like BTMS, a motor controller and a vehicle control unit. We offer versatile charging options with the Flash27 Fast Charger. Another standout feature of our EVs is the Euler Shepherd, a proprietary software application that offers advanced telematics for real-time fleet tracking, vehicle monitoring and charging status.

The EV industry is evolving rapidly. Could you share your insights on the current technological trends that are reshaping the commercial EV segment in India?

Battery technology's evolution, led by lithium-ion batteries, now offers enhanced efficiency, longer range and faster charging for EVs. Concurrently, a robust network of public and private charging stations and the integration of IoT, Telematics, real-time tracking, remote diagnostics and predictive maintenance enhance the efficiency of fleet management, reduce downtime and elevate overall productivity. The government's supportive policies and incentives are compelling businesses to transition towards commercial EVs. As the EV market grows, localised manufacturing of components and vehicles is gaining importance.

What drives your ambition to become a category leader for cargo and passenger vehicles in India?

We aspire to lead the commercial vehicle segment in India with our powerful commercial EV, HiLoad 2023. Our expanding retail presence across India is a testament to making our vehicles and products more accessible and elevating the customer experience.
Euler Motors is driven to support India's mobility transformation. Fuelled by innovation, our focus is unwavering on advancing technology. At the core of this is Euler Shepherd, our in-house software with real-time usage.

Moving ahead, what do you think about autonomous driving in India?

The future of autonomous driving in India holds promise, though its timeline is dependent upon technological advancements. Adaptation to autonomous driving is crucial and in alignment with India's driving habits, road conditions and user preferences for success. Indian start-ups are contributing to this by tailoring advanced driver assistance systems and autonomous features to local conditions, playing a pivotal role in autonomous technology's evolution in India. The successful integration of autonomous vehicles in India will likely require a combination of technological innovation, regulatory adaptation and collaboration between industry stakeholders, government bodies and research institutions.

“Dana India’s expertise and capabilities support worldwide operations”

…says **Gajanan V Gandhe,** Country Head & Vice President, Dana India. In an interview with **Neha Basudkar Ghate,** he discusses how the company has evolved and diversified its offerings to stay competitive in the automotive industry. Excerpts from the interview…

Q **Dana Incorporated has a rich history dating back to its founding pioneers. How has the company’s business model evolved over the years to adapt to changing market dynamics?**

Over the course of our history, we have navigated through more than 117 years of vehicle evolution, persisted through industry turbulence and taken the lead in transformative technological revolutions. In this time, we have established strong relationships and a level of trust with our customers that simply cannot be beaten. We initially began as a supplier of universal joints and drive shafts; however, over the years, we have expanded our capabilities and offerings. From traditional driveline systems, we have diversified into technologies such as e-Propulsion systems, thermal management solutions and software-driven controls. This evolution enables us to stay ahead of industry shifts, delivering comprehensive solutions that cater to evolving customer needs while also driving sustainability and efficiency.

Q **How is your business strategy transforming the future of mobility?**

Our business strategy centres around three pillars: Advancing Sustainability, Embracing Technology and Fostering Partnerships. We are steering the future of mobility by transitioning from traditional powertrains to hybrid and electric solutions, reducing emissions and enhancing efficiency. By embracing technologies like electrification, connectivity and automation, we are creating integrated solutions that cater to changing consumer preferences. Collaborative partnerships with industry leaders enable us to collectively shape the future of transportation, making it safer, more sustainable and more accessible. To enable our customers achieve their sustainability objectives, Dana has taken a leading position in vehicle electrification. We bring together our mechanical drive, electro-dynamic, thermal and digital technologies, making Dana the only supplier capable of delivering all elements of a complete, fully integrated system across all mobility markets.

Q **Could you elaborate on how Dana India fits into the larger global strategy of the company and its role in maintaining the company’s international footprint?**

Dana India plays a pivotal role within the company’s global strategy. India is a strategic hub for engineering and manufacturing, contributing to our global technology and supply chain network.

Dana India aligns seamlessly with our commitment to innovation and sustainability. The expertise and capabilities here support our worldwide operations, ensuring that we can provide localised solutions while maintaining the highest global standards. This synergy helps Dana India enhance its international footprint by contributing innovative solutions and expertise across various global and local customers like Tata Motors, Ashok Leyland, Volvo etc.

Q Dana is shaping sustainable progress through its conventional and clean-energy solutions that support nearly every vehicle manufacturer with drive and motion systems and electro-dynamic technologies. What are your thoughts on this?

Our diverse portfolio positions us as a true industry leader. By supporting various vehicle manufacturers with our advanced drive and motion systems we are empowering the transportation sector to embrace sustainability without compromising performance. We're not just addressing the market; we're actively shaping it, advancing the adoption of cleaner, smarter and more efficient mobility solutions.

Q Operating in various markets worldwide can present challenges due to cultural and regulatory differences. How does Dana India navigate these challenges to maintain a consistent and successful global presence?

Navigating cultural and regulatory differences is indeed a complex task, but Dana India excels in this regard. We prioritise building strong relationships within the local communities where we operate, fostering an understanding of diverse cultures and practices. Moreover, our adherence to global standards ensures consistency in our operations while respecting local regulations. This blend of global expertise and local understanding allows us to maintain a successful and respected global presence while making a positive impact in the regions where we operate.

Q Could you share some success stories of Dana's work with Indian businesses, specifically in the manufacturing sector, over the last few years?

Our collaboration with Indian businesses has been truly rewarding. For instance, we have partnered with leading manufacturers to develop and implement innovative drivetrain solutions that enhance efficiency and sustainability. We have recently expanded our manufacturing capabilities in India, including the establishment of state-of-the-art facilities such as the new TM4 facility. Our noteworthy investment of $18 million in Ashok Leyland's EV arm — Switch Mobility aligns strategically with the vision of establishing a dedicated vertical for EVs and positions the company to play a key role in the development of EV drivetrains.

In 2021, Dana took a significant step towards bolstering its presence in the Electric Vehicle (EV) market in India by establishing a dedicated EV drivetrain manufacturing facility in Pune. This facility marks Dana's 18th plant in India, including joint ventures, highlighting the company's commitment to local manufacturing and its contribution to the Make in India initiative. By 2022, we delivered a record three-year sales backlog of $900 million, with 65% of the sales coming from EV platforms. These success stories underscore our commitment to driving progress in India's manufacturing landscape while fostering mutually beneficial partnerships.

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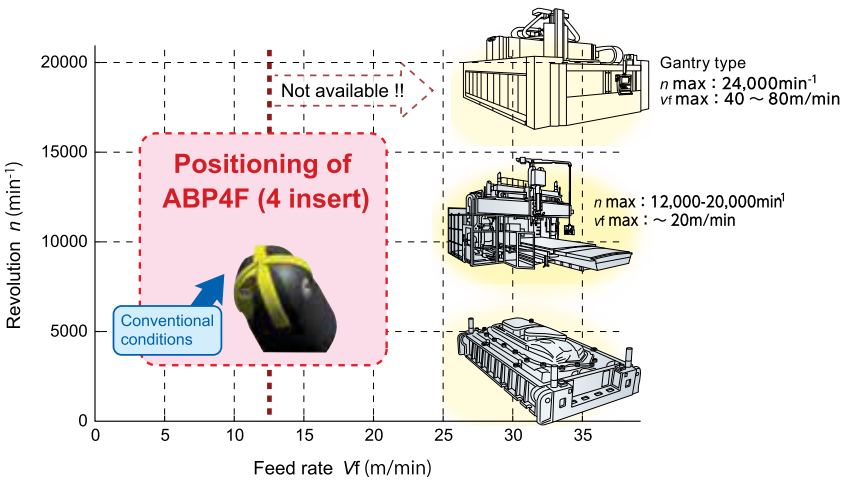
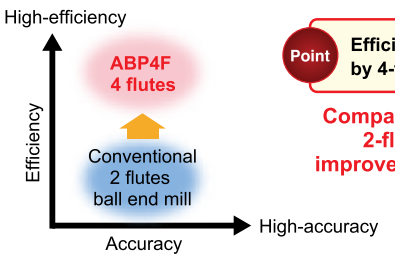


Processing advantage of 4-flutes end mill

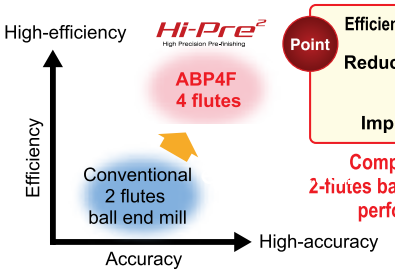
Figure Finishing



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

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

Figure Semi-Finishing



Point **Efficiency processing with small pitch**
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Improve finishing accuracy

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

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YOUR GLOBAL CRAFTSMAN STUDIO

Unveiling the potential of Sodium-ion Batteries

In the dynamic landscape of electric mobility, the push for alternatives to battery technology has given rise to the advent of Sodium-ion Batteries (SIBs). This article offers a comprehensive exploration of the technological and market landscape of SIBs for EVs in India, shedding light on their potential advantages and challenges and the roadmap ahead.

Shubham Chordia,

Assistant Manager,
Sales and Marketing,
Nidec Motor Corporation

Sodium-ion Batteries (SIBs), a promising alternative to their lithium-ion counterparts, share a similar architecture comprising an anode, cathode, electrolyte and separator. Yet, the key differentiator lies in the use of sodium as a core material. This shift opens up new possibilities for sustainable energy storage and transportation, driven by the abundance and affordability of sodium resources.

Key components and materials

SIBs comprise several crucial components:

• Anode:

Anode materials are crucial for sodium-ion storage. Carbon-based materials, such as hard carbons, are promising due to their ability to accommodate sodium ions without significant structural degradation.

Lithium-ion Battery	Sodium-ion Battery
• Lithium availability is limited to a few countries, which is why prices have risen more than seven-fold since 2021.	• Sodium is more than 500 times more abundant than lithium. It can also be extracted from seawater at a low cost.
• Lithium is less environment-friendly than sodium and must always be stored with a minimum charge, increasing fire risks.	• Sodium is more environment-friendly and can be transported at zero volt, making it safer.
• Lithium-ion battery uses copper, which is three or four times more expensive than the aluminium used in sodium-ion batteries.	• A Sodium-ion battery uses aluminium, which is cheaper than copper.
• Lithium-ion batteries have a lower operating tem-perature range and can casue a fire if operated in higher temperatures.	• Shodium-ion batteries have a higher operating temperature range, and can be used in extreme temperatures without the risk of thermal runaway.
• Lithium-ion batteries have a slow charge rate and smaller lifecycle compared to sodium-based batteries.	• Sodium-ion batteries charge faster than lithium-ion bariants and have a thrice higher lifecycle.

