TAGMA TIMES
NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

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CNC Machining:
Manufacturing Perfection

IN FOCUS
How CNC machining could give you the cutting edge?

TIPS AND TRICKS
CNC machining vs. plastic injection moulding

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IN FOCUS

LEADERS SPEAK

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Subbarayan, Sr. Consultant, Makino India Pvt. Ltd.

Touseef Ahmed Khan, General Manager Sales, S&T Machinery (P) Ltd.

TIPS & TRICKS

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Injection molded Bumper part

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EDITORIAL

NISHANT KASHYAP
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tt.edit@tagmaindia.org

Dear Readers,

In the ever-evolving landscape of precision engineering, CNC machining stands as a true game-changer, redefining the very fabric of the tool and die industry. As we dive into the August edition of our magazine, we delve deep into the realm of CNC machining, a pivotal force propelling the die and mould industry to the new frontiers of innovation, precision, and efficiency.

In this issue, we unveil the latest advancements in CNC machining technology and their profound impact on our industry. From precision components to intricate mould designs, CNC machining has revolutionised the way we conceptualise, create, and craft. Industry leaders take center stage, sharing their insights on the dynamic developments that are shaping CNC technology and its resounding implications for the tooling sector.

As we explore the technological frontiers, we witness the seamless synergy of human expertise and machine precision. Our magazine proudly features voices of experience, trailblazers who have harnessed the power of CNC machining to push boundaries and redefine industry standards. Their narratives unfold, shedding light on how CNC technology is not just a tool but a catalyst for growth, resilience, and business expansion.

In this edition, our focus extends beyond the cutting edge; we deliver practical wisdom through insightful articles, offering valuable tips on harnessing the full potential of CNC machining.

CNC machining isn't just about machines; it's about the artistry of engineering, the finesse of design, and the essence of innovation. Our spotlight shines on the breathtaking possibilities carved by CNC precision, a symphony of code and craftsmanship that breathes life into our tools, dies, and moulds.

As we turn the pages of this issue, let us celebrate the trendsetters who have harnessed the potential of CNC machining, elevating the die and mould industry to soaring heights. Their stories, coupled with expert insights and practical guidance, illuminate the path toward a future where precision knows no bounds. Welcome to the world of CNC machining – where imagination meets innovation, and where the tool and die industry evolves before our very eyes.

Happy Reading!

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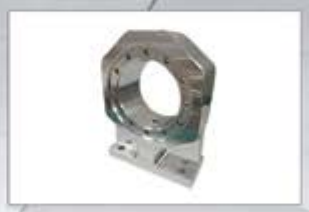

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Air India finalises order for up to 290 Boeing single-aisle and widebody jets

Boeing and Air India recently announced they have finalised an order for up to 290 new Boeing jets and expanded services. At the 2023 Paris Air Show, the companies held a signing ceremony to celebrate the historic purchase of Boeing's market-leading single-aisle and widebody jets to renew and expand Air India's fleet.

The order, which includes 190 737 MAXs, 20 787 Dreamliners and 10 777X jets with options for 50 737 MAXs and 20 787 Dreamliners, is Boeing's largest order in South Asia and highlights its 90-year partnership with Air India. A comprehensive set of aviation services will also enable Air India to sustainably expand its operations in South Asia's rapidly growing aviation market. Over the next 20 years, South Asia is expected to more than triple its in-service fleet from 700 to 2,300 airplanes to meet passenger demand.

The companies announced in February that Air India had selected these Boeing models to serve its strategy for sustainable growth. As a leading global aerospace company, Boeing develops, manufactures and services commercial airplanes, defence products and space systems for customers in more than 150 countries. ◆

Aviation start-up BluJ Aerospace raises $2.25 million in seed funding

BluJ Aero, an aviation start-up, has raised $2.25 million in seed funding to develop a hybrid-electric VTOL aircraft powered by hydrogen fuel cell technology for regional transportation. The funding round is led by Endiya Partners and Ideaspring Capital, with participation from Rainmatter Foundation.

BluJ's vision is to make aviation simpler and sustainable through long-range vertical take-off and landing (VTOL) aircraft, powered by sustainable energy sources. BluJ aims to reduce the travel time between destinations by at least three times compared to the fastest alternatives today.

"We're thrilled to have secured the seed funding and are excited to partner with Endiya, Ideaspring, and Rainmatter Foundation on our journey to revolutionise regional air transportation. We aim to achieve cost-efficiency and sustainability through vertical integration on all the key technologies involved," said Maruthi Amardeep Sri Vatsavaya, Co-founder & CEO of BluJ.

This round of funding will help BluJ accelerate the development of its first commercial product – a fully autonomous cargo e-VTOL aircraft, with a payload of over 100 kg and long-range capability, thanks to its hydrogen-electric propulsion. BluJ will further expand hiring, build its state-of-the-art facilities, and establish the testing infrastructure required to move toward certification, said the company.

Image used for representation only. Courtesy Envato Elements.

"As technologists, we are excited about the potential of our e-VTOL aircraft, powered by a hydrogen-electric propulsion system. This breakthrough technology offers a faster, greener, and more sustainable solution to existing air transport options, and has the potential to provide versatile capabilities to our defence forces," said Utham Kumar Dharmapuri, Co-founder & CTO of BluJ. ◆

Courtesy The Hindu BusinessLine

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Ashok Leyland bags defence orders worth INR 800 cr

Ashok Leyland, the Indian flagship of the Hinduja Group and the largest supplier of logistics vehicles to the Indian Army, recently announced significant order wins, valued at INR 800 crores, in the defence sector. The contracts awarded also include the procurement of the Field Artillery Tractor (FAT 4×4) and the Gun Towing Vehicle (GTV 6×6).

Mr. Shenu Agarwal, MD and CEO, Ashok Leyland, said, "We are immensely proud to have secured these orders from the Indian Army. The defence business has been a strong pillar of growth for us, and this win further establishes our leadership in the defence mobility vehicles business. This is also a testament to our firm commitment to providing advanced mobility solutions for our armed forces. We are grateful for the trust placed in Ashok Leyland by the Government of India, and we remain dedicated to contributing to the country's indigenisation efforts and self-reliance in defence manufacturing."

Mr. Amandeep Singh, President – Defence Business, Ashok Leyland, said, "Ashok Leyland's dependable mobility solutions have consistently remained a formidable asset within the defence sector, catering to the diverse needs of personnel and logistics across the armed forces. We are proud that we have been a leading example of 'Aatmanirbhar Bharat', by serving alongside our forces through our products and solutions. Ashok Leyland has invested in development of mobility platforms ranging from 4×4, 6×6, 8×8, 10×10 and 12×12 for various applications and operational requirements of Indian Armed Forces. These platforms are indigenously designed, developed and manufactured by Ashok Leyland and contribute significantly towards import substitution. This win is even more special as it comes at a time when we mark another milestone and celebrate our 75th year anniversary in September this year."

Over the course of the next 12 months, Ashok Leyland will diligently deliver these cutting-edge vehicles to meet the requirements of the Indian Army. ◆

Local assembly of EVs in India just a matter of time: BMW

German luxury carmaker BMW will locally produce its electric vehicles in India, and it is just a matter of time as the company's vehicles continue to gain traction in the market, according to a senior company official.

BMW, which saw 9 per cent of its sales in India coming from EVs in the first half of 2023, expects to reach up to 25 per cent by 2025. "As the volumes grow, as we have done with every other product, we will localise them (EVs), and we will produce them (locally)," BMW Group India President Vikram Pawah told PTI in an interview.

The localisation of EVs in India has two aspects, "one is the volume here, and the other one is the technology", he noted.

"It is just a matter of time. There has to be some inertia of the volumes and stability. We're seeing good signs now. It's still early days... We have delivered only 500 cars across four models in the first six months, that is still small from that perspective, but it is clearly growing fast," Pawah said. He was responding to a query on BMW's plans for locally producing its EVs in India.

BMW's electric vehicles comprise models like the i7, iX, i4 and MINI SE. "We sold over 500 cars in the first half (of 2023), which is 46 per cent more than what we sold in the entire year last year... We are the absolute leaders in the premium electric vehicles segment because we have over 50 per cent market share," he said, adding the company's iX is the best-selling battery electric vehicle in the Indian market.

Image used for representation only. Courtesy Envato Elements.

"We, as BMW, are already on a generation five batteries because we started way back in 2013. We are not new to this technology. We have already progressed so far that we are already into generation five of this technology, and we are already working on generation six. So we'll make a decision about what is the right time, which one to localise at which time... It will be soon," Pawah said. ◆

Courtesy PTI News

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Godrej Aerospace targets Airbus, Boeing suppliers as India jet orders soar

Godrej Aerospace is in talks to build aircraft parts for suppliers to Airbus and Boeing, as airlines place record jet orders, a top executive at the Indian company said.

Air India and IndiGo between them have nearly 1,000 new planes on order, said Maneck Behramkamdin, associate vice president and business head at Godrej Aerospace, which means 2,000-2,500 engines would at some point need maintenance.

"With so many aircraft coming into India, Airbus and Boeing need to augment their supply chain. Tier two suppliers of Airbus and Boeing are now looking at India ... we are in talks with them," Behramkamdin told Reuters.

There are a lot of opportunities in supplying for the structure of the aircraft and there are also large titanium requirements, he said, adding there will also be demand for maintenance, repair and overhaul of aircraft parts.

Godrej Aerospace already exports some key components to engine makers General Electric (GE) and Rolls-Royce, Behramkamdin said after a media tour of its plant in Mumbai.

The company expects its civil aviation business to clock revenues of 1 billion rupees ($12 million) in the current fiscal year, making up 35% of Godrej's total revenues, he said in an interview, adding that he expects this to grow to 50% next year. ◆

Courtesy Reuters

Tata Technologies collaborates with Government of Chhattisgarh to transform ITIs into Industry 4.0 Technology Centres

Tata Technologies, a global engineering and product development digital services company, announced that it has signed a 10-year Memorandum of Agreement (MoA) with the Government of Chhattisgarh to modernise 36 government-owned ITIs in the state with a total project cost of INR 1188.36 crores. This collaboration is an extension of Tata Technologies efforts to support projects of high social impact and complement the nation-building efforts of the government.
The upgraded ITIs will serve as skill incubation centres, strengthening the technical proficiency of students and potential employers. The MoA signing ceremony was graced by the Hon'ble Chief Minister of Chhattisgarh, Shri Bhupesh Baghel along with other dignitaries from Chhattisgarh Government and Leadership team of Tata Technologies.

Honourable Chief Minister of Chhattisgarh, Shri Bhupesh Baghel, said, "We are determined to nurture the potential of Chhattisgarh's youth, to accelerate the state's industrial growth and economic advancement. Our strategic collaboration with Tata Technologies will empower the youth, arming them with a comprehensive understanding of Industry 4.0 technologies and enhancing their employability while also bolstering the state's industrial landscape through the provision of adept, ready-to-serve human capital."

Mr. Warren Harris, CEO & Managing Director, Tata Technologies, said, "We are delighted to extend our collaborative efforts in upskilling the youth by collaborating with the Government of Chhattisgarh. The significant step towards upskilling the young engineers with Industry 4.0 technology, aligns with our vision of engineering a better world, which includes a better future for the youth at Chhattisgarh."

Tata Technologies is collaborating with 20 global industry partners to upgrade the ITIs which will offer six new trades and 23 new short-term courses that cater to Industry 4.0 demands. The upgraded ITIs will train over 10,000 students annually at full capacity. ◆

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Toyota Kirloskar Motor and Government Tool Room & Training Centre collaborate to enhance safety culture and skill development in Karnataka

Toyota Kirloskar Motor (TKM) was identified by Government Tool Room & Training Centre (GTTC) as an Industrial Training Provider (ITP) for developing skilled human resources for the manufacturing units and first-time entrepreneurs, as a result, a MoU was signed in January 2021 to impart industry-specific skill development training at GTTC locations.

Starting with four GTTC institutes in 2021-22, TKM has developed 11 GTTC institutes to date, and in FY 23-24, TKM has planned to develop five more institutes to foster the auto industry culture and skill development. In the future, the company plans to cover all 30 GTTC institutes in Karnataka in a phased manner.

As a part of the training program, TKM will provide an opportunity for the trainees who have enrolled in the three-year training in automobile welding and automobile assembly trades to acquire skills relevant to the manufacturing industry and improve their employment potential through a 'Learn and Earn' approach consisting of a mix of theoretical and on-the-job development. The students will be trained by Toyota professionals with extensive hands-on experience in the Toyota Production System. The participants on successful completion of the training, will have to take up an exam for certification, which will be conducted by the Automotive Skill Development Council, Delhi, with the support of a third-party assessor. Further, TKM has deployed their trainers in these institutes to develop trainers from the institute to conduct training.

Safety has always been a paramount priority for TKM, and the company has implemented a "safety first" approach in all its processes. As part of the company's commitment to cultivating a safe mindset among students before they join the industry, safe work training is being provided to GTTC students. To promote safe practices, TKM has extended safety training, wherein trainers were deployed to promote a safe culture with a special focus on visualising the safety aspect in the areas of industry, road, and fire.

Mr. H. Raghvendra, Managing Director, GTTC, said: "TKM is taking a proactive initiative towards the development of industry-

Overview of TKM	
Equity participation	Toyota Motor Corporation (Japan) : 89%, Kirloskar Systems Limited (India) : 11%
Number of employees	Approx. 6,000
Land area	Approx. 432 acres (approx.1,700,000 m2)
Building area	74,000 m2
Total Installed Production capacity	Up to 3,10,000 units

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Speaking on the initiative, Mr. K. Srinivas, Director of Factories, Boilers, Industrial Safety & Health, Government of Karnataka, expressed: "We extend our heartfelt gratitude to TKM for their invaluable support in furthering the objectives of the 'Skill India Mission' and promoting a culture of safety among students to work with a safe mindset in the industry. We are fully committed to providing all the necessary assistance to enhance GTTCs to achieve a greater level of excellence. With collective effort and collaboration, we are resolutely working hand in hand to develop the students and meet the industry requirements and inculcate a safe industry culture."

