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AEROSPACE INDUSTRY: Onward Oct

FACILITY VISIT: Sunikh Components

TOOL TALK: Santhosh Raj, ALPLA Group

TIPS & TRICKS: CNC Machining for the Aerospace Industry



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9

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Innovative Solutions

CONTENT



22 IN FOCUS Aerospace Industry: Onward and Upward



Copper alloys: The perfect blend for injection moulding



Santhosh Raj, Head – Technical Centre (Hyderabad), ALPLA Group





FICCI SURVEY 'Manufacturing sector growth to sustain in coming months'

EDITORIAL	6
TECH UPDATE	
INDUSTRY UPDATE	
MATERIAL MATTERS	
LEADERS SPEAK	
TIPS AND TRICKS	
CASE STUDY	
INDUSTRY-ACADEMIA	
EVENT LIST	
INDEX	

2

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EDITORIAL



NISHANT KASHYAP Editor tt.edit@tagmaindia.org

> E Aerospace and Tata Advanced Systems extend \$1 billion long-term contract; Boeing accelerates MRO localisation with Indian partners; Airbus-Tata Consortium to Manufacture C-295 Transport Aircraft; HAL & Israel Aerospace Industries sign MoU and many more such encouraging developments have taken place in the Indian aerospace industry in recent times. These developments clearly suggest a turning point for Indian aerospace – in both the defence and civil aviation segments.

India is currently the 7th largest civil aviation market in the world and is expected to become the third-largest civil aviation market within the next 10 years. With the government's push, the industry has been reaching greater heights in terms of growing number of players (including overseas ones) as well as the increasing number of aircraft.

Now, how can the Indian tooling industry claim its share of the aerospace sector pie? Well, to begin with, it calls for critical and high-precision technology to meet the highly demanding geometrical tolerances required in aircraft component manufacturing. Besides, tooling companies will need to invest in skill development, process improvement, the latest manufacturing methods, greater application of automation, high level of documentation, etc., to qualify. In particular, the stakes for the tooling industry in the Indian aerospace industry are very high.

We have dedicated this issue of TAGMA Times to the aerospace industry. Our 'In Focus' section highlights the developments in the industry and how it can impact toolmakers. You could also read our 'Material Matters, 'Tips and Tricks', 'Case Study', 'Industry-Academia' sections to know more.

Happy Reading!

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DATE 19th - 25th Jan - 2023 TIME 10.00 am - 6.00 pm VENUE Bangalore International Exhibition Centre

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MAKING TECHNOLOGY AFFORDABLE

Safe handling of workpieces weighing up to 115 kg



DMG MORI has developed the new Robo2Go MAX so that even the machining of the heaviest workpieces can be automated with maximum ease. In the strongest version, the robot is designed for handling components with a workpiece weight of up to 115 kg and a diameter range of ø 40 to ø 400 mm. This makes Robo2Go MAX the ideal addition to the Robo2Go family and a suitable automation solution for large lathes and turn-mill centers – starting with the CLX 750 and CTX beta 2000, through the CTX beta 1250/2000 TC, the entire CTX gamma TC series, and up to some NLX and NTX sizes.

The modular design of the Robo2Go MAX includes the robot, housed within a flexible door and safety system, and a storage module. In the basic version, this can be loaded and unloaded quickly and easily via a roller shutter with two EU pallets – if desired, by a driverless PH-AGV. Here, too, the already proven and also here optionally available vision system independently detects the workpieces on the pallet. Furthermore, the system offers space for additional options such as an alignment station or a turning station, which means that even the most complex workpieces can be produced autonomously. A modular gripper system also offers maximum flexibility in terms of component diversity. Regardless of the Robo2Go MAX equipment, the control system and the tool magazine of the respective turning center remain freely accessible.

As with the smaller Robo2Go, no robot programming knowledge is required to set up and operate the system in the case of the Robo2Go MAX. For uniform control of all Robo2Go variants, DMG MORI has developed its own app, which is integrated into the machine operation and enables process creation based on predefined program blocks. A home function additionally facilitates the setup and ensures easy free travel of the robot. The app has a multi-job function for different jobs on one tray – ideal for small and medium batch sizes. ◆

8



NO TIME FOR COMPROMISES

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System 3R Tooling enhances machining operations with universal compatibility



With neutral and open architecture designs, System 3R Tooling provides universal compatibility that extends to all manufacturing processes, so workpieces move from one machine to the next in single setups and without having to relocate and re-reference them. This stable and exact reference functionality also allows operators to preset parts outside of the machine. This enables minimized downtime and reduced stacked tolerances typically associated with repeated part locating and referencing.

System 3R's concept lets users establish fixed references for all machines in the workshop by defining each workpiece's zero point once and for all. This system converts internal setup time to external setup time, allowing machines to keep working uninterrupted as opposed to sitting idle waiting for job setup. System 3R Tooling solutions can be used for any manufacturing process from electrode manufacturing for die-sinking EDM to wire-cutting EDM, Additive Manufacturing and conventional milling.

The System 3R solution portfolio includes the Macro line of workholding chucks and the Dynafix palletization system. The Macro line chucks are available in Standard, High Performance and Nano accuracy ratings, along with the MacroMagnum chuck variant. They feature precise reference elements made from cemented carbide or hardened ground steel that reduce setup times to a few minutes, maximize throughput and practically eliminate rejects.

Repetition accuracy for the Macro reference system ranges from 0.002 to 0.001 mm with a recommended maximum workpiece weight of 50 kg. This reference system is then combined with palletization, which provides incredible accuracy as parts move from machine to machine and process to process for fully automated workholding.

System 3R Dynafix palletization permits machining with optimal cutting data without sacrificing accuracy and quality through the use of convenient aluminum pallets with high-alloy steel reference elements and directly measurable Z-references. Dynafix is a practical, user-friendly reference system that minimizes setup times, increases machine capacity and provides the basis for automated production.

System 3R provides fast and precise pallet changing in sizes from 25 mm in diameter to 400 x 400 square mm with the same basic mounting base – manually or automatically. For extreme precision, the system ensures repeatability to within 0.002 mm. When using the system's chuck adaptors, manufacturers gain access to practically every reference system in System 3R's extensive product range. ◆



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LOOKBEYOND

New HASCO ejector pins Z4430/... - DLC, shouldered, hardened



As the leading manufacturer of high-quality modular, standardised components as well as individually planned hot runner systems, HASCO offers designers, mouldmakers and injection moulders innovative and cost-efficient solutions from a single source. Especially in the field of demoulding, the extensive HASCO ejector portfolio offers maximum flexibility through its different designs and sizes spread across all product models.

High heat resistance and hardness guarantee long life expectancy

The comprehensive ejector range has now been supplemented by the new shouldered ejector pins Z4430/... of hardened HSS with excellent heat resistance for increased process reliability. They are especially suitable for working at high mould temperatures in diecasting and injection moulding and guarantee a long service life.

Suitable for clean-room applications thanks to DLC coating

Through the DLC coating, the new ejectors allow a significant increase in service life, even with abrasive glass fibre-reinforced plastics, and are also ideal for clean-room applications because of their lubricantfree dry cycle properties. Whether flat or round, hardened, nitrided, DLC-coated, shouldered or with a conical head, HASCO ejector pins offer excellent demoulding aids for every application in order to be able to demould even the most complex product batches functionally and reliably. •

Latest software release of Makino® Hyper-i™ Control offers a major advancement in EDM performance



Makino Inc. recently announced a new version of its industry-leading Hyper-i Control software, a unified system for the programming, setup and operation of Makino wire and sinker EDM. Hyper-i brings new levels of capability, intelligence and userfriendliness to Makino EDM machines. It improves operational efficiencies and part accuracy and helps owners meet customer demands for part and delivery requirements.

An operator's best friend

Hyper-i contains a knowledge base of information from experienced machinists and operators and an extensive library of cutting conditions developed for multiple applications. Easy access to information, videos and relevant data help reduce the extensive learning curve often associated with specialized machinery. Hyper-i automatically optimizes the erosion process, even for sealed and poor flush applications. Experienced EDM machinists and novice EDM operators can generate efficient burn routines and produce parts quickly and reliably with the fastest cycle times possible. The Hyper-i software empowers operators to deliver unmatched straightness and accuracy compared to previous technologies.

Introducing QV Assist[™]

Included in the latest Hyper-i software update is the Makino Quick View Dynamic Content Assistant[™] (QV Assist). The improved interface/technology displays key data and information based on a machine's real-time status.

Excellent part quality at a reduced cost

The revolutionary Hyper-i system supports unattended and lights-out manufacturing and offers higher performance, productivity and efficiency when using Makino EDM. •



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Alstom wins order to design and manufacture 312 metro cars for Delhi Metro Phase IV

A lstom, a global leader in smart and sustainable mobility, has been awarded the contract to design, manufacture, supply, test, commission 312 standard gauge metro cars for Delhi Metro Phase IV expansion, by the Delhi Metro Rail Corporation (DMRC). The order, worth €312 million includes:

 Design & manufacturing of 234 standard gauge trains will b metro cars for Line 7 extension (Pink Line 12.558 km) manufactu on the Mukundpur-Maujpur corridor and the Line 8 extension (Magenta Line 28.92 km) for the Janakpuri West-RK Ashram corridor.



Alstom will supply its class-leading Metropolis trainsets for this order. Metropolis trains offer a unique design, a wide range of configurations and ensure the highest performance due to the perfect combination of proven and reliable components and innovations. With

Ather invests INR 320 crore on second manufacturing unit

V marker Ather Energy has inaugurated its second manufacturing facility spread across 300,000 sq. ft. in Hosur (Tamil Nadu), to help increase the company's production capacity to 420,000 units per annum and bring down delivery timelines from months to a couple of days.