• Cathode:

Cathode materials play a vital role in determining the overall performance of SIBs. Materials like sodium transition metal oxides, phosphates and polyanion compounds have been explored for their sodium intercalation properties.

• Electrolyte:

The electrolyte serves as the medium for sodium-ion transport between the anode and cathode. Solid electrolytes, liquid electrolytes and polymer electrolytes have all been investigated for their compatibility with sodium-ions.

• Separator:

Separators prevent direct contact between the anode and cathode, preventing short circuits while allowing for the transport of sodium ions.

Challenges and innovations

While the potential benefits are promising, sodium-ion batteries face multiple challenges that require immediate attention and innovative solutions. They are:

• Energy density enhancement:

Addressing the energy density gap between sodium-ion and lithium-ion batteries is a priority. Researchers are actively exploring advanced materials and electrode designs to enhance the energy density of sodium-ion batteries without compromising safety.

• Extending cycle life:

Prolonging the cycle life of sodium-ion batteries is crucial for their viability in EV applications. Efforts in developing stable electrode–electrolyte interfaces and advanced electrolytes are underway to achieve this objective.

Applications of SIBs

• Grid-level energy storage:

Sodium-ion batteries can play a pivotal role in storing excess renewable energy generated by sources like solar and wind.

• Electric Vehicles (EVs):

Sodium-ion batteries could offer an economical and sustainable alternative for EVs, especially in applications where higher energy density is not a primary concern.

• Portable electronics:

Sodium-ion batteries could power a range of portable electronic devices, such as laptops, tablets and smartphones, providing a greener option for everyday technology.

• Remote and off-grid applications:

In remote or off-grid areas, sodium-ion batteries could provide reliable and affordable energy storage solutions, improving access to electricity.

SIBs present promising potential benefits, yet innovative solutions are imperative to overcome challenges they face. A critical priority involves bridging the energy density gap with lithium-ion batteries, with researchers actively exploring advanced materials and electrode designs to enhance energy density. Equally essential is extending the cycle life for viability in EV applications, where efforts focus on stable electrode-electrolyte interfaces and advanced electrolytes.

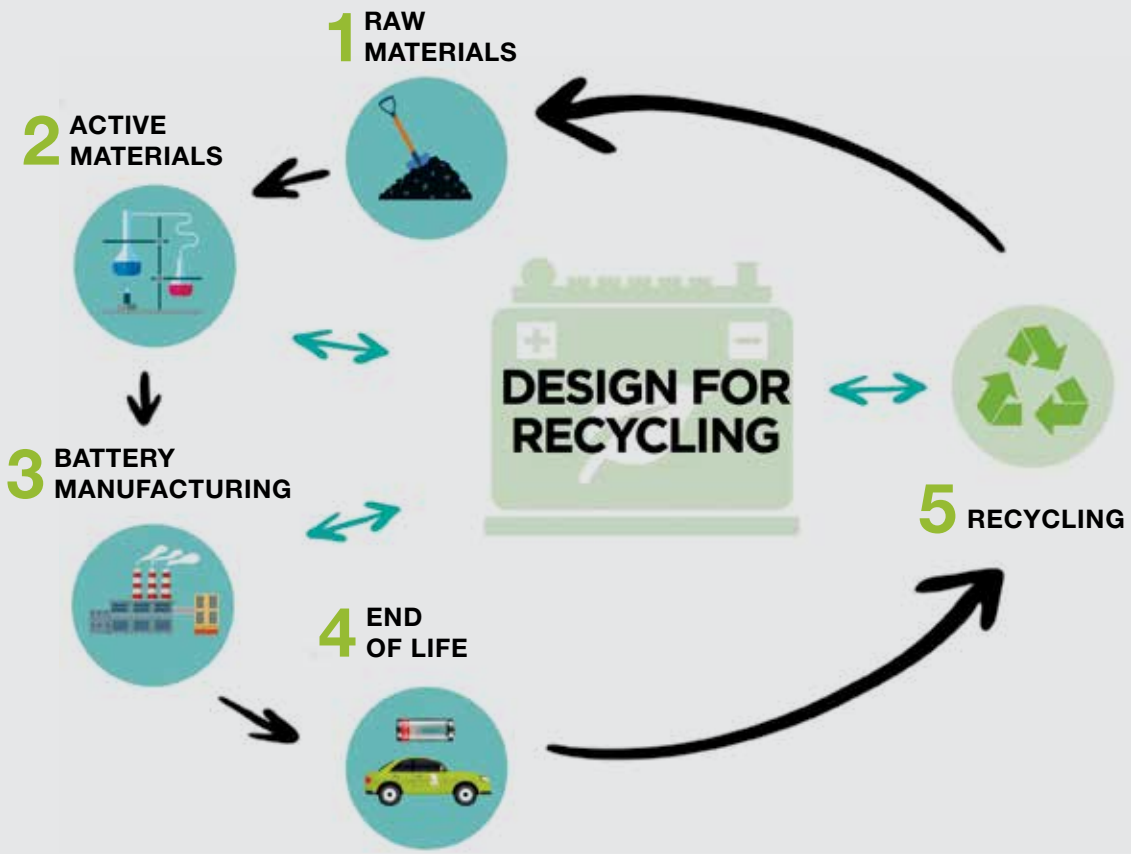
SIBs find versatile applications: firstly, in grid-level energy storage, aiding the stabilisation of grids by storing excess renewable energy from sources like solar and wind. Secondly, in EVs, they offer an economical and sustainable option, particularly for applications prioritising cost over ultra-high energy density. Thirdly, they have potential in powering portable electronics, such as laptops and smartphones, providing a greener choice for everyday devices. Lastly, for remote or off-grid locations, SIBs could furnish reliable and affordable energy storage.

Recycling of SIBs

Recycling SIBs involves a multi-step process that aims to recover valuable materials, minimising environmental impact. While recycling techniques for SIBs are still evolving, the general approach involves disassembling the battery, separating its components, recovering materials and processing for reuse. Here is the recycling process for SIBs:

• Collection and transportation

At the end of their life cycle, SIBs need to be properly collected and transported to recycling facilities. This step is



Batteries need to be designed appropriately to maximise the benefits of recycling. (Image CIC ene)

crucial to ensure safe handling and prevent potential hazards during transportation.

• Battery disassembly

SIBs are disassembled to separate different components, including the anode, cathode, electrolyte and separator. This step can be challenging as it requires careful handling to avoid environmental contamination and personal risks.

• Component separation

After disassembly, the components are separated. Techniques such as mechanical processes, shredding and sieving can be used to break down the battery components into smaller pieces and segregate them based on material types.

• Material recovery

The recovered materials, such as electrode materials and electrolytes, undergo further processing to isolate and refine them. Depending on the materials, techniques like hydro-metallurgical or pyro-metallurgical processes can be employed to recover valuable elements like sodium, cobalt, nickel and other metals.

• Battery chemistry-specific recovery

SIB recycling may differ based on the specific electrode materials used. Different chemistries can require distinct approaches for efficient material recovery. For instance, the recovery process for cathode materials containing sodium transition metal oxides might differ from that of anodes composed of hard carbons.

• Purification and refining

Recovered materials may need purification to remove impurities and contaminants. Refining processes help enhance the quality of recovered materials to meet industry standards.

• Re-processing and re-use

Once the recovered materials are purified, they can be reprocessed to create new battery components. These materials can be used to manufacture new electrodes, electrolytes and other battery components, reducing the need for virgin raw materials.

• Waste management

Any materials that cannot be recovered for reuse need to be properly managed to minimise environmental impact. Proper disposal or treatment of hazardous waste is essential to ensure regulatory compliance and safeguard the environment.

Recycling SIBs presents challenges due to the diversity of battery chemistries, material complexity and the need for efficient and environmentally friendly recovery processes. Additionally, establishing a comprehensive recycling infrastructure, regulatory framework and collaborations among battery manufacturers, recyclers and policymakers is essential for successful battery recycling efforts.

Global potential

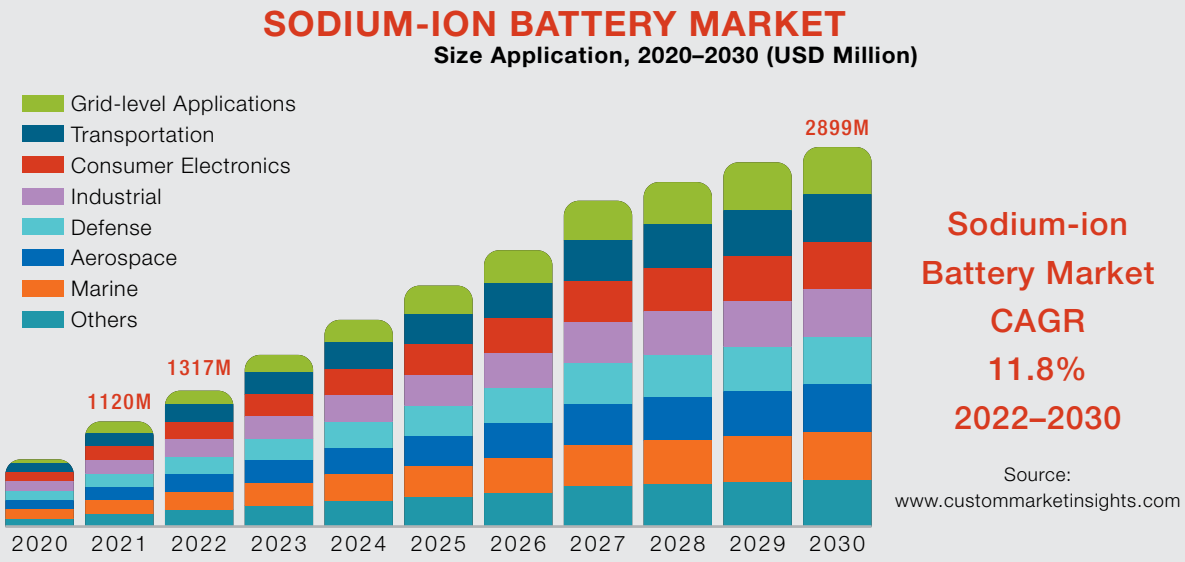
Here are some ways in which global companies are engaging with SIB technology:

• R&D initiatives:

- **Tesla:** Known for its innovative approach to EVs and energy storage, Tesla's research teams have explored SIB chemistry as a potential complement to their lithium-ion battery offerings.
- **Toyota:** A leader in the automotive industry, Toyota's involvement in SIB research reflects its dedication to sustainable transportation solutions.
- **Samsung:** As a major player in the electronics sector, Samsung has demonstrated interest in SIBs for various applications, including portable electronics and energy storage systems.