Overview of TKM 1st Plant	
Established	October 1997 (start of production: December 1999)
Location	Bidadi
Products	Innova HyCross , Innova Crysta, Fortuner manufactured in India.
Installed Production capacity	Up to 1,00,000 units

Overview of TKM 2nd Plant	
Start of Production	December 2010
Location	On the site of Toyota Kirloskar Motor Private Limited, Bidadi
Products	Toyota Camry Hybrid, Urban Cruiser Hyryder, Hilux
Installed Production capacity	Up to 2,10,000 units

Mr. G. Shankara, Senior Vice President & Chief Human Resource Officer, TKM & TKAP, stated: "At the core of delivering exceptional quality products and services, lies our unwavering commitment to nurturing world-class individuals. Toyota's unique philosophy revolves around cultivating quality people, who in turn will drive the establishment of robust processes, leading to the creation of ever-better products and services that delight our customers. The collaboration with GTTC and activities initiated mark a significant step in shaping a skilled and safety-conscious workforce that will drive the growth of the Indian auto industry." ◆

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Smart 5-axis measurement with XM-60 multi-axis calibrator

Renishaw's latest release of its CARTO software suite, version 4.8, provides the ability to perform off-axis rotary measurement with the XM-60 multi-axis calibrator. The off-axis rotary measurement mode in the CARTO Capture application now features the XM-60 multi-axis calibrator, enabling measurement of all axes of a 5-axis machine tool with a single laser system. This expanded capability simplifies the process of calibrating rotary axes where the Renishaw XR20 rotary axis calibrator cannot always be mounted on the centre of rotation.

Dan Throup, Product Owner for Calibration Software, explained, "Users will see a real benefit from the increased productivity from the XM-60 multi-axis calibrator. The XM-60 laser applies CARTO Capture's automatic sign detection and position-based trigger to make the process quicker and eliminate user error previously associated with off-axis rotary measurement."

The Renishaw XR20 rotary axis calibrator is an established market-leading solution for direct measurement of rotary errors for stages, jigs, and machine tools. The off-axis rotary measurement mode in the CARTO software suite provides XM-60 multi-axis calibrator users the ability to quickly capture, and analyse data, from all rotary axes, of any configuration. ◆

Seco JS754 Stub Series brings versatility and value when milling tough materials

To address the challenges of difficult and unstable machining conditions caused by long tool overhangs, the Seco JS754 Stub Series end mills feature short protrusion lengths that maximise tooling value while increasing tool life by 20% to 40%.

The four-flute end mill is designed for mill-turn and multi-tasking machines and incorporates the industry-proven JS754 cutting geometry and unique HXT coating for high-performance machining. This design makes the Seco JS754 series ideal for difficult applications involving ISO M (stainless steel) and S (heat-resistant superalloys and titanium) materials. The shorter length of the JS754 Stub adds strength and vibration control for increased tool stability when machining with main or sub spindles, as well as with milling heads and driven tools.

Many CNC mill-turn and multi-tasking machines are designed with a limited machining envelope that can prohibit the use of longer end mills. The JS754 Stub Series' short protrusion lengths require less room in the sub- or 2nd spindles of these machines. This end mill series provides freedom of movement to easily manoeuvre around workpieces with increased tool stability in these tight workspaces, which allows shops to maximise the benefits that mill-turn and multi-tasking machines offer, including shorter setup times and improved part quality.

The JS754 Stub series is offered in both chamfer and corner radius configurations in diameters from 3 mm to 16 mm and is available in cylindrical and Weldon shanks.

Due to its shorter cutting length, the JS754 Stub end mills provide full cutter engagement along the entire length of the tool. This maximises cutter edge use, which helps reduce carbide waste for improved efficiency and increased sustainability. ◆

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MAKING TECHNOLOGY AFFORDABLE

Challenging long-reach drilling made easy and accurate by new DrillMeister's modular drill bodies

To tackle the challenges of unstable drilling conditions and poor quality holes caused by traditional long-flute exchangeable-tip drills, Tungaloy has introduced DrillMeister TID-M modular drill bodies that are to be used in combination with its TungFlex modular tooling system.

Incorporating the performance of a solid carbide drill with the efficiency of an exchangeable-head system, DrillMeister carries five different geometry options of exchangeable drill heads, including general-purpose DMP and high-precision DMC, which enable the machinists to use the optimal drill tip according to the requirements of the hole dimensions and quality.

The new TID-M modular drill bodies feature an extended-length shank that carries a DrillMeister drill head at the tip and a threaded end on the other that is assembled to any toolholder of the Tungaloy's TungFlex tooling system. In addition, TID-M bodies boasts a thicker core diameter, compared with a typical exchangeable-head drill with helical flutes.

These unique features make the tool quite effective when opening holes in long-reach areas, such as the flange section close to the shoulder, where the risk of tool collision with the component is a great concern. The modularity of TungFlex tooling system provides the tool with not only the ability to tailor optimal assembly lengths but also zero setup time and reduced machine downtime. In addition, a thick core provides the tool with enhanced stiffness and stability, and when combined with a high-rigidity Tungflex carbide shank, the tool brings process security without compromising on cutting data during a challenging drilling operation that requires a long tool overhang.

TID-M modular drill bodies can carry any style and size of the standard DrillMeister drill heads, providing machinists with flexibility to address a broad range of material groups and machining requirements. ◆

Precise cutting in one work step

As the world's leading standard parts manufacturer, Meusburger is working every day to improve its production processes and machines. Meusburger knows the strengths and weaknesses of the different machines and its experts continuously optimise these. The steadily increasing demand for round parts in special lengths has presented Meusburger with the task of finding a solution to cut these in a time-saving and precise manner with repeatable accuracy.

The GMT 6000 Precision cutting and grinding machine represents a new development on the basis of its overall know-how: here Meusburger's accumulated knowledge and practical experience in the machining of round parts are combined.

With the Meusburger precision cutting and grinding machine, which complies with the latest safety regulations of the machinery directive, round parts can be shortened and ground precisely to the desired length in just one work step. State-of-the-art electric and hardware components such as the measuring system, three-phase motors and position indication as well as the stable design guarantee ergonomic work and ensure the lowest vibration and highest precision.

Precision cutting and grinding machine GMT 6000

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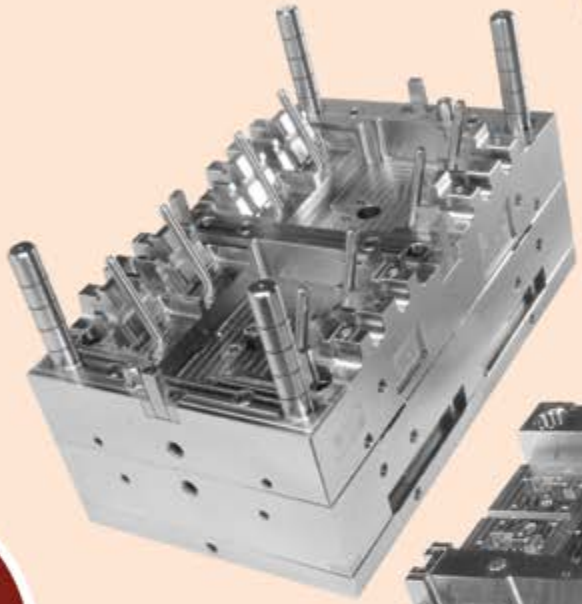

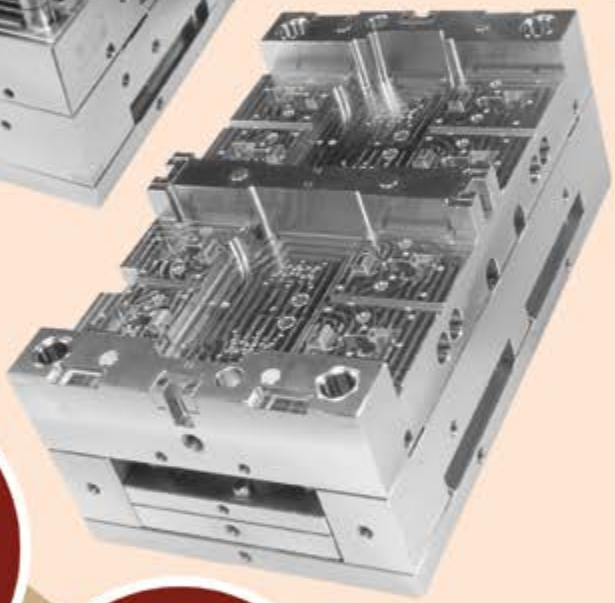

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How CNC machining could give you the cutting edge?

CNC machining has undoubtedly been a part of the manufacturing world for years. Over time, it has metamorphosed to become more flexible, efficient, and versatile. Thanks to CNC machines, it is possible to create accurate pieces, process more materials, and maintain consistency in design. Owing to their tremendous potential, CNC machines have earned a permanent place in tool rooms.

Kimberley D'Mello

CNC machining, also known as Computer Numerical Control machining, refers to a manufacturing process, which uses computer-controlled machines to shape and cut materials with precision. A computer program controls the movement and operation of tools and machinery in order to produce complex parts and components.

Advantages of CNC machining

CNC machining helps manufacturers reach a level of efficiency, accuracy, and consistency that would be difficult to achieve if performed using a manual process. Thanks to CNC machining, operations that were considered difficult to perform years ago, can now be performed easily. CNC machining has truly transformed how products are designed, developed, and produced. In fact, CNC machining offers several advantages over conventional machining methods. For instance, it ensures high precision, repeatability, and accuracy, allowing for the production of complex and intricate parts. Let's take a look at some of its key advantages:

High precision and accuracy: The computer-controlled movements

eliminate the possibility of human errors, resulting in consistent and reliable part dimensions and geometries.

Complex geometries: CNC machines can create intricate shapes that would be challenging to achieve using conventional machining methods.

Repeatability and consistency: Once a CNC program is created and optimised, the same process can be repeated as many times as needed with consistent results.

Automation and unmanned operation: CNC machines can operate autonomously with minimal human intervention.

Reduced human error: The automation provided by CNC machining reduces the potential for human errors caused by fatigue, distraction, or manual mishandling of tools and materials.

Shorter lead times: CNC machining can significantly reduce production lead times. The ability to quickly program and set up machines, along with faster cutting speeds, accelerates the entire manufacturing process.

Flexibility and customisation: CNC machines can be easily reprogrammed to produce different parts or modify designs, making them ideal for customisation and small-batch production runs.

Material versatility: CNC machining can work with a wide range of materials, including metals, plastics, composites, and ceramics. This versatility allows manufacturers to choose the most suitable material for each application.

Improved safety: CNC machines offer enhanced safety features, such as enclosed workspaces and interlocks that prevent access to moving parts during operation.

Remote monitoring and control: Modern CNC systems often come with remote monitoring and control capabilities. This enables operators and supervisors to oversee operations from a distance, enhancing efficiency and response time.

Innovative tooling and machining strategies: CNC machining allows for the implementation of advanced tooling and machining strategies, such as high-speed machining, multi-axis machining, and adaptive machining, which optimise processes and improve results.

Integration with CAD/CAM systems: CNC machines seamlessly integrate with CAD and CAM systems, allowing for seamless design-to-production workflows and reducing errors.

Revolutionising toolmaking

The introduction of CNC machining revolutionised the manufacturing landscape by enabling the precise

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The CNC machining process involves the following key steps:

Step 1: Design

The first step is to create a detailed digital design of the desired part using Computer-Aided Design (CAD) software. The design specifies the dimensions, geometry, and other specifications of the part.

Step 2: Programming

A CNC programmer then uses Computer-Aided Manufacturing (CAM) software to generate the G-code, which are instructions for the CNC machine that specify the tool paths, and cutting speeds, among other machining parameters.

Step 3: Setup

The CNC machine is set up with the necessary tools, like drills, cutters, or mills. The raw material, like metal, plastic or wood, is then securely positioned on the machine's worktable.

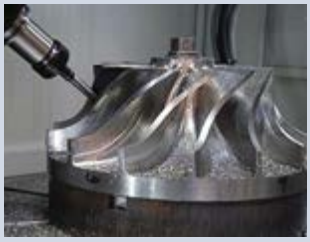
Step 4: Machining

The CNC machine executes the programmed instructions and performs the machining operations. It precisely controls the movement of the cutting tools, such as rotating, translating, or plunging, to shape and remove material from the workpiece as per the design specifications.

Step 5: Quality Control

Quality control measures are implemented throughout the machining process to ensure that the finished part meets the required tolerances and specifications. This may involve the use of measurement tools, such as Coordinate Measuring Machines (CMM), to verify dimensions and check for any defects or deviations.

Future developments



The future of CNC machining holds several exciting developments that are likely to shape the industry. Here are some key trends and advancements that are expected to influence the future of CNC machining:

- **Automation and robotics:** Automation will continue to play a significant role in CNC machining. Advances in robotics and artificial intelligence will lead to the development of more intelligent and autonomous CNC machines. These machines will be capable of self-adjusting, self-monitoring, and self-correcting, resulting in increased productivity and efficiency.
- **Internet of Things (IoT) integration:** CNC machines will become part of the larger network of connected devices, enabling real-time data monitoring and analysis. This integration will facilitate predictive maintenance, remote monitoring, and data-driven decision-making, ultimately improving machine performance and reducing downtime.
- **Additive manufacturing (3D Printing) integration:** The integration of CNC machining with additive manufacturing technologies, such as 3D printing, will enable hybrid manufacturing processes. This combination will allow for complex geometries and the production of parts with improved functionality and reduced waste.
- **Enhanced precision and accuracy:** Advancements in sensor technology and metrology will enable CNC machines to achieve higher levels of precision and accuracy. This will be crucial for industries that require tight tolerances, such as aerospace, medical, and automotive sectors.
- **Advanced materials and composites:** CNC machining will adapt to handle a wider range of materials, including advanced alloys, composites, and ceramics. These materials offer unique properties and performance characteristics, and CNC machines will need to evolve to effectively work with them.
- **Cloud computing and digital twins:** Cloud-based computing and digital twin technology will enhance CNC machining processes. Digital twins, virtual replicas of physical machines, will enable manufacturers to simulate and optimise machining operations before implementing them in the real world. This will reduce costs, improve efficiency, and minimise errors.
- **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies will find applications in CNC machining for training, maintenance, and real-time visualisation of machining processes. These immersive technologies will provide operators with interactive instructions, improve workflow efficiency, and enable remote collaboration.
- **Sustainable manufacturing:** Environmental considerations will continue to drive the future of CNC machining. There will be a growing emphasis on energy-efficient machines, waste reduction, and the use of eco-friendly materials. CNC machining processes will be optimised to minimise environmental impact while maintaining high productivity.