At the time of commissioning its second plant in 2021, Ather had committed to invest INR 650 crore over five years. Of this, it has so far invested INR 320 crore. Ather also plans to build a third manufacturing plant by the end of the next financial year. However, it is yet to decide on the location of the plant.

Speaking at the launch of the new plant, Swapnil Jain, Co-Founder & CTO of Ather Energy, said, "Rapid scaleup is susceptible to quality issues, and delivering safe and reliable products to our customers is our biggest priority while creating a vision for the plant. With deep investments and innovation done on processes and machines, this plant will help us to further strengthen our leadership in delivering quality vehicles"

Ather's new manufacturing facility houses two units - one dedicated to battery production and the other for vehicle assembly. The battery unit will have five assembly lines and the vehicle assembly will have two assembly lines. With a strong local ecosystem that has been developed, most of the supplier base for Ather Energy its extensive track record, low lifecycle costs, and keen focus on passenger experience, Alstom's Metropolis metros set the standard in reliable and attractive metro services around the world.

Alstom has delivered more than 800 metro cars that are in service for the Delhi Metro network. The new trains will be built at Alstom's largest Urban Rolling Stock manufacturing site in Sricity (Andhra Pradesh), which has

> a strong portfolio of delivering for major domestic and international projects. Commenting on this win, Olivier Loison, Managing Director, Alstom India Cluster,

said, "Delhi NCR is amongst the largest urban clusters in the world. Faced with the realities of climate change, such megacities need reliable and sustainable public transport solutions. Alstom is pleased to continue the partnership with Delhi Metro, one of Asia's largest rapid transit systems. Our trains have a high recyclability of all materials and low-weight design to reduce energy consumption that will greatly contribute to minimising environmental impact in the region." •



Image Courtesy: Ather Energy

is in Tamil Nadu and neighbouring Karnataka, making Hosur an ideal location for the factory.

Currently, the new plant produces 500-600 scooters per day but the company expects to scale this to 1,200 scooters per day by March. The plant has the capacity to employ more than 1100 people directly and over 500 people indirectly.

Ravneet S. Phokela, Chief Business Officer at Ather Energy, said the company expects to exit this financial year at a INR 2,400 crore annual run rate. On Ather's charging network, Phokela said it currently has installed fast-charging stations in 500 locations and plans to install 1,400 Ather Grids by the end of this financial year. • *Courtesy: The Hindu BusinessLine*

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Chhattisgarh soon to have drone and UAV manufacturing unit

The Chhattisgarh government has signed two MoUs at the Chhattisgarh Business Summit 2022 at India International Trade Fair-2022 in New Delhi recently. The MoUs were signed for setting up ethanol production plant and drone and a UAV manufacturing unit.

Business delegates and entrepreneurs from across the country participated in the summit organised for business, entrepreneurs and exporters from electronics, minor forest produce and handicrafts and handloom.

An MoU has been signed between the state government and Rajesh Gautam of NKJ Biofuel, Durg, for setting up an ethanol production plant in cooperative sector with an investment of INR 140 crore, while another MoU was inked with Manish Bajpai of Daybest Research Private Ltd. for setting up 4500 drone and UAV manufacturing units at the investment of INR 5 crore.

Labour Minister Shiv Dharaiya encouraged



Image used for representation only. Courtesy Envato Elements.

entrepreneurs to invest and said that Chhattisgarh is a progressive state full of possibilities. He maintained that under the new industrial policy of the state government, many types of concessions and facilities are being given to the entrepreneurs.

The state government has provisioned special packages and concessions to prioritize agriculture and forest-based industries as well as to create a better environment for investment. Besides, the rules for establishment and operation of industries have also been simplified. The government has come up with various exemptions, incentives and benefits to manufacturers interested in setting up a unit in the state. •

Courtesy: The Statesman

Kennametal India inaugurates new metal cutting inserts manufacturing facility

Kennametal India Limited (KIL), a subsidiary of Kennametal Inc., recently launched its new metal cutting inserts manufacturing facility on its Bengaluru campus. The facility is part of Kennametal Inc.'s global modernisation program, and will support demand for Kennametal and WIDIA brand inserts from customers across India and beyond, said the company. Inserts are cutting tools that span a host of applications requiring machining or removal of metals.



"Our manufacturing plant in Bengaluru spans over 27 acres and has been pivotal to our growth in India for decades. It has unique capabilities for end-to-end manufacturing of industry-leading metal cutting tools and technologies that enable exceptional performance for our customers," said Vijaykrishnan Venkatesan, Managing Director, KIL.

According to the company, the new facility consolidates inserts manufacturing operations, which were previously housed in multiple production units within the Bengaluru plant, and incorporates intelligent manufacturing systems for improved quality, consistency, and lead times. Additionally, it has also invested in training the workforce with the specific skillsets needed to leverage these advanced technologies to their fullest, the company added.

"Through expanded capacity, advanced equipment, and a highly skilled and talented workforce, we will bring improved quality, product performance, innovation, and delivery to our customers, so they can build better every day," said Sanjay Chowbey, Vice President, Kennametal Inc. and President, Metal Cutting Segment.

Currently, the company in its Bengaluru facility manufactures tools such as milling, turning, holemaking, threading, and tooling systems of both Kennametal and WIDIA brands. ◆

Courtesy: Hindu BusinessLine



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Mahindra launches first dedicated farm machinery plant in Pithampur



Mahindra & Mahindra Farm Equipment Sector (FES), a part of the Mahindra Group, has formally inaugurated its first dedicated farm machinery plant (non-tractor) in Pithampur, Madhya Pradesh. The new plant was inaugurated by Honourable Union Minister of Agriculture and Farmers' Welfare, Government of India, Shri Narendra Singh Tomar, at an event attended by key state officials, dignitaries, and senior leaders from Mahindra & Mahindra.

Mahindra's new farm machinery plant is strategically situated in the industrial city of Pithampur with access to a diverse supplier base, enabling the company to manufacture durable, high-quality, affordable, and accessible 'Made in India', for Indian farm machinery, marketed under both the Mahindra and Swaraj brands. The plant will also manufacture products for export to global markets in Asia, Africa, Europe, and the Americas.

With its well-planned layout, the new plant is capable of rolling out a series of new products designed at Mahindra's global technology Centres of Excellence in Finland, Japan and Turkey. The new plant is spread over 23 acres and has a capacity to manufacture 1,200 combine harvesters and 3,300 rice transplanters per year.

Speaking at the launch event of the new farm machinery plant, Shri Tomar said, "It gives me immense pleasure to be here at the launch of this one-of-a-kind facility for farm machinery in Madhya Pradesh, set up by the Mahindra Group. Mahindra has one of the most notable investments in the state, providing mass direct and indirect employment in the region. Today, the Group is further enhancing its investment with the launch of its all-new greenfield facility to manufacture 'Made in India' farm machinery in Pithampur. This a milestone moment not just for the Mahindra Group, but also for the country and our farmers."

He added, "Globally, mechanisation has been one of the key components of high agricultural growth and higher food security, with several studies suggesting a direct relationship between increased yields and farm mechanisation. With our ambition of doubling farm mechanisation in India by 2030, the Government of India has introduced several schemes and policies to support greater mechanisation of Indian agriculture, and bringing 'aatmanirbharta' into farm mechanisation is one of them."

Hemant Sikka, President, Farm Equipment Sector, Mahindra & Mahindra Limited, said, "Mahindra has been the leader in the tractorisation of India for several decades and is now determined to be a leader in mechanisation of farming. We aim to grow our farm machinery business by 10x in 5 years, and the new farm machinery plant in Pithampur is a key pillar in the execution of this strategy."

Siemens Limited sets up state-of-the-art production facility for bogies in Aurangabad

Siemens Limited has set up a state-of-theincreasing demand in India and across the world. The factory will deliver over 200 bogies towards an export order. The bogies are based on the proven global design concept from Siemens – SF30 Combino Plus that offers best-in-class passenger experience and easy maintenance.

Sunil Mathur, Managing Director and Chief Executive Officer, Siemens Limited, said, "We are glad to announce this significant milestone for Siemens Limited. The Aurangabad factory will address the increasing demand for bogies not only in India but also globally. We are proud that Siemens has chosen India as a preferred location for this very strategic initiative. This is also an excellent example of making in India for the rest of the world. Siemens stands committed to delivering sustainable mobility solutions that guarantee high-asset availability and improved passenger experience!"



The factory has a highly flexible production line capable of meeting domestic and global rolling stock requirements. It manufactures high-performance bogies for passenger, coaches, locomotives, electric multiple units, trams and metros.

The Mobility business of Siemens Limited is constantly innovating its portfolio in its core areas of rolling stock, rail automation and electrification, turnkey systems as well as related services. With digitalization, it is enabling mobility operators to make infrastructure intelligent, increase value sustainably over the entire lifecycle, enhance passenger experience and guarantee availability. •

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Shibaura Machine to invest INR 225 crore in India to double its manufacturing capacity

Chennai-based Shibaura Machine India Private Limited (SMI) is a subsidiary of Japan's Shibaura Machine, the leading manufacturer of high-precision injection moulding machines in the world, has announced its plans to invest INR225 crore in India primarily to expand its manufacturing capacity in Chennai.

