

TAGMA TIMES

NEWSLETTER

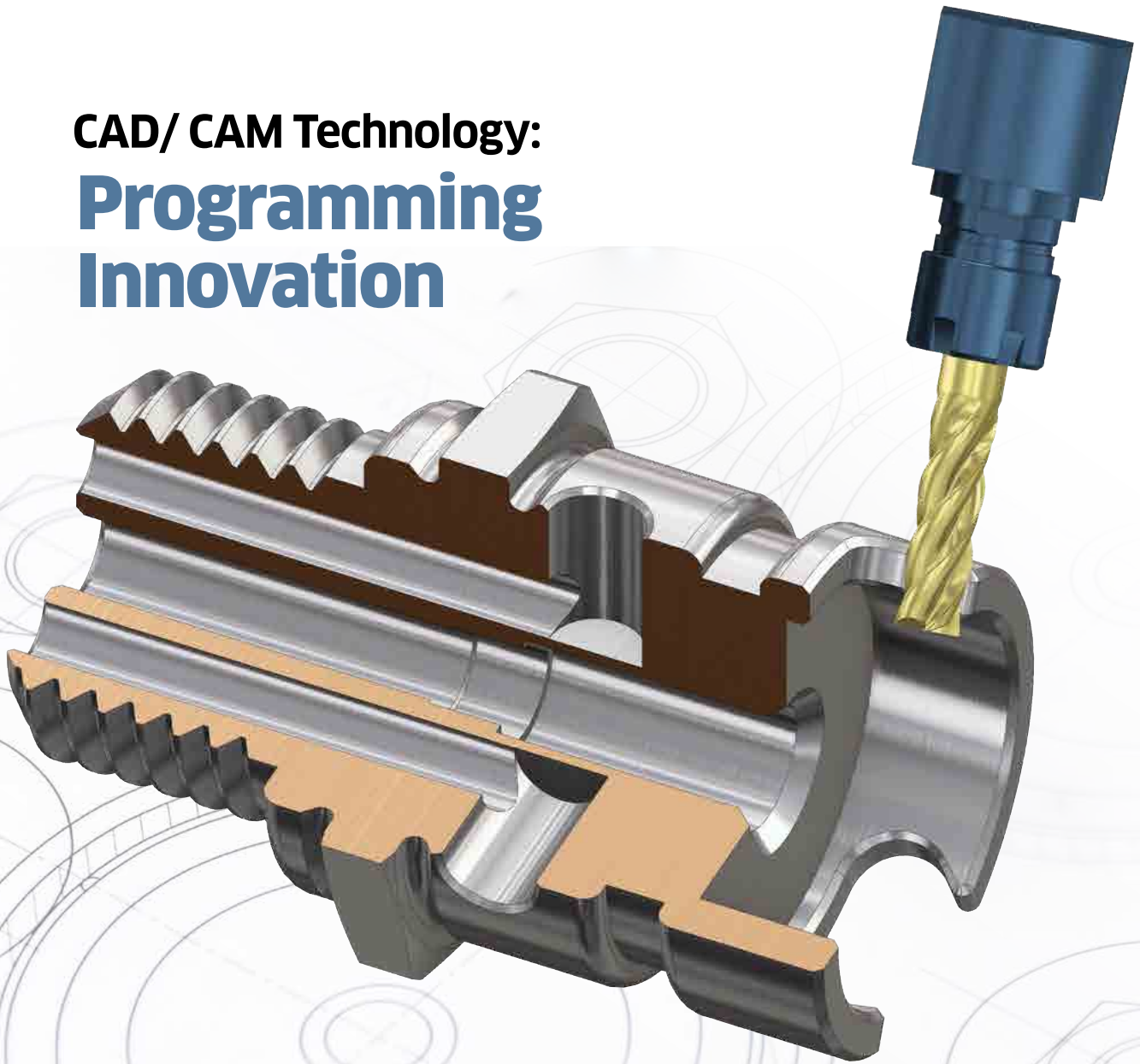
(Technical Info. on Die, Moulds & Toolroom)

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June 2023

CAD/ CAM Technology: Programming Innovation



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CAD/CAM technology:
The present and the future

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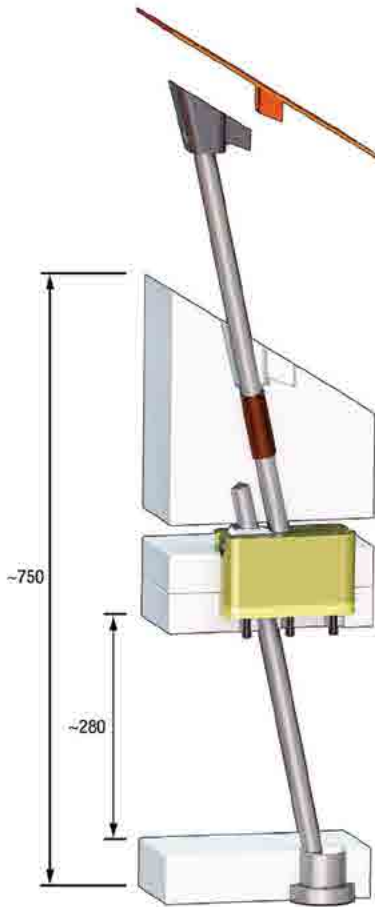
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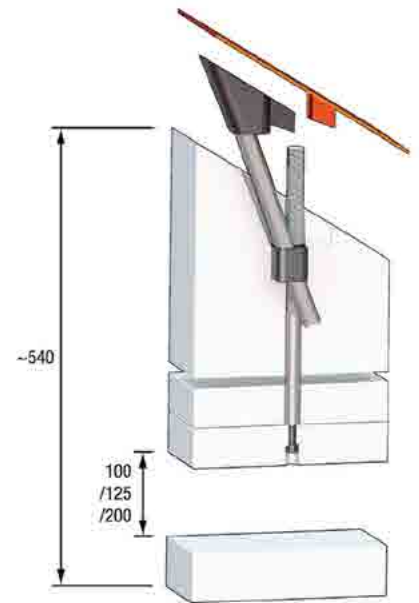
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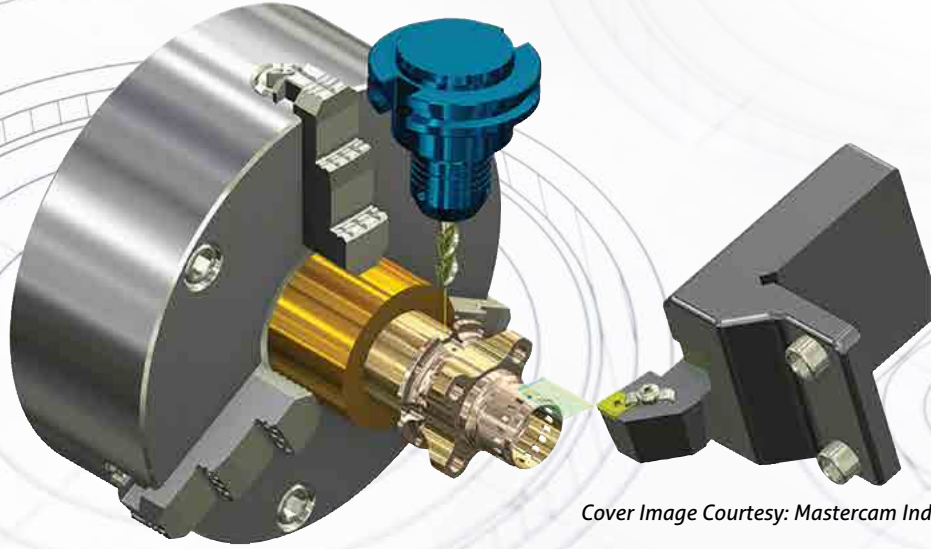
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CONTENT



Cover Image Courtesy: Mastercam India Pvt Ltd

IN FOCUS

20

**CAD/CAM technology:
The present and the future**

LEADERS SPEAK

24



**Vineet Seth,
Managing Director –
South Asia & Middle
East, Mastercam APAC**

30



**Sambit Pradhan,
Sr. Area Sales Director
- India & APAC, HCL
Technologies Ltd.**

32



**Sreenivas Ramaswamy,
Technical Sales Manager
- India ASEAN ANZ,
Autodesk India.**

38



**Sunil Desai,
Founder Director,
Designcell CAD CAM
Solutions Pvt. Ltd.**

TAGMA EXECUTIVE COUNCIL.....	4
EDITORIAL.....	6
INDUSTRY UPDATE.....	8
CASE STUDY - CAM AUTOMATION AND LIBRARY REVITALISE PRECISION MANUFACTURE.....	40
CASE STUDY - SOLID EDGE HELPS DEVELOP HIGH-QUALITY INJECTION MOULDS.....	46
TIPS & TRICKS.....	52
EVENT LIST	53
INDEX.....	54



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Fax : + 91 44 2434 1181
Email : info@pck-buderus.com

Pune Stock Holding Center Machining Division

New Gat 754, Pune Nagar Road
Wagholi, Pune - 412 207
Tel : + 91 20 2705 1958, 3254 6767
Fax : + 91 20 2705 0700
Email : punewh@pck-buderus.com

Ludhiana Stock Holding Center

C-1, Industrial Area C, Jaspal Main Road,
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Tel : + 91 161 6532016 / 2017 / 2510073
Fax : +91 161 2510072
Email : ludwh@pck-buderus.com

Kolkatta Office

Fiat No. 403, Vishal Apartments
4th Floor, No. 18,
Prince Anwar Shah Road,
Kolkatta - 700 033
Tel : + 91 33 2417 1078
Email : info@pck-buderus.com

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Email: tagma.bangalore@tagmaindia.org
Contact: Mr. Ashok Shetty - Secretary
Cell.: +91 98453 97780

CENTRAL OFFICE

A-33, NandJyot Indl. Estate,
Safed Pool, Mumbai - 400 072.
Cell.: +91 96534 27396 / 97694 07809
Email: tagma.mumbai@tagmaindia.org

PUNE OFFICE

Plot A-22/2, Chakan Industrial Area,
Phase II, M.I.D.C., Village Khalumbre
410501
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Cell.: +91-95276 89700
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COIMBATORE CHAPTER

C/o. S & T Engineers (P) Ltd.
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Singanallur, Coimbatore - 641 005.
Tel.: 0422-2590810 • Fax : 0422-2573629
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Mr. D. M. Sheregar
Devu Tools Pvt. Ltd., Mumbai – 400 072
Email: president@tagmaindia.org; sheregar@devutools.com

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Sridevi Tool Engineers Pvt. Ltd., Vasai – 401 208
Email: akshay@sridevitools.com

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Email: paresh@digitaltoolroom.com

Mr. Parveen Satija
Stitch Overseas Pvt. Ltd., Gurgaon – 122 004
Email: parveen@stitchtools.com

SECRETARIAT

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Editorial Team

Nishant Kashyap, *Editor* | Kimberley D'Mello, *Associate Editor*



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NISHANT KASHYAP

Editor

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The evolution of CAD/CAM technology has been nothing short of remarkable. From its humble beginnings as a 2D drafting software to the sophisticated 3D modeling and simulation tools available today, CAD/CAM has revolutionised the way products are conceived, developed, and brought to life. The ability to create virtual models, simulate real-world scenarios, and optimise designs has empowered engineers and designers to push the boundaries of innovation.

Advancements in CAD/CAM technology have enabled seamless collaboration and integration across teams, departments, and even continents. With cloud-based platforms, real-time collaboration has become a reality, eliminating traditional barriers and fostering a truly global approach to design and manufacturing. The era of geographically dispersed teams working on the same project simultaneously has arrived, bringing together diverse expertise and driving innovation at an unprecedented pace.

The integration of Artificial Intelligence (AI) and Machine Learning algorithms within CAD/CAM software has further amplified its capabilities. These intelligent systems can analyse vast amounts of data, identify patterns, and offer valuable insights to enhance design efficiency, optimise manufacturing processes, and minimise errors. The marriage of AI and CAD/CAM technology opens new avenues for automation and optimisation, leading to increased productivity and reduced time to market.

In the June edition of TAGMA Times, we had the privilege of engaging with industry leaders, who shared their invaluable insights on the impact of CAD/CAM technology. Their perspectives shed light on how this technology is reshaping industries such as automotive, aerospace, healthcare, and consumer goods. From streamlining product development cycles to improving manufacturing efficiency, CAD/CAM technology is at the heart of their success stories.

We hope that this edition of TAGMA Times serves as a valuable resource, enlightening and inspiring you to embrace the transformative power of CAD/CAM technology. Together, let us shape a future where imagination knows no bounds and where innovation thrives.

Happy Reading!

A handwritten signature in black ink that reads "Nishant".



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Cisco to manufacture in India as it targets over \$1bn in combined exports and domestic production

Cisco, a global technology leader, recently announced that it will start manufacturing in India, a major step in the expansion of its footprint in the country. This move is a part of Cisco's strategy to create an even more diverse and resilient global supply chain and support India's vision of becoming a global manufacturing hub. With this latest investment, Cisco will cater to the growing demand from customers in India and aims to drive more than \$1 billion in combined domestic production and exports in the coming years.

The creation of a new manufacturing operation was announced by Cisco Chair and CEO Chuck Robbins in New Delhi in May, following a meeting with Prime Minister Narendra Modi, and a series of strategic engagements with Dr. S. Jaishankar, External Affairs Minister, Rajeev Chandrasekhar, Union Minister of State for Entrepreneurship, Skill Development, Electronics & Technology, B. V. R. Subrahmanyam, CEO of NITI Aayog, and K. Rajaraman, Telecom Secretary.

"Fueled by a rapidly developing digital economy, India is a focal point of innovation and business for Cisco, and we remain deeply committed to our partnerships here," said Robbins.

The manufacturing facility will build Cisco's best-in-class



technology, designed to provide flexible, cost-effective delivery of next-generation services and applications and support complex cloud computing environments. Cisco is now building core manufacturing capabilities in India, including testing, development and logistics, and expanding in-house repair operations.