DID YOU KNOW?

The first CNC machine was developed in 1952 by a team of researchers working at MIT (Massachusetts Institute of Technology). This advancement followed the development of the first NC (Numerical Control) machine in 1949. CNC machines were patented in 1958.

The first use of the CNC machine was to machine helicopter blades using mathematically developed aerofoil shapes in 1949.

Source: Xometry.com

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control of machine tools through computer programs. Advancements in CNC machining have been multi-faceted. High-speed machining (HSM) techniques have enabled faster material removal rates while maintaining high levels of accuracy. Multi-axis machining has facilitated the creation of intricate and complex geometries that were once deemed unattainable. Furthermore, the integration of artificial intelligence (AI) and machine learning has enhanced process optimisation, predictive maintenance, and adaptive machining, ushering in a new era of smart manufacturing.

Benefits for toolmakers

The advancements in CNC machining can significantly benefit toolmakers in several ways. For instance, CNC machining ensures unparalleled precision and accuracy, allowing toolmakers to create intricate and complex tool geometries with tight tolerances. This precision in turn translates to higher-quality end products and reduced rework. Additionally, CNC machines' automation and high-speed machining capabilities can enhance efficiency and productivity in tool manufacturing. And, if CNC machines are put to work 24/7, they can not only reduce lead times but also increase overall output.

The latest CNC machines are very versatile when it comes to materials. They can work with a wide range of materials ranging from metals to composites and even plastics. This versatility can empower toolmakers to adapt to the changing industry demands while being able to explore innovative materials.

CNC machines' advanced software and multi-axis machining can enable toolmakers to experiment with creative and innovative tool designs. This flexibility fosters continuous improvement and the development of cutting-edge tools.

The last benefit is cost savings. It's true that the initial investment costs for CNC equipment may be higher, which is why many toolmakers may be hesitant to opt for one. However, manufacturers who have invested in these machines have stated that it results in cost savings in the long term because of factors like minimised material wastage, and improved process efficiency.

Exciting prospects

The advancements in CNC machining have propelled the machine tool industry into a new era of precision, efficiency, and automation. From aerospace to electronics, CNC machining has become the backbone of modern manufacturing, enabling the production of complex and high-quality components. Toolmakers, in particular, stand to benefit immensely from CNC machining, as it empowers them to create cutting-edge tools with unmatched precision and efficiency. As technology continues to evolve, the synergy between CNC machining and the machine tool industry promises an exciting future characterised by innovation and progress. ◆

Applications in the machine tool industry

CNC machining has found extensive applications across the machine tool industry, impacting various sectors such as aerospace, automotive, medical devices, and electronics, among others. Let's understand their impact on the following sectors:

- **Aerospace:** CNC machining plays a pivotal role in manufacturing critical aerospace components like turbine blades, engine parts, and aircraft structures. Its precision and ability to work with exotic materials contribute to the safety and efficiency of air travel.
- **Automotive:** In the automotive sector, CNC machining is used to create engine components, transmission parts, chassis components, and intricate moulds for plastic and metal parts. The speed and accuracy of CNC machining aid in meeting stringent quality and performance standards.
- **Medical devices:** CNC machining is indispensable for crafting intricate and customised medical devices, implants, and surgical instruments. Its ability to work with biocompatible materials ensures the safety and reliability of these life-saving tools.
- **Electronics:** CNC machining is used in the production of electronic components, circuit boards, and connectors. Its precision is crucial for creating miniaturised devices that power modern electronics.

'In India, there is an increase in demand for more complex and higher-precision moulds'

"As India continues to produce such moulds to meet the growing demands, it has simultaneously led to the increased adoption of CNC machines in the country," said **Hank, Sales Manager – Indian Operations, Yeong Chin Machinery Industries Co. Ltd. (YCM)**. Wing Liu, International Business Head, and Patrick P. Chen, General Manager, Yeong Chin Machinery Industries Co. Ltd. had visited India along with Hank Sales, the Manager of the company's Indian Operations in July 2023. During their visit, they had an insightful meeting with Nishant Kashyap, Editor of TAGMA Times, and D. Shanmugasundaram, MD of S&T Group and Vice President of TAGMA (India). Here's an excerpt from their discussions…

Q Can you provide an overview of the current state of the CNC machining market in India, with a specific focus on the die and mould industry?

CNC machining is an essential process in mould manufacturing. With the stable development of the Indian market, the demand for moulds in various industries has been increasing rapidly. Additionally, there is a proactive effort to develop local mould manufacturing to reduce the need for imports. As a result, there is a significant increase in the use of CNC machining processes and capacity requirements in India in order to meet the production needs of large, medium, and small-sized moulds.

Q What are the latest developments in CNC machining technology? How can these developments enhance the efficiency of die and toolmakers?

In order to enhance the efficiency of mould manufacturing, CNC machining plays a critical role in improving the dimensional accuracy, surface roughness and cutting feed rate. To achieve these, relevant technologies can be categorised into software and mechanical aspects.

On the software side, the main focus is on enhancing the operating speed of numerical controllers, by reducing program cycle times and incorporating intelligent functions. However, the most crucial factor is the use of CNC machines with higher rigidity and faster speeds. Only with such machines can the utmost mechatronics integration capabilities be utilised to maximise mould machining efficiency.

Q How have automation and digitalisation influenced the CNC machining landscape?

Automation can significantly reduce reliance on manual labour. It can effectively increase the production time with unmanned operations, and greatly reduce the dependency on equipment operators.

Digitalisation of the CNC machining centre and shop floor reporting enables real-time collection and analysis of digital information. This gives managers immediate access to the factory's production

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status and identifies critical issues that need to be promptly tackled.

Q Are there any notable trends or emerging technologies in CNC machining that you believe will have a significant impact on die and mould professionals in India?

Yes, I believe in terms of the mechanical aspects, higher-speed spindles ranging from 15,000 to 40,000 RPM for advanced machining techniques, high stability spindle run-out accuracy to ensure precise and stable operations, and effective thermal deformation control to maintain stability during machining will be among the notable trends.

In terms of CNC aspects, digital twin technology will be a crucial aspect in the future. This technology can accurately calculate machining time predictions with a precision rate of up to 99.9%. It can also simulate mould surface finishing accuracy and optimise the process before actual machining.

Q In your opinion, what are the key factors contributing to the growth and adoption of CNC machines in the die and mould industry in India?

In India, there is an increase in demand for more complex and higher-precision moulds, which are manufactured using CNC machines. As India continues to produce such moulds to meet the growing demands, it has simultaneously led to the increased adoption of CNC machines in the country.

Q What would you say should be the main considerations for die and mould professionals when choosing CNC machines for specific applications?

The first consideration should be the rigidity performance of the machine design and the precision capacity of the spindle. Additionally, when the mould design involves large incline angles and steep structures, adopting five-axis machining can enhance processing efficiency. Therefore, local technical service support in India becomes important for achieving optimal results.

Q Looking ahead, how do you envision the future of CNC machining in the die and mould industry in India? Are there any upcoming developments or initiatives we should be excited about?

Currently, the mould market in India is highly competitive. Apart from quantity, there is an increasing demand for high-quality moulds. We can expect the five-axis machining technology in the production process to meet these demands. Additionally, integrating smart automation, smart machine, and smart management software systems will also be adopted to align with top-notch mould manufacturing standards. This integration will enable India to achieve a leading position in mould manufacturing.

Looking at the growth of the Indian mould manufacturing business, we are very confident that in collaboration with S&T Group, YCM will be able to meet the growing demands for dies and moulds. We will rely on our outstanding CNC machining technology, backed by S&T's strong sales, service, and application support to achieve the same. YCM will also cater to Indian customers in a major way by developing a technical centre as well as a manufacturing unit in India within a year. ◆

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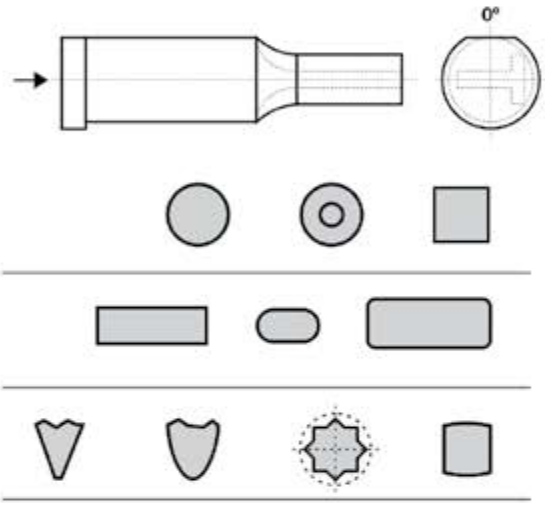

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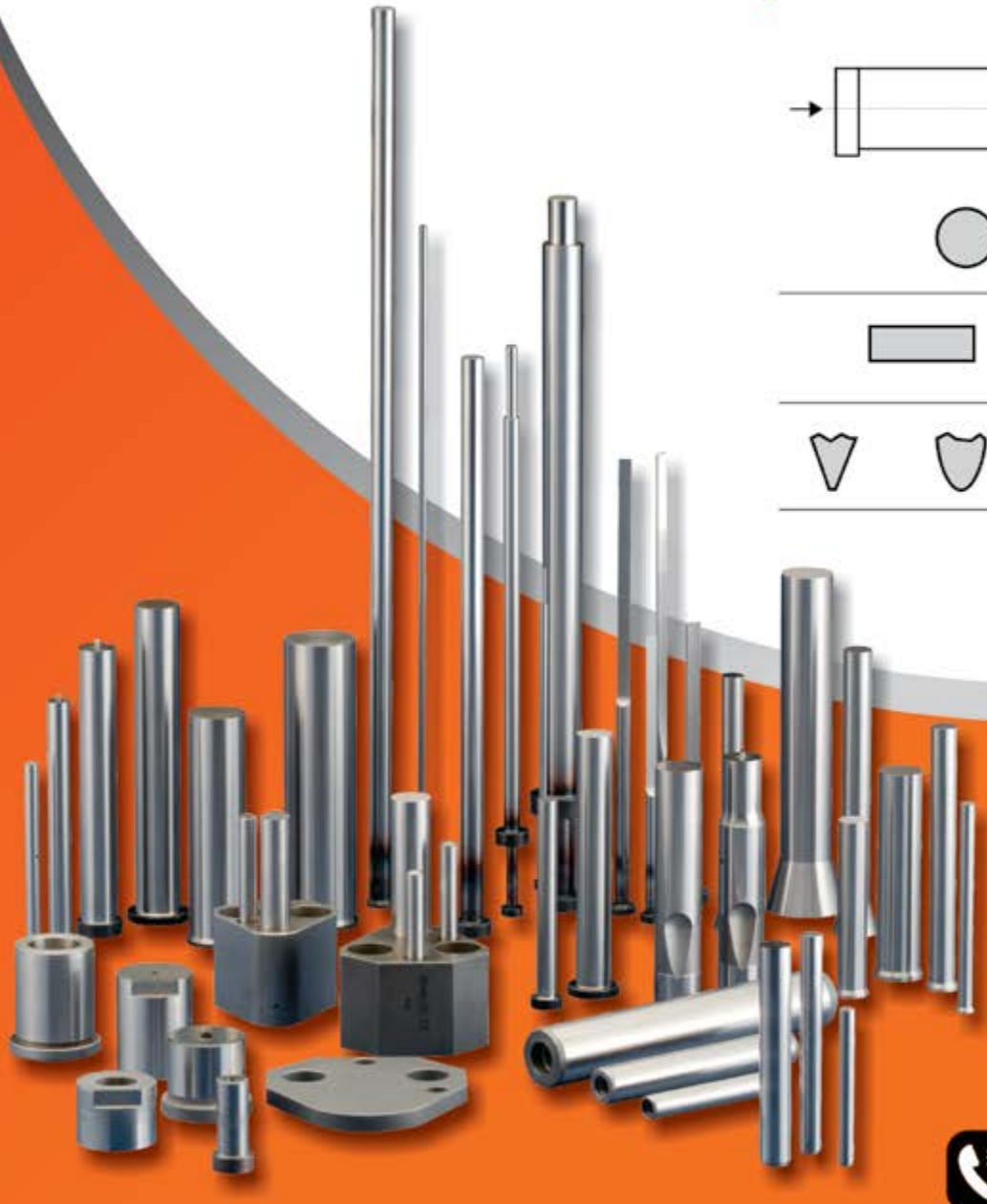

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'Today's die and mould professionals in India need to get familiarised with the developments in CNC machining'

"While the machines are getting more complex and are being equipped with improved capabilities, there is a significant effort to reduce the human skill required to operate these machines," says **Subbarayan, Sr. Consultant, Makino India Pvt. Ltd.**

Nishant Kashyap

Q Can you provide an overview of the current state of the CNC machining market in India, with a specific focus on the die and mould industry?

The Indian die and mould Industry has evolved over the years and currently caters to the complex, high-precision demands of end users. Earlier, these demands were met through imports from toolmakers in the far East and Europe.

Such demand for complex and high-precision parts is predominantly driven by the local manufacturing push by the global automotive OEMs. India is becoming their global manufacturing and development base, which is driving local mould makers to catch up with efficient machining technologies, processes, and equipment. We can see a similar trend in other sectors too, such as white goods, and electrical & electronics industries.

There is a growing demand for high-speed and high-precision spindles on machining centers, 4- and 5-axis machining capabilities to improve cutting efficiency and reduce processes. There is a clear shift from low-cost machines to high-speed/efficient machines, which can deliver the required precision levels within the shortest possible time.

Large tool rooms are gradually shifting to automation to reduce expenses related to labour costs and challenges related to skilled labour availability. Additionally, independent manufacturing cells integrating milling and EDM processes with automated tools (electrode) and work handling are enabling unmanned lights-off machining.

Q What are the latest developments in CNC machining technology? How can these developments enhance the efficiency of die and toolmakers?

Today's CNC machines are faster, more accurate, and very reliable. High-speed spindles enable the usage of very small tools, which machine fine and intricate shapes. Previously, this was done using the time-consuming EDM process. In combination with the 4th and 5th-axis capabilities, these spindles help us greatly minimise EDM work. Besides, intelligent and user-friendly CAM software have been beneficial in simplifying the programming complexity associated with 4th and 5th-axis machining. Smart control systems have greatly simplified machine operation in terms of job setups, tool management, on-machine inspection, and unmanned operation. On CNC EDMs and WEDMs, the current generator technologies have vastly improved the machining speed and finishing capabilities, thereby reducing manufacturing lead times.