• Investments and acquisitions:

- **IBM:** IBM has ventured into the SIB field through its acquisition of a Canadian battery start-up called Electrovaya. This move demonstrates IBM's interest in leveraging SIB technology for data centres and renewable energy storage.
- **Total Energies:** This energy major has invested in Ionic Materials, a company working on advanced solid-state electrolytes, showcasing a broader interest



in new energy storage technologies that can be applied to various battery chemistries, including sodium-ion.

• **Partnerships and collaborations:**

- **BASF and Eneris:** BASF, a leading chemical company, has partnered with Eneris, a start-up specialising in energy storage solutions. Together, they are working on developing advanced SIBs that could address energy storage needs in various industries.
- **Faradion and Infraprime Logistics:** Faradion, a UK-based company focused on SIBs, has partnered with Infraprime Logistics to integrate its SIBs into commercial EVs.
- **NEC Corporation:** NEC, a multi-national information technology and electronics company, has collaborated with Ambri, a company specialising in innovative energy storage solutions.

• **Start-ups and innovators:**

- **HiNa Battery:** HiNa Battery, a start-up based in China, aims to develop high-performance and cost-effective SIBs for various applications, including EVs and energy storage systems.
- **Ionic Materials:** Ionic Materials' partnerships and research collaborations underscore the growing interest in new materials that could revolutionise energy storage.

Conclusion

In the rapidly evolving energy landscape, SIBs have emerged as a beacon of hope, offering a transformative solution that transcends borders. Globally, the energy storage paradigm is undergoing a profound shift, as industries, researchers and governments collectively acknowledge the pressing need for cleaner, more efficient and sustainable energy storage technologies. SIBs have captured the attention of innovators, setting the stage for a dynamic future where these batteries play a pivotal role in reshaping our energy systems.

From a global perspective, major companies are investing in research, forging partnerships and exploring applications for SIBs across various sectors. The appeal lies not only in the technological advancements but also in the environmental consciousness that drives the quest for greener energy solutions. As the world grapples with the challenges of climate change, resource scarcity and electronic waste, SIBs stand poised as a promising bridge between the demand for energy and the imperative for sustainability.

In the Indian context, a nation of burgeoning energy needs and growing environmental concerns, SIBs offer a unique promise. Indian companies, research institutions and initiatives have stepped up to contribute to this global movement. With a blend of indigenous innovation, strategic collaborations and a commitment to sustainable growth, India is poised to not only embrace this technology but also emerge as a significant player in the SIB landscape.

The journey towards SIBs as a mainstream energy storage solution is undoubtedly an intricate one, marked by challenges and breakthroughs alike. Yet, the collective momentum and collaborative spirit driving this endeavour offer a beacon of optimism. As we move forward, embracing the vision of a cleaner, more resilient energy future, SIBs stand as a testament to human ingenuity and determination — a symbol of our capacity to innovate towards a sustainable tomorrow, both on a global scale and within the diverse tapestry of India's own aspirations. ☐

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Atmanirbhar Bharat: Riding towards self-reliance

In recent years, the global push towards sustainable development and the need to combat climate change have placed Electric Vehicles (EVs) at the forefront of transportation solutions. Here is how India is progressing towards self-reliance in the EV manufacturing sector.

Rahil Gupta,

Co-founder & Chief Technology Officer, HOP Electric Mobility

The government's vision of 'Atmanirbhar Bharat' aims to foster self-reliance across various sectors, including the EV landscape. Further, India's involvement as the only developing nation in the coveted Mineral Security Partnership (MSP), a US-led collaboration of 14 countries that aims to catalyse public and private investment in critical mineral supply chains, adds to its advantage. The recent milestone of discovering significant lithium reserves in Rajasthan further strengthens India's position in the EV market. Additionally, India has witnessed increasing adoption of EVs, with over 100,000-unit monthly sales during the first half of CY2023. This feat highlights the growing understanding and traction among consumers toward EVs. The Indian government's commitment to becoming carbon neutral by 2070 is yet another significant step in promoting a sustainable and self-reliant future.

Localisation of the EV supply chain

Promoting the localisation of the EV supply chain is a vital step towards self-reliance. The government, in collaboration with private sector stakeholders, should focus on developing a robust ecosystem of domestic suppliers for raw materials, components and spare parts.

Accelerating EV technology

Investment in Research and Development (R&D) is essential for driving innovation and indigenous development of EV technology. While the government's efforts are aligned in the direction of facilitating public–private partnerships and supporting academic and research institutions to conduct cutting-edge research in battery technology, electric powertrains and materials science, the journey has just begun and needs acceleration.

Efficient EV manufacturing

A skilled and competent workforce is crucial for efficient manufacturing practices in the EV space. The government and private sector should collaborate to design specialised training programs that cater to the specific needs of the EV industry. By nurturing a skilled workforce with expertise in EV manufacturing and technology, India can enhance

productivity and maintain high-quality standards in the production process.

Promotion of indigenous EV manufacturers

Supporting and promoting indigenous EV manufacturers is vital to achieving self-reliance. The government can provide incentives to domestic manufacturers, facilitate access to finance and technology and create a favourable environment for start-ups and established players in the EV industry. These measures will not only boost local manufacturing but also encourage innovation and competition within the sector.

Increasing EV adoption

The government has introduced various initiatives and schemes to accelerate the adoption of EVs. The 'Production Linked Incentive' scheme aims to boost local domestic production, while the 'Faster Adoption and Manufacturing of Hybrid and Electric Vehicles 2' (FAME) scheme provides subsidies to enhance EV adoption. These incentives include tax benefits, reduced registration fees and financial assistance for EV purchases. Moreover, the establishment of a robust charging infrastructure is crucial to allay range anxiety and encourage more people to switch to EVs. Public and private entities should work together to deploy charging stations across the country, making charging convenient and accessible for all EV owners.

Strengthening collaboration

India's status as the only developing nation in the coveted MSP provides a unique opportunity to secure access to crucial minerals for EV production. The government should actively engage in strategic partnerships with other countries and organisations to ensure a stable supply of essential minerals for battery manufacturing. Additionally, promoting sustainable mining practices can contribute to India's commitment to environmental responsibility.

Leveraging our lithium reserves

The discovery of substantial lithium reserves at Nagaur, Rajasthan, is a significant milestone for India's EV industry. Lithium is a critical component in EV batteries, and its availability within the country can reduce dependency on imports and ensure a stable supply of raw materials for battery production. In addition to reducing our import and dependence on other countries for lithium, India will be able to reach their sustainability goals statistically earlier than expected with the help of the reserves found.

Carbon neutrality by 2070

India's commitment to becoming carbon neutral by 2070 underscores its dedication to environmental sustainability and energy transition. The EV industry offers a greener alternative to conventional internal combustion engine vehicles. By prioritising EV adoption and efficient manufacturing practices, India can significantly contribute to the global efforts in mitigating climate change challenges.

Bottom line

As India charts its path towards self-reliance in the EV ecosystem, efficient manufacturing practices are critical to achieving this vision. Leveraging indigenous lithium reserves, localising the supply chain, investing in research and development and promoting skill development are essential to fostering self-sufficiency. The increasing adoption of EVs in the country, supported by government initiatives and commitments, demonstrates the growing understanding and traction among consumers towards electric mobility. As India is the only developing nation in the coveted MSP, it must capitalise on its resources and strengths to emerge as a leader in the global EV market. Thus, by embracing efficient manufacturing practices and sustainable technologies, India can accelerate its journey toward a cleaner, greener and self-reliant future. ☐

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Igniting innovation and growth with R&D

Research and Development (R&D) play a key role in driving innovation and shaping the future of industries. It involves exploring new ideas, developing cutting-edge technologies and advancing scientific knowledge. Here is a brief overview of the factors driving the importance of R&D in welding in India.

Somanth Chakravarty,
Head of Research, Development & Quality (Welding Consumables), Ador Welding

R&D in welding leads to cost reduction and process improvements, developing new techniques and technologies that make welding more affordable and efficient on a global scale. From healthcare and technology to agriculture and renewable energy, the importance of R&D cannot be overstated, as it enables countries to compete, adapt to a changing environment and unlock the potential of human intelligence. Thus, it truly forms the backbone of any industry, including manufacturing, which is currently the fastest-growing sector in India with an estimated contribution of 25% to the GDP. Within the manufacturing industry, R&D in the welding sector stands out for its unique approach.

In addition to regular research and development activities, the welding industry focuses on commercialising welding processes and technologies to effectively reduce costs, boost productivity and enhance competitiveness.

There are many organisations that conduct premier research in the field of welding and allied areas, including the Welding Research Institute, Bhabha Atomic Research Centre, Indira Gandhi Centre for Atomic Research and various IITs and NITs. Industry bodies play an important role in applied research for the development of welding in India. The major roles played by private organisations for welding research in India include:

- **Investment in R&D:**

Private companies allocate significant funds for R&D activities in welding. They allocate funds for research projects, experimental studies and the development of new welding technologies, processes and materials. This financial assistance supports innovation and enables the exploration of cutting-edge strategies and solutions.

- **Technological advancements**

Private organisations are actively involved in the development of advanced welding technologies and solutions. They focus on improving welding processes, automation, digitisation and efficiency. These improvements are aimed at increasing the efficiency, quality and cost-effectiveness of welding operations.

- **Skill development and training**

Need of skilled manpower is essential for the growth of welding fraternity. In private organisations, research is conducted to identify skill gaps and develop training modules to enhance welder capabilities. This focus helps to develop skilled workers who can effectively use the latest welding technology and techniques.

R&D is an important part of the welding industry and facilitates continuous growth, improvement and innovation. It inspires new product development, improvement of welding techniques and processes and welding of newer materials. In the welding industry, the development of innovative and successful products is consequential of the years of study, experimentation and hard work dedicated to R&D in the field. Implementing its output effectively, we can compete globally, ensure quality competitive products in the welding industry and contribute to the broader goals of industrial development in the country. ☐

Towards a digital manufacturing operation

Driven by digital technologies and the right partners, India's manufacturing industry can accelerate its business transformation and be competitive globally. Here is a brief introduction to how you can transform your manufacturing using digital techniques.