"India is of strategic importance for Cisco, and we continue to bet on India. This announcement marks a significant milestone to power the next phase of growth for Cisco. This investment will enable us to bring state-of-the-art technologies to more people and businesses and help accelerate India's transition into a leading digital economy," said Daisy Chittilapilly, President, Cisco India & SAARC. ♦

Government reduces FAME-II subsidy on electric two-wheelers from June 1

The government has reduced the subsidy provided under FAME-II (Faster Adoption of Manufacturing of Electric Vehicles in India) scheme applicable on electric two-wheelers registered on or after June 1, 2023.

The Heavy Industries Ministry notified the changes. For electric two-wheelers, the demand incentive will be

INR 10,000 per kWh. The cap on incentives for electric two-wheelers will be 15 per cent of the ex-factory price of vehicles from 40 per cent at present.

The Faster Adoption and Manufacturing of Electric and Hybrid Vehicles (FAME) India scheme commenced on April 1, 2019, for a period of three years, which was further extended for a period of two years up to March 31, 2024.

The total outlay for FAME Scheme Phase II is INR 10,000 crore to provide incentives to buyers (end users or consumers) of electric vehicles to enable wider adoption, which may be encouraged as a purchase price. The scheme is exclusively for public and commercial transport in the segments of electric three-wheelers (e-3W), electric four-wheelers (e-4W), and electric buses.

The benefit of the incentive is available to privately owned registered electric two-wheelers (e-2W). ♦



Illustration courtesy TATA Capital

Courtesy PTI News

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Garuda Aerospace, HAL's subsidiary Naini Aerospace partner to scale indigenous drone manufacturing

Garuda Aerospace and Naini Aerospace, a wholly owned subsidiary of Hindustan Aeronautics Limited (HAL) under the administrative control of the Ministry of Defence, have signed a joint development partnership. It will enable Garuda to manufacture Advanced Precision Drones on Indian soil for various applications. The drones will be able to carry a payload of around 25 kg, according to Garuda Aerospace.

"Our Prime Minister's vision of achieving the milestone of 1 lakh 'Made in India' drones by 2024 is well on track. Our partnership with Naini Aerospace is a natural next step for us. Our drone yatra has also been a grand success and we have pre-booked over 7000 drones at INR 4.5 lakhs each," said Agnishwar Jayaprakash, founder and CEO, of Garuda Aerospace.

Garuda Aerospace recently partnered with BEML at Aero India for drone manufacturing at their Mysore facility and initiated a massive indigenization campaign. The company has also collaborated with 120 local suppliers with the objective of reducing reliance on foreign imports of drone parts, components, and Unmanned Aerial Vehicles subsystems.

R. R. Thakur, Chief Executive Officer, Naini Aerospace Limited (NAeL), said, "We are very excited to be working along with Garuda Aerospace on the rapidly evolving drone sector. Our experience with the production of



Image used for representation only. Courtesy Envato Elements.

helicopter structures was launched on July 11, 2018, in a newly constructed aerostructure hangar equipped with state-of-the-art facilities. The first batch of helicopter structures duly cleared by the Director General of Aeronautical Quality Assurance (DGAQA) was delivered to the Helicopter Division of Hindustan Aeronautics Limited on November 22, 2018. NAeL has now reached the level of full-fledged operationalization with proven capabilities in the field of production of aerostructures and aircraft loom manufacturing." ♦

Courtesy ANI

South Korea's Hyundai Motor to invest \$2.45 billion in Indian state

South Korea's Hyundai Motor Co. recently said it will invest 200 billion rupees (\$2.45 billion) in the Indian state of Tamil Nadu over the next 10 years to beef up electric vehicle production in the world's most populous country. Tamil Nadu's Chennai, dubbed the Detroit of Asia, is a hub for automobile manufacturing where the likes of Ashok Leyland, TVS Motor and Renault-Nissan churn out millions of vehicles every year.

Hyundai, through its Indian subsidiary Hyundai Motor India, will also set up a battery pack assembly unit with an annual capacity of 178,000 units and install 100 EV charging stations across the southern state in the next five years, it said in a statement.

The company plans to increase the production volume at its factory near Chennai to 850,000 vehicles per year from roughly 775,000 currently. However, the car maker did not disclose a timeline to achieve the

target, citing volatile demand. Hyundai also expects its export volumes to hit 319,000 vehicles by 2032, from 181,000 in 2022. The investment plan comes days after India's federal government said it would raise taxes on imported vehicles to boost local manufacturing.

Hyundai is also developing a local vendor base for EV parts instead of importing them, as the government's production incentive scheme is applicable only when manufacturing is done within the country, Puneet Anand, a senior executive for corporate affairs, said in a news conference.

India's EV industry is growing rapidly with a slew of launches by domestic carmakers Tata Motors and Mahindra & Mahindra as well as global rivals Nissan Motor and Renault SA. Hyundai is lining up five new EV launches in the third largest car market in the world, targeting a 20% share by 2032. ♦

Courtesy Reuters





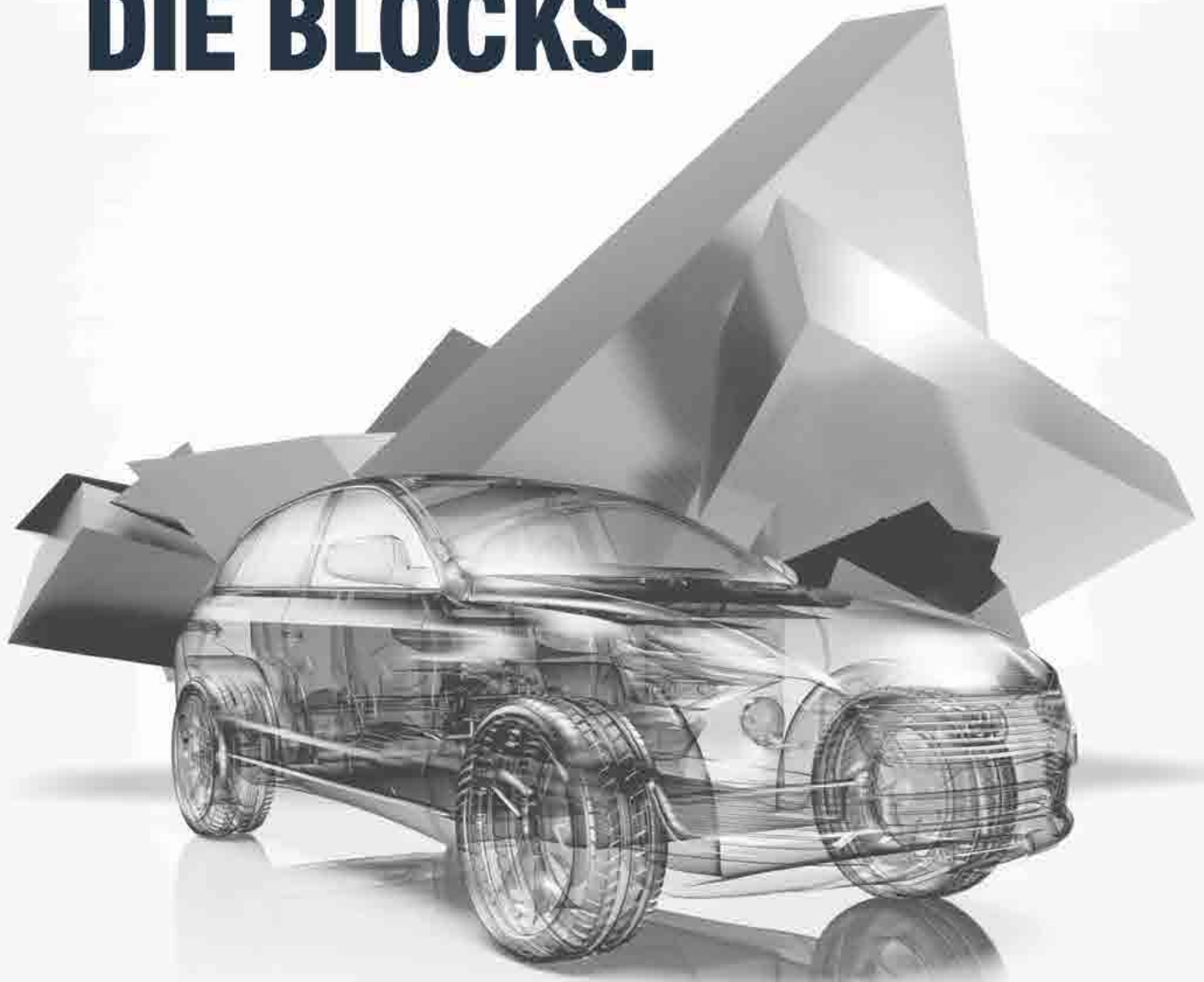
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Ola Electric begins working on its cell gigafactory amid buzz of Tesla setting up manufacturing plant in India

Ola Electric, an electric vehicle maker, recently said it has started working on its first cell gigafactory in India. Ola CEO Bhavish Aggarwal tweeted that the company has started working on its cell gigafactory. Aggarwal claimed that this factory will be "India's biggest and amongst the worlds biggest cell factories".

The tweet also contained a video and images of workers working on the construction of the plant. This comes at a time when Elon Musk's Tesla is in talks with the Indian government regarding setting up its own manufacturing plant in the country.

Last year, Ola CEO had announced that the firm plans to launch its own lithium-ion cell by the end of 2023. These lithium-ion cells are used in the batteries of electric vehicles. As of now, Indian EV manufacturers rely on China, Taiwan, Japan, and Korea for lithium-ion battery cells. This factory's initial capacity is expected to be 5 gigawatts.



Image Courtesy @bhash on Twitter

"We will be India's first and largest lithium cell manufacturers. We had been building the technology for the last two years... we have already built our own tech without any dependence on other countries or players," said Aggarwal.

This Ola gigafactory is located in Krishnagiri, Tamil Nadu. Aggarwal had stated, "We are putting up a large Gigafactory in Krishnagiri for the lithium-ion cell...we will first utilise it to our bikes and think of monetising the same and make it available for the market."

Talking about Ola Electric's 2023 agenda, Bhavish Aggarwal said that the company aims to focus on manufacturing motorbikes, lithium-ion cells and entering the commercial vehicle space. "Our investment focus for 2023 will be getting into small and light-weight commercial vehicles, motorbikes and launch other products as well along with lithium-ion cells," he said.

♦ Courtesy Business Today

Statiq wins order from HPCL for over 500 EV chargers in 12 states

EV charging network provider Statiq recently said it has won a contract from public sector oil marketing firm, HPCL, for setting up over 500 EV chargers across 12 states.

Under the contract, the firm will install over 500 chargers, for all types of electric vehicles, including two and four-wheelers, at HPCL's outlets spread across Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu and West Bengal, the company said in a statement.

Of the total 500 chargers, over 400 chargers will be of 3.3 kw capacity each, while a few more than a hundred chargers will be of 7.7 kw capacity each, it stated.

"With HPCL undertaking a major and country-wide exercise in terms of setting up EV charging stations at their petrol pumps, we have won this tender and become a part of their EV infrastructure building up journey," said Aman Rehman, head of government relations at Statiq.

Last year, Statiq had installed nearly 200 chargers some 130 chargers of 3.3 kw and 75 chargers of 7.7 kw capacity at

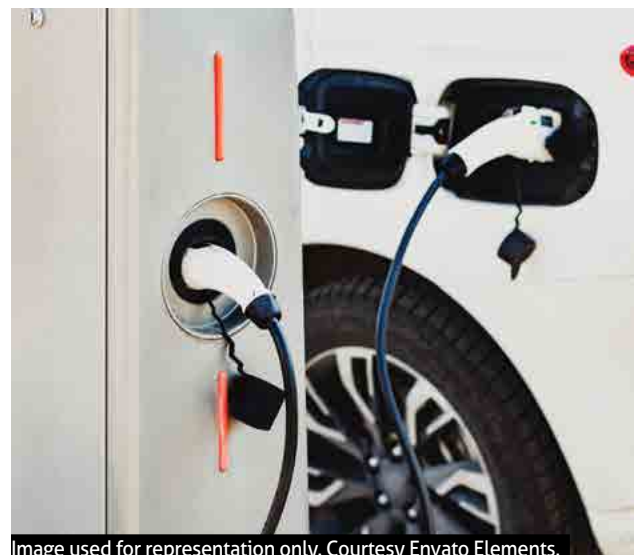


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HPCL's outlets in cities such as Gorakhpur, Kanpur, Lucknow, Patna, Agra, Meerut, Dehradun and Varanasi.

♦ Courtesy PTI News



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Siemens consortium partners with Gujarat Metro Rail Corporation for advanced rail electrification technologies

Siemens Mobility, as part of a consortium with Rail Vikas Nigam Limited, received two separate orders from Gujarat Metro Rail Corporation Limited (GMRL) for the Ahmedabad Metro Phase 2 and for the Surat Metro Phase 1. Both cities are in the western state of Gujarat. Siemens Mobility's share, as part of the consortium, is worth approximately €75 million.



Image Courtesy Siemens

Andre Rodenbeck, CEO of Rail Infrastructure, Siemens Mobility, said: "We are proud not only to supply our state-of-the-art technologies for both lines, but also our local know-how. India's sustainable transformation of the transport sector is in full swing, and with both projects, in the cities of Surat and Ahmedabad, the local Mass Rapid Transit systems

will develop into a world-class public transportation system for the people. This will be a huge advantage for travelers but also for the environment where technology strengthens sustainability."

The first order is for Ahmedabad Metro Phase 2, which comprises two corridors covering more than 28 kilometers and features 23 stations and one depot. The second order is for Surat Metro Phase 1 being built to serve Surat with a route length of more than 40 kilometers, covering 38 stations and two depots. In addition, Siemens Mobility will also be providing advanced digital solutions including Supervisory Control and Data Acquisition (SCADA) for both metros, to increase reliability, energy efficiency and productivity. ♦

Xiaomi partners with Dixon Technologies to make mobile phones in India



Contract manufacturer Dixon Technologies (India) Ltd. recently said it is partnering with Xiaomi Corp's Indian arm to make and export phones for the Chinese firm.

The news, which boosted Dixon's shares by 4%, comes after Xiaomi India revealed plans to start making wireless audio products in the country by partnering with electronics manufacturer Optimus.

India has been encouraging global companies to invest more in local manufacturing as a part of its efforts to become a powerhouse in the global electronics supply chain.