Q How have automation and digitalisation influenced the CNC machining landscape?

The Indian die and mould industry is yet to incorporate full-scale automation. But larger tool rooms are actively considering automated cells for certain specific areas such as inserts and electrodes, mould base elements, etc. As the volume and scale of operations increase, we should witness more demand for automation solutions in the near future.

As far as digitalisation is concerned, I would say that it is still in the early stages. With most machine tool manufacturers offering IoT capabilities on their machines, customers are testing and evaluating the various solutions being offered.

However, with the ever-growing demand for efficient, and reliable manufacturing systems, most tool rooms will have to embrace automation and digitalisation in the near future.

Q Are there any notable trends or emerging technologies in CNC machining that you believe will have a significant impact on die and mould professionals in India?

CNC machines are getting smarter by the day. With the integration of digital libraries for tools, cutting strategies and materials, CAM programming has been highly simplified. Smart controllers on CNC machines are able to simplify job setups, manage tool data efficiently, and enable on-machine process verification. Besides these, various automation features help in implementing unmanned operations during the night and on weekends.

Today's die and mould professionals in India need to get familiarised with the developments in CNC machining. While the machines are getting more complex and are being equipped with improved capabilities, there is a significant effort to reduce the human skill required to operate these machines.

CNC machines are getting smarter by the day. With the integration of digital libraries for tools, cutting strategies and materials, CAM programming has been highly simplified. Smart controllers on CNC machines are able to simplify job setups, manage tool data efficiently, and enable on-machine process verification.

Q In your opinion, what are the key factors contributing to the growth and adoption of CNC machines in the die and mould industry in India?

I would accredit the automobile industry here! Its sizable investments in local R&D are helping the die and mould industry in India grow qualitatively as well as quantitatively.

Most OEMs are upgrading their local R&D centres to meet the demands of the global market. They are actively developing local tool rooms to support them in their new product developments. Now, with the current focus on EVs, local tool rooms are heavily investing in upgrading their facilities with the latest CNC machines.

Besides the abovementioned factors, other sectors such as electronics, electrical, white goods, and FMCG are also fuelling the demand for a large number of CNC machines in the die and mould industry in India.

Q What would you say should be the main considerations for die and mould professionals when choosing CNC machines for specific applications?

Customers should look for key technology features, which will enable them to achieve accuracy and speed. Mere specifications could sometimes be misleading. So, one needs to first evaluate the technology behind these features and their long-term performance capabilities. The machines should also be future-ready in terms of implementing automation and digitalisation requirements.

Apart from the machines' features and capabilities, one should also evaluate the machine tool providers' capability to support technology transfer and training. Integrating the machine with the relevant supporting technologies such as cutting tools, holders, work holding and CAM is a key requirement that decides how well the machine is going to produce the expected results.

Q Looking ahead, how do you envision the future of CNC machining in the die and mould industry in India? Are there any upcoming developments or initiatives we should be excited about?

The die and mould industry faces tremendous pressure to reduce mould manufacturing lead times. As a result, there is an increasing trend towards unmanned operations, usage of 5-axis machines to reduce setup time and EDM operations, automation of work handling, smooth transition from milling to EDM, and other machining operations, and on-machine inspection to reduce re-machining and rejections at the assembly stage.

Going forward, we will be seeing more multi-process machines, and limited automation of work handling between milling (core/cavity and electrodes), EDM, and other processes. Metal 3D printing is also gaining relevance, particularly for rapid new product developments and for implementing conformal cooling requirements. ◆

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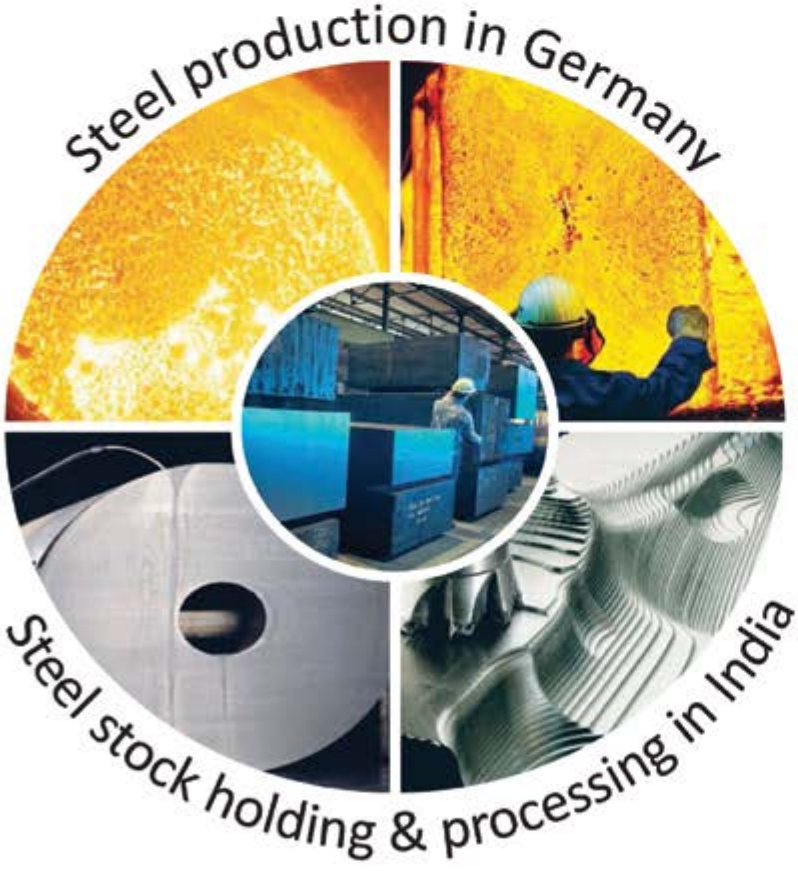

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'Most CNC machines are manufactured domestically, leading to reduced dependence on imports'

"The surge in demand for 5-axis machines, even within the die and mould sector – a field previously characterised by rarity – has led to the establishment of numerous manufacturing facilities by machine tool builders to cater to these demands," says **Touseef Ahmed Khan, General Manager Sales, S&T Machinery (P) Ltd.**

Nishant Kashyap

Q Can you provide an overview of the die and mould industry in India?

The die and mould market size in India is expected to accelerate at a CAGR of 9% by 2031. The Indian industry's market size is close to INR 18,000 crore. While 70% of its demands are being met domestically, 30% are being met through imports. The market is fragmented due to the presence of many established vendors holding significant market share. The non-automotive sectors have been meeting a large part of their tooling demand through imports. Quality, cost, and delivery time are some of the major expectations from the user industry with respect to the procurement of the tools.

Q What are the latest developments in CNC machining technology? How can these developments enhance the efficiency of die and toolmakers?

Other than making standard machines, machine tool builders have started developing multi-axis machines, which produce moulds with a significantly reduced cycle time, thereby enhancing productivity. The dependence on high-end automation machines with high speed is higher. While these machines were imported earlier to meet the manufacturing requirements, today, most of these machines are manufactured domestically, leading to reduced dependence on imports. The surge in demand for 5-axis machines, even within the die and mould sector – a field previously characterised by rarity – has led to the establishment of numerous manufacturing facilities by machine tool builders to cater to these demands.

The die and mould industry's requirement for high-speed machines has prompted the creation of machines with elevated precision and spindle speeds. The challenge posed by larger components has been addressed through the development of double-column machines featuring multi-angled heads, significantly enhancing productivity. This innovation allows for multiple-face operations to be executed within a single setup, further amplifying efficiency.

Q How has IIoT influenced the CNC machining landscape?

There are several key areas where the Industrial Internet of Things (IIoT) can take on a significant and decisive role in CNC machining. They are:

Machine utilisation

◗ IIoT's most prominent role in CNC machining is increasing machine utilisation. With connected devices either added to the existing equipment or embedded into new machines, manufacturers can accurately identify and act on downtime issues.

Maintenance strategies

◗ With IIoT, CNC companies can move from preventive to predictive maintenance strategies. IIoT sensors and advanced-edge computing enable maintenance teams to unlock

machine performance and condition data to inform when maintenance activity should occur.

- With real-time machine condition data, manufacturers can set up workflows and notifications in machine metrics to automatically alert the right person when a machine goes down. Further, you can set up thresholds (a given temperature, vibration, load, etc.) that, when met, create a work order in a CMMS, preventing downtime altogether.

Productivity and efficiency

- Because IIoT technology eliminates manual data collection across the shop floor, operators have the ability to focus on higher-value tasks, like managing more machines. Additionally, since the production data is autonomously collected, managers can have confidence that the data is accurate.
- Machine metrics track the overall equipment effectiveness and consider variables that impact everything, from operator performance to maintenance to continuous improvement initiatives. As equipment utilisation goes up, so do efficiency and productivity.

Q Are there any notable trends or emerging technologies in CNC machining that you believe will have a significant impact on die and mould professionals in India?

Yes, I believe that there are two notable trends or emerging technologies in CNC machining that will have a significant impact on die and mould professionals in India. They are:

- **Automation:** From creating product moulds to assembly line design, automation is increasing productivity and limiting human error for many tool and die manufacturers.
- **3D Printing:** This is another trend that has grown over the years, particularly in the manufacturing space. This form of printing allows exact designs and precise specifications to be replicated at a quicker pace, lower price, and with increased accuracy. Metal 3D-printed parts are becoming more mainstream as a cost-effective measure among major manufacturing companies.

Q In your opinion, what are the key factors contributing to the growth and adoption of CNC machines in the die and mould industry in India?

The tooling market is directly affected by the fluctuations and developments occurring within the end-user industries. In India, the automotive industry consumes over 60 per cent of the total tool production. Tool production has been witnessing tremendous growth ever since the automotive industry made a strong comeback in 2022. The growing demands for lightweight electric vehicles, safety & security norms, and the focus on localisation are some of the trends, which are driving the demand for toolmakers. For instance, the increase in consumption of consumer electrical and electronic (E&E) devices is driving the growth of the tooling market to sustain the high-production demand for E&E device manufacturers.

The escalating demand for light commercial vehicles (LCVs) around the world on account of the inflating global oil prices is positively influencing the market too. Furthermore, key market players are focusing on different varieties of tool production in the automotive industry. They are also focusing on expanding their product portfolio to offer more economical products. The burgeoning plastic industry and new developments in biodegradable polymer material are offering a positive outlook to industry investors.

Q What would you say should be the main considerations for die and mould professionals when choosing CNC machines for specific applications?

Precision, efficiency, and reliability are paramount for die and mould professionals. STM, a leading CNC machine manufacturer, understands their needs. Our cutting-edge CNC machines offer unparalleled precision and accuracy, while their robust designs ensure stability and consistency. With high spindle speeds and advanced tooling options, our machines optimise cutting speed and productivity. Usually, it is preferable to look for excellent repeatability and tight tolerances, as they ensure consistent results for intricate designs. User-friendly interfaces (CAD/CAM) and programming languages make operation seamless, accommodating professionals of all expertise levels. From ample work envelopes to compatibility with diverse materials, our CNC machines provide flexibility and versatility. Backed by exceptional technical support, STM guarantees minimised downtime and exceptional RoI.

Q Looking ahead, how do you envision the future of CNC machining in the die and mould industry in India? Are there any upcoming developments or initiatives we should be excited about?

The die and mould industry is one of the major contributors to the Indian economy. Dies and moulds are pivotal for industries like packaging, plastics, auto components, electronics, electrical, machine tools, etc. Driven by our latest developments—the VL, VD, VG, VR, and DL series—the STM manufacturing unit of the S&T Group envisions a greater future for CNC machining in the die & mould industry in India.

Our VL series with belt-drive technology ensures exceptional precision and versatility, while the VD series, equipped with direct-drive technology, promises high-speed, and high-precision machining. The VG series is tailored for graphite applications, and our VR series is designed for mass production with rotary capabilities, offering high speed and feed rates. ◆

CNC machining vs. plastic injection moulding: Differences and comparison

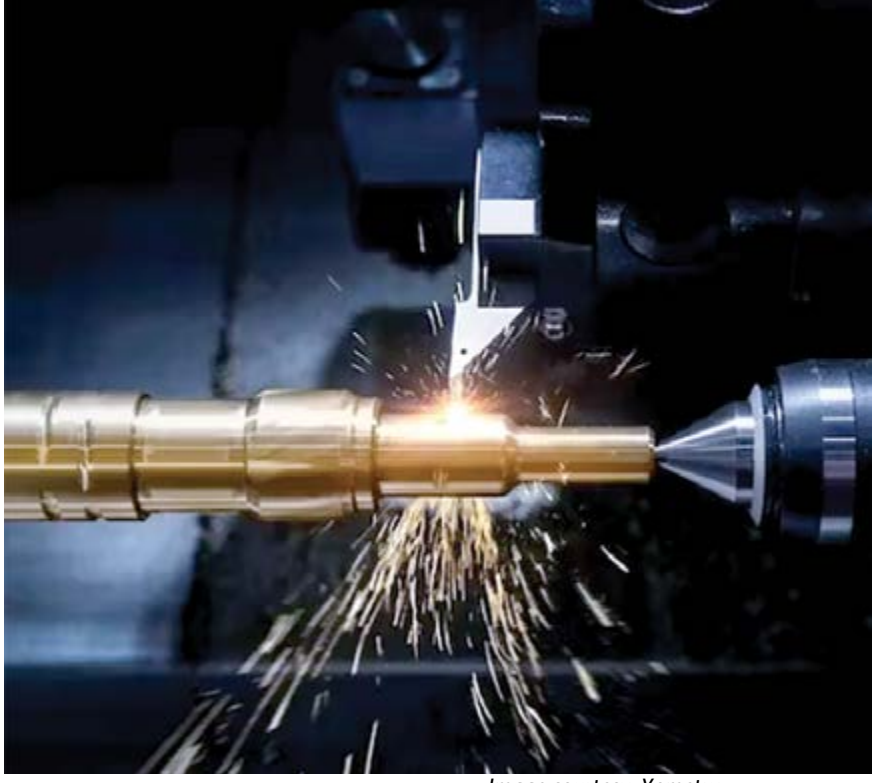

Image courtesy: Xometry

This article presents a comparison of CNC machining and plastic injection moulding, explains what they are, and discusses each of their different attributes.