Suprakash Chaudhuri,
Head, Digital Industries, Siemens

The recent report by PwC on digital manufacturing trends is very encouraging and insightful. It says that 54% manufacturers in India have implemented Artificial Intelligence (AI) and analytics for improving business functions. The report also states the importance of collaborating with the right partners for earning higher returns on investment. This is consistent with the belief that digital/smart manufacturing or Industry 4.0 delivers significant value in terms of business transformation and achieving strategic objectives. Digitalisation and automation are the game changers to remain competitive and for other long-term benefits.

Unlike a few years ago, digital manufacturing today includes a wide array of technologies and methodologies that hold the potential to reshape the sector's landscape. It is essential to collect, understand and use the massive

amount of data created in the Industrial Internet of Things (IIoT). The key is in combining the real and the digital worlds and shaping the journey towards a true 'Digital Enterprise'.

Product and production integration

Combining the real and the digital worlds makes it possible to seamlessly integrate the entire value chain from design to realisation while optimising with a continuous flow of data. A true Digital Enterprise can harness the unlimited power of data by gaining valuable insights to make fast and confident decisions and create the best-in-class products through efficient production.

Using a Digital Twin

The comprehensive Digital Twin approach drives continuous optimisation throughout the product and production lifecycle, enabling fast product introduction, flexible manufacturing and data-driven performance optimisation. By examining 'what if' scenarios and predicting future performance with the Digital Twin, you can be sure that your product and production will work exactly as you designed and planned.

Horizontal integration

The integrated Digital Enterprise approach enables the horizontal integration and digitalisation of the entire value chain — from design to production, service and recycling. Seamless horizontal integration bridges the gaps between information silos and connects everything from product innovation to production through products in use.

Vertical integration

All field devices and control units operating on the shop floor are producing a lot of data. Industry 4.0 is dependent on the smart use of data and communication. A vertical integration adds these data analytic capabilities precisely, from the Information Technology on the top floor also to the Operational Technology on the shop floor for data-driven decision-making.

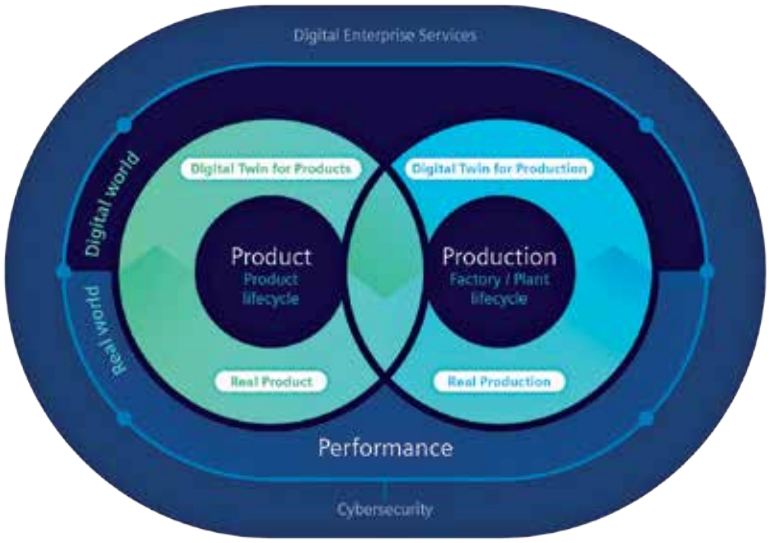
IIoT and manufacturing

The Industrial Internet of Things (IIoT) has evolved as a key driver in the growth of digital transformation for the manufacturing sector. IIoT involves connecting physical devices, machinery and equipment to the internet, allowing them to collect, exchange and analyse data, leading to intelligent and interconnected systems.

This real-time data exchange enables manufacturers to gain valuable insights into their production processes, machine health and overall efficiency. By harnessing IIoT, manufacturers have realised benefits such as optimised operations, reduced downtime, predictive maintenance and enhanced quality control.

AI in digital manufacturing

AI is now a driving force behind the transformation of digital manufacturing. AI-powered algorithms can process vast amounts of data, identify patterns and make data-driven decisions in real time. AI-driven analytics can optimise production schedules, reduce waste and streamline supply chain management, leading to cost savings and improved productivity. Furthermore, AI-driven insights empower manufacturers to make strategic decisions, adapt to market trends and respond to customer demands promptly.



Upcoming trends

As digital manufacturing continues to evolve, several trends are expected to shape the the industry, such as:

- **5G connectivity:** The widespread adoption of 5G technology will enable faster and more reliable data transfer. This helps the manufacturing process by supporting real-time communication between machines, devices and stakeholders.

- **Edge computing:** Edge computing is set to become more prevalent as it reduces latency and enables data processing closer to the source, enhancing the efficiency of IIoT applications.

- **Cybersecurity focus:** As digital manufacturing relies heavily on data exchange and connectivity, there will be a growing emphasis on cybersecurity measures to protect critical information and systems from cyber threats.

- **Sustainable manufacturing:** Digital technologies will play a vital role in facilitating sustainable manufacturing practices, including energy-efficient operations, waste reduction and environmentally friendly production processes.

Digital manufacturing is constantly evolving to a new era of efficiency, productivity and innovation in the manufacturing industry. From IIoT to robotics and automation, digital twin technology and AI, these transformative technologies are reshaping traditional manufacturing practices. Embracing these digital advancements will be crucial for manufacturers seeking to thrive in the increasingly competitive and dynamic landscape of the digital era.

The right digital partners

Irrespective of the technology and the expertise available, transforming a manufacturing organisation into a digital manufacturing operation is not an easy task. For achieving a successful transformation, leaders must have their goals and priorities aligned at all levels, and the changes need to be communicated to all employees who need to invest in upgrading skills. Moreover, the legacy systems must be updated and leaders must choose the right digital partner to help them succeed.

To enable smooth operations and rapid changes across workstations, line and factory levels, manufacturers need partners with expertise across feasibility studies, process engineering, additive manufacturing, part manufacturing, process simulation, factory design, automation engineering, manufacturing execution, service engineering, specification management, electronics, quality, IIoT analytics and supplier management. Manufacturers have strategic objectives to meet. Thus, how can we innovate faster? How can we reduce the risk of manufacturing? How do we ensure high efficiency and quality? How do we maintain complex systems across service engineering, production and product support? How do we optimise the supply chain and get end-to-end visibility?

The answer lies in embracing digitalisation and a top-down commitment. Over 50% Indian manufacturers are convinced and have invested in digital practices to enhance their factories. Through digitalisation, manufacturing enterprises can enhance efficiency, reduce the cost of production, minimise manufacturing defects and shorten production time. With this, they can not only meet international quality standards but also strengthen their position as competent suppliers for the global market. Therefore, the real question for the entire manufacturing community is: How ready are you? ☐

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Walter is focusing on **innovations in turning**

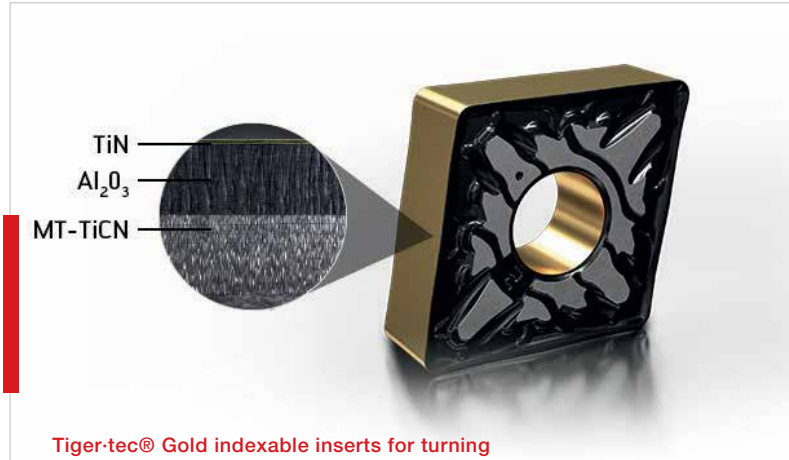
The manufacturing landscape is constantly evolving. Thus, machining companies must continuously evolve their machining solutions to stay competitive and meet the changing demands of the industry. Here is a look into how Walter AG makes constant, incremental improvements to stay on top of their game.

In principle, all machining companies are evolving with the changing components, small batch sizes, high price pressure, new materials and the highest demands on the surface quality of the manufactured components. Working economically also places the highest demands on the machining tools used. Manufacturers like Walter are therefore continuously working on their portfolio of machining solutions. The ambition of the machining experts at Walter in Tübingen goes beyond that. Optimisations or innovations that do not bring significant productivity improvements for real customer processes are viewed with scepticism. The developmentally strong manufacturer, therefore, focuses primarily on innovations that have the potential to become the new benchmark in the market. In the last two years, the turning and grooving segment has benefited the most from this.

Innovative Tiger tec® Gold coating solution increases performance

In milling, Walter's Tiger·tec® Gold indexable inserts have been the gold standard for productivity and performance for five years. Last year, the machining experts from Tübingen also launched Tiger·tec® Gold indexable inserts for turning. Compared to the previous indexable inserts for this application, the new grade provides up to 50% more tool life when turning components made of ISO P steel as well as for special machining of martensitic stainless steels and ductile graphite iron.

The decisive difference for the new Tiger·tec® Gold indexable inserts is the structure and orientation of the coating. Usually, only the aluminium oxide layer is highly textured during CVD coating; however, with Walter Tiger·tec® Gold, this is also done with the titanium nitride layer. This significantly increases the homogeneity and, therefore, the wear resistance of the coating. In the application, this is reflected in the greatly reduced flank face wear and the massively reduced crater wear. Thanks to the multi-layer TiCN coating, the Tiger·tec® Gold indexable inserts offer improved resistance to cracking and increased toughness. Under the electron microscope, you can see that three interruptions are built into the last third of the layer. These make the entire layer more elastic and improve the residual stress characteristics. When the cutting edge meets the component to be machined, the layer designed in this way dampens the forces acting on it. This makes the Tiger·tec® Gold indexable inserts the optimum solution when the tool has to repeatedly engage with the component during a turning process, such as when machining cranks or gears. To exploit the full potential of the Tiger·tec® Gold indexable inserts, Walter also uses a special three-stage finishing process: This further improves toughness, friction behaviour and crack resistance. The golden colour increases the contrast to the cutting edges. This makes it much easier for machine operators to assess their status and ensures that all cutting edges are used.



Tiger·tec® Gold indexable inserts for turning

The Tiger·tec® Gold family for turning achieves a higher tool life, flexibility and process reliability, thanks to the new highly textured TiCN and Al2O3.