SMI has a world-class facility in Chembarambakkam, Chennai, that manufactures about 1,200 injection moulding machines a year and its auxiliary equipment. The machines find their applications in automotive, electrical, household & furniture, material handling, medical, packaging, preforms, PVC, toys, writing instruments, and other industries. The company has a growing customer base in India and over 45 countries in North America, the Middle East, East & West Africa, and the SAARC region. With the new investment plan, the manufacturing capacity of SMI will be increased to 3200 machines a year in a phased manner.

Shibaura Machine India began its operations with the takeover of the plastics machinery business of Larsen & Toubro in 2012. Celebrating its tenth anniversary this year, the company has recently laid the foundation stone for the construction of a new manufacturing facility at a sprawling over 11 acres, adjacent to its existing plant. The new factory is



Image Courtesy: ANI

expected to begin its trial production by November, 2023. In the next 3-4 years, SMI is expected to create new jobs, increasing the team size. In addition, about 50 MSME vendors will be developed to cater to the need of increased capacity.

Announcing its investment plan, Shigetomo Sakamoto, President, Shibaura Machine Group, Japan, said, "Our fresh investment will see doubling of production capacity, and rapid strides in the adoption of advanced material technology, control, mechatronics, and IoT in our Indian factories, in the next three years."

In his comments, M. Kumar, Managing Director, SMI, said, "With the new investment, we will continue to grow our capacity and team. We will add new products, and increase our customer base, buoyed by the track record of being able to meet varied requirements of our customers and the stringent standards of importing countries USA, Africa, Middle East, South & Southeast Asia."

Courtesy: ANI

TVS Motor plans to ramp up EV capacity to 25,000 units by March

TVS Motor Company has drawn up plans to ramp up its electric vehicle (EV) capacity to meet its target of 25,000 units by March 2023. Sales of e-scooter iQube (electric scooter) are doing well, with October wholesales at about 8,000 units, director and CEO K.N. Radhakrishnan said in an earnings call.

"Our first challenge is to deliver 10,000 this month [in November] and then 18,000 to 25,000 by March. We have the capacity. We are now ramping up," he said. According to Mr. Radhakrishnan, iQube has about 25,000 bookings open and is being

sold across 100 cities and towns in the country. Asked whether EV would be hived off into a separate subsidiary, the management said that it was exploring all options.

For FY23, the company has set aside a capex of INR 750 crore, predominantly towards EVs. About INR 320 crore had already been invested during the first half. "EV is an important strategy and in the 12 quarters, we will look at a full product pipeline," Mr. Radhakrishnan said.

He also said the company would grow ahead of the industry, both in domestic and international markets, on the back of investments made, especially in the area of marketing coupled with the unveiling of new products. Stating that there had been a slowdown in the

> international markets due to macro economic factors, he said TVS Motor had moderated dispatches and added that he was expecting improvement in semiconductor supplies in the third quarter.

Asked about the product gaps across spectrum, he said: "Still there

are gaps, there are opportunities, white spaces and TVS will continue to invest, because our strength is understanding the customer, customer segments and delivering something which is really a super hit product." The company raised prices by 1% in the second quarter of FY23 in both domestic and exports markets, and 1.1% in October for domestic market alone, he said. • *Courtesy: The Hindu*



Image Courtesy: TVS Motors

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Aerospace Industry: Onward and Upward

The scenario is looking up for the aerospace industry in India. The rapidly growing multi-billion dollar global market for aerospace products provides entrepreneurs in India opportunities to meet a part of the manufacturing requirements of global aerospace original equipment manufacturers. By equipping themselves with the required skills, certifications and infrastructure, toolmakers in the country could become active contributors to the Indian aerospace industry.

Kimberley D'Mello

he Indian aerospace industry is setting its sights high. Today, it has become one of the fastest growing sectors and is expanding at a fast pace, owing to increased activity in both the defence and civil aviation sectors. The Indian aerospace industry offers tremendous opportunities to Indian as well as international companies throughout the supply chain. With the objective of achieving self-reliance in production, Indian aerospace companies have been continuously upgrading, modernizing, and expanding their range of products.

"The aerospace industry is now globalised. As a nation, we can be viewed as a new entrant or a new contender looking to provide products and services in that arena. But we are catching up. In fact, now there are many players in India, who are already serving the global aerospace industry," said Mr. Vipul Vachhani, Founder & CEO, Jaivel Aerospace.

Growth factors

Before the pandemic, it was predicted that this decade would belong to manufacturing. Between 2005 and 2015-18, the industry was highly focused on ramping up production. Mr. Vachhani elaborated: "In fact, before the pandemic, it was projected that over the next 10 to 15 years, a significant volume of aircraft will be manufactured. Most OEMs and engine manufacturers have an order book of about 15 to 17 years, which is quite robust. The pandemic disrupted everything, but those demands have definitely not gone away."

"Besides, there has been significant disruption at the supply-

chain level in the last 2 to 2.5 years. Several small players have not been able to sustain and it will still take at least two years to get back into a proper rhythm. This is the current scenario. From an Indian aerospace industry perspective, I think all of this presents a significant opportunity because when the situation is steady, it is difficult for new players to come into play. When the scenario is dynamic, it presents an opportunity for new players to come up with solutions, which could be better than the ones being currently used or even far more reasonably priced, or it could be both," he added.

The Confederation of Indian Industry on its website highlighted: "There are several factors driving growth in manufacturing in the Indian aerospace industry. These include both macro and micro factors – strong economic growth



that has resulted in rapidly growing domestic aircraft demand, the liberalization of civil aviation policies, offset requirements, a strong domestic manufacturing base, cost advantages, a welleducated talent pool, the ability to leverage IT competitiveness and a liberal Special Economic Zones law that provides attractive fiscal benefits for developers and manufacturers."



GE Aerospace, Tata Advanced Systems extend \$1 billion long term contract

According to a PTI News report published in November 2022, GE Aerospace and Tata Advanced Systems Ltd. have extended their longterm contract worth USD 1 billion for production and supply of several commercial aircraft engine components. The engine parts will be manufactured at the Tata Centre of Excellence for Aero Engines (Tata-TCoE).

AZAD begins delivery of NAS parts to Boeing

A news report published by The Hindu BusinessLine in November 2022 revealed that highly engineered complex precision parts' manufacturer Azad Engineering has delivered the first consignment of National Aerospace Standard (NAS) parts to global aircraft manufacturer Boeing. The consignment carried critical and unique aerospace components required for multiple Boeing aircraft.



Image used for representation only. Courtesy Envato Elements.

Jaivel Aerospace wins contract for aircraft protection systems of Boeing T-7A Red Hawk

In a press release issued in November 2022, Jaivel Aerospace informed that it won a contract with Boeing to manufacture and supply aircraft protection system products for the T-7A Red Hawk aircraft. The aircraft protection systems will be manufactured by Jaivel at their state-of-the-art, advanced manufacturing facility 'Inspire One' in Gujarat.



Image Courtesy: Boeing

In Focus

BIG DEALS

Garuda Aerospace to build advanced drone solutions for the armed forces

An IANS news report published in November 2022 revealed that drone-as-a-service company Garuda Aerospace has raised \$5 million from a large infrastructure development company,



Image used for representation only. Courtesy Envato Elements.

high-net-worth individuals and angel investors. With the acquired funds, Garuda Aerospace will focus on building advanced drone solutions for the armed forces in collaboration with global giants from the defence and aerospace sectors, the company said.



Image used for representation only. Courtesy Envato Elements.

Boeing accelerates MRO localization with Indian partners

In October 2022, Boeing announced a significant expansion of its partnerships within the Indian Maintenance, Repair and Overhaul (MRO) ecosystem over the last year, having concluded

considerable work agreements and deliveries with diverse indigenous partners across the public as well as private sectors, including with AI Engineering Services Ltd., Horizon Aerospace, and Air Works Group.

MIDHANI and Boeing India to explore collaboration for aerospace raw materials

In October 2022, Boeing India, in a press release, announced it will assess and collaborate with Mishra Dhatu Nigam Limited (MIDHANI) to develop raw materials for standards aerospace parts and components in India. The availability of essential aerospace materials is the first step in securing the supply chain.

Airbus-Tata Consortium to Manufacture C-295 Transport Aircraft in Vadodara

A consortium of Airbus and the Tata group will manufacture C-295 transport aircraft for the IAF in Vadodara in Gujarat, the Defence ministry said, announcing the INR 22,000-crore project where a military plane will be produced in India for the first time by a private company, stated a PTI News report published in October 2022.



DID YOU KNOW?

Hyderabad ranked number one in the third edition of fDI's Aerospace Cities of the Future 2020/21 rankings, under the category of 'Top 10 Aerospace Cities in Cost-Effectiveness' by fDI Intellegence.com, a division of Financial Times Group.

Source: invest.telangana.gov.in



India successfully launches first privately made rocket

According to a Reuters news report, India successfully launched its first privately developed rocket, the Vikram-S, in November 2022, a milestone in the country's effort to create a commercial space industry and to compete on cost. The 545-kg rocket, developed by space startup Skyroot, took off from the Indian space agency's launch site near Chennai and hit a peak altitude of 89.5 kilometers (km). The rocket has the capability of reaching Mach 5 - five times the speed of sound - and carrying a payload of 83 kg to an altitude of 100 kilometers, the company said.

THE BIG DEALS

Aequs & Hindalco enter strategic alliance in commercial aerospace sector

Aequs Pvt. Ltd., a leading aerospace components maker, and Hindalco Industries Ltd., one of the leading integrated aluminium products companies globally, sealed a strategic alliance for long-term collaboration and joint business development in the commercial aerospace sector, informed a press release issued in luly 2022.