Picking an appropriate manufacturing method for a new product is often easier said than done. CNC machining and plastic injection moulding are both commonly used and cost-effective ways to produce parts. While both methods are similar in those regards, they are completely different fabrication methods. CNC machining is a subtractive manufacturing process that uses metal cutters to remove material from a workpiece to create the final part shape. Plastic injection moulding forces liquid plastic to conform to the shape of a mould to make the finished part. Three major differences exist between the two methods. These are materials that can be used, the volume of production that can be attained, and part dimensional tolerances and precision.

These differences lead to significantly different costs for the two processes. This article discusses everything there is to know about CNC machining vs. plastic injection moulding, including the advantages and disadvantages of each, and process alternatives to both.

CNC Machining Definition and Comparison to Plastic Injection Moulding

CNC machining is a subtractive manufacturing process that uses machines like mills, lathes, drill presses, and saws, to make highly precise parts. Computer-Aided Design (CAD) data is developed during the product design phase. This CAD data is then used as the basis for programming and optimising the machine tool sequences and paths. The material is then processed using cutters, such as end mills and drill bits, to create the parts. Auxiliary machinery, including honing, hobbing, or grinding machines, may also be needed to complete parts to customer specifications.

While manual machining of parts has existed since 1300 BC, CNC machining wasn't developed until the mid-1940s. The first control mechanisms that eventually were used on CNC machines were used to punch code tapes as a way of communication. In 1949, the first experimental 3-axis milling machine was created to make helicopter blades and stiffer skin for various aircraft. In the 1970s, CAD and CAM software began to be integrated into CNC systems. Now, CNC machining is one of the most widely used manufacturing methods in the world. It is used to make products for several industries, from automotive to agriculture. CNC machining is often preferred to injection moulding due to its ability to easily accommodate product design changes, its ability to produce tight tolerance parts, and the possibility of using several different materials.

What Are the Advantages of CNC Machining Compared to Plastic Injection Moulding?

Listed below are some advantages of CNC machining over injection moulding:

1. Beautiful surface finishes and tight tolerances are easily obtainable with CNC machining since small-diameter tools

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can be used and each process parameter can be optimised.
2. A wide range of materials can be shaped using CNC machining since both plastic and metal materials can be cut.
3. It is easy to modify part designs since programs containing the CNC machine instructions and fixtures can quickly be changed to match successive design iterations.
4. CNC machining has faster tooling lead times than injection moulding since complex moulds don't have to be made.

What Are the Disadvantages of CNC Machining Compared to Plastic Injection Moulding?

Listed below are the disadvantages of CNC machining vs. injection moulding:

1. Large production volumes and price-per-part are more expensive for CNC-machined products due to the longer per-part cycle time needed to make parts.
2. Labour-intensive since workpieces, completed parts, tools, and tool holders, must be fixed to and removed from the machine depending on the job.

Plastic Injection Moulding Definition and Comparison to CNC Machining

Plastic injection moulding is a manufacturing method that uses an injection moulding machine (IMM). These machines contain components such as injection screws, injection barrels, and fabricated moulds. Plastic pellets are fed into the barrel and are melted through the rotation of the screw and heater bands. The molten plastic is injected into the mould and formed into the geometry of the part. The IMM holds pressure on the mould until products have been properly formed and cooled. The completed parts are ejected and the cycle restarts.

Brothers Isaiah and John Hyatt developed injection moulding in 1872 and used it to mould hair combs, buttons, and other small items. In the 150 years since that first machine, injection moulding has blossomed into a multi-billion dollar global industry. Injection moulding is considered a more cost-effective and efficient way to make plastic parts than CNC machining.

What Are the Advantages of Plastic Injection Moulding Compared to CNC Machining?

Listed below are the advantages of injection moulding vs. CNC machining:

1. It can easily produce large volumes of parts in a rapid and repeatable fashion since multiple-cavity moulds can create many parts in one injection cycle.
2. Injection moulding has the lowest price per part of any manufacturing process, since the moulds have long lives, and multiple-cavity moulds can increase the capacity of each machine to support high-volume orders.
3. Minimal post-processing is required because parts are often ready to be shipped immediately after ejection depending on the type of gate (entry point from the runner into the cavity) that is used.

What Are the Disadvantages of Plastic Injection Moulding Compared to CNC Machining?

Listed below are the disadvantages of injection moulding vs. CNC machining:

1. It is difficult to accommodate product design changes since rework on complex moulds with several plates, cams, and complex geometries can be troublesome.
2. Imperfections on the interior of the mould can result in finished parts with surface flaws.
3. Enormous upfront investment is required for mould fabrication since multi-cavity moulds can cost anywhere from a few thousand to hundreds of thousands of dollars.

Comparison Between CNC Machining and Injection Moulding

With CNC machining, tighter-tolerance parts can be made from a wider range of materials than with injection moulding. However, injection moulding can produce parts at a much more rapid pace without the need for post-processing - making it ideal for high-volume production. While injection moulding is ideal for higher volumes, a large upfront investment must be made to fabricate an injection mould. However, injection moulds will pay for themselves once a sufficient amount of parts are produced and sold.

CNC Machining vs. Injection Moulding: Lead Cost Comparison

Tooling costs for CNC machining are significantly less than for injection moulding. CNC machining costs are associated with the fabrication of fixtures and jigs and the procurement of raw materials and tools. Moulds for injection moulding can cost a few thousand dollars for single-cavity and low-cavitation moulds and up to hundreds of thousand dollars for multiple-cavity moulds. An injection mould will pay for itself when its cost is spread over a sufficiently high production

volume. Assuming you have the necessary machinery to make parts and only need to make arrangements for tooling like moulds, fixtures, and jigs, upfront costs on CNC machining are lower.

CNC Machining vs. Injection Moulding: Speed Comparison

Both CNC machining and injection moulding are notable for their ability to rapidly produce parts. For small-volume runs, CNC machining is often preferred. Injection moulding is preferred for larger runs because multiple-cavity moulds can rapidly produce parts and reduce per-piece cost. Taking into account the lead time for mould production, it takes longer to start series production using injection moulding than using CNC machining. Consider using CNC machining for small production runs and injection moulding for large runs.

CNC Machining vs. Injection Moulding: Volume Comparison

Injection moulding can both produce more parts per base machine and more parts per dollar invested compared to CNC machining. Moulds used in injection moulding can have multiple cavities - from one cavity to several hundred. Hence, injection moulding can quickly produce large numbers of parts. In CNC machining, parts are generally made one by one. While CNC machining is fast at producing parts, injection moulding is even faster.

CNC Machining vs. Injection Moulding: Materials Comparison

A broader range of materials can be used in CNC machining processes than in injection moulding. CNC machining is capable of producing parts from certain plastics, but also from metals, like aluminium and steel. Many thermoplastics, thermosets, and elastomers are too soft to be CNC machined. However, they can easily be fabricated into parts using injection moulding machines. ◆

This article was written by various Xometry contributors. Xometry is a leading resource on manufacturing with CNC machining, sheet metal fabrication, 3D printing, injection moulding, urethane casting, and more.

'ITS 2023 will be the perfect platform for OEMs to share their expectations and for toolmakers to showcase their capabilities'

"Every edition of ITS offers insight into the cogs of the Indian tooling industry and its latest developments and new trends," says **T.S. Gopalakrishnan, Director - Marketing, Multiple Special Steel Pvt. Ltd.**

Nishant Kashyap

Q Please tell us about your company and its product range.

We are an ISO 9001:2015-certified and EN 9120:2018-certified trading firm dealing in ferrous and non-ferrous metals for applications in aerospace and defence. For more than six decades, we have been catering to the needs of the aerospace, defence, automotive, medical, white goods, etc., industries. Our value-added line consists of machining, grinding, deep-hole drilling and tapping. All these are available under one roof.

Q What are your views on the upcoming International Tooling Summit (ITS) 2023?

International Tooling Summit 2023 will take place in Bengaluru, which is well-known for its manufacturing sectors including aerospace, toy making, and now, electric vehicles. The tooling fraternity in India has been patronised mainly by the automotive sector but sectors like electricals & electronics, aerospace & defence, white goods, medical devices and toy making have also contributed towards helping the tooling industry grow. However, tool rooms in India need to focus on bettering their accuracy, reducing their lead times and creating a clean and safe environment.

TAGMA's initiative, ITS 2023, aims to bring together toolmakers and OEMs from various manufacturing sectors. This conference will be the perfect platform for OEMs to share their expectations from toolmakers and for toolmakers to showcase their capacity and capabilities.

Q What are the current trends and demands that you have observed in the die and mould industry in India?

As I have already mentioned, aerospace, medical devices and toy-making sectors are going to witness tremendous growth. This will definitely augur a golden era for the die and mould industry in India notwithstanding its challenges.

Q How do you envision the future of the tooling industry?

I would say that we are on the runway of success, where the sky is the limit. Countries across the globe are looking for an alternative to China to source world-class moulds and components. We need to grab this opportunity and showcase our strengths.

Q Can you share your previous experiences at various editions of ITS?

We have attended all the ITS editions from 2016 onwards. It has been a fantastic experience worth the time and money spent on it. Every edition of ITS offers insight into the cogs of the Indian tooling industry and its latest developments and new trends. ◆

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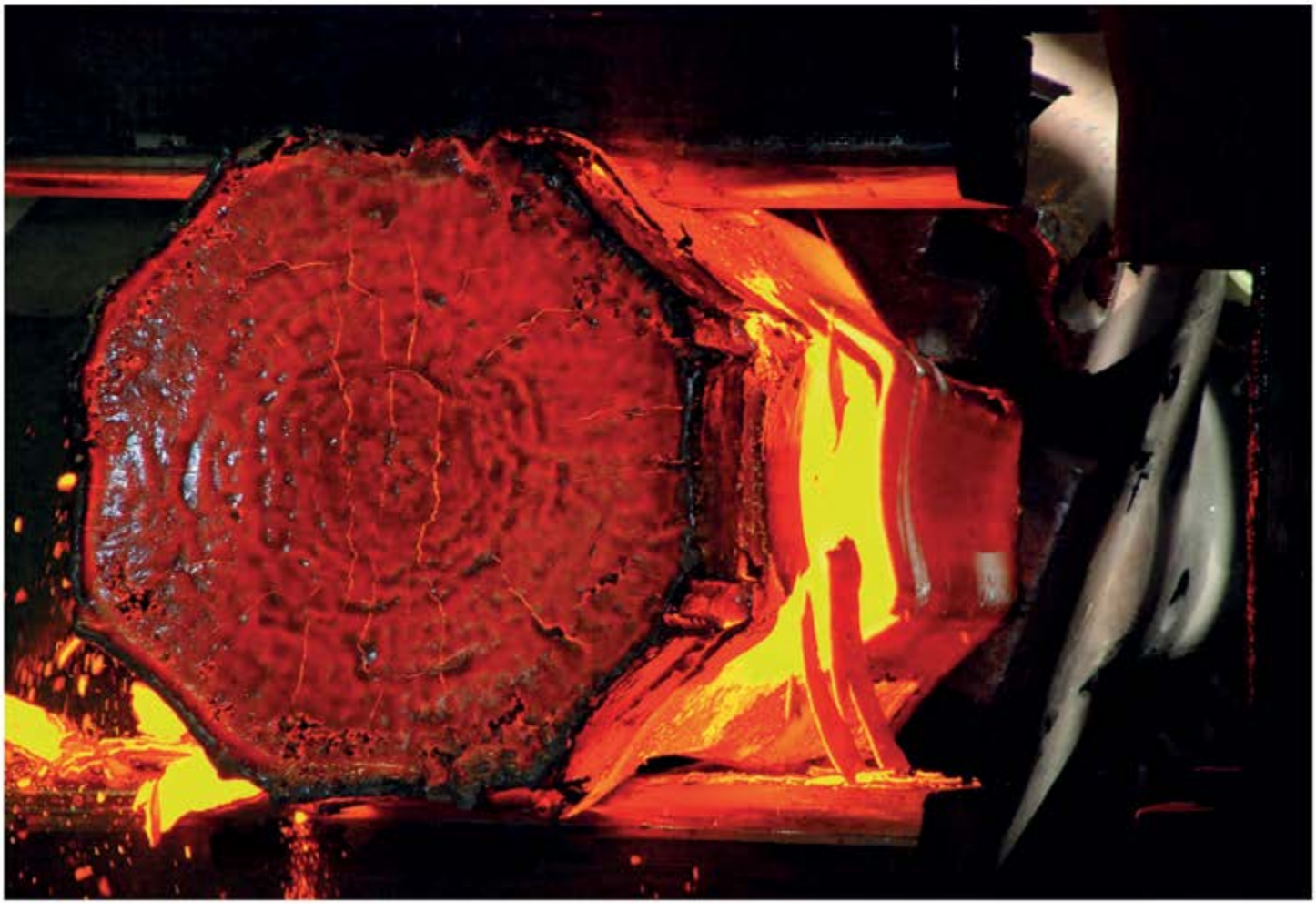

'Manufacturing sentiments remain positive in first quarter'

Domestic demand outlook remains optimistic; future investment outlook improves.

Global headwinds notwithstanding, FICCI's latest quarterly survey on manufacturing reveals that sentiments remain positive for Indian manufacturing during the first quarter of 2023-24. The survey observed that after experiencing revival of the Indian economy in FY 2021-22, the momentum of growth has continued for the subsequent quarters as well. In the Q4 January-March FY 2022-23, 55% of the respondents reported higher production levels. Further, over 57% of the respondents expect a higher level of production in Q1 April-June 2023-24 with an average increase in production in single digits. This assessment is also reflective in order books as 58% of the respondents in Q-1 April-June 2023-24 have had higher number of orders and demand conditions especially domestic, continue to be optimistic in Q-2 July-September 2023-24 as well, noted the FICCI survey.

FICCI's latest quarterly survey assessed the sentiments of manufacturers for Q-1 April-June (2023-24) for nine major sectors namely automotive & auto components, capital goods & construction equipment, cement, chemicals fertilizers and pharmaceuticals, electronics & white goods, machine tools, metal & metal products, textiles, apparels & technical textiles, toys & handicrafts and miscellaneous. Responses have been drawn from over 400 manufacturing units from both large and SME segments with a combined annual turnover of over INR 7.70 lakh crores.