Image: Walter AG

Currently, the Walter Tiger·tec® Gold WPP10G, WPP20G and WPP30G grades are available: They primarily cover typical applications when steel turning in automotive series production, general mechanical engineering or power generation, such as machining drive shafts, rotor hubs or flanges. In a field test, it was possible to increase the output of drive shafts per indexable insert from 170 with the previous solution to 250 components with the Walter Tiger·tec® Gold WPP20G. Across all 130 field tests, it was possible to increase the tool life by an average of ~50%. The grades can also be used for machining ductile graphite iron (GGG) and roughing martensitic stainless steels. There are 24 different geometries available, including special geometries for optimised chip breaking on long-chipping, low-carbon steels (MP3) or geometries specially developed for interrupted cuts (RP7). The new high-performance grades WKP1G (for finishing) and WPP05G (for roughing) were introduced on 15 April 2023. With them, the cutting speed can be increased by 20%–30% compared to a P10 grade, thus increasing productivity.

Copy turning systems: More precision, increased tool life quantities

With its W1011-P system, Walter has also launched a technically innovative solution for copy turning, which brings a significant improvement in the cost-efficiency of the process when compared to conventional indexable

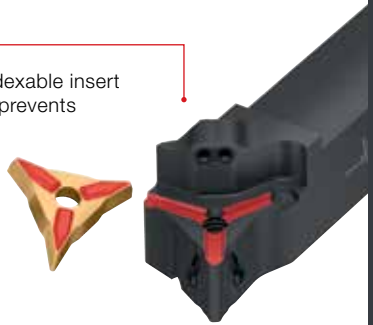
inserts. The insert seat is a key issue for process reliability and precision in copy turning. The conventional systems with VCMT or DCMT inserts only have a small amount of play, which is enough for micro-movements during turning. Thus, the stability of the tool, especially with undercuts up to 50°, and the precision of the components suffers. In the new W1011-P copy turning system, the new three-edged WL25 indexable inserts are fixed in the tool holder via a prism in such a precise fit that they no longer move. The precise fit improves the accuracy of insert changes by over 50% when compared to ISO inserts. The system offers the option to work in both directions of movement. The new WL25 indexable inserts have a total of three cutting edges and four different designs. For this purpose, the system has precision cooling and can be used universally: All four insert types for different copying angles and applications fit in the same tool holder. All ISO materials P, M, S and K can be machined with it. In addition to copy turning (for example, on drive shafts, ball bearings, valves etc.), dynamic turning is an important field of application, especially in operations with different or alternating machining directions.

Fixed insert seat and easy handling: Walter Cut DX18 parting-off system

The Walter development team has also set itself the goal of fundamentally improving the stability and handling of the Walter Cut DX18 parting-off system. The system is suitable for diameters up to 35 mm. The new Walter Cut DX18 cutting insert geometry locks the insert securely in place via the form fit on the face. Thanks to the form fit, the new cutting insert adjusts 100% correctly, even with very narrow insert widths from 1.0 mm.

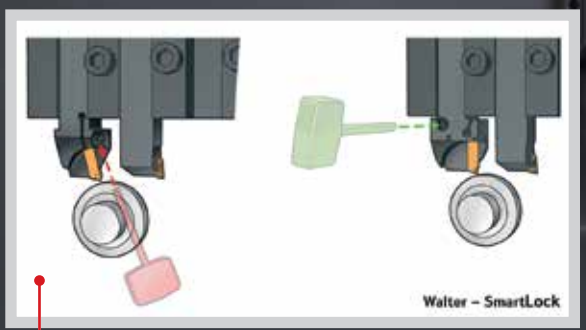
Another innovation is the SmartLock system, which implifies insert indexing on long centre lathes. With conventional screw-clamped systems, the machine operator has to remove the entire tool for this purpose in cramped and usually unfriendly machine conditions. With the Walter SmartLock system, the clamping screw is located on the side of the tool. Simply insert the screwdriver, unscrew and change the indexable insert. ☐

Courtesy: Walter AG
To go to the Walter website: www.walter-tools.com



The form fit on the three-edged indexable insert absorbs higher cutting forces and prevents movement in the tool holder.

Image: Walter AG



User-friendly cutting insert change

In contrast to conventional groove turning holders, the clamping screw of the new G4014-P tools with SmartLock is easily operated from the side.

Image: Walter AG

Walter W1011 Copy Turn System

The form fit on the three-edged indexable insert absorbs higher cutting forces and prevents movement in the tool holder.

Image: Walter AG

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AI, Data and simulation in Aerospace and Defence

The Aerospace and Defence sector holds utmost significance in any nation. This article emphasizes how automation, technologies such as Artificial Intelligence (AI), Big Data, and simulation tools can enhance this vital industry.

Sunil Dixit,
Country Manager,
India, Markforged

In the dynamic realm of aerospace and defence, where precision, reliability and innovation reign supreme, the convergence of cutting-edge technologies is redefining the landscape. Among these technologies, 3D printing stands tall as a transformative force, revolutionising how complex components are created. However, the true potential of 3D printing is unleashed when it is coupled with AI, data analytics and simulation, a triad that is propelling these industries into a new era of efficiency and adaptability.

Evolution of 3D Printing

The journey of 3D printing from being a mere novelty item creator to a powerful tool for crafting intricate aerospace and defence components has been nothing short of remarkable. With the advent of Industry 4.0 and the digitisation of manufacturing processes, 3D printing has transformed into a data-driven phenomenon. This transformation has empowered 3D printers to gather extensive information about the fabrication process, creating a wealth of data that becomes the bedrock for further innovation.

Data-driven 3D Printing

At the heart of data-driven 3D printing lies the immense treasure trove of information that is collected during the fabrication process. Smart 3D printers, interlinked with digital repositories of existing components, possess the capability to discern the ideal candidates for additive manufacturing techniques. By analysing historical data and patterns, these printers can not only optimise the manufacturing process but also predict potential pitfalls.

In the aerospace and defence industry, where precision and reliability are non-negotiable, the ability to ensure the quality of each printed component is paramount. AI algorithms, fed with the wealth of data gathered during the fabrication process, become vigilant sentinels. They meticulously inspect components as they materialise, identifying anomalies and ensuring the highest standards of quality. The synergy of data and AI not only expedites production but also serves as an insurance against faulty parts, contributing to the industry's uncompromising safety standards.

AI's empowering effect on 3D Printing

Artificial intelligence (AI) adds a layer of intelligence to 3D printing that extends beyond quality assurance. It empowers 3D printers to make autonomous decisions, optimising the manufacturing process for performance, cost and time constraints. These AI-driven decisions are not merely reactive but proactive, adapting to real-time challenges and dynamically adjusting printing parameters to ensure optimal outcomes.

Furthermore, AI's prowess reaches beyond the fabrication process. It assists engineers in the design phase by simulating and optimising the structural integrity of the components. Complex aerospace and defence parts often need to withstand extreme conditions, and AI-powered simulations play a pivotal role in predicting how these parts will perform under stress. By mimicking real-world scenarios, these simulations enable engineers to fine-tune designs for maximum efficiency, durability and safety.

Simulation: In innovation

Simulation is the bridge that connects data and AI in the realm of 3D printing. It enables engineers and designers to virtually test their creations in a controlled environment, making informed decisions before physical production even begins. In the aerospace and defence industry, where precision and reliability are typically tested over and over through multiple, varied iterations, simulation is a game-changer.

In the context of composite materials, which play a crucial role in aerospace and defence applications due to their lightweight and durable nature, simulation is particularly impactful. It allows designers to experiment with various composite material combinations, structures and manufacturing methods, predicting how these variations will affect performance under different conditions. By optimising the design through simulation, engineers can avoid costly iterations and streamline the path from concept to reality.

Benefits for aerospace and defence

The amalgamation of AI, data analytics and simulation catapults 3D printing to new heights in the aerospace and defence industries. The ability to predict and prevent defects through data analysis, coupled with AI-driven decision-making, minimises risks and ensures consistency in production. Simulation, on the contrary, paves the way for innovation, allowing designers to push the boundaries of what's possible, maintaining rigorous quality standards.

For aerospace and defence supply chains, notorious for their vulnerability to disruptions, this triad of technologies presents a silver lining. The real-time data acquisition and analysis ensure that supply chains can swiftly adapt to unforeseen disruptions, offering a buffer against the unpredictability that often plagues these industries. With the capability to simulate and optimise designs, engineers can accelerate the development of new components and adapt existing ones to changing requirements, facilitating agile responses to emerging challenges.

Markforged and the futuristic approach

Navigating uncharted skies with confidence, as the aerospace and defence industries continue their relentless pursuit of innovation and efficiency, the role of AI, data and simulation in 3D printing is set to be a cornerstone of progress. The future envisions aerospace and defence manufacturers harnessing the power of AI to make data-informed decisions, while simulation acts as a virtual playground for testing and refining designs.

As this convergence gathers momentum, the aerospace and defence sectors will be well-equipped to navigate the challenges of an ever-evolving landscape, confident in their ability to create, adapt and excel. Through the fusion of AI, data and simulation, 3D printing emerges not just as a manufacturing technique, but as a catalyst for innovation, resilience and progress in the aerospace and defence industries.

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Precision at its finest

Grinding technology plays a crucial role in modern manufacturing processes, enabling precise shaping, finishing and cutting of various materials. This article explores different aspects of grinding technology, including the internal grinding process and its applications and tips to optimise grinding machine performance and an overview of various grinding machine types.

Grinding machines are vital in achieving fine finishes, precise shapes and accurate dimensions on a wide range of materials, particularly metals. They utilise an abrasive wheel to remove small amounts of material, typically around 0.25 mm to 0.50 mm in depth. Here is a guide to understanding surface, cylindrical, tool & cutter, 5-axis, CNC precision cylindrical pinch/peel and double-column surface grinders, detailing their functions and applications.