HAL and Israel Aerospace Industries sign MoU for MMTT

In April 2022, HAL entered into an MoU with Israel Aerospace Industries to convert Civil (Passenger) aircraft to Multi Mission Tanker Transport (MMTT) aircraft in India. Under the pact signed recently, HAL will convert pre-owned Civil (Passenger) aircraft into air refueling aircraft with cargo and transport capabilities.

Factors toolmakers need to consider

The Indian aerospace industry is poised for growth. India Brand Equity Foundation, an initiative of the Ministry of Commerce and Industry, Government of India, on its website stated: "The aerospace industry in India is growing day by day and is projected to reach US\$ 70 billion by 2030."

If you're looking to venture into aerospace manufacturing, toolmakers need to understand that "aerospace is an extremely mature industry; the technology, production line, and supply chain are all set. So, entering into it is a little bit more challenging and needs a slightly different mindset", explained Mr. Vachhani.

He added: "Aerospace is a document-heavy industry that requires certain types of certifications and standards. From a quality perspective, many Indian companies are at par with global toolmakers, but from a documentation or traceability point of view, those are the gaps to really focus on."

Flying into the future

India has a competitive advantage over its competitors. Factors such as low labour cost, availability of resources and favourable government regulations, among others, offer huge growth opportunities in the aerospace industry. Besides, policies like 'Make in India' and 'Aatmanirbhar Bharat' are aimed at luring global players to invest in India's manufacturing industry and promote India as a manufacturing hub.

"Further, India is considered a strategic geographical location and significant international market with high aircraft demand, technical skills and competitive labour costs by Boeing, Airbus and other leading OEMs. To meet the needs of Tier 1 suppliers and build an aerospace industry ecosystem in the country, manufacturers worldwide are partnering with Indian suppliers and small and medium enterprises. Active participation of global players is expected to further boost growth of the aerospace industry in India," concluded India Brand Equity Foundation on its website. •



Image used for representation only. Courtesy Envato Elements.

Points for toolmakers to ponder over

- Aerospace manufacturing is complex: Aerospace components often have complex geometries because aerospace applications usually require components with integrated functions.
- It is capital intensive and technology driven: The aerospace industry requires huge capital investments and requires upgrading of technologies.
- Certifications required: Getting certified in ISO AS9100, a quality management system for the aerospace industry that comprises of aviation, space and defence organizations, is mandatory to ensure the required standards are met.
- Processes and paperwork: Aerospace manufacturing requires you to deal with a lot of paperwork, government regulations, and company auditing and tracking, among other processes. If your documentation and systems are not in order, aerospace companies will not move ahead irrespective of however good your machines, software and capabilities are.
- Data is also high on priority: Aerospace companies would like to know how well you manage the data security, how well is the confidentiality rolled out in the organization, how you educate your people and for that how you educate your suppliers and every stakeholder.
- Risks involved: Aerospace is a niche industry and has a long gestation period of Research and Development (R&D); there's risk involved.

Includes inputs from Mr. Vipul Vachhani, Founder & CEO, Jaivel Aerospace

Tech Focus

Copper alloys: The perfect blend for injection moulding

Injection moulding is the manufacturers' preferred choice for mass production due to its simplicity and repeatability. **Copper-based alloys** are vital in reducing cvcle times, thus significantly improving the productivity of the process. The right tooling material can save up to 40% of your production costs. Here you'll learn why copperbased alloys are superior to conventional tool steel in injection moulding.

hat do Lego bricks, car bumpers, PET bottles, and medical syringes have in common? Well, all these products are typically produced by injection moulding. No wonder the global injection moulded plastics market is booming. In 2021, it was valued at \$284.7 billion. And, thanks to



the growing demand for plastic components, the market is expected to expand even further. An annual growth of 4.2% can be expected from 2022-2030, as various end-use industries, including automotive, packaging, and healthcare, drive the market.

Cycle time is crucial in injection moulding in the plastics industry.

The longer the cycle, the higher the total costs associated with producing finished parts. A few seconds may not make a big difference at first glance, but when millions of parts must be produced, every second that can be gained by a shorter cycle time plays a big role. And there is a way to keep the cycle time as low as

Cooling time

Unmolding

Injecting Holding

Saving



Cooling time when using high conductivity copper alloys

Tech Focus





possible and increase the process productivity.

When it comes to injection moulding, the one thing that you want to achieve is to cool down the molten plastic as quickly as possible. On the one hand, this increases your productivity. On the other hand, it also increases the quality of the manufactured product, as the risk of shrinkage increases with a longer cooling time. Especially, if the finished machined parts need to suit accurate dimensions with very tight tolerances, it becomes essential that the molten plastic solidifies rapidly. This is where typical tooling materials such as tool steels or even high thermal

conductivity steels (HTCS) reach their limits. Therefore, manufacturers must consider alternative tooling materials to build the mould.

Due to their outstanding thermal conductivity, copper-based alloys such as AMPCOLOY® are ideally suited to dissipate heat as quickly as possible. On the one hand, these copper alloys can form the entire core of the mould. On the other hand, they can also be used in the places of the mould where they are specifically needed.

For the unique challenges in plastic tooling, AMPCO METAL has developed special high copper alloys called AMPCOLOY[®] that provides exceptional conductivity, high strength, and unique wear characteristics, delivering higher lifetime, quality, and performance.

Why are high-conductivity copper alloys important?

Conventional tool steel reaches its limits quite quickly. Be it due to limited thermal conductivity, due to limits of the design and feasibility, or its fundamental physical limits. For instance, products fabricated with tool steel may have sink marks due to plastic shrinkage, as the cooling time was too long. In addition, studies have shown that standard steel does not distribute heat uniformly. Therefore, moulds made of steel can cause several problems, as an uneven heat distribution can lead to distortion and warpage.

Yet, copper by itself is not strong enough to serve as an injection mould. Experienced metallurgists have solved this problem by developing copper alloys that attain strength and hardness while maintaining much conductivity. These alloys not only exceed the thermal conductivity of conventional steel but also match and even exceed the hardness and strength of these

conventional steel moulds. Thanks to their excellent heat transfer properties, mould designs that use copper alloys show far less warpage, thus increasing productivity. Furthermore, these materials can significantly speed up the cooling phase, reducing cycle times. These alloys combine good strength, wear resistance, hightemperature resistance, and high toughness with excellent conductivity. Article, images and graphs courtesy: AMPCO METAL



'Toolmaking is a passionate profession'



Nishant Kashyap

"Like any other business resource, the most important aspects of tooling are quality and skill set. So, an experienced stable team with a long-term vision is mandatory to succeed in this business," says **Santhosh Raj**, Head – Technical Centre (Hyderabad), ALPLA Group.

Can you tell us what ALPLA Group is all about?

ALPLA is a world leader in the development and production of innovative plastic packaging solutions. We produce innovative packaging systems, bottles, caps and injection-moulded parts for a wide range of industries. Our long history as a family-run business, our cutting-edge technologies and the knowledge and dedication of our employees sets us and our products apart. Founded in 1955, we have about 177 production facilities (including 64 in-house), more than 21,000 employees, and presence in 45 countries. Our global turnover in 2021 was Euro 4 billion.

That's impressive! How would you describe your growth journey in India?

We started our operations in India in 2005 when we set up our first facility at Baddi in Himachal Pradesh. Today, we have a total of 10 production facilities in India with a technology centre and our headquarters in Hyderabad. At the end of 2020, during the pandemic, we also set up a mould shop, which is an injection moulding shop. Besides these, we have a new integrated manufacturing site at Silvassa, which is a production facility for plastic components.

When we started doing business in India, we recorded a revenue of approximately INR 30 crores. Last year, we crossed the INR 1300-crore mark. So, that's the kind of growth we have witnessed in India.

The plastic packaging industry has been focusing on the environment and design. What would you say are the current trends in the industry?

Before I answer this question let's understand what packaging means. Packaging basically refers to something that contains a product. So, it could refer to a shampoo bottle or a pesticide pack or something like a medical appliance/device, among other things.

Over the past few years, the trend has been focussed on offering functional products. Plastic packaging now has more functionality such as focusing on

28

creating lightweight packaging. Besides, every packaging format has a lifecycle of 3-5 years based on the customers, who look for changes in the designs and formats, among other aspects. So, this does not only mean reducing the weight, but also trying to make the packaging more durable with some design changes and adaptations.

Now, when it comes to tooling, we always work with the range of Class 101 moulds, where the cycles are more than 1 million shots. Normally, we talk about three to five million shots in our field of business for the tool life and then comes the extended tool life with more refurbishment, etc. Then, there is also the emphasis on high process reliability, which is a combination of the tool as well as the machining or the moulding processes. We also talk about the consistent output. These are critical as far as the tooling industry is concerned.

In our field of business, we work with high-cavitation tools. Normally, a pilot tool can have a single cavity to up to four cavities. But when it comes to the production format or mass production format in commercialization, the tools can go up to 196 cavities. In India, we still have moulds running very successfully, which can go up to 128 cavities. Additionally, there is a trend for a highly automated production environment for better reliability and consistency.

What kind of tools would the rigid packaging industry need?

Injection moulds for mono and bi-colour caps/closures, preforms; extrusion blow moulds for single/ multi-layered bottles/cans/jars and stretch blow moulds for bottles.

What is the eligibility criteria to make a toolmaker your supplier? What infrastructure and skill set do you look for? Most of the moulds we need are

made by us in our tool rooms. But everything is not possible in-house. So, we engage with commercial toolmakers to fulfil our requirements. ALPLA has presence in many countries, where the processes are highly standardised. It's like the McDonald's model; you'll find the same quality and taste anywhere you go.