Earlier in March, Xiaomi India President Muralikrishnan B. told Reuters that the company will open more stores beyond its current network of 20,000 retail partners and boost local procurement of mobile phone parts, in an effort to reduce costs. ♦

Courtesy Reuters

India's Tata Group signs \$1.6 billion EV battery plant deal

India's Tata Group recently signed an outline deal on building a lithium-ion cell factory, based on investment of about 130 billion rupees (\$1.58 billion), as part of the nation's efforts to create its own electric vehicle supply chain.

Compared to the size of its population, India's car market is tiny.

Tata Motors dominates its electric vehicle (EV) sales, which made up just 1% of India's total car sales of about 3.8 million last year.

A joint statement on the memorandum of understanding, between Tata's unit Agratas Energy Storage Solutions and the government of the western state of Gujarat, said work on the plant, to be based in Sanand, northern Gujarat, was expected to start in less than three years.

It would have initial manufacturing capacity of 20 Gigawatt hours (GWh), which could be doubled in a second phase of expansion, the statement said.

"The plant will go a long way in contributing to the development of the EV ecosystem in Gujarat and India," Vijay Nehra, an official in the Gujarat state government told Reuters. ♦

Courtesy Reuters



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Renishaw launches new line of products for industrial automation



Global engineering technologies company, Renishaw, is set to unveil a newly developed product line specifically designed for the industrial automation market. Building on its existing expertise and technologies for industrial metrology applications, the new RCS product line aims to transform the process of commissioning and servicing industrial automation technologies.

The new product line has been developed to solve some fundamental challenges within the global industrial automation industry. It focusses on the problems associated with manual set-up, calibration and maintenance of robots, such as operational accuracy and repeatability. The range comprises three products: RCS L-90, RCS T-90 and RCS P-series, all supported by a dedicated software suite.

RCS L-90 is a ballbar device, which improves robot system accuracy, reduces deployment time and monitors robot health with simple routines controlled by its supporting software suite. RCS T-90 is a tri-ballbar system, which enables robot users to identify root causes of poor performance, with further comprehensive tests to capture critical robot information – such as remastering the joint offsets to calculated positions, running master-recovery routines, and plotting 3D path performance. The third RCS product, RCS P-series, integrates a permanent Renishaw probing solution within a robot cell to apply in-process metrology and automatic recovery to automation processes.

Will Lee, Renishaw's Chief Executive, says, "Our success over 50 years has been built on providing robust and reliable products that solve manufacturing problems across a wide range of industry sectors." He continues, "With the global growth in the use of robots, which are increasingly



being used for precision production applications, we are seeing significant challenges with aspects of robot operation. We believe we can address these based on decades of experience providing solutions for calibration and set-up within the machine tool and motion control industries."

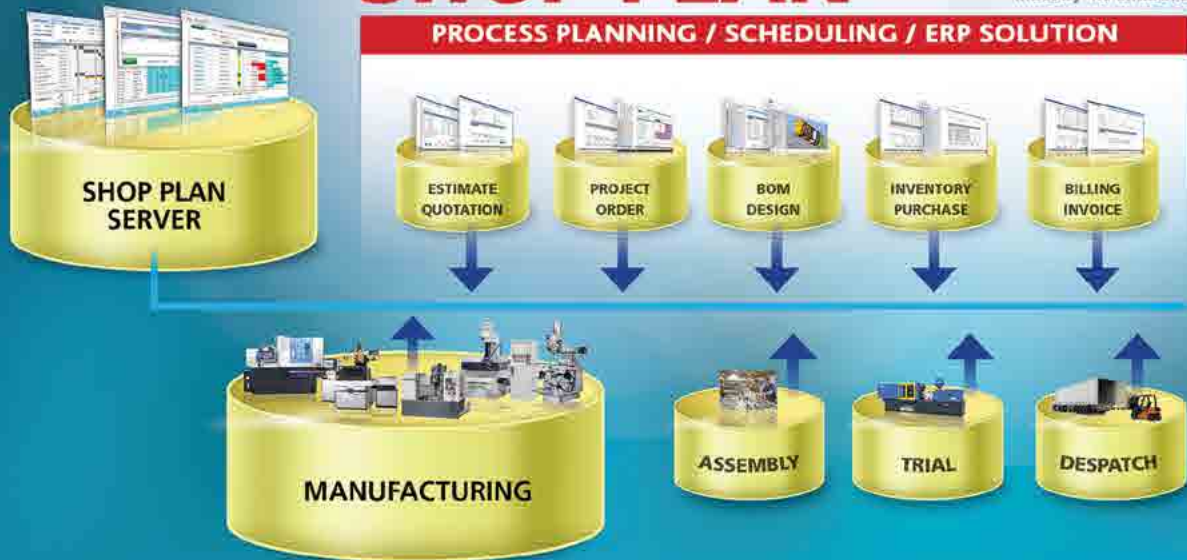
Built upon established and trusted Renishaw technology, this new product line for industrial robotics brings the company's metrology expertise to an industry that has significant challenges with performance accuracy and repeatability. Categorised as either 'in-field' or 'in-process' products, the new RCS products help to simplify robot set-up, health checks and recovery of robotic applications following collisions. Working with Renishaw's new intuitive robotics software, RCS Software Suite, the products support robots from a wide range of manufacturers.

"The existing processes surrounding robot set-up and maintenance are largely manual for an industry built upon automation," says Dr. Kevyn Jonas, Director of Renishaw's Industrial Automation Products Division. "With no existing fully comprehensive solutions, these methods have been accepted, until today. Robot integrators and users now finally have a solution for a quick, simple and traceable means to manage their robots."

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Optimised set-up time thanks to multi coupler

Meusburger offers the perfect solution for optimising set-up times with their system EU & USA multi couplers. The various multi couplers from Meusburger make it possible to connect the temperature control circuits in just one step. Through the central connection, customers benefit from optimised set-up times of the temperature regulation components of, for example, 20 minutes down to 20 seconds. Errors such as mixing up the hoses can also be avoided. This makes set-up processes not just fast, but also easy and reliable. Time savings start already in the design phase thanks to clear selection, CAD data and ordering at the press of a button, as well as delivery from stock.

It makes sense to use the same coupling profile that is currently in use. This allows coupling to the multi coupler on the mould parallel to the changeover of the individual hoses on the machine. For this purpose, Meusburger offers the multi coupler in the systems EU (E 2861 / E 2871), USA



(E 2862 / E 2872) and RMI-Stäubli (E 2830 / E 2833). In mould making, the pressure test can then also be carried out with single couplers. In the Meusburger range, the multi couplers are available with free flow or with valve. Due to the modular design, the connection of the hoses is possible by means of different nozzles or threads.

By preheating the mould before the changeover, the time until the first good part can often be significantly reduced again. Due to the simple connection option, the multi coupler is also ideal in this situation. With frequent mould changes, downtimes can be greatly reduced and the number of skilled personnel required can be significantly minimised.

WIDIA introduces M8065HD indexable milling platform for heavy roughing

WIDIA™ recently announced the release of the M8065HD indexable milling platform for heavy-duty milling operations in steel and cast iron materials. Designed with eight cutting edges and extra wide chip gashes, the M8065HD is capable of achieving deep depths of cuts while producing high metal removal rates during face milling applications.

“Face milling is one of the most common machining operations, so we designed a versatile and cost-effective solution that delivers substantial improvements in metal removal rates in steel and cast iron for our customers,” said Christine Schneider, WIDIA Senior Global Portfolio Manager. “The M8065HD represents a turnkey solution for general engineering, energy and automotive customers, who want to reduce their face milling tooling inventory and increase their machining outputs.”

Engineered with a 65-degree approach angle with

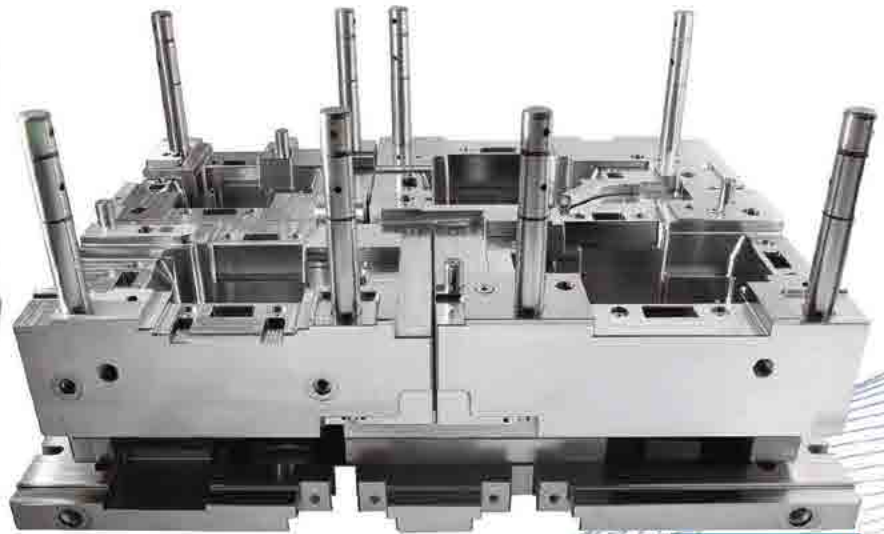
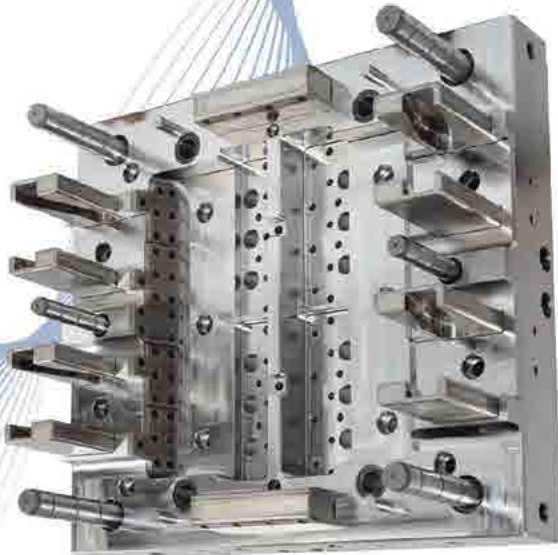


a 6.35 mm thick insert, the M8065HD has one universal insert geometry in three versatile grades: WP35CM, WK15CM and WU20PM. The WP35CM grade targets all types of steels, while the WK15CM grade is designed for cast iron materials and performs best in dry applications but can also be used in wet conditions. The

universal WU20PM grade can be used for the machining of steel, stainless steel and high-temperature alloys in both dry and wet applications.

All inserts are designed with a 2.37 mm wiper facet to provide superior reliability and surface finish. These key design features coupled with eight cutting edge inserts enable customers to reduce overall machine set up times and inventory costs by utilising one tool for multiple operations. M8065HD indexable milling cutters are available in nine metric diameter ranges between 50 mm and 315 mm and one insert geometry.

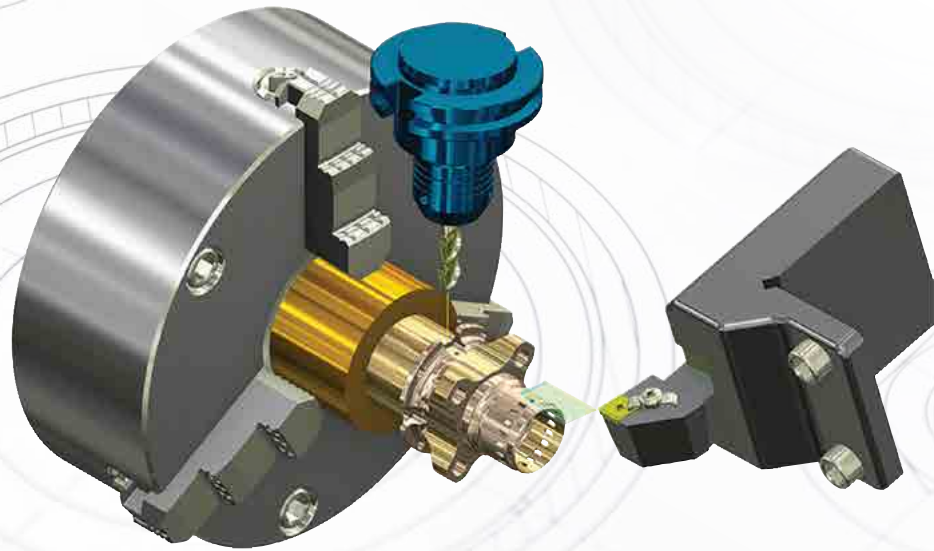
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Cover Image Courtesy: Mastercam India Pvt Ltd

CAD/CAM technology: The present and the future

The CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) industry has witnessed remarkable advancements in recent years, transforming the way we design, engineer, and manufacture products. With the ever-increasing demand for efficient and innovative solutions, it is crucial to stay abreast of the latest trends and futuristic technological developments that shape this dynamic industry. In this article, **Nishant Kashyap** explores some of the most significant trends and breakthroughs that are reshaping the CAD/CAM landscape.

The global CAD/CAM industry is experiencing steady growth and is projected to continue expanding in the coming years. The increasing demand for efficient product design, reduced time-to-market, and improved manufacturing processes have been driving the growth of the industry. And, the rising adoption of 3D modeling, simulation, and virtual prototyping have further fueled its expansion.