Image used for representation only. Courtesy Envato Elements.

Capacity Addition & Utilisation

- The existing average capacity utilisation in manufacturing is around 75%, which reflects sustained economic activity in the sector and is the same as in the previous quarter. The future investment outlook has also improved as compared to the previous quarter, as over 56% of respondents reported plans for investments and expansions in the coming six months. This is an improvement over the previous survey, where 47% reported plans for investments in next six months.
- Global economic slowdown caused by the recessionary climate in the America, EU and other developed nations and Russia-Ukraine war continue to add to volatilities in supply chain and demand.
- High raw material prices, increased cost of finance, cumbersome regulations and clearances, high logistics cost due to high fuel prices, low global demand, high volume of cheap imports into India, shortage of skilled labour, highly volatile prices of certain metals, etc. and other supply chain

Figure: % of Respondents Expecting Higher Production in the Quarter vis-à-vis Respective Last Year's Quarter

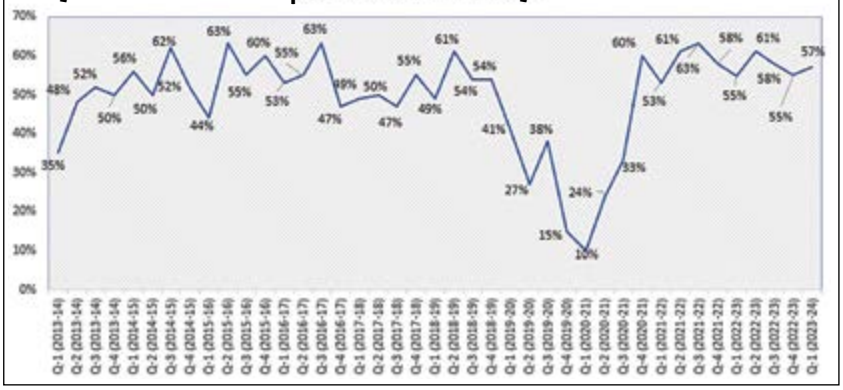

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Table 1: Current Average Capacity Utilisation Levels as Reported in Survey (%)

Sector	Average Capacity Utilisation
Automotive & Automotive Components	**80%**
Capital Goods & Construction Equipment	**71%**
Cement	**85%**
Chemicals, Fertilizers & Pharmaceuticals	**65%**
Electronics & White Goods	**77%**
Machine Tools	**72%**
Metals & Metal Products	**80%**
Textiles, Apparels & Technical Textiles	**75%**
Toys & Handicrafts	**60%**
Miscellaneous	**75%**

disruptions are some of the major constraints, which are affecting expansion plans of the respondents.

The table 1 gives average capacity utilisation for various sub-sectors of manufacturing.

Inventories

85% of the respondents had either more or same level of inventory in Q-4 January-March FY 2022-23, which is almost equivalent to that of the previous quarter. In Q-1 April-June FY 2023-24, about 87% of the respondents are expecting higher or same level of inventory.

Exports

The outlook for exports seems to be waning, as about 30% of the respondents reported higher exports in Q-4 January-March FY 2022-23, as compared to 28% of the respondents expecting their exports to be higher in Q1 April-June FY 2023-24.

Hiring

The hiring outlook looks positive, as over 38% of the respondents are looking at hiring additional workforce in the next three months.

Interest Rate

The average interest rate paid by the manufacturers has more or less remained the same at a little over 9% p.a. during the last quarter and the highest rate at which the loan has been raised is 16% p.a.

Sectoral Growth

Based on expectations, the electronics & white goods sector is likely to enjoy strong growth. Sectors like auto & auto components and capital goods & construction machinery are expected to have strong growth forecasts. Cement and machine tools sectors are also to experience moderately strong growth. All the other sectors are expected to register moderate to moderately low growth in Q-1 April-June FY 2023-24, as given in the table 2.

Production Cost

- There seems to be an upward trend in the cost pressures on manufacturers in Q-1 April-June FY 2023-24. The cost of production, as a percentage of sales for manufacturers in the survey, has risen for 77% respondents, which is higher than 73% as reported in the survey for previous quarter.
- High raw material prices, especially that of steel, increased transportation, logistics and freight cost, and rise in the prices of crude oil and fuel, have been the main contributors to increasing cost of production. Other factors responsible for escalating production costs include enhanced labour costs, high cost of carrying inventory, and fluctuation in the foreign exchange rate. ◆

Article, tables and graph courtesy FICCI

Table 2: Growth expectations for Q-1 FY 2023-24

Sector	Growth Expectation
Automotive & Automotive Components	**Strong**
Capital Goods & Construction Equipment	**Strong**
Cement	**Moderately Strong**
Chemicals, Fertilizers & Pharmaceuticals	**Moderate**
Electronics & White Goods	**Very Strong**
Machine Tools	**Moderately Strong**
Metals & Metal Products	**Moderately Low**
Miscellaneous	**Moderately Low**
Textiles, Apparels & Technical Textiles	**Moderately Low**
Toys & Handicrafts	**Moderate**

Note: **Very Strong >20%; Strong 10-20%; Moderate 5-10%; Low < 5%**
Source: **FICCI Survey**

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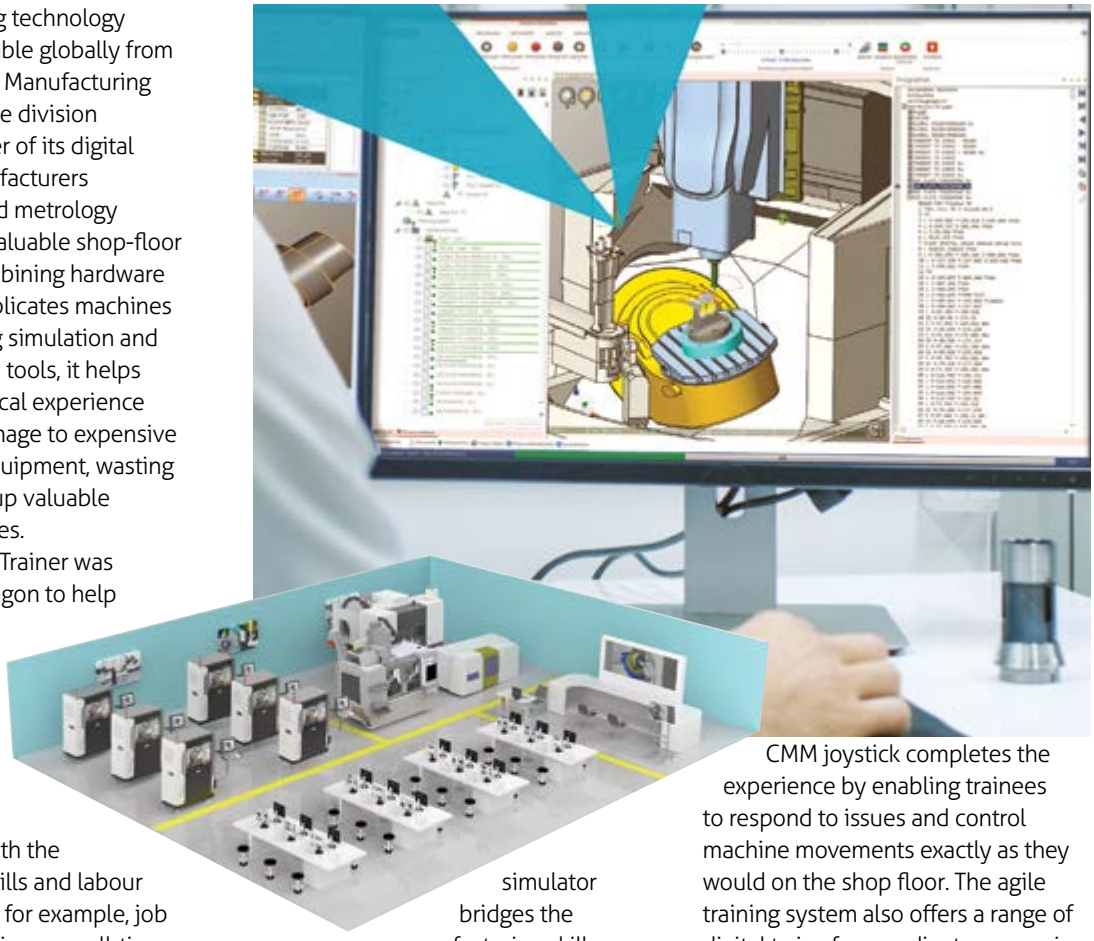
Hexagon machine training system leverages digital twins to help manufacturers bridge shop-floor skills gap

New training technology now available globally from Hexagon's Manufacturing Intelligence division leverages the power of its digital twins to help manufacturers train machinists and metrology specialists to use valuable shop-floor equipment. By combining hardware that realistically replicates machines with manufacturing simulation and operator's software tools, it helps trainees gain practical experience without risking damage to expensive business-critical equipment, wasting materials, or tying up valuable production resources.

HxGN Machine Trainer was developed by Hexagon to help companies and educational institutions attract and train the next generation of machine workers – something that is vitally important with the industry facing a skills and labour shortage. In the US, for example, job openings are hovering near all-time highs at 800,000 with 55% of roles unfilled[1], while almost three in 10 manufacturing firms in Europe reported production constraints in the second quarter of 2022 due to a lack of workers[2]. The skills shortage is compounded by the fact that training people to use CNC machines, and similar tools, is expensive, slow and potentially dangerous. By training machine operators using an accurate and interactive physical simulator, manufacturers can onboard and upskill their staff faster and more cost effectively than ever before.



Hexagon's new hardware simulator bridges the manufacturing skills gap by making it easier to prepare inexperienced staff for the demands of the factory. It is versatile because a digital twin can be created for the specific machine brand, type and configuration they will use. Once trained, workers can easily move from HxGN Machine Trainer to real machines, because the simulator is designed to be as realistic as possible – with hardware that replicates the look and feel of a real machine and a 43-inch screen that displays accurate simulations of a large variety of machine and cutting tools. A light tower, physical CNC hand wheel and CMM joystick completes the experience by enabling trainees to respond to issues and control machine movements exactly as they would on the shop floor. The agile training system also offers a range of digital twins for coordinate measuring machines (CMMs) to provide practical experience.

Each trainer unit can be equipped with up to three CNC controllers — including those by Fanuc, Heidenhain, and Siemens — on a single training console. The machine trainer utilises the latest version of Hexagon's NCSIMUL CNC simulation software to simulate 3-axis, 5-axis, and mill-turn machine tools; and I++ Simulator software to simulate complete metrology processes.

"Crashing a machine tool because of incorrect setup is a nightmare for both the new machinist and

management concerned that a piece of machinery worth millions could be permanently damaged," said Alexander Freund, Director of Product Management at Hexagon, "Crashing a virtual machine tool or CMM is safer for staff and equipment and provides a realistic experience to trainees while ensuring that valuable resources remain up and running."

Staff training to be machine-tool operators, machinists and, ultimately, CNC programmers, can use any of the three controllers to learn how to use its associated conversational programming language. Accompanying student exercises include instruction sheets that mimic typical manufacturing workflows and job specifications. These instructions list virtual cutting tools to be assigned to jobs and the CNC program to be loaded to the trainer unit. In addition to troubleshooting and learning how to switch between manual and automatic run modes as needed, students learn how to set machine-tool origins and tool parameters, and to determine cutting tool compensation.

HxGN Machine Trainer is available globally now, supporting 3-5 axis CNC machine tools, mill-turn machining and CMM training, with support for up to 3 CNC controllers on a single unit. It comes with a library of machine digital twins for Hermle, DMG and Fanuc machines. CMMs support includes the Hexagon TIGO SF, with support for other CMMs through the I++ Simulator, paired with either QUINDOS or PC DMIS metrology software. ◆

© Hexagon AB 2023. Photographs of the equipment, including a version with callouts to features, is from the available Hexagon Manufacturing Intelligence division PR team by return.

Sources:
1. Deloitte 2023 Manufacturing Outlook
2. World Economic Forum, Future of Jobs Report, 2023.

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Website: www.anilplastics.com
Activities: Injection moulded parts,mould design & development along with customozed/talor made injection moulded plastic products. Serving to Automotive, Wire Harness, Textile, Electrical, medical and aerospace industries. Our key products include specially designed plastic products,engineering products, Auto clips, Fasteners, Enclosures, Pedal arms, Levers, Pulleys, Brackets, Covers, Cable Ties, Electrical Connectors, Grommets, Bushes, Handles, Casings etc.

EDS TECHNOLOGIES PVT LTD

The Estate, Second Floor, 121, Dickenson Road, Bangalore - 560 042, Karnataka
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Website: www.edstechnologies.com
Activities: EDS Technologies Pvt. Ltd. (EDST) is one of the largest technology solutions providers in India. With over 28 years of experience in various industries, we enable companies in the Automotive, Aerospace & Supply chains, Industrial machinery, High-tech and Electronics, Railways, Infrastructure, Defence and Research verticals to achieve their business goals. EDST provides products & solutions that empower our customers, enrich their value chain and transform their business processes to create new products and services. EDS Technologies established in 1995 is headquartered in Bengaluru. EDST has the largest customer base in the Indian market in PLM and Visual Simulation business and have successfully partnered with more than 2000 customers in various industry verticals.

NULO INNOVATIONS (OPC) PRIVATE LIMITED

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Mobile: +91 9891920530, **Helpline:** +91 8595886851
Email id: nulo@nuloinnovations.com
Website: www.nuloinnovations.com
Activities: Die Design & Simulation, Prototype Parts, Press Dies for Skin Panels / High Strength & Ultra High Strength Steel Parts (1180MPa & above) / Hot Forming Parts / Aluminium Parts / Battery Components, Assembly Tooling - Welding Lines, Plastic Molds, Gauges & Fixtures, Batch Production and Technical Services (HLTO Support and Tool Room Upgradation / Technical Support).

De-coupling from Chinese manufacturing dominance through education in advanced manufacturing

Right from the Iron Age, humanity has been evolving through manufacturing, which has propelled societies forward, drove innovation, and technical advancements, and led to prosperity and wealth generation. However, the global manufacturing sector battles an acute shortage of skilled workforce, hindering its ability to work with the demands.