We follow a list prepared by our global experts, which applies to vendors across geographies.

We prefer to work with those suppliers, who have a standard process set, who can adapt to our standards, who should be able to supply to multiple geographies and who have a certain bandwidth to provide us with after-sales services. Regarding the technical capabilities, we look into their capabilities of designing and ability to adapt to our mould standards. They need to be equipped with adequate infrastructure and quality standards.

The qualification also involves some understanding of their challenging projects. This includes what they have done, how successful they have been in the market, and what is their scale of business... We look at our toolmakers as partners and not vendors; we must know each other well before we start any project.

Do you think that Indian die mould manufacturers are fully equipped to serve the demands of the packaging industry?

To some extent, yes! Because there are very few, who are well equipped with the latest technologies, have the required skill set, and can take up large quantity orders. But India, as a country, has lots of technical and commercial bandwidth, which has to be capitalized on soon. When it comes to the actual core of business, what we see from our high cavitation tools, etc., we still have a lot of scope for improvement at the reliability levels. When it comes

Building tools for every industry requires a different skill set. What is it like to design & build moulds for the plastic rigid packaging industry?

It's designed by CAD and built by CAM and checked and verified by simulation digitally. So, the entire process lifecycle is digitally mapped, monitored, and controlled. For example, we work on different types of technologies called tool technologies. We make HDP PP bottles using extrusion blow moulding and pet bottles using injection stretch blow moulding, while we use the injection moulding process to make caps and closures. All these processes need a tool design as per a certain standard. Standardization backed by excellent tool design capabilities are important in our industry.

Our product design capabilities are excellent because we have years of experience in the packaging industry. After designing, we pass this design through a simulation process to get a realistic idea of the end product. We do repeated modelling and then bring these models into the tooling activity, where the designs are worked out in the injection moulding, hot runner system or machining process. We bring a huge level of standardization when it comes to building a tool. We emphasize standard processes right from the design stage. When we go into the next step of assembly and tool proving, we make sure that there is a certain level of experiments being run such as differential pressure, temperature levels, and ejection cycles, overall cycle times.

Tool Talk

As someone, who has spent years in the tooling industry, what are your expectations from the tooling industry?

Our expectations are quite clear. We require:

- Excellent quality with consistent output: The quality of the product made from a particular tool should be the same whether it's the first part or the millionth one.
- Get things right the first time: Toolmakers should aim to provide tools and moulds right the first time to avoid any last-minute discussion.
- Cost-effectiveness: Toolmakers need to constantly work on ways and methods to reduce the cost while maintaining quality.
- Design quality: Tool design is an art and we work with companies that excel in tool design.
- Transparency and communication: We expect our tooling partners to keep us informed about the latest developments and challenges they face. In the past, we have had an experience wherein the toolmaker did not update us on the developments and challenges they were facing, which resulted in overall project delay.
- Process-oriented: We want companies to have a certain process in place that they strictly follow.

to productivity from the tools, we see big players are able to match the global standards and medium players are catching up.

I would say, they must focus on the things they are good at instead of working on multiple activities. You focus on one thing and source the remaining from the experts. This strategy could help Indian toolmakers match the global standards. The other aspect is that toolmakers should also integrate low-cost automation or costeffective automation in their internal processes. This will help them attain higher efficiency and productivity. Most Indian toolmakers are at the 1 sigma quality level. They got to reach the 7 sigma quality level, which can be achieved through training and skill development activities.

Commercial vs captive tool room: What will be the way forward for OEMs like ALPLA?

Every large manufacturing organisation, which requires a large number of tools, has its captive tool room. But most of them work with commercial tool rooms because of capacity constraints. One has to understand that we are not into the tool-making business. We need tools to make our products either from our tool room or source them from outside. The only thing we need to ensure is that the toolmaker we work with follows our standards and supplies us with high-quality products. So, I see both things happening simultaneously going forward.

You must have worked with many toolmakers from India and abroad. How would you compare you experience of working with overseas toolmakers vis-à-vis Indian toolmakers?

Indeed, we work with lots of toolmakers from around the world; everywhere we have a good collaboration with our toolmakers.

We work closely with them and handhold them if they need our support. In terms of comparison, I wouldn't say that anyone is superior to the other. But what I see predominantly in the global context is that the toolmakers stick to their capabilities, are extremely focussed and try to upgrade their capabilities in their respective domains. For example, if a toolmaker deals with packaging tools, he would not do an automobile tool. He would focus on his strength. But, in India, I have seen companies trying to do multiple activities and sectors just because they have the relevant infrastructure. In my opinion, this affects the quality and time because you are not able to develop your core expertise.

Also, in the global scenario, mould makers focus on the design element. They do a thorough analysis on design, and production, which results in a much better output. This is one area Indian companies need to work on. Indian companies also need improvement with regard to communication, project management, and transparency if they seek effective collaboration.

What message would you want to give Indian toolmakers?

Toolmaking is a passionate profession. Like any other business resource, the most important aspects of tooling are quality and skill set. So, an experienced stable team with a long-term vision is mandatory to succeed in this business. There's a simple but apt quote in the toolmaking business – "a satisfied customer never leaves and a dissatisfied customer never returns". So, our common goals should be to please the customer, to achieve sustainability and profitability. Remember, the last cost of the tool is never hard to negotiate if the right quality is delivered on time at the right price even with good profit margins. 🔶

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Reinventing itself part by part

Three decades and still growing strong, Bengaluru-based Sunikh Components Pvt. Ltd. has amassed vast experience in the fields of tooling and precision engineering. The company currently caters to the tooling, components manufacturing and other precision engineering needs of more than 100 big and small companies, including MNCs. **Nishant Kashyap** visits Sunikh Components Pvt. Ltd. to explore the aspects that are helping this company forge ahead.

he year 1991 is a very significant year. It was the year of financial liberalisation, the year wherein reforms were introduced to help the economy deflect a crisis and then prosper. It was also the year that Mr. M. A. Khadar, an enthusiastic entrepreneur, believed was the perfect time to set up Sunikh, a tooling and precision engineering company, in Bengaluru.

After the financial liberalisation, India has grown into one of the strongest nations in every field, including manufacturing. The growth in the manufacturing sector has helped numerous small companies, like Sunikh, in their progress.

The early days

Mr. Khadar is a first-generation entrepreneur, who has been and is still highly passionate about the Indian tooling industry. Even at the age of 80+ years, he spends lot of his time on the shop floor and personally checks all the tooling production, and quality activities.

> Sunikh Components Pvt. Ltd. has a workforce comprising qualified and trained engineers and diploma holders, who get onthe-job training in their respective areas of specialisation.

Reminiscing the early days, Mr. Khadar said: "Initially, we started with one injection moulding machine and were making caps and bottles. After 3 months, we loaned funds to upgrade our infrastructure with a wire-cut EDM machine. As time progressed and we continued to update our infrastructure with many more machines, we have built a good reputation in the industry."

The infrastructure

Located in Electronic City, Bengaluru, Sunikh Components Pvt. Ltd. is built on one acre land and has a built-up area spanning 55,000 sqft. The company designs, manufactures and offers press tools and pressed components –

Facility Visit



these being their forte. They also offer services related to plastic injection moulds, special purpose components, die casting dies, jigs, fixtures, or any type of tool elements in part or full to produce either sheet metal or plastic components.

Sunikh Components Pvt. Ltd. owns all the necessary machines and technologies to serve the growing demands of customers. The press shop is equipped with presses with a capacity from 10 to 600 tonnes. "We have a 500-tonne capacity hydraulic press for deep

draw parts and a friction screw press of 200-tonne capacity to take up cold forging jobs. Our tool room is equipped with all the necessary conventional machines along with CNC wire EDM, large VMCs and water jet cut machine," said Mr. Salim E.A, the company's Managing Director.

It manufactures various types of press

tools to meet the requirements of automobiles, electricals & electronics, and mechanical engineering industries. "Generally, we manufacture progressive, compound, blanking, punching, piercing, forming, bending, forging and lancing tools, which we can custom-make as per the requirements. We can design components and tools or can work with the designs offered by the customers," added Mr. Salim.

The company also has 8 CNC wire EDM machines, including the latest linear motion technology

machine from Sodick, Japan, along with high-end software like AutoCAD, Creo, VC and CIMATRON.

Elaborating on how the process works, Mr. Salim said, "We take up sub-assemblies of various components and have facilities like spot welding, projection welding, aluminium welding, TIG welding, drilling, tapping, milling, and grinding, among others. We undertake any sort of profiles as per the customers' requirements. Generally, the drawings or the samples are converted to CAD drawings. These drawings are



Facility Visit



further converted to machine drawings with the required CNC data. We have capabilities to design components or can take our design file from customers and manufacture the parts and tools."

Skill development

Sunikh Components Pvt. Ltd. has a workforce comprising qualified and trained engineers and diploma holders, who get on-thejob training in their respective areas of specialisation. Classroom training is also planned and conducted to develop their skills and impart knowledge on aspects related to safety, production, and quality management system, among others. "I have always believed that manpower is the biggest asset and one has to take care of them," said Mr. Khadar.

"As the industry continues to evolve and technologies continue to upgrade, we need to ensure that our employees are also upgrading themselves with the latest developments in the industry. We work with many independent management consultants, who visit us periodically and train our employees on various subjects related to the business," informed Mr. Khadar.