The business and technological advancements in CAD/CAM software are directly related to the manufacturing industry and have become an integral part of various industries, including automotive, aerospace, healthcare, consumer goods, and architecture. The expanding manufacturing sector has created an increased demand

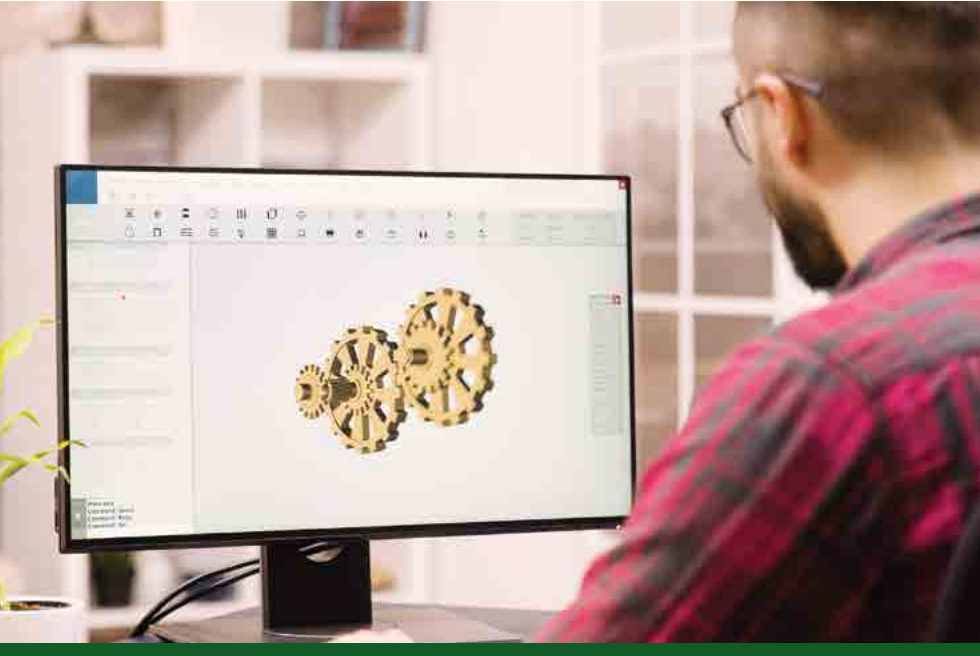
for CAD/CAM software to create complex product designs, optimise manufacturing operations, and ensure efficiency and accuracy in production, thereby supporting design and manufacturing processes. Adoption of advanced manufacturing technologies, such as CNC machining and additive manufacturing, also drive the need for CAD/CAM software to control and optimise these processes.

The global expansion of the manufacturing industry has created international market opportunities for CAD/CAM software providers to cater to manufacturers worldwide. Overall, the growth of the manufacturing industry drives the demand, innovation, and market opportunities for the CAD/CAM software business.

Technological Advancements

The growth of the manufacturing industry has led to diverse requirements across different sectors, prompting CAD/CAM software providers to offer industry-specific solutions and customisations. It has also spurred innovation and technological advancements in CAD/CAM software, with providers developing new features, tools, and functionalities to meet evolving demands. Collaboration and integration between stakeholders in the manufacturing industry are also facilitated by CAD/CAM software, which enables efficient communication, data sharing, and integration across the entire product development and manufacturing ecosystem. Let's take a look at some of the technological advancements.

Image used for representation only. Courtesy Envato Elements.



Cloud-based CAD/CAM Solutions:

The advent of cloud technology has revolutionised the CAD/CAM industry, offering enhanced collaboration, scalability, and accessibility. Cloud-based CAD/CAM solutions enable seamless sharing of design files, real-time collaboration across geographies, and on-demand scalability to handle complex projects efficiently. This trend empowers teams to work collaboratively and increase productivity while reducing infrastructure costs.

Generative Design: Generative design, powered by artificial intelligence (AI) and machine learning, is revolutionising the product design process. By defining the design parameters and desired performance outcomes, generative design algorithms generate a multitude of optimised design alternatives. This approach enables engineers to explore innovative and highly efficient designs that were previously unattainable, leading to lighter, stronger, and more sustainable

products.

Simulation and Analysis: CAD/CAM software is increasingly incorporating advanced simulation and analysis capabilities. This allows designers and engineers to perform virtual testing, evaluate the performance of designs, optimise manufacturing processes, and identify and resolve potential issues before physical prototyping or production.

Additive Manufacturing Integration: The integration of CAD/CAM systems with additive manufacturing technologies is opening up new possibilities in product development. The seamless transition from digital design to physical production allows for rapid prototyping, customisation, and complex geometries that were traditionally challenging to achieve. The CAD/CAM industry is witnessing an increasing synergy with additive manufacturing, empowering designers and manufacturers to push the boundaries of creativity and innovation.

Simulation and Virtual Prototyping:

Simulation tools have become indispensable in the CAD/CAM industry, enabling engineers to validate designs, test performance, and optimise manufacturing processes virtually. From finite element analysis (FEA) for structural integrity to computational fluid dynamics (CFD) for fluid flow simulations, virtual prototyping minimises costly physical prototyping iterations and accelerates time to market. The integration of simulation capabilities within CAD/CAM platforms streamlines the design process and enhances product performance.

Internet of Things (IoT) and Digital Twins:

The rise of the Internet of Things (IoT) has paved the way for the concept of digital twins in the CAD/CAM industry. Digital twins are virtual replicas of physical products, systems, or processes, continuously updated with real-time data from sensors. This technology enables product performance monitoring, predictive maintenance, and optimisation throughout the product lifecycle. CAD/CAM systems integrated with digital twins offer valuable insights for design optimisation, quality control, and operational efficiency.

CAD/CAM software and the die & mould industry

CAD/CAM software has transformed the die & mould industry by revolutionising the design and manufacturing processes. Design efficiency and accuracy are greatly enhanced through CAD software, enabling designers to create intricate and precise die & mould designs. The software offers specialised tools and features tailored for die & mould design, allowing for the creation of complex part geometries, inclusion of draft angles and fillets, and definition

Image used for representation only. Courtesy Envato Elements.



of clearances. This streamlines the design process, reduces errors, and ensures high accuracy in the final product.

One of the significant advantages of the new-age CAD software is its ability to provide 3D visualisation and simulation capabilities. Die & mould designers and engineers can visualise the product in detail before manufacturing, helping identify potential design issues, interference, or areas for improvement. Furthermore, CAD software often integrates simulation functionalities, enabling virtual tests, analysis of part behaviour, and optimisation of die & mould designs for performance, durability, and manufacturability.

CAD/CAM software fosters increased collaboration among different teams involved in the die & mould manufacturing process. By working together in a digital environment, designers, engineers, and manufacturers can easily share and review design files, incorporate feedback, and make real-time adjustments. This collaborative approach minimises errors, reduces rework, and improves overall

efficiency.

In the manufacturing phase, CAM software plays a vital role in generating toolpaths for CNC machines. It determines the most efficient toolpaths, cutting strategies, and machining parameters, optimising the manufacturing process for accuracy, speed, and cost-effectiveness. CAM software also allows for the simulation of machining operations, enabling manufacturers to detect and correct any potential issues before physical production.

CAD/CAM software facilitates rapid prototyping in the die & mould industry, enabling manufacturers to quickly create physical prototypes for testing and validation. This accelerates the iterative design process and reduces time to market. Additionally, the integration of additive manufacturing technologies with CAD/CAM software opens up new possibilities for rapid prototyping, allowing for the production of complex geometries and customised dies & moulds.

Overall, CAD/CAM software has significantly improved the efficiency, accuracy, and speed of die & mould

designs and manufacturing processes. It enables seamless collaboration, ensures design accuracy, and optimises the manufacturing process, ultimately leading to higher-quality dies & moulds, reduced lead times, and increased productivity in the industry.

Revolutionising manufacturing

The CAD/CAM industry is undergoing a rapid transformation, driven by technological advancements and evolving customer needs. Cloud-based collaboration, generative design, additive manufacturing integration, simulation tools, and the emergence of digital twins are just a glimpse of the exciting trends reshaping this industry. Staying informed and embracing these cutting-edge developments will empower professionals in the CAD/CAM domain to unlock new possibilities and drive innovation in product design and manufacturing. As we move forward, the CAD/CAM industry holds tremendous potential for revolutionising how we bring ideas to life and shape the future of manufacturing. ♦

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'The outlook for the CAD/CAM industry is extremely optimistic'

“The adoption rate of CAD/CAM in India is one of the highest in the world. Although the country started embracing CNC machining relatively late, i.e., around the 1990s, CAD/CAM has now become an integral part of technology acquisition for both MSMEs and large manufacturers,” says **Vineet Seth**, Managing Director – South Asia & Middle East, Mastercam APAC.



Nishant Kashyap

Q There have been significant advancements in CAD/CAM technology in the past few years. What are some of the latest technological innovations that have caught the industry’s attention?

Indeed, CAD/CAM technology has experienced significant advancements in recent times, with a focus on simplifying modelling, generating toolpaths, and improving processing capabilities. These advancements have enabled the software to design and manufacture complex parts more efficiently, with increased speed and accuracy. There has also been a notable emphasis on integrating CAD/CAM with lifecycle management systems and enhancing the interoperability of CAD data across different brands.

Specifically, on the CAM front, innovations have sprouted under these main categories:

- Integration and interoperability
- Simulation and verification, as well as optimisation
- Hybrid & adaptive manufacturing support
- Automation & paperless factory system
- Cloud integration
- Multi-tasking machines and advanced controller function support.

Collaboration and seamless integration between systems have become essential in the current era, and CAD/CAM systems are no exception when it comes to interoperability. Nowadays, CAD/CAM models and information can be easily communicated to

decision support systems, enabling effective communication and project management. Over the years, CAD/CAM systems have also evolved to improve their ability to read native CAD model files from popular CAD systems, ensuring precise and consistent manufacturing output.

Reliability is a critical aspect of manufacturing confidence, and CAD/CAM systems have advanced to provide realistic simulation and verification of toolpaths in a virtual environment that closely mimics real-world machine tools and controllers. This ensures a high level of safety and trust in the physical machining process.

Another area of advancement lies in the seamless integration of CAD/CAM systems with additive and hybrid manufacturing machines,

enabling efficient production of components. Modern CAD/CAM systems can generate hybrid paths that encompass both additive and subtractive manufacturing techniques, instead of solely focusing on subtractive toolpaths. And, when combined with metrology software, these systems can adaptively machine critical components for specific applications, such as blade repair or mould/die repair.

In the information era, staying connected to current technological advancements in cloud technologies is crucial. Additionally, the integration of third-party apps facilitates the transition to a paperless environment for estimation, design, and communication of manufacturing information to the shop floor.

Furthermore, modern machine tools are also evolving to meet customer demands for minimal changes in machining setup. As a result, there is a growing demand for multi-tasking machines. CAD/CAM systems are working closely with machine tool manufacturers to offer advanced multi-tasking toolpaths and ensure compatibility with specific cycles and macros supported by CNC controllers.

These are only a handful of innovations; not all of the innovations under development are disclosed.

Q Are there any emerging trends or technologies in CAD/CAM software that you believe will have a major impact on the industry?

CAD/CAM software will continue to evolve with the primary objectives of speed, reliability, and increased intelligence. In the future, CAD/CAM software is expected to align more closely with the concept of 'knowledge-based manufacturing'

compared to its current state. Ongoing research is exploring promising technologies such as the integration of 'Physics of Machining' into the toolpath process. This incorporation allows for the prediction and management of machining forces, taking into account machine tool kinematics. Additionally, advancements in 'Auto CAM' aim to intelligently comprehend part geometry, tolerances, material characteristics, and other relevant factors, thereby potentially revolutionising the manufacturing industry.

Q What role will Cloud, AI, and Machine Learning play in the future of CAM software?

Cloud computing, AI, and Machine Learning (ML) are poised to play crucial and integral roles in the future of CAM software. Cloud-enabled CAM offers enhanced collaboration and data sharing capabilities, enabling real-time teamwork regardless of geographical locations. Moreover, AI and ML are expected to automate CAM programming tasks, optimising toolpaths, cutting conditions, and even predicting potential machining issues. Through AI-driven adaptive machining, CAM software can dynamically adjust parameters based on real-time feedback, leading to improved efficiency. Additionally, AI-powered simulation and optimisation functionalities can enhance process analysis and provide optimal strategies. Utilising ML algorithms, predictive maintenance can anticipate machine failures, thereby preventing unexpected downtime. Lastly, AI can contribute to intelligent toolpath planning, optimising manufacturing processes for enhanced time and resource utilisation.

Q How do you perceive the growth and adoption of CAD/CAM software in India? What unique opportunities or challenges do you foresee in this region?

The adoption rate of CAD/CAM in India is one of the highest in the world. Although the country started embracing CNC machining relatively late, i.e., around the 1990s, CAD/CAM has now become an integral part of technology acquisition for both MSMEs and large manufacturers. As manufacturing initiatives continue to grow due to increased industrialisation, infrastructure demands, and government initiatives like the Production-linked Incentive (PLI) Scheme in manufacturing under the 'Aatmanirbhar Bharat' campaign, the need for CNC machines and advanced manufacturing practices is expected to further drive the adoption of CAD/CAM technologies.

MSMEs form the backbone of the Indian manufacturing sector, accounting for nearly 70% of the manufacturing ecosystem and continually expanding. These organisations are gradually recognising the importance of advanced CAD/CAM systems and their potential to enhance profitability. However, the existing skill gap in the country could impede this profitability unless adequate measures are taken to bridge the gap between the industry and academia.

Moreover, as CAD/CAM technology transitions to the cloud and incorporates AI/ML techniques, challenges related to data hygiene, data handling, and data management may arise, particularly in terms of maintaining consistency and ensuring security.

Q How does Mastercam cater to the specific demands of the Indian market? Are there any localised features or initiatives that have been implemented to enhance the software's effectiveness in India?

Mastercam develops industry-specific solutions tailored to meet the unique requirements of sectors such as automotive, aerospace, medical, and die & mould, among others. In India, we leverage the expertise of our sales and technical specialists to provide solutions that align with the customer's current and future manufacturing needs. With colleagues located all over the country, who understand the local language and culture, we offer comprehensive training, technical consulting, and collaborative solutions with industry partners at the local level. Whenever specialised input is required, whether from our India headquarters or the international level, we actively engage with stakeholders in the ecosystem to ensure that customers benefit from our extensive organisational knowledge.

Through active engagement with Indian industry associations, educational institutions, and customers, we gather valuable insights to develop features and solutions that are well-suited to the Indian market. Regular updates and enhancements based on user feedback ensure that Mastercam remains up-to-date with the latest industry trends and requirements. Additionally, when specific requirements arise, we work closely with our customers to integrate and provide micro-automations, ensuring localisation and customisation as needed.

One of the significant areas where we add value to our customers is

In the future, CAD/CAM software is expected to align more closely with the concept of 'knowledge-based manufacturing' compared to its current state. Ongoing research is exploring promising technologies such as the integration of 'Physics of Machining' into the toolpath process.

in the provision of custom post-processor configurations. Our experienced team of post-processor developers collaborates with each customer to deliver a custom post processor that enables them to directly send their NC codes to the CNC machine without the need for manual alterations.

Q What unique value propositions or strategies does Mastercam employ to maintain a competitive edge in the market?