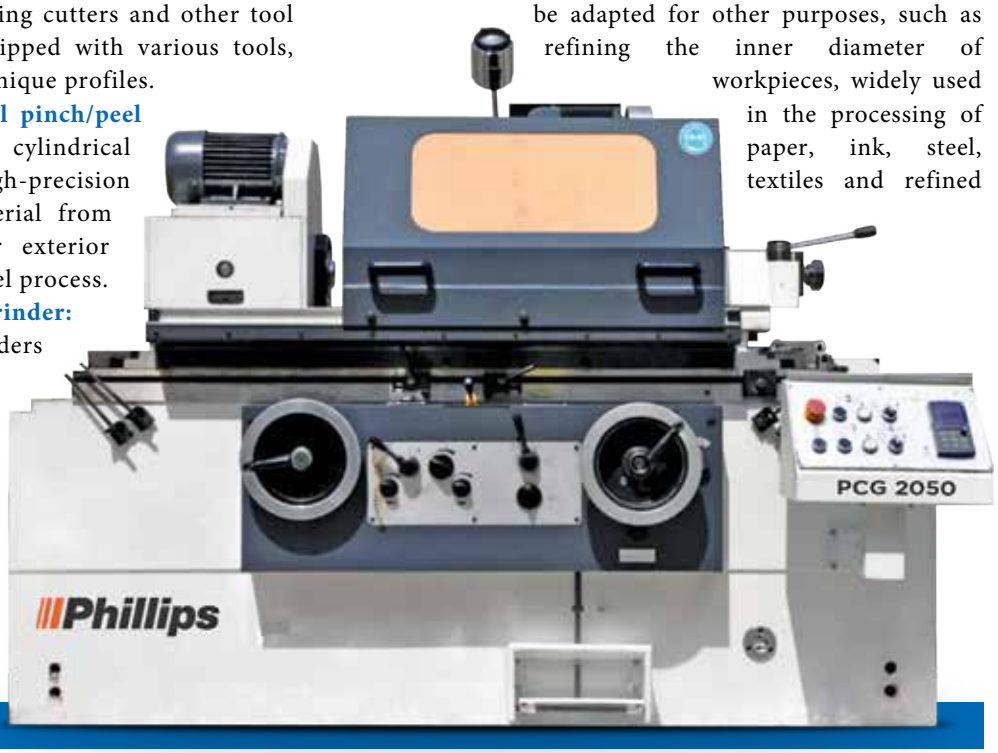
- **Surface grinder:** Surface grinders are designed to grind flat surfaces with exceptional precision. There are various types of surfaces grinding machines, including creep feed grinding machines, spindle reciprocating table grinders and spindle rotary table grinders.
- **Cylindrical grinder:** Cylindrical grinders are used to grind cylindrical surfaces on workpieces. They consist of several key components, including the base, bed, work head, tailstock, worktable and grinding wheel head,
- **Tool and cutter grinder:** Tool and cutter grinders are used to sharpen and manufacture cutting tools such as milling cutters, drills, reamer, hole mill cutter, hobbling cutter, ball nose cutter & bullnose cutter, chamfer cutters and end mills. They find extensive use in metal-cutting and woodworking industries. CNC and cutter grinding machines have become indispensable assets across industries, revolutionising the manufacturing process.
- **5-axis tool and cutter grinder:** A 5-axis grinding machine is a versatile tool and cutter grinder primarily used to shape and sharpen milling cutters and other tool bits. This machine can be equipped with various tools, allowing it to generate endless unique profiles.
- **CNC precision cylindrical pinch/peel grinder:** The CNC precision cylindrical pinch/peel grinder is a high-precision machine used to remove material from metal objects and form their exterior profiles through the pinch or peel process.
- **Double-column surface grinder:** Double-column surface grinders are engineered for the high-precision grinding of large components, making them ideal for demanding applications in die and mold base manufacturing.

Grinding machines have revolutionised the industry by enabling precise shaping, finishing and dimensioning of workpieces. Tool and cutter grinding machines are essential components in metal-working industries. They come in different types, each tailored to specific grinding needs. CNC machines play a vital role in producing precision surgical drills, automotive components, aerospace components, machine tools, die/mold products and various tooling components. With various types of grinding machines available, each tailored to specific applications, industries can achieve unmatched levels of accuracy and efficiency in their machining processes.

Internal grinding processes

CNC Internal Grinding machines offer a high-precision internal grinding process, ideal for cutting and grinding exterior surfaces, creating small metal parts such as bores, holes and tubes. The internal grinding process involves the use of an internal grinding wheel to machine the internal surface of a workpiece while rotating around an axle. It offers cost-effectiveness, simplicity, improved surface finishing and excellent dimensional precision.

The internal grinding process offers several advantages, making it a preferred method for various applications, including cost-effectiveness, simple operation, improved surface finishing, excellent dimensional precision and versatility. Internal grinding machines find applications in various industries where high precision and accuracy on the inner counts of workpieces are crucial. Internal grinders can be adapted for other purposes, such as refining the inner diameter of workpieces, widely used in the processing of paper, ink, steel, textiles and refined



petroleum products. Internal grinding is a challenging yet essential abrasive finishing process that delivers precise results for various industrial applications. PHILLIPS, a prominent distributor of machine tools in India, collaborates with global leaders like PALMARY Grinding to offer world-class grinding machines and tools to meet the diverse needs of the manufacturing industry.

Cylindrical grinders for grinding operations

Cylindrical grinders are specialised machines used for grinding both external and internal parts of a workpiece. They excel at achieving accurate grinding of cylindrical and conical surfaces. The workpiece is mounted between centres, and a grinding wheel is employed to remove unwanted material. The combination of movements allows the cylindrical grinder to deliver high-precision grinding, making it suitable for a wide range of applications and materials. Phillips offers a comprehensive range of cylindrical grinding machines, each tailored to specific grinding requirements and applications.

The primary types of cylindrical grinding processes are external and internal. Phillips Machine Tools has emerged as a leading distributor of machining solutions, including cylindrical grinders in the Indian market. With world-class grinding machines from top manufacturers, Phillips ensures that businesses can efficiently manage their machining needs with precision and quality. Grinding machines are complex pieces of machinery that require careful maintenance and management to ensure optimal performance. Here are 10 tips to get the most out of a grinding machine:

- **Maintain the temperatures:** Proper temperature maintenance is crucial for the smooth operation of a grinding machine.
- **Take extra care of grinding wheels:** Regular dressing and conditioning of grinding wheels are necessary to ensure their optimal functioning and enhance surface finish.
- **Follow the manual rules:** Adhering to the manufacturer's advice and guidelines can significantly contribute to the long-term health and performance of the equipment.
- **Cleanliness is the key:** Maintaining cleanliness in the grinding machine system is of utmost importance.
- **Effective cooling system:** The cooling system of a grinding machine should be diligently monitored, filtered, and kept clean.
- **Stick to prescribed maintenance schedules:** Creating a comprehensive maintenance schedule is crucial to prevent major technical issues from arising.
- **Handle fragile elements with care:** Proper handling and storage of delicate components are essential to maintain their condition and ensure long-lasting quality performance.
- **Maintain the condition of collets:** Regularly inspecting and replacing collets as needed ensures consistent and accurate grinding.
- **Ensure the supply of air and electrical power:** Following the manufacturer's instructions regarding the required quality of air and electricity helps prevent potential breakdowns.
- **Quality of blanks:** Investing in high-quality blanks and ensuring their proper insertion into the collets guarantees optimal results and extended equipment lifespan.

By diligently implementing the ten tips, users and surface grinding machine manufacturers can maximise the efficiency, lifespan and profitability of grinding machines. A well-maintained and efficiently used grinding machine can offer superior performance, increased productivity and reduced downtime, making it an asset in various industrial applications. ☐

Courtesy: Phillips Machine Tools India

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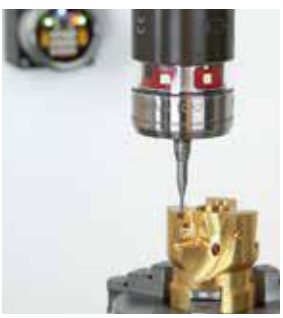

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Advancing endmill machining **with ISCAR**

The rise of five-axis machining in metal cutting brings advantages like machining complex parts in a single setup, improved accuracy and reduced cycle time. Advanced workpiece fabrication and additive manufacturing complexity demand high-performance cutting tools. Here are the various configurations of segment endmills and ISCAR's trailblazing innovations in this field.

It is apparent that five-axis machining is becoming increasingly popular in modern metal cutting. Five-axis machining provides significant advantages such as machining complex-shaped parts by use of one set-up without changing the location of the workpiece, high machining accuracy and reduced cycle time.

Machining revolutionised

Advanced technology of workpiece fabrication has led to increased capabilities of precise forging, casting and mainstreaming Additive Manufacturing (AM). This has resulted in the increased complexity of workpiece geometry and decreased machining allowance and material by cutting operations. Furthermore, this helps us achieve end results that reflect the final shape of the workpiece. The requests for high-performance cutting tools intended for finishing and semi-finishing geometrically complex surfaces are now vitally important.

Ball-nose milling cutters, particularly, are considered traditional tools for machining 3D surfaces. They are the most common tools for semi-finishing and finishing profiles in milling operations. Machine tools and their cutting geometry, referred to as segment or barrel-shape endmills, have evolved due to the significant progress in the field of five-axis machining centres and modern Computer-Aided Manufacturing (CAM) systems. However, although these tools are well known to machinists, they remain ignored. Five-axis machining, combined with CNC software and computer modelling of complex tool configurations, has re-surfaced the use of circular segment endmill applications.

The cutting edge of these endmills is an arc that represents the segment of a circle with a radius that is larger than the nominal radius of a tool. For comparison purposes, in ball-nose cutters, the tool radius is the radius of the cutting edge. Machining surfaces using the 'passes technique' segment-type endmills enable a substantially increased step size compared to ball-nose cutters, thus reducing the cutting time. A three-axis CNC controlled cutting process cannot guarantee the correct position of a barrel-shaped cutting tool when machining complex surfaces. The five-axis machining concept allows taking full advantage of segment endmills.

Depending on the orientation of the cutting edge with respect to the tool axis, segment endmills possess various configurations such as pure barrel, tapered barrel, lens and oval or parabolic shapes. The form of the tool cutting edge determines the tool application. For example, lens-shaped tools are suitable for both five- and three-axis machines, while endmills with a tapered barrel profile are intended for five-axis machines. Segment cutter designs appear in multi-flute solid endmills that deliver ultimate tool accuracy and maximise the number of teeth on the cutting tool.

ISCAR and segment endmill technology

The ISCAR NEOBARREL tool line includes several tool families. These are Solid Carbide Endmills (SCEM) in a diameter range of 8–12 mm. The 10-mm oval-shaped solid carbide endmill has an arcuated peripheral cutting edge with an 85-mm radius. This endmill, compared to a 10-mm ball-nose cutter, quadruples the step size repeatability and provides the same machined surface finish quality.

One insert barrel-shape cutters demonstrate high-performance parameters when machining complex surfaces of vital components.

The ISCAR MULTI-MASTER tool line refers to assembled tools that mount exchangeable carbide heads. This line offers new barrel-shaped heads that feature the same cutting geometry and diameter range as SCEM and provide a wide array of options within the MULTI-MASTER line for five-axis machines. The exchangeable head concept featured in the MULTI-MASTER tool line guarantees rational use of cemented carbide with a true economical advantage. Diverse tool bodies, extensions and reducers enable the customisation of a modular tool assembly for complex machining projects.