Apart from the standard facilities such as a provident fund, employees' state insurance, and gratuity, etc., the company has introduced Sunikh Employees'



Welfare Fund. This is an additional savings fund with management participation wherein employees can avail of no/low-interest loans using this fund.

Talking about finding skilled manpower, Mr. Khadar feels the "Indian tooling industry has huge opportunities in the coming years. We should all be prepared to fulfil the demands. The industry should come together and work closely to attract young engineers and compete with imports. The young generation is not joining the tooling business. We all must work to make tooling a lucrative career option".

Looking ahead

Sunikh Components Pvt. Ltd. currently serves industries like automotive, electrical, medical, and solar, among others, and has names like TATA, Schneider Electric, IFB, Rittal, Xylem, etc., in their list of happy customers. With the growth in the Indian manufacturing industry, Mr. Khadar is confident about the future of the tooling industry. He said, "Tooling plays a vital role in the development of the manufacturing industry. The industry needs more attention from the government and policymakers to uplift the condition of Indian toolmakers. The impact of the tooling industry is huge and we must consider it as a strategic sector. As a passionate toolmaker, I am happy that we have come a long way and serve global giants. But as a nation, we still have a long way to go."

"Considering the growth in the manufacturing sectors and localisation trends among the OEMs, we are confident about the future of the industry. We will continue to invest in the latest technologies in the future to upgrade our existing infrastructure. Also, in the coming days we will be focussing more on export orders," concluded Mr. Salim. •

3D-printed PEKK's lightweighting potential for aerospace engineers with simulation unlocked

exagon's Manufacturing Intelligence division and Stratasys, a leader in polymer 3D printing solutions, have applied Hexagon's simulation technology to capture the behaviour of Stratasys' high-performance, ultra-lightweight Antero™ reinforced polyetherketoneketone (PEKK) materials and its additive manufacturing processes. These rigorously validated simulations offer Stratasys customers unique insight so they can lightweight components and introduce new sustainable aircraft and spacecraft faster.

3D-printed plastic parts offer transformative lightweighting for aerospace, reducing the energy use and increasing the range of new aircraft. When the material and processes are fully exploited by product designers, it may also reduce the cost caused by overengineering and the waste and lead times of traditional manufacturing. However, the adoption of plastics and additive methods for structural components has remained slow due to the industry's safetycritical nature and regulations. Providing engineering teams the simulation tools to validate that these materials will achieve the required part performance when manufactured is the 'missing link', enabling designers to apply these

breakthroughs today. Rigorously-validated multiscale models of these new highperformance aerospace-approved materials — Stratasys Antero 840CN03 and Antero 800NA have now been added to Hexagon's Digimat materials exchange ecosystem, with associated print process parameters from Stratasys' aerospace-ready 3D printers. Using these detailed proprietary models, engineers can create digital twins that accurately predict how parts printed with the chosen material and approved aerospace-ready Stratasys printer will perform in a digital reality with real-world use cases and certification tests before any physical prototypes are manufactured.

Developed

to be open, Digimat software gives manufacturers the ability to design lighter parts that can match metals in performance and avoid costly overengineering using their preferred finite element analysis (FEA) and computer-aided engineering (CAE) tools. Moreover, companies that use Digimat in conjunction with Hexagon's MSC Nastran and MSC Apex will accelerate the certification and documentation of their work.

The Antero[™] materials are already being used at the cutting edge of aerospace engineering, bringing major innovations to reality on time, such as Lockheed Martin using Antero 840CN03 to create NASA's Orion spacecraft docking hatch cover. By making rigorous digital engineering and virtual manufacturing possible with these new simulation tools, more product development teams can apply and de-risk Stratasys' aerospace additive manufacturing solutions.

Aziz Tahiri, Vice-President of Global Aerospace and Defence for Hexagon's Manufacturing Intelligence Division, said: "As the aerospace industry continues to push for more sustainable designs, unlocking the lightweighting potential of thermoplastics and 3D printing will be key. By leveraging the power of our simulation technology, manufacturers gain access to proprietary information so their engineers can 'work the problem' with reliable information. We're excited to see how this next chapter with Stratasys will help the industry create lighter, stronger designs in any design engineering tool with more confidence and less cost and help bring next-gen aircraft to market faster."

Foster Ferguson, Aerospace Business Segment Leader, Stratasys, said: "The Antero 840CN03 and Antero 800NA thermoplastics provide unprecedented strength, heat, and chemical resistance. When combined with Hexagon's simulation insights and actionable data, these 3D-printed materials' ability to replace certain applications of aluminium and steel clearly points to growing use in the aerospace industry. We believe they meet manufacturers' increasingly complex performance needs, and by combining innovative modelling software with 3D printing, can reduce production timelines from months to days." •

'Indian companies will have a GREAT FUTURE'

"Toolmakers, tool steel providers, and machine manufacturers are all part of the same family. We have to work together to make the most of the emerging trends and reduce imports. Once we fulfil the local demands, we will definitely become a strong player in the global tooling industry," says Manikantan Gopalakrishnan, Managing Director, Multiple Special Steel Pvt. Ltd.

• How would you describe the journey of Multiple Special Steel Pvt. Ltd.?

Multiple Special Steel Pvt. Ltd. is a 60-year-old company, which deals in all grades of tool steel. We started the company when the Indian manufacturing industry was at a very nascent stage. At that time, there were very few toolmakers. Our company's founder Mr. N. R. G. Krishnan was a visionary. He foresaw the growth of the Indian manufacturing industry and realised that it would have a positive impact on the tooling industry. Back then, there were very few tool steel providers in India. Sensing an opportunity, he took the plunge and started supplying tool steel to tooling companies.

Over time, as the industry progressed, toolmakers started demanding special grades of tool steels, which were reliable and durable. To cater to their growing demands, we partnered with Lucchini SA, an Italian giant in tool steel and other railways components. Ever since, we have been supplying Lucchini products to toolmakers in India and today, we serve more than 800 customers.

As you've mentioned, Multiple Special Steel Pvt. Ltd. has been serving the Indian tooling industry for a long time. What changes would you say have been witnessed in terms of demands?

In my opinion and experience, I feel that the Indian tooling industry has come a long way. From being a conventionally driven industry, it has evolved into an industry that demands technology in every aspect of its products – be it tool steel, machines, or software to any other general components.

I also see a change in the perception as well. Earlier, customers' discussions would mostly revolve around cost. But now, it's more about ROI. Today, customers are looking for better solutions and the latest technologies.

Times have changed. Overall, the industry has matured a lot. Many toolmakers are now exporting to developed countries. So, they need to be at par with international standards.

Speaking of being at par with their international counterparts, how capable would you say are Indian toolmakers of making any type of tools?

The following factors will answer this question:

- India has become a manufacturing hub with a huge number of global manufacturing giants setting up manufacturing units in India.
- Indian toolmakers are using world-class products to manufacture tools.

The fact that India is serving global manufacturing leaders with the latest technologies, proves it's capable of making tools of global standards. That's the only way to become the vendor for these companies. So yes, while we are capable of making any type of tools in India, we lack capacity. Building capacity is something Indian toolmakers need to work on.



Apart from capacity, what are the other challenges Indian toolmakers face?

There are many challenges, but I will essentially discuss two that impact Indian toolmakers the most. They are:

- Lack of options in terms of finance: The tooling industry is a capital-intensive industry. Toolmakers definitely need help from the government and financial institutions. There's a need for better financing options and interest rates, etc. Lack of options in terms of finance is one of the reasons why we are not able to attract more toolmakers to the tooling industry.
- Lack of a collaborative approach: Indian toolmakers are a little conservative when it comes to the collaborative approach. They do not share information about the customers they are serving, the infrastructure they have, and the projects they are carrying out. I believe, if they collaborate

on certain projects, they can grab bigger opportunities, which are going to southeastern countries because of lack of capacity. Also, we don't have any specific tooling clusters on the lines of China and Taiwan. Such clusters help in the overall development of the ecosystem.

What opportunities do you see in the future of the Indian tooling industry?

With 'Aatmanirbhar Bharat' becoming a reality and the emergence of sectors such as aerospace and defence, toy making, white goods, packaging, and home appliances, among others, Indian companies will have a great future.

As foreign companies increase their manufacturing output in India, they will need more local content in their products. They will certainly look for domestic toolmakers to fulfil their tooling demands.

Also, the government has already received a huge number of investment commitments

from Indian and overseas companies owing to the PLI schemes. The success of the PLI schemes will directly impact the Indian

toolmakers. I would like to conclude by saying that toolmakers, tool steel providers, and machine manufacturers are all part of the same

family. We have to work together to make the most of the emerging trends and reduce imports. Once we fulfil the local demands, we will definitely become a strong player in the global tooling industry. •



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CNC Machining for the Aerospace Industry: What You Need to Know

he aerospace industry encompasses not only all things aviation and flight, but also aircraft operations in space, and it services the private, commercial, and government defence sectors. In 2019 alone, the industry contributed over \$900 billion to the U.S. economy and employed over 2 million people, according to the Aerospace Industries Association. In 2020, however, the industry took the biggest downturn in its history when COVID-19 impacted the global travel demand.

Experts agree that aerospace manufacturing is once again on the upswing, but Deloitte reports that recovery will be uneven between commercial aerospace and defence; travel demands are not forecasted to return to normal until 2024, but most governments have not reduced their defence budgets and are still driving forces in the industry. For both sectors, though,



some scheduling delays and minor cost increases are expected as a result of the instability of 2020 and early 2021.