Mastercam's mission is to assist customers in solving their manufacturing challenges through our software and services, with a strong emphasis on sustainable manufacturing. With a 40-year track record, Mastercam has been at the forefront of CAM technology, consistently delivering comprehensive, user-friendly, and unique solutions to stay ahead of the competition. By pioneering technologies like Dynamic Machining, PrimeTurning, Accelerated Finishing, and Unified Multiaxis, among others, Mastercam sets the industry benchmark through customer-centric innovation.

User experience is a top priority for Mastercam, reflected in its intuitive and user-friendly interface.

The software is designed for both experienced professionals as well as newcomers. This emphasis on usability translates into a shorter learning curve and increased productivity, giving Mastercam a competitive edge.

Additionally, Mastercam boasts of an extensive network of partners, including resellers, machine manufacturers, and educational institutions. This network enables Mastercam to provide comprehensive support, training, and customisation options to users. The strong partner ecosystem enhances customer satisfaction and ensures that users can harness the full potential of the software. With its global reach and localised support, Mastercam is able to cater to the unique needs and demands of specific markets, fostering a strong and loyal customer base.

Q What is your overall outlook for the CAD/CAM software industry? Are there any specific areas or markets that you believe will witness substantial growth in the coming years?

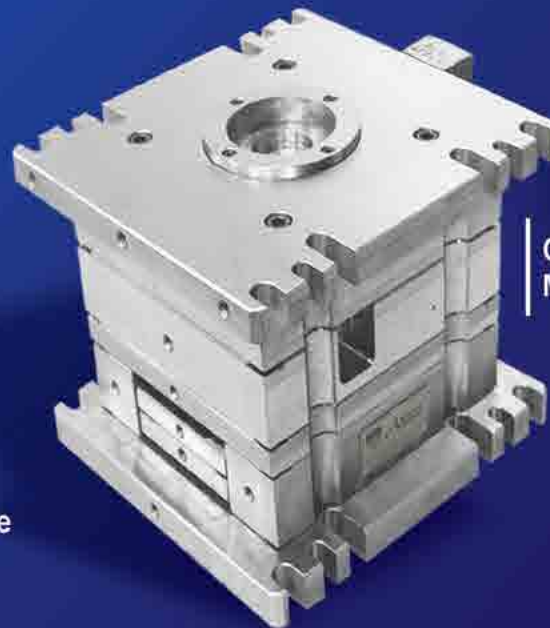
The outlook for the CAD/CAM industry is extremely optimistic, especially for the next decade. India is on the brink of significant manufacturing growth, and the demand for CAD/CAM software, services, and training is set to rise. The defence and medical manufacturing sectors in India are experiencing rapid expansion, leading to increased usage of machine tools and manufacturing software. Additionally, the aerospace and electric vehicle markets are poised for substantial growth, necessitating advanced manufacturing equipment and software to meet the demanding requirements of precision and sustainability. ♦

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Pune Office :

Warehouse & Machining Division:

Gat. No. 191, 192, 193, Alandi-Markal Road,
VaduKhurd, Tal. Haveli, Pune - 412216/INDIA
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Kolkatta Office

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'I see immense opportunities for the growth and adoption of CAD/CAM software in India'

"With the anticipated growth in manufacturing, the Indian industry needs to embrace innovative technologies to meet the rising demand. CAD/CAM has become an integral part of this growth story," says **Sambit Pradhan**, Sr. Area Sales Director - India & APAC, HCL Technologies Ltd.



Nishant Kashyap

Q In recent years, we have seen significant advancements in CAD/CAM technology. What are some of the latest technological innovations that have caught the attention of the industry?

CAD/CAM technology has undergone significant transformation in recent times, with a strong focus on providing industry-specific solutions.

CAD tools, in particular, have evolved from being mere design and drafting tools to becoming invaluable assistants for engineers. The current developments in CAD systems are centred on the industrial metaverse, digital twins, and digital thread. These advancements have led to reduced environmental impact, enhanced collaboration, and improved industrial efficiency.

CAM has also evolved alongside CAD, gaining strength in programming automation. The efficiency of CAM has been greatly enhanced through

the integration of advanced tools for high-speed machining. Furthermore, collaboration tools have witnessed significant advancements, helping to maintain the digital thread throughout the manufacturing process.

Q Are there any emerging trends or technologies in CAD/CAM that you believe will have a major impact on the industry?

The CAM programming and CNC machining market are gradually shifting towards automation. Automation requires an investment in tools and software. It can unlock capabilities that go beyond an individual's experience.

Manufacturers are increasingly turning to automation owing to its advantages, namely, to reduce expenses driven by the rising labour cost, and to address challenges related to skilled labour availability.

Moreover, the use of CAM software significantly decreases the risks associated with human labour.

Q In the future, what role will Cloud, AI, Machine Learning, and IIoT play in CAM software?

Cloud computing is becoming the foundation for every business. As industrialisation continues to surge, there is a growing adoption of CAM software for precise and cost-effective design and manufacturing purposes. The field of Augmented Reality (AR) and Virtual Reality (VR) is also experiencing rapid development, which requires significant PC processing power to run CAD/CAM software effectively. However, this entails high-quality components with substantial initial investments, posing a major challenge for the widespread use of advanced technological innovations.

To overcome these obstacles and enhance accessibility

while reducing costs, numerous organisations, particularly manufacturing companies and R&D institutions, are leveraging emerging cloud technology. They are harnessing the power of AI and ML technologies embedded within the Industrial Internet of Things (IIoT) to streamline operations, increase productivity, and achieve leaner processes. Cloud technology facilitates a 'design anywhere and manufacture anywhere' paradigm, enabling organisations to take advantage of opportunities and support flexible workflows. Additionally, it helps organisations save significant costs associated with maintaining high-end IT infrastructure.

By embracing cloud technology, businesses can optimise their operations, improve accessibility to advanced technologies, and achieve greater cost efficiency. The combination of cloud computing, AI, ML, and IIoT empowers organisations to operate more efficiently in the CAD/CAM domain while driving innovation and productivity enhancements.

Q How do you perceive the growth and adoption of CAD/CAM software in India? What unique opportunities or challenges do you foresee in this region?

I see immense opportunities for the growth and adoption of CAD/CAM software in India. According to the World Economic Forum, by 2030, India is expected to be the manufacturing hub for the global market with its capacity increasing to \$1 trillion, and to \$20 trillion by 2047. This also aligns with our need to generate over 100 million jobs by 2030 with a focus on the manufacturing sector.

With the anticipated growth in manufacturing, the Indian industry needs to embrace innovative technologies to meet the rising demand. CAD/CAM has become an

integral part of this growth story. However, challenges lie ahead in terms of technology adoption and the availability of skilled manpower, which could potentially hinder progress.

Q How does HCL Technologies Ltd. cater to the specific demands of the Indian market? Have any localised features or initiatives been implemented to enhance the software's effectiveness in India?

HCL CAMWorks is committed to deliver and meet our customers' expectations. In fact, we have been delivering customised solutions for different industry applications, which is our biggest USP. CAMWorks provides CAD/CAM integration and an automation capability, which helps save programming time, improve resource utilisation, and reduce lead time.

Based on the current and future requirements, we have aligned our product roadmap to meet the needs of the industry. Some of our initiatives are already in place. They include:

- By using CAMWorks, customers have mitigated human error, accounted for the most subjective aspects of machining, and optimised quantifiable costs such as spindle time, consumables, labour, and rework.
- The adaptive automation tools help accelerate the machining process, improve tool life, facilitate clearer shop-wide communication, and automatically integrate changes and design updates.

CAMWorks will continue to play a pivotal role in scaling without sacrificing quality in our customers' growth journey.

Q How does your CAD/CAM software address concerns related to sustainability and eco-friendly practices? Does it have any features or functionalities that promote

efficient resource utilisation or support sustainable manufacturing processes?

Tolerance-Based Machining (TBM) for paperless manufacturing is one such initiative. TBM provides technology to help users move their programming to Industry 4.0 procedures by recognising and using Product and Manufacturing Information (PMI) – such as GD&T dimensions, notes and callouts – as well as Model-Based Definition (MBD) information in the 3D model.

TBM is most effective when combined with other CAM automation tools such as Advanced Feature Recognition (AFR) and intelligence-based machining. AFR recognises machinable features and adds them to the model so that programmers can utilise the technological advancements of feature-based CAM.

Q What is your overall outlook for the CAD/CAM software industry? Are there any specific areas or markets that you believe will witness substantial growth in the coming years?

According to CIMdata reports, the CAM software market in the Asia-Pacific region accounted for a market share of 23.8% in 2020 and is on a growth trajectory. Furthermore, the region is expected to witness significant growth of approximately 6% during the forecast period from 2021 to 2026. There is a surge in demand for CAM software to streamline and automate manufacturing processes, which is driving this growth.

The global CAM market size reached \$2,689 million in 2020 and is projected to reach \$5,477 million by 2028, with a Compound Annual Growth Rate (CAGR) of 8.4% from 2021 to 2028. This growth is expected across all verticals, with automation in manufacturing, robotics, and skill development being some of the areas that will see substantial growth. ♦

'We see automation continuing to evolve in the years ahead'

"Automation is not new, but its effective use throughout the entire product development process – from ideation to design to CAM programming through factory floor execution – is now having a significant impact on businesses around the world," says **Sreenivas Ramaswamy**, Technical Sales Manager - India ASEAN ANZ, Autodesk India.



Nishant Kashyap

Q What are some of the latest technological innovations in CAM software?

Among the CAD/CAM technologies, two significant advancements come to mind. They are:

➔ **Cloud-based platform to drive collaboration:** CAD and CAM have been disparate and unique user experiences. This outdated approach often causes disconnect between design and manufacturing teams, resulting in data loss, human error, and waste. To resolve this, modern software solutions are increasingly offering a platform approach that combines CAD, CAM, CAE, simulation, PCB design, and other workflows together – all with data at the centre. For maximum efficiency and productivity, these 'design & make' platforms must be cloud-based, allowing teams to work together; sharing data seamlessly and instantaneously, allowing critical business decisions to be made by the right people at the right time. Data is the common thread here; all data is secured and accessible by anyone with a connected device and the appropriate authority. So, if a designer makes a change to a 3D model, the modification is instantly available for everyone else in the

company to see and consume. Project managers can consider the impact of the change on overall delivery costs and timescales, CAM programmers can consume the change and update the NC code, and shop floor engineers are able to consider the possible impact on machine setup and fixturing. Simply put, a cloud-based platform provides seamless collaboration that greatly reduces the likelihood of mistakes being made, saving huge amounts of time and money.

➔ **Data-driven automation to boost productivity:** Data extensibility is one of the leading advancements across all industries. What that really means is capturing more data and using it to power automation to increase the overall speed and efficiency of a manufacturing organisation. Automation can greatly reduce iteration rounds between teams; allowing waste (both in terms of time and materials) to be quickly identified and improved. Automation is not new, but its effective use throughout the entire product development process – from ideation to design to CAM programming through factory floor execution – is now having a significant impact on businesses around the world.

Are there any emerging trends or technologies in CAD/CAM software that you believe will have a major impact on the industry?

For years, the acronyms CAD and CAM have been somewhat misleading. Sure, traditional CAD/CAM software provides tools to help designers and manufacturers, but the 'A' (aided) in CAD and CAM often feel a little underwhelming. With the emergence of technologies, such as Machine Learning, Generative Design, Automated Modelling, and Automatic Collision Avoidance for CNC machining, we are entering an era when the 'A' in CAD and CAM really does mean 'aided'; freeing workers from some of the more repetitive processes, allowing them to focus on what humans do best – innovate and succeed.

For many years, the very best CAD/CAM tools have only been accessible via high-end enterprise solutions. The cost of implementation can be extremely high in terms of both time and money with large upfront payments and ongoing annual fees. This often means these elite tools are out of reach of smaller businesses that could truly benefit from using them. More recently, CAD/CAM software



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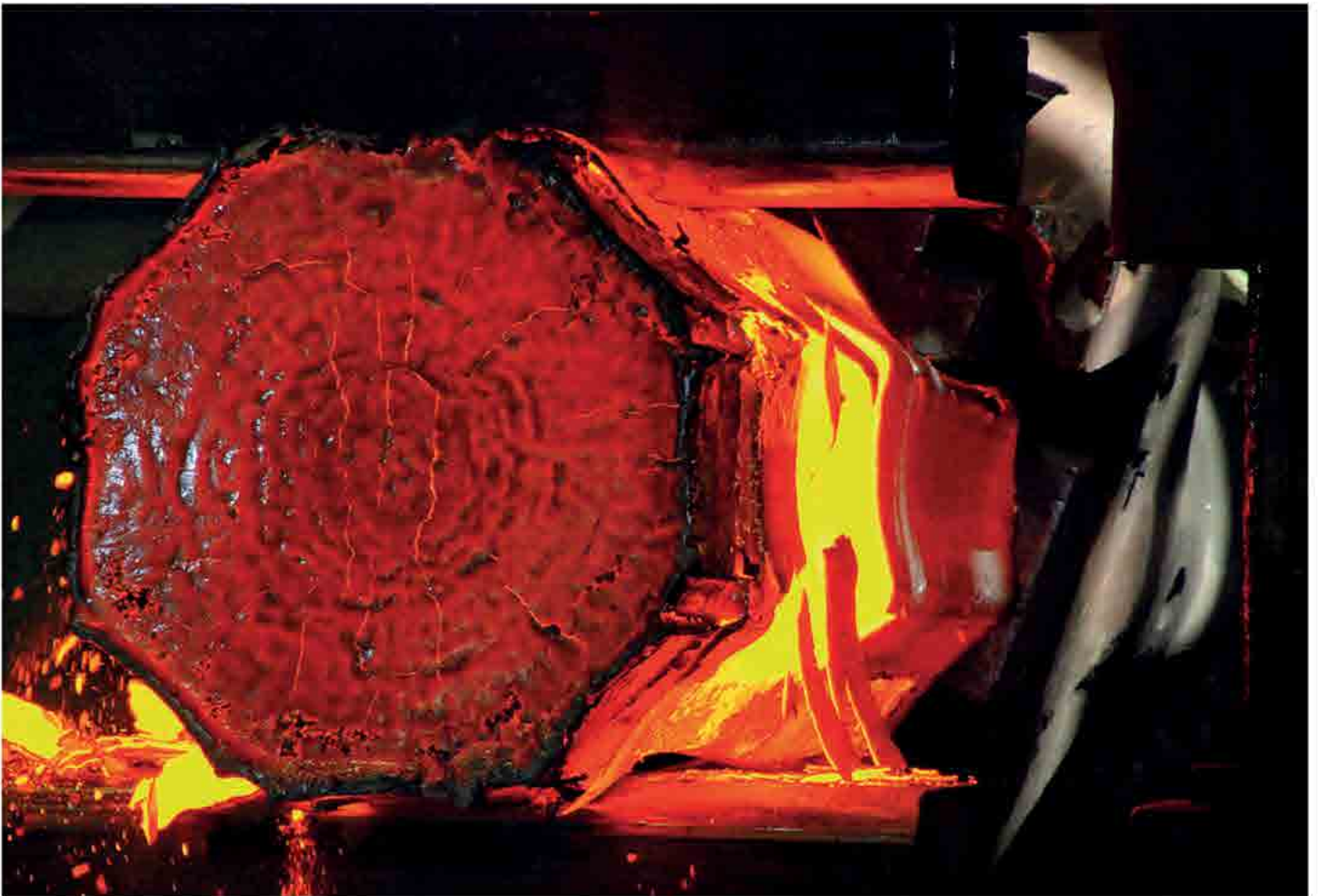
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suppliers have moved away from these expensive perpetual licences to offer flexible subscription-based options. These offer many advantages, including a significantly lower entry-price point, which frees up capital to invest in other equipment (such as tooling and fixturing) that can help a business become productive sooner. Additionally, subscription licensing provides greater levels of flexibility, as designers and manufacturing engineers can access enterprise-grade tools and capabilities as and when needed – and only pay for what they need when they need it. The most flexible CAD/CAM products available today can even be accessed daily, monthly, or annually – allowing VSBs and SMBs to unlock tools that can have an immediate impact on their day-to-day business, all without the vast, upfront expense associated with enterprise-grade contracts.