Challenges India faces

India, despite its 1.4 billion population, finds it nearly impossible to find a steady, trained, and reliable workforce for the manufacturing industry, as an increasing number of individuals are migrating to Tier-1 cities and aspiring to work in the perceived lucrative sectors such as finance, back-office functions, and IT.

India is now the world's 5th largest economy with its GDP standing at $3.75 trillion and is a force to reckon with, as far as technology-related expertise is concerned, for which the seeds were sown more than 20 years back. When it comes to modern-day manufacturing, India has left far behind the prowess of Japan, Germany, and low-cost countries such as China and Vietnam. The main reason is the absence of a trained workforce for advanced manufacturing and the lack of infrastructure that supports it. The government has ambitious plans of 'Make in India' and an 'Aatmanirbhar Bharat', however, the road will be bumpy, unless systemic changes are made at a rapid pace.

Role of Phillips Education

Phillips Education has emerged as a catalytic force, empowering learners with the knowledge and skills they need to skyrocket India's manufacturing sector. This is vital, as India plans to export goods worth a whopping $1 trillion by 2030, with manufacturing accounting for a quarter of the economy's output by 2025.

Phillips Education is an ambitious initiative of Phillips Corporation, a 60-year-old advanced manufacturing solutions provider having presence in the US, India, Bangladesh, Middle East & Africa, Malaysia, and Sri Lanka. Through its India office, Phillips Education is on a mission to partner with thought leaders and decision-makers of India, to provide accessible and transformative resources, machinery, training & certifications, and global opportunities to unlock the full potential of advanced manufacturing.

Centers of Excellence (CoE) program

Realising the huge need for skill development within advanced manufacturing, Phillips Education launched its Centers of Excellence (CoE) program to provide a comprehensive solution to its partners. Phillips Advanced Manufacturing CoE usually partners with state governments in India, leading universities, or government agencies working on behalf of the state to set up a CoE, which solves their purpose. Their purpose could range from skilling the youth of that region to make them employable, to pushing research & development and improving the curriculum to synchronise it with the industry.

This is done through hands-on training sessions, workshops, and access to state-of-the-art equipment to empower the local industry with advanced manufacturing technologies, processes, and best practices. The subjects cover prevalent Industry 4.0 technologies such as robotics, additive manufacturing, digital manufacturing, and more – each of which is indispensable for India if it chooses to not remain dependent on China for products and parts and gain the geopolitical edge in the region.

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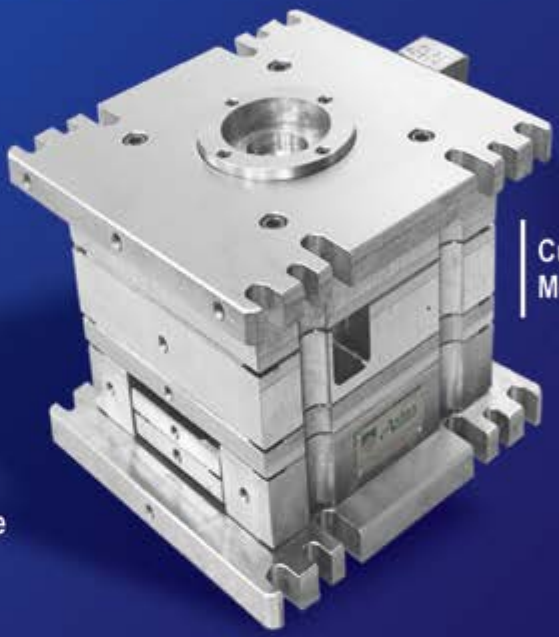

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India has the unique opportunity to dominate the world economy by being the leader in the services economy through its IT workforce and in the products economy through its advanced manufacturing workforce, provided they take all the right steps such as setting up CoEs at breakneck speed.

Coming up this August: A CoE in Haridwar

In just one year, Phillips Education has already set up a CoE in Bhubaneshwar, Odisha. Another CoE in Haridwar, Uttarakhand, is set to be inaugurated on August 15, 2023, on India's 76th Independence Day, representing a milestone in the nation's journey towards self-reliance.

By collaborating with partner organisations and establishing CoEs in strategic locations across India, Phillips Education directly addresses the skill gap and equips individuals with the expertise demanded by the Indian manufacturing sector. CoEs enhance the nation's competitiveness in the global manufacturing landscape by directly addressing the need for skilled labour, empowering the country to position itself as a formidable player in international trade.

Globally speaking

Phillips Education is active beyond India and has partnered with Malaysian government agencies to develop a CoE in an effort to drive Industry 4.0 in the country. Phillips is also collaborating with Factory One – a model factory by Qatar Development Bank – to develop Qatar's first advanced manufacturing CoE led by McKinsey.

As more countries and states within India join the CoE revolution initiated by Phillips Education, a network will be created, wherein student exchange programs will help exchange ideas and facilitate technology transfer to improve the overall competitiveness of the entire region.

In the modern era, the manufacturing industry has benefited immensely from Industry 4.0 and machines that didn't exist a decade ago. However, pandemics, wars, and supply-chain shocks regularly create huge problems for this industry, as seen during the COVID-19 outbreak and the Russia-Ukraine wars. Manufacturing at your shore has become the need of the hour, and hence, countries such as Saudi Arabia, Qatar, UAE, Malaysia, and India are trying to de-couple from China for its product and parts needs.

Phillips carefully designs and develops each CoE with the needs of the local industry in mind, managing everything from creating the curriculum to training CoE instructors extensively through its rigorous 'Train the Trainer' program. Having long-standing strategic partnerships with world-renowned manufacturing technology providers such as Haas, EOS, Markforged, and Universal Robots, the Phillips team even provides state-of-the-art, industry-grade equipment so that learners are trained in leading technologies. Individuals can also receive industry-recognised certification upon successfully completing a program, which immediately boosts their employability.

Democratising manufacturing resources

The education division goes one step further with the 'Phillips Machinist' app, which is a one-of-a-kind mobile application tailored especially to the manufacturing industry. It allows professionals of the sector to upskill via a host of online modules, engage with Phillips' global machinist community, access resources to help understand machines better, and even submit inquiries to get help from Phillips' experts. There is also a 'Job Connect' platform through which businesses in the sector can post job vacancies at no cost, and professionals can apply to them.

In a nation, like India, where there are estimated to be over 600 million smartphone users, the 'Phillips Machinist' app, provides a unique opportunity for industry specialists to upskill and access valuable resources at their fingertips, no matter where they are. More innovative features are constantly added to the platform, but it is already one that both, Indian businesses, and professionals can leverage. It enables machinists to constantly gain the knowledge the sector so desperately needs, as well as providing manufacturers access to a pool of industry-ready talent.

The road ahead

It isn't news that the Indian manufacturing sector is at a critical juncture, grappling with numerous challenges that demand immediate attention. The shortage of skilled labour, shifting market dynamics, and the urgent need to embrace advanced technologies are key concerns that must be addressed to ensure the sector's growth and success. Education is the anchor in overcoming these obstacles and realising the mission of a self-reliant India.

By focusing on vital areas like robotics, additive manufacturing, and other digital manufacturing technologies through various offerings that can even be tailored to the needs of specific regions, Phillips Education aims to serve the nation by paving the way for a brighter future – one where Indian manufacturing shines on the global stage driving economic growth, unparalleled innovation, and is an indisputable manufacturing powerhouse.

To conclude, Rakshit Kejriwal, President of Phillips Education would like to quote Alan Mulally, the former President and CEO of Ford Motor Co., who had said: "No country is ever successful in the long term, without a really strong and vibrant manufacturing base." ◆

Article and image courtesy: Phillips Education (Phillips Machine Tools India Pvt. Ltd.)

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FOR DETAILS:

International Tooling Summit 2023: Uniting global experts to shape the future of the tooling industry

The highly anticipated International Tooling Summit (ITS) is set to take place on August 24-25, 2023, at the Sheraton Grand Bangalore Hotel at Brigade Gateway in Bengaluru. With an impressive lineup of more than 350 delegates, 35+ distinguished speakers, 4 engaging panel discussions, and 15 enlightening technical sessions, this year's ITS is poised to be a landmark event for the tooling industry.

As a premier platform for knowledge sharing, networking, and exploring the latest trends, the International Tooling Summit brings together esteemed leaders from various sectors, including tooling, automotive, aerospace, machine tools, consumer electronics, and home appliances. This convergence of industry pioneers offers a unique opportunity for attendees to gain insights, foster collaborations, and gain a competitive edge in today's rapidly evolving marketplace.

"We are thrilled to host the International Tooling Summit, which serves as a global nexus for industry professionals and thought leaders," said Mr. D.M. Sheregar, President, TAGMA India. "This summit is a testament to our commitment to advancing the tooling industry, fostering innovation, and driving sustainable growth. We look forward to the fruitful discussions, knowledge exchange, and networking opportunities that this event will provide."

The International Tooling Summit is set to feature an impressive array of speakers from renowned organisations, including International Aerospace Component Manufacturing

Pvt. Ltd. (IAMPL), Toyota Kirloskar Motors, Fanuc India, Toyoda Gosei, Bajaj Auto, Schneider Electric, Manjushree Technopack, NTTF, Aequs, Ather Energy, TATA Electronics and many more toolmakers and technology providers. These industry experts will share their valuable insights, success stories, and future outlooks during the enlightening technical sessions and engaging panel discussions.

"International Tooling Summit, an event that showcases the power of collaboration and innovation in the tooling industry has come a long way and become the best platform for the tooling fraternity to learn from the experts and meet potential customers," stated Mr. D. Shanmugasundram, Vice President, TAGMA India. "The summit offers a remarkable opportunity to exchange ideas, build new partnerships, and shape the future of our industry. We encourage all participants to make the most of this platform and forge connections that will propel us towards a more prosperous tomorrow."

The International Tooling Summit promises to be a transformative

event, enabling attendees to stay ahead of the curve, discover cutting-edge technologies, and learn from industry visionaries. Don't miss your chance to be part of this groundbreaking event that will shape the future of the tooling industry. ◆

Contribution of the domestic plastic sector in making India a developed nation will be invaluable: Piyush Goyal

The 2nd Technology Conference for Growth of Plastic Industry was organised on July 7, 2023, at The Hotel Lalit, Mumbai. More than 450+ attendees, including senior government officials, visionaries of the industry, researchers and entrepreneurs, were present at this conference. The conference was addressed virtually through video conferencing by Hon'ble Minister of Commerce and Industry Shri. Piyush Goyal, as its chief guest. The conference was a great success with his presence, his vision and his motivation on the theme of 'Plastic Import Substitution'.

Shri Goyal said that the domestic plastic sector in the country has fared well in recent years, and has tremendous potential to grow even further. Its contribution to making India a developed nation will be unparalleled and invaluable. He added that the exports of the country were stalled at around $500 million till 2020. However, the scenario has changed in the last two years, as the country has managed to touch the $776-million mark in the exports' sector. The plastic industry's contribution was $12 billion and it has the potential to grow. The sector has the potential to add business opportunities, jobs for the young generation, opportunities in the world, and it can help the government grow the entire ecosystem of the plastic sector over the next few years.

He stated that the government is always ready to listen to their suggestions for the orderly growth of this industry in the near future. He informed that two FTAs were finalised with Australia and the UAE last year and currently, the government is actively negotiating with many other countries. The government is looking to engage with the developed world more significantly. He appealed to the plastic industry to significantly use these FTAs and expand their basket, access newer markets, and promote greater exports. He pointed out the potential for huge imports in this sector by both the UAE and Australia.

While underlining the importance of quality, he said that government is striving for quality and high standards and will not accept substandard production in this sector. Therefore, the government is awaiting suggestions from the industry to make it more reliable and at par with global standards and will implement them immediately. He also mentioned that quality does not require high cost. It can be attained at a low cost; it is good for the industry, which helps it to expand the scale of operations, reduce waste and it also helps reduce the cost of production. The industry should have the mindset to give the best to its consumers.

He assured that the government is very sensitive to the potential of the industry as well as to its problems. He also appealed to identify ways to contribute towards ensuring its sustainability and sustainable growth

together and also towards how they can contribute to a circular economy and support the recycling of plastic waste, reuse of plastic raw materials, and make the disposal of plastic waste more effective and efficient.

He proudly mentioned that India is far ahead on the recycling front. The country has a recycling average of 13%, which is far ahead of the global average of 9%; some developed economies, have a recycling average of a mere 4%.

He advised the industry to mould them with emerging times, emerging world and according to the needs of the world with newer ideas and newer technologies and collaboration of the stakeholders.

As per the mandate of the Hon'ble Prime Minister, to reduce import dependence and become 'aatmanirbhar', The All India Plastics Manufacturers' Association (AIPMA) has conducted a detailed study on the import of plastic goods in the country. As per the study, plastic goods worth INR 37,500 crores were imported in 2021-22. After a detailed analysis, AIPMA selected 553 plastic products for import substitution. It is estimated that import substitution of plastic goods worth INR 37,500 crores would create an additional requirement of around 4 million tons of raw materials per annum and 16,000+ plastics processing machines including tools, moulds, jigs and fixtures. It would also create 5 lakh additional jobs in the country.

This conference is supported by the Ministry of Micro Small and Medium Enterprises, Government of India; Department of Chemicals and Petrochemicals, Government of India; and Department of Commerce, Ministry of Commerce & Industry, Government of India. The main objective of these conferences is to help the industry in import substitution, thereby helping them to manufacture 'Make in India – Make for the World' plastic products.

AIPMA President Mr. Mayur D. Shah emphasised that the plastic industry will play a vital role in India's ambition to become a $5-trillion economy. Chairman of AIPMA's Governing Council Arvind Mehta acknowledged the government's initiatives such as 'Digital India', 'Make in India', and 'Skill India', as catalysts for boosting India's plastic industry. He highlighted the conference's focus on technology and business opportunities for local plastic goods manufacturers resulting from import substitution. The conference showcased exhibits and samples of imported plastic products, offering a technical and business roadmap to the plastic processing industry for manufacturing these products in India.