Luckily, aerospace manufacturers are eager to meet the demands of a recovering industry. What will set successful manufacturers apart from the rest will be their production approach. These companies will need to manufacture parts at top speeds to make up for the past year and a half of stymied production, maximize their profit margins by eliminating manufacturing errors and wasted time, and provide the highest quality parts possible.

Why does the aerospace industry use CNC machining?

While CNC machining is not the only manufacturing process used in aerospace, it may well be the most widely used. 3D printing is often used for lightweight components that aren't crucial to system functions, like the 3D-printed polymer sensor covers for radiation monitors on the International Space System. For engine parts and other critical components, though, the only way to achieve the necessary tolerances is with CNC machining. Otherwise, the parts just would not be precise

enough to be safe. Today, every sector within the aerospace industry uses CNC machining. For producing screws and other long, thin parts that must meet specific tolerances, many shops use Swiss machining. For complex parts with odd geometries like the combustion components in modern turbines, many shops use multiaxis machining. There are combinations of 3D printing and **CNC** machining to get some printed parts to tolerance. CNC machining is almost universal in aerospace, but its applications are as varied as the parts it creates.

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What materials are used?

Aerospace was once dominated by lowcost, low-weight aluminium. While it is still used today, more composites and alloys are taking their places as go-to manufacturing materials. Materials of lower weights and higher temperature resistances are needed for engine parts and other components likely to endure high stresses during flight. A modern lean-burn engine can run as hot as 3,800°F (2,100°C) and must be made out of material that can withstand that. Heatresistant alloys, often nickel and titanium, are becoming more common, along with nonmetal composites like ceramics. However, these materials are more difficult to machine than aluminium and require advanced CAM software to ensure safe machining.

5-axis machining in the aerospace industry

Aerospace parts are most often highly complex. Most have odd geometries that require difficult approaches and sophisticated work-holding solutions. None, under any circumstances, can fail during use but are often made out of frangible or difficult-to-machine materials. Many are relatively large and need machines with huge work envelopes. The best way to solve these problems is by using multiaxis machining, namely 5-axis machining. Any modern, competitive aerospace shop will be using 5-axis machining to produce parts that meet the tolerance and scheduling requirements of customers.



Mastercam aerospace CNC machining capabilities

With 5-axis machining – and aerospace manufacturing in general – comes a level of risk. As parts become more complex, so the opportunity for error grows. With five different axes, for example, there are more chances for machines to self-interfere. This is where a capable CAD/ CAM system comes into play. Mastercam CAD/CAM software offers complete solutions specifically tailored to the aerospace industry, like efficient toolpaths that conform to forgings and castings; streamlined, 5-axis cutting, trimming, and drilling; intelligent toolpaths that efficiently target uncut areas; and specialized motion for extended tool life and decreased cutting time. The software also integrates seamlessly with third-party solutions that aid in design and process tracking. ◆

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Renishaw reduces machining time for aerospace impeller manufacturer

oneywell Aerospace, part of global commercial and consumer engineering conglomerate Honeywell, produces a large number of the impellers and blisks used in commercial aeroplanes. The impellers, which are essentially radial and axial compressors, rely on a workpiece datum being maintained throughout the machining process to ensure that they are suitable for use. If the workpiece datum point is not maintained, the impeller will be considered incompatible and will require rework, repair or scrapping entirely.

To help maintain accuracy in the machining process, Honeywell turned to global engineering company Renishaw to supply a RMP600 high-accuracy machine tool probing system and Productivity+[™] PC-based inspection software for machining Since we started using the RMP600 touch-probe and Productivity+ inspection software, we have had no discrepancies, scrap or faults in production.

- Honeywell Aerospace (Mexico)

centres. The technology allows Honeywell to take measurements prior to machining and detect any axial displacement early in the process.

Background

Honeywell conducts its impeller machining process at its manufacturing plant in Chihuahua, Mexico. Grinding, milling, turning and drilling processes are all carried out regularly and the facility is equipped with the latest machinery. Impellers produced here come in various sizes from 14 inches to 17 inches in diameter. The majority are made of titanium, except for one, which is manufactured in aluminium.

The Chihuahua plant is a provider for the Honeywell assembly plant in Phoenix, Arizona, where aircraft turbines are assembled and tested. If the workpiece datum of a finished part is off-centre, the impeller must be submitted for design analysis, in which a designer reviews the component and decides whether it can be used. Each analysis costs approximately \$66,900 per part and lengthens the manufacturing process. Production alone can take up to 60 hours, and uses around 130 tools, including assembly in the machine.

At Honeywell, this production

Customer: Honeywell Aerospace

Industry: Aerospace

Challenge:

Axial displacement which can result in an increase in the time taken to finish a part

Solution:

Automated part setting and onmachine measurement using RMP600 machine tool probing system with Productivity+[™] software



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With the help of the Renishaw probe and software, Honeywell can be sure that the machining process will run as expected. Before the new technology was introduced, the machine operator would fit the part, set the gauge and state the diameter and the faces. If any of this information was missed, inaccurate, or if the fixture was damaged, the final product would not be suitable. Now, we can nip any defects in the bud by detecting them in advance.

- Honeywell Aerospace (Mexico)

time is scheduled over a two-week period. If the part is found to be off-centre after it is machined, the required analysis can take an additional week. This leads to machine downtime and delays in the workflow, both of which have an impact on the production time and the cost of manufacture.

Challenge

"During the impeller machining process, Honeywell found that the workpiece datum was not being maintained axially, resulting in an increase in the time taken to finish a part," commented Raúl Barriga, Sales Director at Renishaw Mexico.

Axial displacement of the central point of origin can occur as a result of incorrect part set-up, which can be caused by operator error, a damaged fixture, and/ or burrs left on the part from a previous machining operation.

Solution

When the first cycle of Honeywell's impeller production process came to an end, Luis Adrian Gallegos, Manufacturing Engineer at Honeywell, discussed the ways that the company could reduce misalignment during the machining process with his Quality Product Engineer.

"After the first cycle, we knew that we needed to improve our machining process, but didn't want to make a huge investment," commented Gallegos. "We met with Renishaw to discuss the possibility of using a highprecision compact touch probe, along with Renishaw software, to measure the parts prior to machining and detect any misalignment so that they can be corrected before machining. After exploring our options, we decided to purchase an RMP600 machine





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Case Study



Honeywell Aerospace Manufacturing Engineer Luis Adrian Gallegos alongside Gilberto Ochoa, Renishaw Applications Engineer, reviewing the part adjustments.

tool probe with radio signal transmission. This offered all the benefits of automated job set-up and had the capacity to measure the geometry of complex 3D parts, such as our impellers."

During the machining process, the Renishaw probe touches the part in various places to identify whether there are any errors or misalignments. "The probe helps us detect any inaccuracies before a defect occurs," continued Gallegos. "Previously, we had no way of identifying a problem until 16 hours of machining and over an hour of measuring had passed. We can now receive some warning that a part is incorrect and perform the necessary corrective actions before precious machining time and resources are wasted."

"As well as investing in a probe, Honeywell also opted for PC-based inspection software, Productivity+, for its machining centres. This provided Honeywell with an easyto-use programming environment for incorporating inspection probe routines and in-process decision making into machining cycles. The software helped simplify component set-up and part verification, and assisted in core areas of the machining process: process and job set-up, and part and tool identification. Productivity+ also helps in post-process reporting, as it gathers information about the completed process and helps with decision-making for subsequent operations and processes," commented Barriga.

Results

"Since we started using the RMP600 touch-probe and Productivity+ inspection software, we have had no discrepancies, scrap or faults in production," said Gallegos. "The software helps perform control tasks during the machining process, such as monitoring the status of the tool, updating the tool measurement and adaptive machining, depending on the results gathered by the probe."

"With the help of the Renishaw probe and software, Honeywell can be sure that the machining process will run as expected. Before the new technology was introduced, the machine operator would fit the part, set the gauge and state the diameter and the faces. If any of this information was missed, inaccurate, or if the fixture was damaged, the final product would not be suitable. Now, we can nip any defects in the bud by detecting them in advance. Although it was always possible to rework incorrect parts after machining, it did come at a cost to the business. Receiving real-time data from the Renishaw on-machine probing system helps eliminate the chance of the same problems occurring on multiple parts, as we are able to adapt the machining process based on feedback from the probe. Renishaw's equipment has helped us improve our machining process, reduce machine downtime and produce rightfirst-time impellers for today's commercial aerospace sector," concluded Gallegos.

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'Manufacturing sector growth to sustain in coming months'



Existing average capacity utilization over 70% reflecting sustained economic activity

he growth momentum picked up by the manufacturing sector in the last few months is likely to be sustained for the next six to nine months, as assessed by the latest FICCI Quarterly Survey on Manufacturing.

FICCI's latest Quarterly Survey on Manufacturing reveals that after experiencing revival of Indian economy in FY 2021-22, the momentum of growth continued in subsequent quarters of Q1 (April-June 2022-23) and Q2 (July-September 2022-23) with over 61% respondents who reported higher production levels in Q2 (July-September 2022-23). This is significantly more than the percentage of respondents experiencing higher growth in Q2 of the last few years, including pre-COVID years too. This assessment is also reflective in order books, as 54% of the respondents in Q2 (July-September 2022-23) had higher number of orders.

FICCI's latest quarterly survey assessed the sentiments of manufacturers for Q2 (July-September 2022-23) for ten major sectors namely automotive & auto components, capital goods, cement, chemicals fertilizers and pharmaceuticals, electronics, machine tools, metal & metal products, paper products, textiles, textile machinery and miscellaneous. Responses have been drawn from over 300 manufacturing units from both large and SME segments with a combined annual turnover of over 2.8 lakh crores.