What role will Cloud, AI, and Machine Learning play in the future of CAM software?

There's no denying the impact of Cloud, AI, and Machine Learning on the world right now. These technologies will continue to accelerate and offer greater benefits in all areas of life. For designers and manufacturers, this technology already offers huge benefits. For example, the use of spindle-mounted probes and in-cycle inspection routines can be combined with intelligent software fixture alignment that can automate the setup of heavy or non-prismatic parts on CNC machines. Likewise, CAD/CAM software can already define accurate digital twins of CNC machines that can be used to produce collision-free 5-axis toolpaths automatically for greater peace of mind.

We see automation continuing to evolve in the years ahead. For example, there's a growing number of CAD/CAM products that can combine the power of Cloud Computing with AI Machine Learning to fully automate CAM programming. The most capable software products can allow the user

to select the 3D CAD model, and then use the AI algorithms to automatically choose the right tools and strategies to machine the part – all with minimal human input. This level of automation greatly improves the programming of simple parts and frees up workers to focus on more challenging or profitable work. At the same time, it can help onboard new workers, shortening learning curves and allowing them to become productive sooner.

The use of cloud-based AI and Machine Learning will allow more complex and disconnected processes to be joined and completed more easily. In fact, technologies like Generative Design are already being used by mainstream manufacturers. These tools can create hundreds of manufacturing-aware models using parameters such as materials, loads, interference geometry, production volumes, and different methods of manufacture – revealing designs that the human brain may never have considered. While this may seem daunting to many, the truth is that AI-based CAD and CAM workflows are already being used to assist manufacturers to remove the waste in both the parts we produce and the methods we use to produce them. As more and more businesses wake up to the need for sustainability, technologies like AI-based CAD and CAM will automate manual tasks, resulting in reduced cost and waste, and less negative impact on the world.

How does Autodesk's CAD/CAM software address concerns on sustainability and eco-friendly practices?

At Autodesk, sustainability is central to everything we do. It underpins our ability to create technology that improves energy and material productivity. We take sustainability seriously and lead by example with our own operations, advancing sustainability business practices, and supporting every employee to make a positive impact. Our latest impact

report is proof. It shows that our financial grants, software donations, and technical training, among other aspects, support many entrepreneurs and innovators on the frontlines of solving today's most pressing social and environmental challenges.

Focusing on Autodesk CAD and CAM solutions, we have countless examples of manufacturing customers, like Pembree in the UK, who are using Fusion 360 to design and make better parts that have less impact on the world. In this case, the Pembree team is using a Makersite add-in that works inside Fusion 360 to instantly calculate the environmental and cost impacts of their mountain bike component designs. As much as 80% of the ecological impact of a product is locked down in the design phase. Therefore, the design phase of a product is the first and most necessary stage to get more sustainable goods into the world successfully. With access to a library of more than 300 materials, the Pembree team can instantly see the impact that design changes will have on material and energy costs, and access guidance on compliance, risk, health, and safety issues.

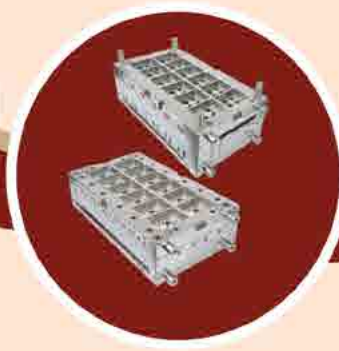
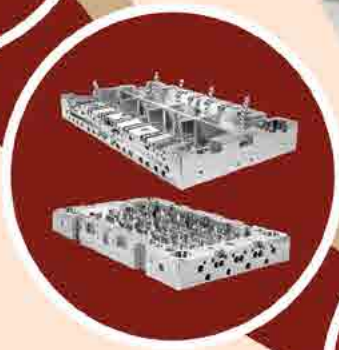
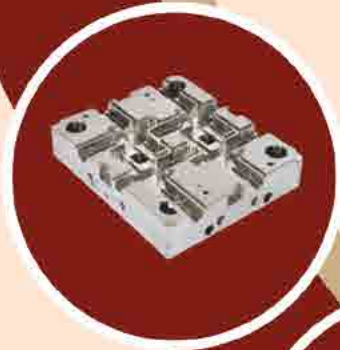
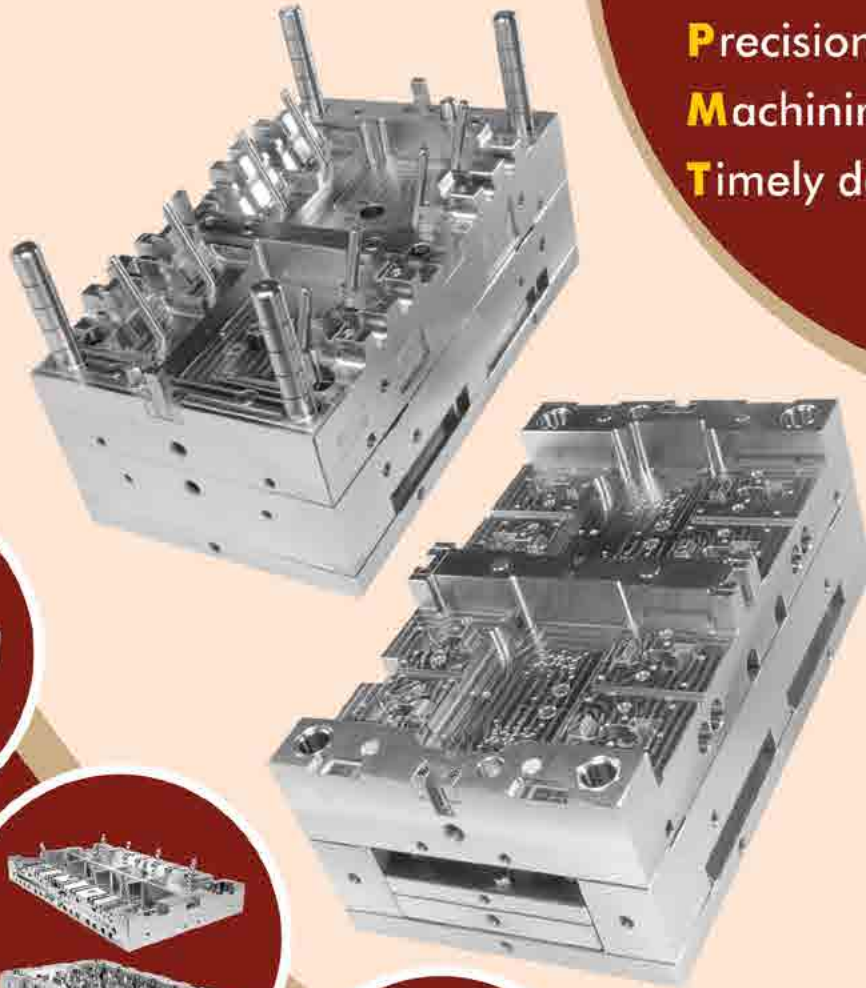
What is your overall outlook for the CAD/CAM software industry?

In recent years, there has been a drive towards 'lights-out' manufacturing that keeps productivity high and has humans doing higher-order, creative work, uncovering better solutions by pairing human expertise with insights from data. We foresee an increasing focus on the use of AI-based tools to make sustainability a central part of the world of design and make. As we have already discussed, sustainability is no longer a 'nice-to-have' but a 'priority' for product manufacturers, customers, and to governments that are implementing a sustainability policy. We predict an increasing reliance and use of AI-based tools that influence the design of the products we use and the processes that are used to make them. ♦

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'In a rapidly growing market like India, the momentum of CAD/CAM PDM adoption is only natural'

"The expanding manufacturing sector, coupled with the shift towards advanced manufacturing technologies, presents significant opportunities for growth. Initiatives focused on skill development and training, along with considerations of cost and accessibility, further contribute to the adoption of CAD/CAM software," says **Sunil Desai**, Founder Director, Designcell CAD CAM Solutions Pvt. Ltd.



Nishant Kashyap

Q In recent years, there have been significant advancements in CAD/CAM technology. What are some of the latest technological innovations in CAM software that have caught the attention of the industry?

The need for digital solutions is growing significantly with the increasing demand for efficiency and productivity. In fact, CAM software is undergoing substantial changes and is assisting manufacturers in effectively utilising resources.

The manufacturing industry is rapidly embracing digitalization, which requires seamless integration of all tasks from order to dispatch. And, CAM serves as a crucial link in the digital chain. Integration is key, as all processes – from costing to delivery – must be in sync. CAM plays a vital role in achieving this.

There have been advancements in CAM software over the years. Let's take a look at some of them:

➔ **Cloud-Based CAM:** Cloud computing has been making its way into various industries,

including CAM. Cloud-based CAM software allows users to access their manufacturing tools and data from anywhere. All they need is an internet connection.

➔ **AI-driven CAM:** Artificial intelligence (AI) has been increasingly integrated into CAM software to optimise manufacturing processes. AI algorithms can analyse large amounts of data, such as tooling parameters, machine performance, and cutting strategies, to provide automated recommendations and optimise toolpaths for faster and more efficient machining.

➔ **Generative Design:** In CAM software, generative design can create optimised toolpaths automatically, exploring various possibilities to achieve the desired outcome. It helps reduce material waste, weight, and production time while maintaining structural integrity.

➔ **Integration with Manufacturing Execution Systems (MES):** Integration between CAM software and MES enables seamless communication between design, production planning, and shop floor execution.

In the coming days, CAD/CAM software will be influenced by various emerging trends and technologies. These include integrated digital factories, readiness for Industry 4.0, generative design, augmented reality/virtual reality, IoT integration, advanced simulation capabilities, and a continued focus on user experience and accessibility. These advancements will drive increased efficiency, innovation, and optimisation in the design and manufacturing processes.

In the future of CAM software, what role will Cloud, AI, and Machine Learning play?

Cloud computing, Artificial Intelligence (AI), and Machine Learning (ML) are expected to play significant roles in the future of CAM software. Cloud-based CAM will allow manufacturers to access software and data from anywhere, facilitating collaboration and remote work. Currently, it offers scalability, flexibility, and cost-effectiveness by reducing the need for extensive on-premises hardware.

AI-driven CAM has the potential to automate various aspects of manufacturing. It can also aid in automated decision-making, adaptive machining, and predictive maintenance. Generative design, powered by AI, can create optimised toolpaths and manufacturing strategies, minimising waste and improving production efficiency.

ML algorithms can analyse vast amounts of machining data, optimising toolpaths, reducing cycle times, and improving efficiency.

The future of CAM software will likely see the integration of cloud computing, AI, and ML technologies. This integration promises improved productivity, cost reduction, enhanced product quality, and more efficient resource utilisation in the manufacturing industry.

How do you perceive the growth and adoption of CAD/CAM software in the Indian market? What unique opportunities or challenges do you foresee in this region?

Companies that fail to embrace digitalization may face the risk of being left behind. In a rapidly growing market like India, the momentum of CAD/CAM PDM adoption is only natural. The expanding manufacturing sector, coupled with the shift towards advanced manufacturing technologies, presents significant opportunities for growth. Initiatives focused on skill development and training, along with considerations of cost and accessibility, further contribute to the adoption of CAD/CAM software.

The integration of CAD/CAM software with Industry 4.0 technologies is a key driver for its widespread adoption. As the industry progresses towards interconnected systems, automation, and data-driven decision-making, CAD/CAM software becomes essential for enhancing productivity and efficiency.

However, challenges related to skill development, cost, and

accessibility need to be addressed to unlock the full potential of CAD/CAM software in India. Efforts aimed at improving skill development programs, reducing costs, and enhancing accessibility through training initiatives, government support, and partnerships are crucial for driving widespread adoption and fostering the growth of the CAD/CAM industry in India.

The CAD/CAM software industry has become more competitive. What unique value propositions or strategies does your company employ to maintain a competitive edge?

India is actively seeking high-end manufacturing solutions with a proven track record in advanced countries that are easy to learn and adapt to Indian conditions. These solutions should enable seamless workflow, facilitate extensive traveling, support online collaboration, provide monitoring and simulation capabilities for shop floor activities, and ultimately foster a paperless environment. Additionally, the ability to dynamically analyze both current and future situations is desired. This is where TopSolid comes into the picture. It offers a comprehensive range of digital manufacturing solutions that cover the entire process – from the order stage to delivery. Whether it's precision machining of plastic or metal components, manufacturing applications, or even infrastructure-related activities, TopSolid provides a complete solution.