Recently, ISCAR unveiled a new family of segment endmills that utilise the single insert tool design principle.

The segment of barrel-shaped endmills has organically incorporated various design concepts.

It is a known fact that the accurate parameters of a single-insert tool are lower when compared to a cutter with exchangeable carbide heads, not to mention the solid carbide endmill. Precision can be compromised if we analyse how a single insert tool with two teeth can compete against a multi-flute SCEM or carbide head tool. To dissipate the arisen doubts, we should consider several aspects.

The single-insert tool concept facilitates cost-effectiveness by expanding the diameter range of segment mills. These cutters feature nominal diameters of 16–25 mm, and their durable insert structure and highly rigid insert clamping enable increasing the feed per tooth in comparison with the feed values that are recommended for solid carbide endmills and exchangeable heads, ensuring an appropriate level of feed and speed to machine productively. When operational stability is poor, decreasing the number of teeth contributes to vibration control. Inserts mounted on the BALLPLUS tool family can transform the tool to a segment endmill using only inserts. ISCAR BALLPLUS tools include a diverse choice of tool bodies, adapters and extensions, which greatly simplify tool customisation. Choosing a single-insert segment tool design is now more logical and justified.

In modern manufacturing, barrel-shaped mills have good prospects. The metal-working industry has found many uses for applying a multitude of cutting barrel designs. These include solid carbide endmills, cutters with exchangeable heads and single-insert tools, which have formed a complete segment of profile milling tools with a challenging future. □

Courtesy: ISCAR

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Mining and roadway construction advance forward

India has the second largest road network in the world of 5.8 million km, comprising national highways, state highways and urban and rural roads. National highways in India account for 2% of the total road network and carry about 40% of passenger traffic. This article explores India's road construction and mining sector achievements.

Neena Nikam,

Head, Marketing Communications, Wirtgen India.

The Indian government is encouraging the PPP (Public–Private–Partnership) model in the highway sector to increase the pace of road construction. An analysis of future trends indicates that road construction projects in India are set to increase, and new technologies will be required to fulfil this need. In India, the Government has laid a foundation of digitisation in road construction with its 'Digital India' mission and various other schemes. The Ministry of Road Transport and Highways is encouraging the implementation of a Value Engineering Program to promote the use of new, emerging and advanced technologies. Moreover, it is encouraging new and advanced technologies in road construction and development to achieve the following objectives:

- **Increase the road construction rate**
- **Making the project eco-friendly**
- **More efficient lifecycle cost management**

The codes and specifications to include advanced technologies in the project are reflected in the DPR of the road project. The construction of roads using plastic waste, a green initiative by the government, also requires advanced technology for efficient conduction. In recent years, some Indian states have also initiated proposals to adopt advanced technologies like 'Intelligent Compaction Measurement Systems' to support quality monitoring programs in road construction. The government's existing codes and specifications are quite supportive of advanced technologies. The development of infrastructure, especially road building, has witnessed a major boost in the last five years. It has been functioning with the intention to reduce the high logistics costs and help India achieve greater global competitiveness.

The Ministry of Surface Transport has set itself a target of building 40 km of roadways per day. Due to many major projects being launched under the BHARATMALA programme, there has been a paradigm shift in road construction methods. With a clear focus and exclusive emphasis on highways through an accelerated highway development program, the NHAI announced and awarded several greenfield expressway projects, such as the Delhi–Mumbai Expressway, the Amritsar Jamnagar Industrial Corridor project, Delhi–Katra Expressway, Ganga Expressway and more. As it has been necessary to accelerate the speed of construction while keeping the costs in control to achieve targets while maintaining high-quality standards, the current conventional construction practices are being slowly replaced with new innovative methods. This has proven essential for both achieving good ride quality and durability while also completing these projects within time.

Sustainable construction goals

At the Wirtgen Group, sustainability is a firmly rooted element of our corporate principles and a guideline for our day-to-day actions. The Wirtgen Group understands sustainability as a social commitment and simultaneously as an opportunity for furthering the success of our company and the business activities of our customers. This is the reason why we firmly anchor the topic of sustainability in all of our corporate processes. Sustainability already plays an essential role in the design and construction of all our products and is a key factor in all further phases of the value chain, up to and including the use of machines in projects around the world. Our vision is 'smarter, safer and more sustainable road construction'.

As far as the mining industry is concerned, there has been a growth in the demand for crushing and screening equipment, as most of the mining lease of iron ore and coal has been renewed. The new owners of the mines have started their operations. The surface mining market has seen increased growth opportunities at the global level after the pandemic. Industrialisation, growth in construction and infrastructure development projects and urbanisation are the major factors contributing to the surface mining market growth. Countries such as China, Mexico, Vietnam, Indonesia and India are witnessing significant opportunities for potential growth due to rapid industrialisation. ☐

Redefining the future of industrial safety products

Gone are the days of traditional, one-size-fits-all safety equipment that often failed to address the specific needs of diverse industries. As we step into the future, the integration of cutting-edge technologies promises to redefine industrial safety products. In this article, we explore how embracing technology can shape the future of industrial safety products, making workplaces safer, more productive and increasingly sustainable.

Swayam Prakash Agrawal,
Founder & CEO,
Aarika Innovation

The shifting paradigm of industrial safety

The landscape of industrial safety has undergone significant transformations in recent years, with technological advancements revolutionising the way safety products are designed, manufactured and utilised. In the past, industrial safety products were relatively static and standardised, catering to general safety requirements across various sectors. However, this one-size-fits-all approach often left workers vulnerable to specific hazards that were unique to their work environments. As industries evolved and became increasingly complex, the limitations of traditional safety equipment became apparent.

Today, industrial safety has transcended beyond mere compliance with regulations; it now centres around proactively safeguarding the well-being of workers and enhancing overall productivity. The rising focus on human-centric safety practices recognises that a well-protected and healthy workforce is crucial for meeting legal obligations and fostering a thriving and efficient work environment. Thus, it is essential that employers and organisations take industrial safety practices into account.

Technological advancements

Technological progress has been the driving force behind the transformative journey of industrial safety. Breakthroughs in various fields, such as the Internet of Things, artificial intelligence, virtual reality and advanced materials, have paved the way for a new era of safety solutions. These technologies have enabled safety products to become smarter, more adaptable and tailored to the specific requirements of diverse industries and individual workers.

Personalisation in industrial safety

Central to the technological revolution in industrial safety is the concept of personalisation. Gone are the days when generic safety equipment sufficed for all workers in a given industry. Today, technology empowers safety products to become highly personalised, catering to the unique needs of individual workers based on their roles, environment and health conditions.

Through the utilisation of AI algorithms, safety products can now analyse a myriad of data points from various sources. This data includes environmental conditions, worker behaviour patterns, equipment status and even individual health vitals. By processing this vast array of information, AI-driven safety solutions can craft personalised safety protocols that precisely address the specific risks faced by each worker.

For example, consider a construction site where different teams are exposed to various hazards based on their tasks. AI-powered safety wearables can assess the risks faced and provide real-time feedback accordingly. A worker operating heavy machinery may receive safety guidance that emphasises the importance of maintaining a safe distance from others, while a worker working at height may receive alerts to prevent potential falls.

Intelligent safety management

Another pivotal aspect of embracing technology in industrial safety is the ability to harness the power of data analytics. The vast amounts of data collected through IoT devices, wearables and safety sensors are invaluable for improving safety management practices. AI-driven safety management systems can analyse this data to identify patterns and trends related to safety incidents, near-misses and potential hazards. By recognising recurring issues, safety managers can develop proactive strategies to mitigate risks before accidents occur.

Moreover, data analytics can provide organisations with insights into worker behaviour, revealing areas where additional training and safety reinforcement may be required. This data-driven approach to safety management enables organisations to cultivate a proactive safety culture, where safety practices are continually refined to prevent incidents and protect the workforce.

Enhanced protection and safety guidance

Wearable technology has been at the forefront of the personalised safety revolution. AI-powered wearables offer more than just physical protection; they act as personalised safety assistants, equipped with advanced sensors and communication capabilities. These intelligent wearables continuously monitor the wearer's surroundings and vital signs, alerting them to potential hazards and unsafe conditions. For instance, a worker in a hazardous environment may receive real-time alerts if toxic gases are detected nearby, prompting them to take immediate action.

Furthermore, wearables provide workers with on-the-spot safety guidance through Augmented Reality (AR) technology. AR overlays digital information onto the physical environment, offering step-by-step instructions for complex tasks and highlighting potential hazards in real-time. This hands-on approach to safety ensures that workers are well-informed and equipped to make safer decisions on the job.

Driving sustainable safety practices

In tandem with the emphasis on personalised safety, the integration of technology in industrial safety has also facilitated the promotion of sustainability. Sustainable safety practices encompass the use of eco-friendly materials in safety product manufacturing and the adoption of energy-efficient technologies.

For instance, safety equipment manufacturers are increasingly incorporating renewable energy sources into their products. Solar-powered safety lights, self-charging wearables and energy-efficient safety monitoring systems contribute to reducing the carbon footprint of industrial safety practices. Furthermore, the adoption of recycled and recyclable materials in safety product design aligns with the broader global effort to reduce waste and promote circular economies. By embracing sustainable safety practices, industries not only safeguard the environment but also enhance their reputation as socially responsible organisations.

Challenges and the path forward

While the integration of technology in industrial safety presents numerous opportunities, it also comes with its share of challenges. Data privacy and security remain paramount concerns, as the collection and analysis of personal data require strict adherence to privacy regulations. Organisations must ensure robust cybersecurity measures to protect sensitive information from potential breaches.

The adoption of advanced technologies may necessitate upskilling the workforce to ensure that workers can effectively use and benefit from the new safety solutions. Adequate training and education are essential to harnessing the full potential of technology in industrial safety. To maximise the benefits of technology-driven safety, collaboration among stakeholders like manufacturers, researchers, safety experts and workers is crucial.

Conclusion

The landscape of industrial safety is rapidly evolving, shaped by the convergence of technology and human-centric practices. As we embrace technology to redefine industrial safety products, we usher in an era where safety is not just a regulatory obligation but a strategic imperative for organisations. Through personalised safety solutions driven by AI, we empower workers with tailored protection and guidance, enhancing their safety and well-being. Intelligent safety management systems fuelled by data analytics empower organisations to proactively address safety risks and cultivate a culture of prevention. Furthermore, sustainable safety practices underscore the commitment to protect not only the workforce but also the planet.