During the conference, sessions were divided into various interesting topics. The 1st session, 'Innovations in raw material & supply chain requirement for import substitution', was discussed by the session chairperson Mr. Makarand Dixit, Head-Marketing Petrochemicals, Nayara Energy Ltd. The 2nd session was conducted on 'Requirement of innovative plastic processing technologies for import substitution by session chairperson Mr. Raju Desai, Director, Jyoti Plastic Works. A session was addressed by Mr. Akshay Kalyanpur, Director, Sridevi Tool Engineers Pvt. Ltd. on 'Requirement of tooling, dies & jigs fixtures for import substitution'. Mr. Sunil Shah, AIPMA's Vice President, West, concluded the conference with the Vote of Thanks to all dignitaries, speakers and attendees.

The upcoming conferences on import substitution will take place in Chennai on August 18, 2023, and in Kolkata on August 31, 2023. ◆

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INDIAN TOOLING INDUSTRY: POISED FOR GROWTH

Day 1: 24th August 2023

Timing (Hrs)		Programme (Tentative)
09:00 Hrs	09:45 Hrs	Registration & Hi Tea
09:45 Hrs	10:00 Hrs	Inauguration Ceremony
10:00 Hrs	10:10 Hrs	"Welcome Address Mr Devaraya M Sheregar, President, TAGMA India"
10:10 Hrs	10:25 Hrs	"Chief Guest Address Mr. Sudeep Dalvi - Sr Vice President & Director - Technical & Purchase and Chief Communication Officer, Toyota Kirloskar Motor"
10:25 Hrs	10:35 Hrs	"Guest of Honor Address Mr. Seenivasan Balasubramanian, Chief Executive Officer, International Aerospace Manufacturing Pvt. Ltd. (IAMPL)"
10:35 Hrs	10:45 Hrs	"Guest of Honor Address - Mr. Yuki Kita - President & CEO, FANUC India Pvt. Ltd, Bangalore"
10:45 Hrs	10:55 Hrs	"Guest of Honor Address Mr. G.Manikantan, Managing Director, Multiple Special Steel Pvt Ltd."
10:55 Hrs	11:00 Hrs	"Vote of Thanks Mr. D Shanmugasundaram, Vice President, TAGMA India "
		Hi-Tea Break
11:15 Hrs	11:25 Hrs	Keynote Address by BP Shiv, Vice President & Head - Sales & Marketing, Tractors and Farm Equipment Ltd (Engineering Plastics & Tooling Division)
11:25 Hrs	12:10 Hrs	Panel Discussion on 'Indian tooling industry: Diversifying for Greater Heights'
		Moderator: Mr. Ashim Sharma, Senior Partner & Group Head - Business Performance Improvement Consulting, Nomura Research Institute
		Mr. James Walsh - VP - Tooling, TATA Electronics
		Mr. N Prabakaran, Managing Director, DieTech India
		Mr. Vijay Kumar Baheti, Director - Technical, Manjushree Technopack
		Mr. Nithish Parambath, Director- Industrialization, Schneider Electric
12:10 Hrs	12:40 Hrs	"Overview of Indian Tooling Industry by Aashutosh Sinha - Principal | Business Performance Improvement Nomura Research Institute (NRI) Consulting & Solutions"
12:40 Hrs	13:10 Hrs	""Technical Session on ""Forging the Future : Evolution of Tool Steels and it's Impact on Tooling"" by Mr. Paolo Frassi | Tool Steel Development Manager | Lucchini"
		Lunch Break
14:15 Hrs	14:40 Hrs	""Technical Session on ""Inspirations for the value chain of your sheet metal production"" by Mr. Steffen Domay | Business Development Manager | FIBRO GmbH"
14:40 Hrs	15:05 Hrs	""Technical Session on ""Global Die & Mould industry Trends"" by Hidehiko Yamamoto | Specialist/ DM Business Development - Project Sales Department | Makino Milling Machine Co., Ltd "
15:05 Hrs	15:30 Hrs	""Technical Session on ""Rethinking Digital Solutions for the Indian Tooling Sector"" by Sachin Sanghi, Principal Architect - Manufacturing, Google "
15:30 Hrs	15:55 Hrs	Case Study Presentation by YCM
		Hi-Tea Break
16:15 Hrs	17:00 Hrs	Panel Discussion on 'Designing and building moulds for the aerospace industry'
		Moderator: Mr. Vineet Seth, MD - India, S Asia, Middle East, Mastercam

Timing (Hrs)		Programme (Tentative)
		Dr Ravi Guttal, Sr Vp & CTO, Aequs
		Mr. Rakesh S B, Vice-President - Aerospace, Sansera Engineering Limited
		Mr Maneck Behramkamdin - Business Head, Godrej Aerospace
17:00 Hrs	17: 25 Hrs	"Technical Session on 'Ideal toolroom for EMS industry' by Kannan R From TATA Electronics "
17:30 Hrs	17:40 Hrs	Closing Remarks by Mr. T S Gopalakrishnan, EC Member, TAGMA India
		Break
		Entertainment Program - Cocktails - Networking Dinner

Day 2: 25th August 2023

Timing (Hrs)		Programme (Tentative)
09:30 Hrs	10:00 Hrs	Registration & Hi Tea
10:00 Hrs	10:05Hrs	Opening Remarks by Mr. D Ravi, EC Member, TAGMA India
10:05 Hrs	10:25Hrs	"Technical Session on 'High Hard Aluminium for Injection Moulds - The French Connection' by Mr. G.Manikantan Managing Director of Multiple Special Steel Pvt Ltd. "
10:25 Hrs	10:45 Hrs	"Technical session on 'Advancements in Mould Manufacturing Technologies' by Dr. Vishwas R Puttige, Business Head, amace Solutions Private Limited."
10:45 Hrs	11:30 Hrs	Panel Discussion on 'Let Us Get Ready & Play for the World'
		Moderator: Mr. Rajesh Nath, MD, VDMA
		Mr. Bapugauda Patil, GM, Division Head - Purchase Division, Toyota Kirloskar Motor Pvt Ltd
		Mr. B V Sudarshan, Dy MD, NTTF
		Mr. Santosh Kulkarni, Vice President Materials – Polymer & Elastomer, Bajaj Auto Ltd
		Mr. Shin Jung Hyun, Managing Director, SEO YEONG DIETECH PVT LTD
		Hi-Tea Break
11:45 Hrs	12:15 Hrs	"Technical Session on ""New Machining Strategies for Die Mould industry (barrel machining, Trochoidal Milling)"" by Sashi Menon, Cutting Tool Expert "
12:15 Hrs	12:40 Hrs	Technical Session by Mr. Santhosh Raj, Head - Technical Centre, ALPLA Group
12:40 Hrs	13:05 Hrs	"Technical Session on 'How to prepare for the aerospace industry?' by Mr. M Mohanavel, Aerospace Machining Consultant "
		Lunch
14:15 Hrs	15:00 Hrs	Panel Discussion on 'Die & Mould Sourcing Challenges in EV'
		Moderator: Mr. Akshay Kalyanpur, Director, Sridevi Tool Engineers Pvt Ltd
		Mr. Ramesh K S from Ather Energy
		Mr. Thej Kumar, Vice President - Operations, Product Development and Quality, Toyoda Gosei South India Pvt. Ltd.
		Mr. Vinod Kubher, Partner, Prabha Industries
15:00 Hrs	15:30 Hrs	Technical Session by Mr. Raghunanda Gupta B V - Vice President - Sales (Region Head – Karnataka & Kerala), Siemens Financial Services Pvt. Ltd.
15:30 Hrs	16:00 Hrs	"Technical Session on ""Conformal cooling insert by Binder Jet 3D Printing (BJT)"" by Ambresh Nagaraj, Team Leader, Indo-MIM"
16:00 Hrs	16:25 Hrs	Technical Session
16:25Hrs.	16:30 Hrs.	Closing Remarks by Mr. D Shanmugasundaram, Vice President, TAGMA India

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National

ITS 2023

International Tooling Summit - the FLAGSHIP event of the Tool and Gauge Manufacturers Association of India (TAGMA India), is a platform that brings together the tool-making fraternity and the user industry under one roof. The two-day event provides a unique platform for industry professionals to network with potential customers, learn from subject experts and update their technological know-how.

Date: August 24-25, 2023
Venue: Hotel Sheraton Grand (Brigade Gateway)
Organiser: TAGMA India
Contact: 96534 27396
tagma.mumbai@tagmaindia.org

GDCTech Forum

The three-day event will feature exhibitors from OEMs, suppliers, and service providers, occupying over 3000 sq.mtr of exhibition space to showcase the latest advancements in die casting and forging technology.

Date: December 1-3, 2023
Venue: Chennai Trade Centre, Chennai
Organiser: GDCtech
Contact: gdctech@arkeycell.com / 09764711315

Plastvision India 2023

The exhibition is a great platform for companies in the plastics industry to launch new products, grow their network, learn new technologies and exchange ideas on a global level.

Date: December 07-11, 2023
Venue: Bombay Exhibition Centre, Mumbai
Organiser: The All India Plastic Manufacturer's Association
Contact: +91 99303 55494
sanjeevani@plastivision.org

International

Taimold

Taipei International Smart Mold & Die Industry Fair 2023 is set to highlight latest developments and innovations in die mould manufacturin and related technologies.

Date: August 23-26, 2023
Venue: Taipei Nangang Exhibition Center, Taipei
Organiser: Chan Chao International Co., Ltd
Contact: +886 2-26596000 (ext.176)
show@chanchao.com.tw

EMO Hannover 2023

World's leading trade fair for production technology, EMO hannover is all set to showcase the latest and best in the machien tool industry and beyond.

Date: September 18-23, 2023
Venue: Hannover, Germany
Organiser: VDW & CECIMO
Contact: +49 69 756081-0 / vdw@vdw.de

Blechexpo

International tradefair for sheetmetal working. Blechexpo represents the world's range of products and solutions for the industrial processing of sheet metal, tubes and profiles.

Date: November, 7-10
Venue: Messe Stuttgart, Germany
Contact: knauer@schall-messen.de
Contact: +49 (0)7025 9206-668

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Date: December, 13-15
Venue: Dubai International Convention & Exhibition Centre Dubai, United Arab Emirates
Organiser: Al Fajer Information and Services
Contact: rasheed@alfajer.net / +971 50 900 6466

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Yield strength Rp 0.5	MPa	517	725	750-1000
Elongation A5	%	13	5	3
Brinell hardness	HBW 10/3000	210	294	270-320
Rockwell hardness	HRB	95	106	103-107
Modulus of elasticity	GPa	131	135	127
Density ρ	g / cm³	8.71	8.7	8.7
Coefficient of expansion α	10⁻⁶ / K	17.5	17.5	18.1
Thermal conductivity λ	W / m · K	208	156	100
Electrical conductivity	% I.A.C.S.	48	30	17

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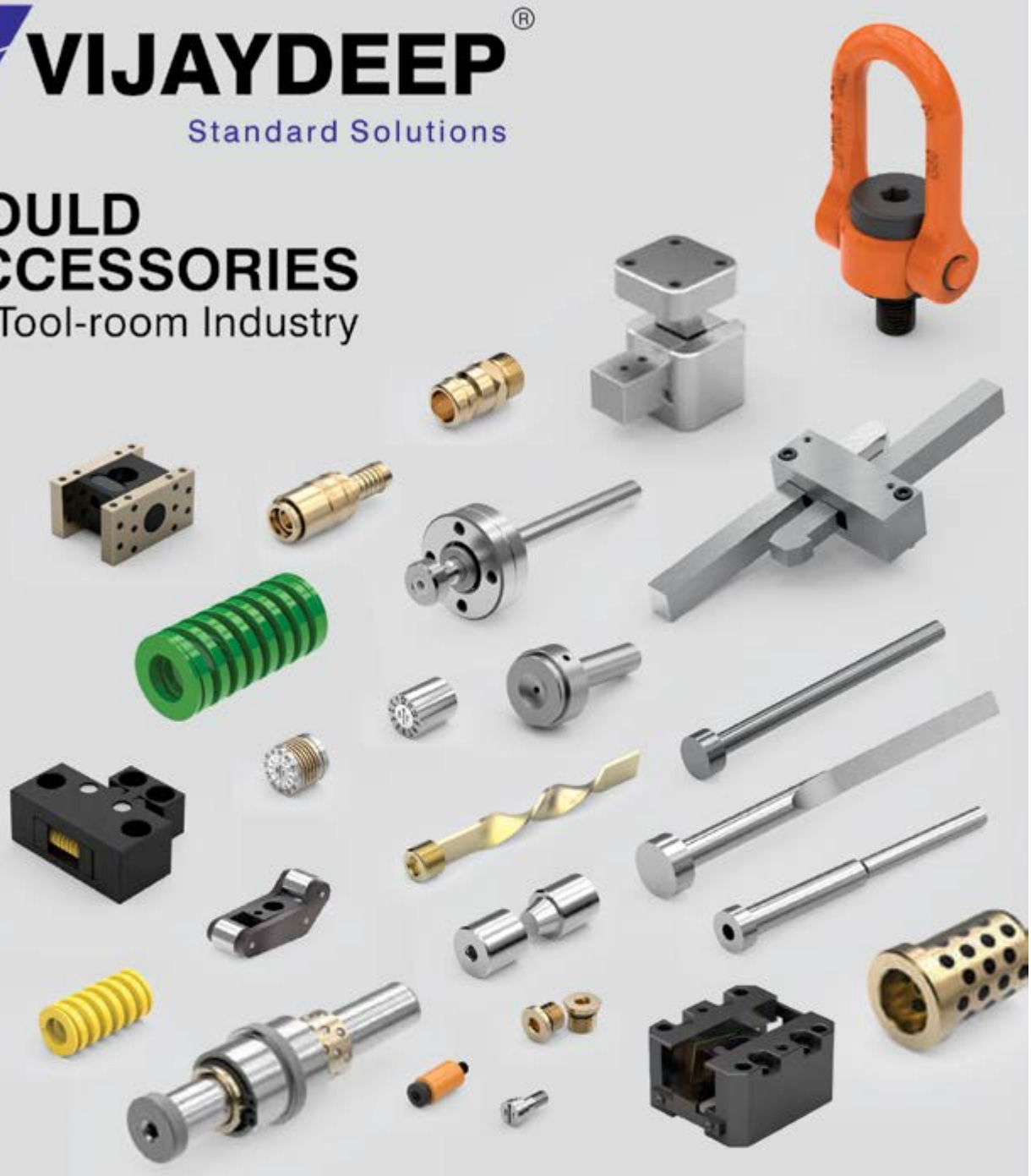

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