Earlier this year, TopSolid announced the release of TopSolid Integrated Digital Factory 2023, which includes numerous new features. One of the notable enhancements is the strengthened 3D element achieved through partnerships with 3Dconnexion and Adobe Substance 3D. TopSolid' Design now supports the latest generations of SpaceMouse®, providing users with exceptional 3D navigation

capabilities that offer ergonomic design, advanced technology, and precise control of tools.

What is your overall outlook for the CAD/CAM software industry? Are there any specific areas or markets that you believe will witness substantial growth in the coming years?

India finds itself in a stable position within the global scenario. It enjoys a favourable environment for technological advancements and industrial growth with a focus on manufacturing. The geopolitical ecosystem in India is nurturing the 'Make in India' initiative. There is a growing need for tooling, precision manufacturing, Special Purpose Machinery (SPM), Fast Moving Consumer Goods (FMCG), as well as aerospace & defence-related manufacturing activities.

The CAD/CAM software industry is experiencing steady growth worldwide and is expected to continue expanding in the years to come. It plays a vital role in various sectors, including manufacturing, engineering, architecture, and automotive design. Several factors contribute to its positive outlook, such as technological advancements, the digitization of industries, the increasing complexity of products, and the overall growth of the global manufacturing sector.

The rising adoption of 3D printing presents significant growth opportunities for the CAD/CAM software industry. Additionally, the emergence of cloud-based CAD/CAM solutions and the development of industry-specific software tailored to sectors like automotive and aerospace further contribute to the industry's potential. And, the integration of virtual reality (VR) and augmented reality (AR) technologies with CAD/CAM software shows promise in revolutionizing design and manufacturing processes, enabling more immersive experiences and enhanced visualization. ♦

CAM automation and library revitalise precision manufacture

TECMA transitions to digital machining by rejuvenating its manufacturing processes with CAMWorks.

TECMA, a family-owned precision machining business, provides machining services for the aerospace and defence industries. They have provided parts for many historic U.S. space programs – from the first Apollo missions to the upcoming Artemis mission. To remain competitive and continue their growth, the company needed to transition from 2D to 3D programming capabilities. They found an excellent solution in CAMWorks, which enabled them to increase output, control costs, and position for the future.

For more than six decades, TECMA, Inc. has been providing precision machining services for the aerospace and defence industries. When Neil Armstrong descended the stairs of the Apollo 11 Lunar lander module, TECMA celebrated alongside the nation, knowing it had critical parts on the lander that ensured the astronauts safe return to earth. The pride of this accomplishment carried them through all six Apollo missions, all Space Shuttle missions and still motivates them today. Now, 53 years later, they are machining over 250 critical parts for the Artemis missions on the SLS Rocket and Orion Capsule, which will bring the first woman and man back to the Moon since 1972. The company has supplied parts for many U.S. defence contracts as well, and in recent years,

has expanded into producing parts for carbon-negative energy systems. The company specializes in CNC and conventional precision machining for hard-to-manufacture, mission-critical components. For 64 years, they have built a reputation for quality workmanship, pristine finishes, and creative problem-solving.

The company was founded by Fred Schwarz in 1957, alongside his partner Alfred Nohr. Schwarz led TECMA for more than 50 years until his daughter Sonia Susac took over ownership in 2012 after Schwarz's passing. Wanting to keep TECMA competitive, she recognized the need for the company to transition from 2D programming and manual machining to 3D digital production.

"My dad was old-school. He built the company by consistently delivering the precision components needed by aerospace and defence customers, utilizing his close

personal ties with those customer's engineers," Susac explains. "When my father passed away and I took over management, I quickly realized that we needed to re-tool and modernize to continue to be successful. While TECMA had and still has a great reputation in the aerospace and defence industries, we needed to expand our customer base and update our compliance to NASA and Department of Defense requirements. Part of that was to obtain some important certifications—such as AS9100/ISO9001 Quality Management Systems and ITAR [International Traffic in Arms Regulations and Export Administration Regulations], and cybersecurity compliance—in order to remain competitive and grow."

When Susac took control of the company, it had only two CNC machines to nearly 20 manual machines. It also had a

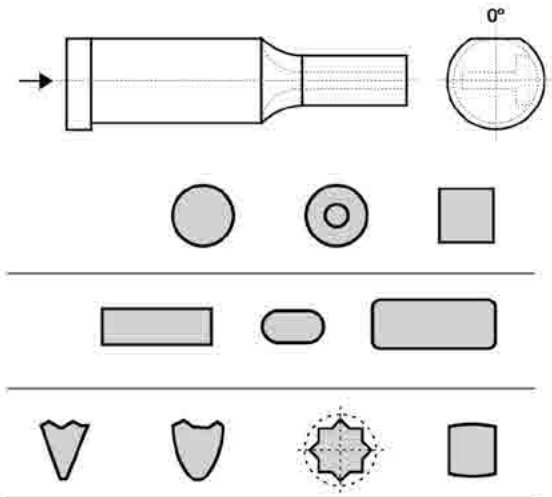


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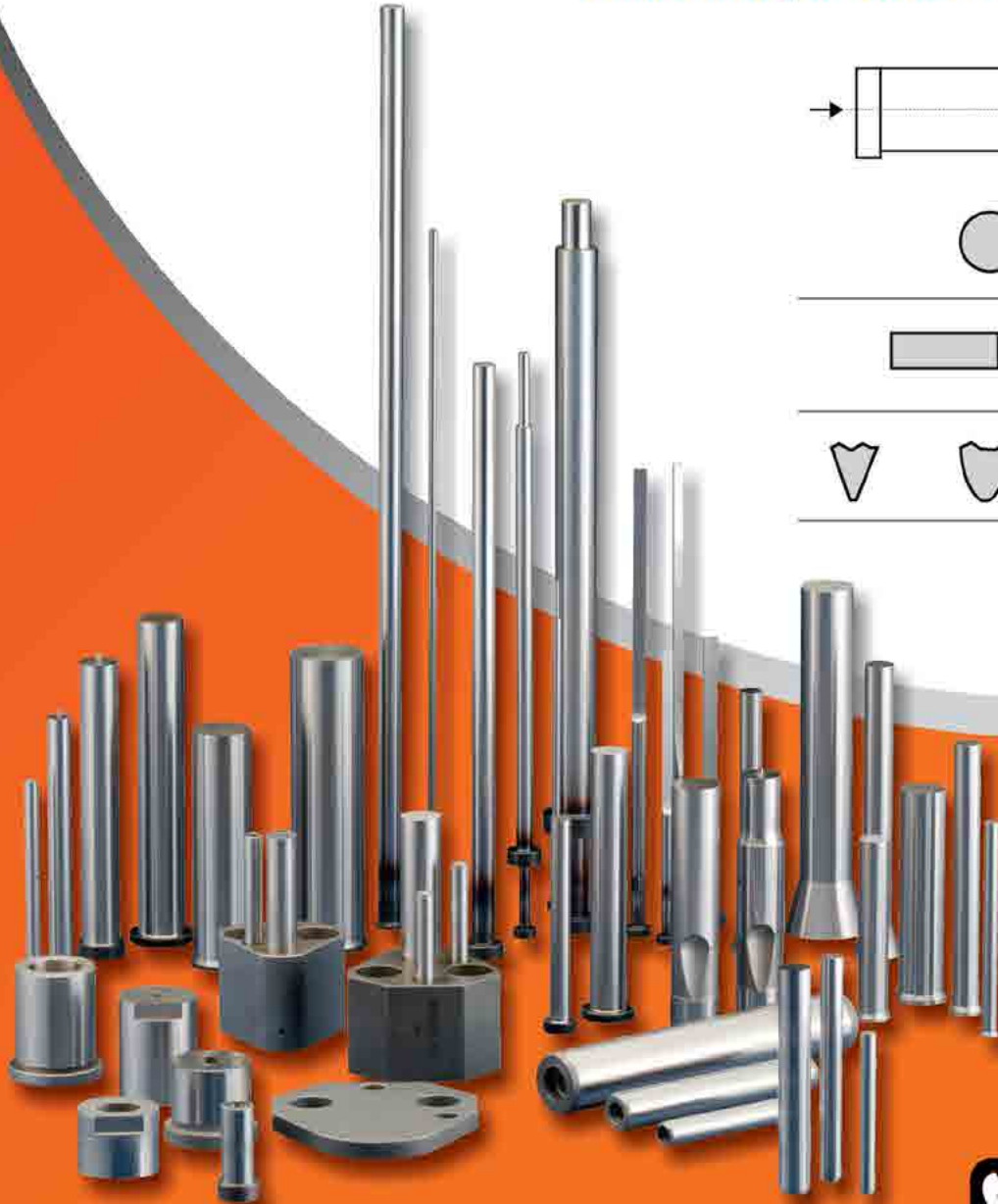
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small employee base who each used different and outdated 2D programming programs. Investing in automated, state-of-the-art CNC machining centers with 5-axis machining capabilities as well as a software system to automate digital machining operations would enable the company to compete for new business. CAMWorks provided the solution that met TECMA's goals of modernizing, increasing efficiency, and improving quality.

"In 2012, I didn't want to see my father's legacy disappear or have his employees lose their jobs, so I decided to manage the company to supervise the transition from predominantly manual machining to machining parts in the digital world," Susac explains.

"I reached out to my father's friends, colleagues, and customers, and learned that our future success was all about progressing and keeping up with technology. Through word of mouth, we eventually started working with GoEngineer, a reseller that supports CAMWorks® machining software. We dove into CAMWorks to support our newer capabilities and haven't looked back. During that time, I came to understand the passion that drove my father to never want to retire, and now I feel it too."

"We looked at many different CAM systems, but what really sold



us on CAMWorks was the fact that the software uses the features from a SOLIDWORKS® CAD model, which is the Gold Standard we need. It provides automation of the programming of toolpaths and the generation of G Code to run our machines."

Transitioning to 3D Digital Machining

Since transitioning to CAMWorks, the rejuvenated TECMA is able to bid on a wider range of parts while maintaining its flight-rated business. According to Production Manager Tirath Singh, the move to CAMWorks in conjunction with the installation of 3-axis, 4-axis, and 5-axis machining centers has allowed the company to boost efficiency and productivity while reaping a host of associated

benefits.

"With CAMWorks, our throughput has increased substantially. Now, it takes less time to set up a machine and we have much fewer jobs that need to be reworked. If there is a change to the model, the G Code updates automatically," Singh points out. "Our communication is better—you can actually see the part, simulate the toolpath, and see how it's set up—which means that there are fewer mistakes and less scrap. The CAMWorks VoluMill high-speed machining module lets us reduce stress on the spindles and end mills while accelerating machining, helping us to control costs while increasing throughput."

Starting from a Clean Slate to Increase Future Productivity

Another reason that TECMA chose CAMWorks is the software's extensive knowledge database. This helped TECMA start digitizing their machining processes. With CAMWorks, they can embed their experience and expertise for difficult machining operations in the software's technology database for future use. "We don't typically run the same machining job over and over," Singh notes. "Nevertheless, there are machining operations on difficult features that can be re-used for portions of future jobs. We are invested in CAMWorks for longevity and work daily to build up the technology database for the long term. That database includes



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everything that we've ever done since implementing CAMWorks. It has grown, and will continue to grow, over the years, capturing our precision machining expertise and reusing it for years to come."

Training the Next Generation of TECMA Machinists

TECMA's transition from manual machining to 3D digital machining with CAMWorks has created opportunities for the company to work with local schools to initiate apprenticeship programs and train the next generation of TECMA machinists. "When we upgraded our machines and programming capabilities, we encountered difficulties finding machinists. At the

same time, we were donating our old manual machines to local high schools to help them build their mechanical engineering and robotics programs," Susac explains. "This helped us build relationships with the teachers and students to offer summer internships and eventually custom apprenticeships. We hired one of the summer interns who is now going through our apprentice program, learning CAMWorks, and is already programming 5-axis work. Not every 20-year-old can say he is making space propulsion engine parts on a 5-axis! CAMWorks is an important spoke in the wheel that's rejuvenating the company, and we have quadrupled our number of machinists as a result."

Ultimately, TECMA's switch to CAMWorks has done more than just increase productivity. By allowing the company to remain competitive, its impact is bigger than business: "This whole experience has made me really proud of my father and the strong foundation that he built. His passion for high quality workmanship and pristine finishes is embedded in TECMA, so when I use modern tools like CAMWorks, it's been easy for me and the company to remain successful. I think the advancements we have made uphold my father's legacy and I think he would be really proud of the growth we have made." ♦

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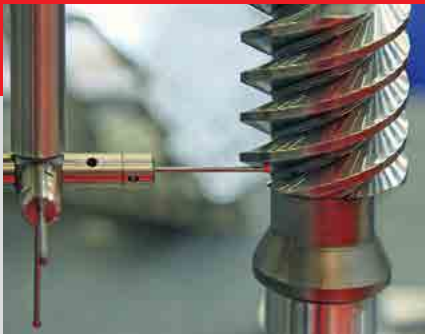
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Solid Edge helps French research firm develop high-quality injection moulds

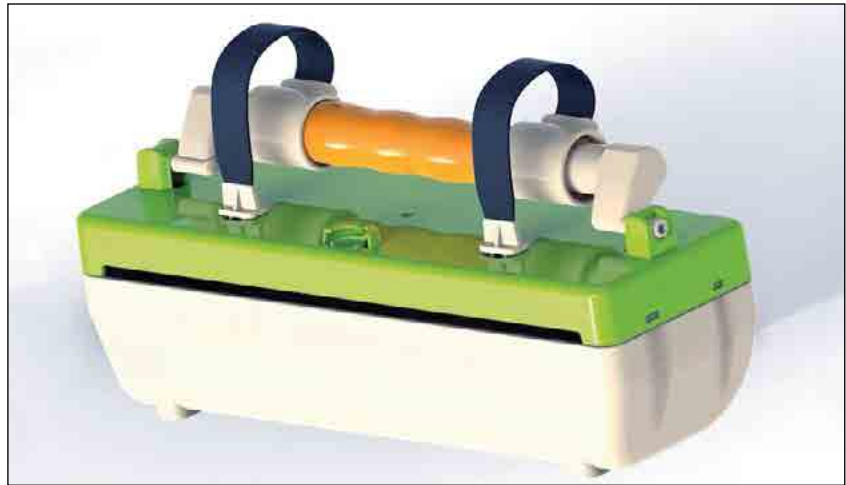
MOLD'ALP combines moulding expertise with advanced 3D CAD to gain a competitive advantage.