As we venture into the future, the continuous integration of cutting-edge technologies will further optimise industrial safety, making workplaces safer, more productive and increasingly sustainable. By embracing the power of technology, organisations can ensure that the workforce thrives in an environment where safety is at the heart of every operation, securing not just individual lives but also the success and resilience of industries as a whole. ☐

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FOR DETAILS

LMW shines with remarkable exhibits at DMTX 2023

LMW recently showcased some of its latest machines and solutions at the Delhi Machine Tool Expo 2023, Delhi, from August 24 to 27. The exhibited line-up comprised a range of cutting-edge machines that epitomise innovation and technological excellence. The machines showcased were:

Smart Minimaster: A horizontal turning center:

Smart Minimaster is an ultra-compact turning center equipped with Turret & Linear tooling options to cater to the evolving needs of emerging industries where accuracy and productivity are paramount. This cutting-edge machine is designed to deliver outstanding performance while taking up minimal space on your shop floor, occupying 1.77 sqm.

The Smart Minimaster comes packed with essential features as standard, ensuring efficient operations and enhanced productivity. It has a 5" chuck, spindle speed up to 6000 rpm and power of 3.7/5.5 kW. For maximum efficiency, the machine offers rapid rates of 30 m/min, significantly reducing idle times and enhancing overall productivity. This makes it the ideal solution for small part turning with high volume demands, catering to the needs of diverse industries. When it comes to precision machining, the Smart Minimaster stands out as a best-in-class choice. Perfectly suited for industries dealing with fittings, connectors, bearings and more, it truly lives up to its name as a mini master.

JD 1: A high-speed drill tap center

JD1 has a stroke capabilities of 500 mm on the X axis, 400 mm on the Y axis and 320 mm on the Z axis. It also boasts a spacious pallet size of 650 mm × 400 mm, allowing for efficient handling of the materials. This machine is designed to deliver superior performance and precision. The high-speed drill tap center features a rigid structure that provides a wider working area, allowing for greater flexibility and precision. With a direct-drive BBT 30 high-speed spindle upto 24,000 rpm, this machine is capable of delivering unparalleled performance and accuracy. The high-speed pocket tilting automatic tool changer ensures smooth and seamless tool changes, while the 48-m/min rapid transverse rates enable efficient and speedy movements of the machine. Its advanced design ensures exceptional precision and efficiency in the production of high-quality components for the automobile, EV, die and mold and electronic segments.

J2: Vertical machining center:

J Series machines have high demand in the market for their exceptional reliability, performance and precision. These machines boast spindle power ranging from 7.5 to 22 kW, with direct drive spindle speeds of upto 12,000 rpm. The machine features a direct-drive BT 40 spindle and the option of a BT 50 spindle.

In addition, the J series machines are equipped with a 24 tool ARM type automatic tool changer (ATC) that facilitates rapid and efficient tool changes, taking less than 2 sec. The machines feature precision linear guideways on the X,Y and Z axes, ensuring accuracy and stability during operation. A Rotary Automatic Pallet Changer (RAPC) is available in selected models of the J Series as an optional feature. J Series machines can be easily configured to handle different materials like steel, aluminium, brass, die steel, inconel and titanium. These machines are highly versatile and cater to major industries like automobile, die-and-mold, pumps-and-valves, forging and general engineering.

JG50, High Productivity, and Compact Machine:

JG50 is a compact yet highly productive high-speed moving column VMC, purpose-built to meet the rigorous demands of modern industries. Tested extensively for components with stringent quality parameters and high-volume production, the JG50 has proven its capabilities.

Featuring a remarkable acceleration of 1G+ and spindle speeds upto 16,000 rpm, the JG50 ensures rapid machining processes without compromising accuracy. Its lightning-fast tool change, taking only 1 sec, resulting in increased productivity. The machine's enhanced speeds and accelerations minimise idle movements, further optimising efficiency. In addition to its high performance, the JG50 has an ultra-compact design that saves shop floor space, making it an ideal choice for manufacturers seeking to maximise their operational footprint.

LMW | Tamil Nadu

Milling instead of drilling

MAPAL has introduced a PCD-tipped high-volume milling cutter from the SPM range. This milling cutter comes with a smaller diameter that enters the material circularly and covers a significantly longer distance during machining, which results in a higher cycle time. However, certain materials can cause non-productive times that cancel out the drill's time advantage. The milling strategy also demonstrates its flexibility when bores with different diameters are required. A single milling cutter can be used for this. For larger bores, it eliminates the need to replace one or even two drills for pre-machining. MAPAL favours using the milling cutter for the materials in question since it is possible to save time, particularly during pre-machining, which outweighs the initial performance disadvantages compared to drilling. For certain workpieces, the milling cutter is superior from the outset, for example, when there is a risk of deformation due to drilling thin walls of structural parts or when bores with a very specific roughness are required in chassis technology.

A PCD-tipped high-volume milling cutter from the SPM range

MAPAL | Coimbatore

A substantially revised single-phase asynchronous motor

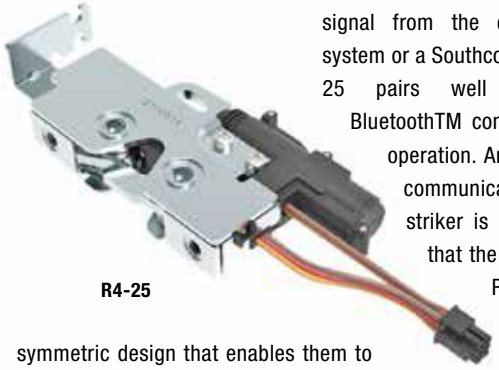
Nord Drivesystems is renowned for its IE4 and IE5 motors but also offers reliable solutions for lower performance ranges. The new single-phase asynchronous motor not only has a new design but also features improved efficiency by one efficiency class. Corresponds to efficiency class IE2 The new single-phase asynchronous motor can be used in a power range from 0.12 to 1.5 kW as before, but now corresponds to efficiency class IE2 according to the Ecodesign Regulation 2019/1781. A new electronic relay replaces the previous mechanical one. The design was also refreshed, and the capacitors were mounted in the terminal box. Therefore, the motor now also complies with protection class IP66 and is protected against the entry of dust and water. Jörg Niermann, Head of Marketing, NORD, emphasises, "For simple applications, for example in mobile concrete mixers or pumps, our revised single-phase asynchronous motors are a cost-effective and efficient drive solution".

NORD single-phase asynchronous motor

Nord Drivesystems | Pune

New high-strength rotary latches with electronic actuation and door status sensors

Southco continues to expand its rotary latch portfolio with new versions that can enable electronic actuation and provide an electronic door status signal. The new R4-25 product is a response to customer requests for electronic control and monitoring in demanding applications. A 12-volt actuator can actuate the latch with a signal from the customer's control system or a Southco controller. The R4-25 pairs well with Southco's BluetoothTM controller for wireless operation. An integrated sensor communicates when the door striker is present to indicate that the door is closed. The R4-25 latches feature a symmetric design that enables them to be used in either right- and left-handed positions. This reduces stock requirements, speeds assembly and improves inventory management. Additionally, the integrated cable mounting bracket eliminates the need for the purchase or design of a separate cable mounting bracket.



R4-25

Southco | Pune

Tailored for maximum performance

Walter has launched two innovative high-performance cutting tool materials for turning operations in the form of the WKP01G and WPP05G grades, which reduce the machining time by 20%–30%. WKP01G has been specially developed for finishing high tensile steels and cast iron (GGG/GG) at the maximum cutting speed and is the only one of its kind on the market designed specifically for this purpose. The optimised cutting edge rounding of the turning inserts improves the surface quality on the workpiece, while their multi-stage post-treatment produces an extremely smooth rake face which significantly reduces friction. The WPP05G grade is designed for medium machining and roughing of steels at the maximum cutting speed. Both cutting tool materials are ideal for finish cuts and occasional interrupted cuts in high tensile materials (900–1400 N/mm²). The main USP of the inserts is their coating with the patented Tiger·tec® Gold technology.

Walter Tiger·tec® Gold WKP01G and WPP05G grades

Walter Tools India | Pune

Highlights – October 2023

» **Medical Machining**
Medical machining is a complex and highly specialised field, requiring expertise in multiple factions. The MedTech industry in India is rapidly advancing with technological innovation, strategic investments and a focus on indigenous production. Under this focus, we highlight how these developments are revolutionising healthcare by improving accessibility, accuracy in diagnostics and patient care through the integration of digital health solutions, AI and telemedicine.

» **Precision Cutting Technology**
Precision cutting has evolved from traditional methods to advanced techniques like laser cutting, waterjet cutting and CNC machining. This section will emphasise the benefits of precision cutting, including enhanced accuracy, minimised waste and the ability to fabricate complex geometries. Real-world applications in industries such as automotive, aerospace, electronics and medical devices will be highlighted. The article will provide a comprehensive overview of the pivotal role precision cutting plays in modern manufacturing.

» **Predictive and Preventative Maintenance**
Our next issue delves into the technological aspects of predictive and preventive maintenance, including Industrial IoT, data analytics, Machine Learning, AI, digital twins, augmented reality and blockchain. Articles in this section will discuss the significance and impact of predictive and preventive maintenance in the context of industrial operations, emphasising on how traditional maintenance methods are inadequate in preventing downtime and optimising asset utilisation.

» **Textile Machinery Manufacturing**
In the coming issue, we dive into various aspects of the textile industry, including the historical context of the Industrial Revolution and its impact on manufacturing processes and the significance of the textile industry in modern times, highlighting its widespread influence on various aspects of life. The article will focus on the machinery used in textile manufacturing, covering different types of machines and their functions in the production of fibers, yarns, fabrics and finished textiles.

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IMPRINT

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Tel: +91-7410009435/36

Subscription
Cover Price: ₹100
Annual Subscription Price: ₹1200
em.magazine@pi-india.in
Tel: +91-7410009435/36

Printing
United Multicolour Printers Private Limited,
264/4, Riverview Apartment,
Shaniwar Peth,
Pune 411 030, India

Website: http://pi-india.in/

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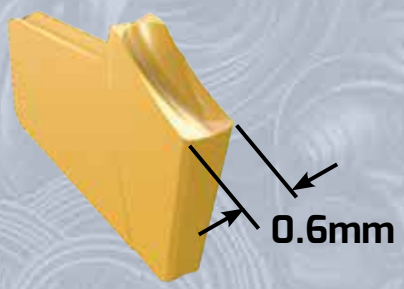

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