Capacity Addition & Utilization

- The existing average capacity utilization in manufacturing is over 70%, which reflects sustained economic activity in the sector.
- The future investment outlook also slightly improved, as compared to the previous quarter, as close to 40% respondents reported plans for capacity additions in the next six months, by as much as over 15% on an average.
- 3. Global economic uncertainty caused by the Russia-Ukraine

FICCI Survey



War and increasing cases of various mutations of the COVID virus worldwide have accentuated the volatilities, impacting the major economies. High raw material prices, increased cost of finance, cumbersome regulations and clearances, shortage of working capital, high logistics cost due to rising fuel prices and blocked shipping lanes, low domestic and global demand, excess capacities due to high volume of cheap imports into India, unstable market, high power tariff, shortage of skilled labour, highly volatile prices of certain metals, etc. and other supply chain disruptions are some of the major constraints, which are affecting the expansion plans of the respondents.

The table on the right, gives the average capacity utilization for various sub-sectors of manufacturing.

Inventories

87.32% of the respondents had either more or the same level of

inventory in Q2 July-September 2022-23, which is same as compared to that of the previous quarter, where around 86.19% respondents expected either more or same level of inventory.

Exports

The outlook for exports seems to be positive, as over 42% of the respondents expect a high increase in exports in Q2 2022-23, as compared to the Q2 July-September of FY 2021-22.

Hiring

Hiring though positive, remains below potential, as 36% of the respondents in Q2 2022-23 were looking at hiring additional workforce in the next three months.

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

Sector	Average Capacity Utilization	
Automotive & Automotive Components	90%	
Capital Goods	73%	
Cement	75%	
Chemicals, Fertilizers & Pharmaceuticals	70%	
Electronics	65%	
Machine Tools	68%	
Metals & Metal Products	64%	
Paper Products	95%	
Textiles	69%	
Textile Machinery	90%	
Miscellaneous	80%	

Table: Growth expectations for Q2 2022-23 compared with Q2 2021-22



Sector	Growth Expectation
Automotive	Strong
Capital Goods	Moderate
Cement	Moderate
Chemicals, Fertilizers & Pharmaceuticals	Moderate
Electronics	Moderate
Machine Tools	Moderate
Metals & Metal Products	Moderate
Miscellaneous	Moderate
Paper Products	Moderate
Textiles	Strong
Textile Machinery	Strong

Note: Strong > 10%; 5% < Moderate < 10%; Low < 5%

Source: FICCI Survey

Interest Rate

Overall, the average interest rate paid by the manufacturers has decreased to 8.37% p.a. as against 9.3% p.a. during the last quarter and the highest rate at which loan has been raised is 13.5% p.a. High lending rates were reported by around 62% of the respondents.

Sectoral Growth

Based on expectations in different sectors, all sectors were expected to register moderate to strong growth in Q2 2022-23, as given in the table above.

Production Cost

The cost of production as a percentage of sales for

manufacturers in the survey has risen for 94% respondents in the quarter. Reduced availability and 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.

Workforce Availability

Most sectors have sufficient labour force engaged in their operations and are not facing shortage of labour at factories. While 81% of the respondents mentioned that they do not have any issues with workforce availability, the remaining 19% feel that there is still lack of skilled workforce available in their sector. •

> Article, graph and tables courtesy: FICCI Media Division

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IIT-M and GE Joint Innovation Program: Product enters testing phase at National Aerospace Laboratories



product developed by IIT Madras (IIT-M) and GE Aviation (GE) under a joint innovation program started in 2016 has now entered the testing phase. The locally designed and developed aviation high-speed Micro Turbomachine is being tested at National Aerospace Laboratories (NAL), an important step towards technology maturation.

"The development of Micro Turbomachine is a shining example of academia-industry collaboration to drive innovation in India. It was designed and developed as part of Ucchatar Avaishkar Yojana (UAY) launched by the Government of India to promote industrial innovation of a higher order that addresses the needs of the local industry. We are excited to see the enhanced aviation testing facilities at NAL. Testing is an important part of product development cycle, and we are delighted to work with NAL on testing the locally designed and developed Micro Turbomachine," said Alok Nanda, CEO, GE India Technology Centre & CTO GE South Asia.

During the product design process, GE and IIT-M engineers

Image credit: IIT-M and GE Joint Innovation Program

and researchers worked together to develop a local aviation supplier ecosystem for the manufacture of high-precision and high-speed turbomachinery that adhered to global aviation industry manufacturing standards. Two local aviation industry companies Pragati Transmission Pvt. Ltd. and Turbocam India Pvt. Ltd. participated in the manufacture

The development of Micro Turbomachine is a shining example of academia-industry collaboration to drive innovation in India. It was designed and developed as part of Ucchatar Avaishkar Yojana (UAY) launched by the Government of India to promote industrial innovation of a higher order that addresses the needs of the local industry. Alok Nanda, CEO, GE India Technology Centre & CTO GE South Asia



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and assembly of the prototype.

"The project was conceived by Late Professor B. V. S. S. Prasad (former head of the Department of Mechanical Engineering Department, IIT-M). His team of talented researchers and faculty members could meet the demands and challenges of developing the Micro Turbomachine. It took us months to conduct several simulations necessary to arrive at the optimum design of the product. Further, test rigs were designed and developed with active collaboration between IIT-M and GE teams. Throughout the process, the researchers were in touch with GE Aviation engineers and there was a free and friendly exchange of knowledge between

GE & IIT-Madras Collaboration for Aviation

IIT-M and GE signed a memorandum of understanding (MoU) in 2016 to collaborate on research and development. An investment of about INR 10 crores (INR 100 million) over the last five years was funded — 75% by IIT-M through the UAY scheme of Government of India and 25% by GE. Under this scheme, a new Micro Turbomachine was designed, manufactured, and is being readied for testing in India.

them. It is unfortunate that Professor B. V. S. S. Prasad and Dr. S. Soundarpandian left us for their heavenly abode and could not witness their efforts bearing fruit," said Prof. A. Seshadri Sekhar, principal investigator of the project and the current Head of the Mechanical Engineering Department, IIT-M.

"NAL has established Versatile Turbine Test Rig (VTTR) for highspeed turbine testing up to 50,000 rpm & 500 kW power and it will be used for performance evaluation of Micro Turbomachine developed by IIT-M and GE. We are proud to be part of the journey towards technology maturation," said Shri Jitendra J. Jadhav, Director, CSIR-National Aerospace Laboratories and congratulated teams of CSIR-NAL IIT-M and GE.

> Article courtesy: © 2022 General Electric

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Application & features
Product image
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For more details write us mail at tt.edit@tagmaindia.org tagma.mumbai@tagmaindia.org

National

Auto Expo 2023

The Auto Expo, over the years has grown tremendously in size and transformed itself into a global event. Owing to the tremendous growth of Auto Expo - Asia's largest Automotive expo is now seen at two different venues with clear focus on Automobiles (Auto Expo - Vehicles) and Components (Auto Expo - Components)

Date: Jan, 12-15 Venue: Pragati Maidan, New Delhi Organiser: ACMA, CII, SIAM Contact: +91 0124 4060 neelam.bhagat@cii.in

IMTEX 2023

IMTEX is a flagship event for the Indian metal cutting industry. It is South Asia's apex exhibition showcasing the latest trends as well as technological refinements from India and other global players. The mega event attracts visitors from a wide spectrum of manufacturing and ancillary industries including key decision and policy makers as well as industry captains who are keen to source latest technologies and manufacturing solutions for their product lines.

Date: Jan, 19-25 Venue: BIEC, Bengaluru Organiser: IMTMA Contact: +91 80 6624 6600 info@imtex.in

PLASTINDIA 2023

10 exhibitions old, today, Plastindia has grown into a global experience, covering the entire gamut of plastics producers, processors and users of plastics, and it witnesses intense participation by both Indian and International Plastics Fraternity.

Date: Feb, 01-05 Venue: Pragati Maidan, New Delhi Organiser: PLASTINDIA FOUNDATION Contact: +91 22 26832911/14 contact@plastindia.org

International

Intermold Korea 2023

INTERMOLD KOREA is the only mold exhibition in Korea and is held every two years. It promote the development of dies, molds and related equipment and facilitate the exchange of cutting-edge technology and Know-how.

Date: Mar, 14-18 Venue: KINTEX Exhibition Center, Seoul Organiser: Korea Die & Mold Industry Cooperative (KODMIC) Contact: +82 (2) 783-1711 koreamold@koreamold.com

Intermold Japan

Largest exhibition for tooling industry in Japan with global participation. The exhibition showcases latest in the die mould industry and provide ideal opportunities for technology providers to showcase their capabilities.

Date: Apr, 12-15 Venue: Tokyo Big Sight, Tokyo Organiser: Japan Die & Mold Industry Association Contact: +81-6-6944-9911 / iminfo2023@tvoe.co.jp

Hannover Messe 2023

HANNOVER MESSE is the most important international platform and hot spot for industrial transformation - with excellent innovations or unusual products.

Date: April 17 - 21 Organiser: Deutsche Messe AG Contact: +91 022 41562727 / yash.panchal@hmf-india.com

Moulding expo 2023

Moulding Expo is one of the most important European events for tool, pattern and mould making.

Date: Jun, 13-16 Venue: Messe Stuttgart Organiser: Landesmesse Stuttgart GmbH Contact: +49 711 18560 0 / info(at)messe-stuttgart.de

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