MOLD'ALP is a research firm specialising in the 3D design of tools for plastic injection moulding. Located in Haute-Savoie, France, the company designs injection moulds used in diverse industries such as automotive, consumer goods, pharmaceuticals and medical, for products including caps, tips, handles, pressure sensors, flow control systems and others.

Company founder Thierry Blain is fully familiar with the tooling business, having worked for more than 20 years in workshops that manufactured and maintained injection moulds for prestigious companies before moving on to work in research. He speaks of his vocation with enthusiasm and pride: "Tools are assemblies that are complex to produce because they contain many components and must perform several functions - shaping, feeding, adjusting, guiding and separating. My workshop experience allows me to quickly make the necessary technical design choices and to justify these choices, as well as advise my customers on possible modifications to be made to the parts to optimise the manufacturing process. This is decisive in such a fiercely competitive market."

Maintaining a competitive advantage

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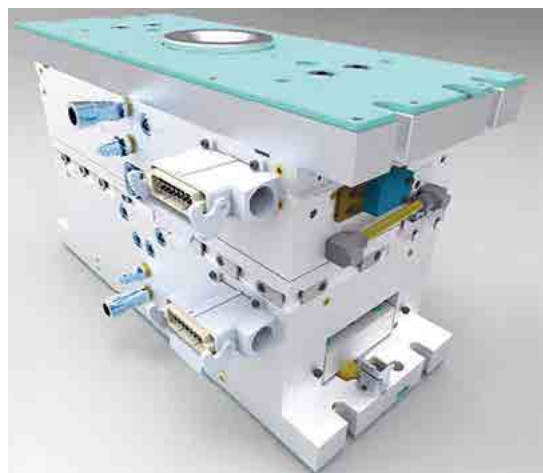


and the quality of its services. Its customers, mainly consisting of toolmakers, are under considerable pressure from their prime contractors, and are particularly demanding in terms of quality and production time. To fulfill these demands, the company knows that it can depend on Solid Edge® software from product lifecycle management (PLM) specialist Siemens Digital Industries Software to meet its customers' quality and lead time requirements.

Solid Edge: Flexible, user-friendly and reliable

MOLD'ALP has used Solid Edge since

2012. At that time, support for the software was provided by Bytics, a Siemens partner and the Solid Edge solution reseller in Switzerland. When Blain decided to create his own business, he had to select a 3D computer-aided design (CAD) software solution as the cornerstone of his design activity. He initially considered a number of alternatives and turned to Bytics for advice to help him with his choice. After conducting a technical and economic analysis, he opted to continue with Solid Edge, based on key attributes of the software including its flexibility, ergonomics, reliability and especially its cost.



Extraordinary flexibility

The synchronous technology capability of Solid Edge offers enormous 3D design flexibility. It enables users to work intuitively in the structure of the product without having to concern themselves with the modeling environment. Synchronous modeling techniques can be used to create new parts, or to modify existing native Solid Edge parts and data produced by other CAD solutions without leaving the

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assembly environment. Consequently, users can easily and freely navigate and work inside the model. "It's a bit like being on a boat that starts to pitch: you have to be able to steady it quickly," explains Blain.

Outstanding ergonomics

Blain also underscores Solid Edge's ergonomic attributes. He notes that the software is extremely intuitive compared to other CAD solutions that he has observed in use by his customers. "Just a few hours after getting started, I was operational," Blain says. "I went on to explore the features on my own and basically taught myself. The Solid Edge radial menu and the use of a 3D mouse help me gain huge amounts of time. I only use the keyboard to type in text; everything else is done using the two mice."

Reliability and stability

"I have always been very pleasantly surprised by the stability of Solid Edge, even after installing new versions," Blain adds. "For a mid-sized company like ours, putting business on hold for a few hours or even days is simply inconceivable. A business leader has to be able to count on reliable working tools. With Solid Edge, I have never had to worry about reviewing models subsequent to a change of version. As far as I'm concerned, this is much more important than fancy functionality."

Close relationship with partner Digicad

For support in its activities, MOLD'ALP knows that it can fully count on Siemens Digital Industries Software solution partner Digicad. Blain particularly appreciates Digicad's responsiveness: "Our customers impose very tight schedules, and we need to be able to quickly resolve any problems that might arise. Digicad employees have both the requisite technical knowledge of the software and the industrial skills to go with it; they understand our business and our

Challenges

- Maintain competitiveness in France and beyond
- Meet customer demands for quality and lead time
- Advise customers on modifications to optimise manufacturing
- Address complexity of mould tools

Keys to Success

- Leverage extensive practical mould-making expertise
- Implement Solid Edge for design flexibility, ease of use and reliability
- Use in-context assembly design, mouldability analysis, and flow simulation

Results

- Reduced modification times by two-thirds
- Virtually eliminated errors and improved quality
- Sustained international competitive advantage

requirements, and always have the right answers."

As France's leading reseller of Solid Edge software, Digicad has successfully established a trusting relationship with its customers, and contact goes far beyond that of a simple technical hotline. Ahmed Ben Abdelkader, MOLD'ALP's technical contact at Digicad, says, "My customers know that they can call me whenever necessary in case of

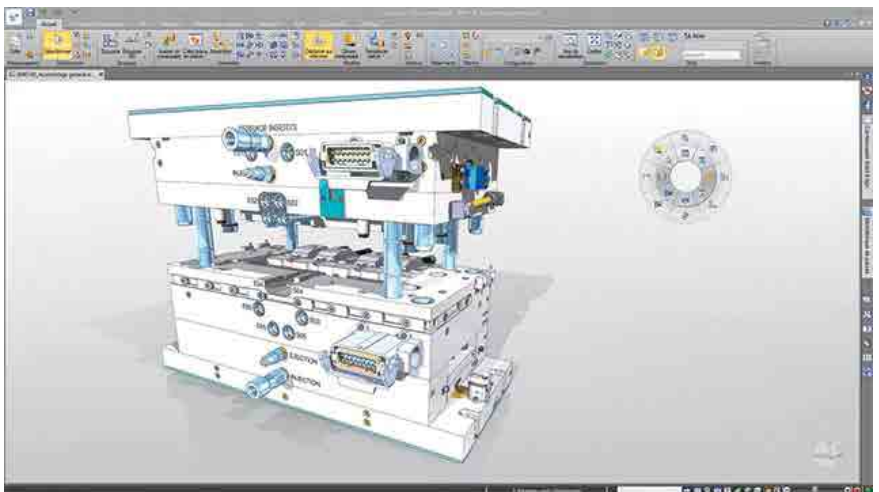
I went on to explore the features on my own and basically taught myself. The Solid Edge radial menu and the use of a 3D mouse help me gain huge amounts of time. I only use the keyboard to type in text; everything else is done using the two mice.

- **Thierry Blain,**
Founder, MOLD'ALP

any problem, and the people I have trained often send me screen grabs of their projects. It's very rewarding to see what they are capable of producing." Asked about Solid Edge's key distinctions, Abdelkader cites: "Solid Edge provides superior ergonomics, like Windows, and its price is three to four times lower than other tools on the market."

Modification times reduced by two-thirds

The process for designing a mould comprises a number of steps. The first step is to analyze the part's 3D digital shape model provided by the customer to determine whether it is compatible with the plastic injection manufacturing process. If not, exchanges between the customer and MOLD'ALP's research department establish a dialogue



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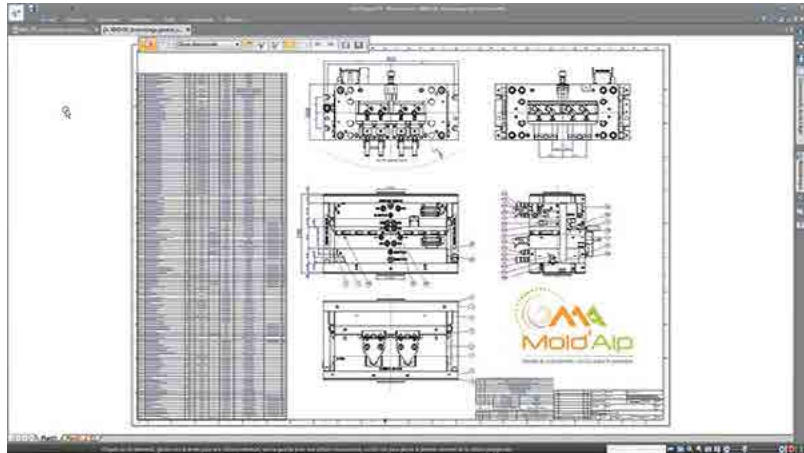


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before making the necessary changes to the part. This is followed by the actual design of the tool's 3D model, which includes defining the parting surface and positioning the injection point. "At this stage, if more advanced studies are needed, we can use specialised rheology tools such as those of CADFLOW, which interfaces directly with Solid Edge," Blain explains. "These tools serve to optimise the position and number of injection points, detect weld lines and air entrapment locations, and design the filling so that all the requirements of the part are met."

The mould tooling design process is seldom trouble-free: the part's geometry is liable to change at any time, in which case the modifications to its geometry must be applied to the tool, often as a matter of urgency. "For example, if the customer decides to move a hole one-half of a millimeter on the part, then everything on that hole's axis will also have to be moved one-half of a millimeter," says Blain. "With the multibody feature available in Solid Edge, all of the associated elements can be moved automatically. This reduces modification times by at least



two-thirds, and removes any risk of forgetting an element, which means gaining time, quality and peace of mind. That, for me, is what it's all about."

Parts design and analysis

MOLD'ALP also works on parts analysis projects, and seeks to expand this activity in the future. Blain cites the example of an innovative project in the medical sector: "We worked alongside a startup on a 6-axis robot handle intended to assist surgeons during operations on the spinal column," he says. "Based on a pre-study sketch, we designed the handle from A to Z

using Solid Edge."

Here too, MOLD'ALP intends to build on its toolmaker expertise. "When you design a part, obviously you have to not only comply with the specifications but also keep in mind all of the constraints inherent in its manufacture, including technical feasibility and costs," Blain says. "For example, a simple rounding of a corner on a part can lead to considerable supplementary tooling costs. In other words, you have to 'think tool' when designing, and this is in our DNA."

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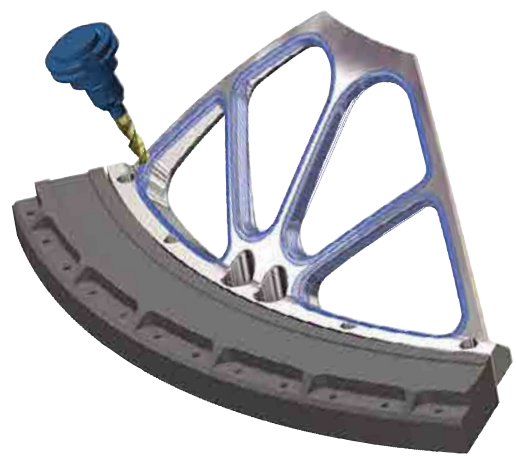
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What are the types of libraries in CAD/CAM Programming?

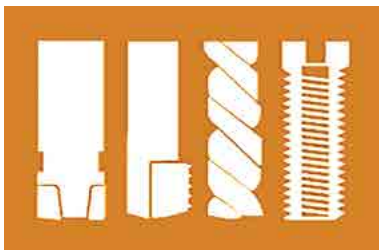


Most CAD/CAM software—or computer-aided design and computer-aided manufacturing software—will come with various libraries as part of its base package. These digital collections of tools and data can be game changers for most shops. Unfortunately, libraries are one of the most underused tools within a CAD/CAM program. This article explains the different types of libraries you can find in a CAD/CAM system and how best to use them.

Tooling Libraries

A tooling library within a CAD/CAM system is a digital collection of a shop's inventory of machine cutting tools, or end mills. These tools are what are attached to the CNC machine to act as the cutting implement. Certain end mills are more specialized than others, while some are generalists and can be applied to a wide range of machining applications. This depends on their length, diameter, and shape, and on the material from which they are made. By keeping a comprehensive library of your shop's tooling, you make finding the perfect tool for the job simple.

Many tooling solutions' manufacturers will have digital catalogs of their entire end mill selections, and these catalogs can be uploaded directly into certain CAD/CAM programs. For example, Mastercam partners with Harvey Tool, Sandvik Coromant, and over a dozen other cutting tool developers so that their full tooling collections can be integrated within the Mastercam programming interface. This means



that users can quickly and easily find one tool among thousands. Once pulled up within the library, the tool's digital data will highlight its specifications and applications for ease of use.

Material Libraries

Like tooling libraries, material libraries represent the inventory of a machining shop. The difference is that the material library is a digital collection of the stock material that the shop uses to create its parts. A good material library will not only document how much of each material is present in the shop at a time, it will also record data for each (size, tensile strength, heat tolerance, etc.). For example, aluminium is an exceptional choice of material for aerospace applications because of its strength-to-weight ratio, while cast iron is easy to machine but has low ductility. Your materials library should be able to tell you this.

Fixture Libraries

The fixture is the clamp or vice that holds the stock material in place during cutting. Choosing the best fixture for the job is crucial because the cutting tool needs to be able to reach as much of the part as possible, but the part itself must be kept absolutely stable. Failing to pick a good fixture could mean inefficient cutting and extra set-ups, or it could even result in gouged stock material

or a machine crash. Designing a new fixture for each new part is time- and cost-prohibitive, as well. The solution? A fixture library. These libraries will hold the data for all of a shop's universal, special, assembled, modular, and combination fixtures. This data should include the fixture's size, shape, mounting information, and supported CNC machines.

Toolpath Strategy Libraries

So far, we've gone over libraries that represent real, tangible objects in a shop. The toolpath strategy library is entirely different. Toolpath strategies are the tried-and-true machining approaches created in the process of programming a part. Imagine that you are programming a part with a particularly tricky undercut. After some trial and error, you create a safe and efficient toolpath strategy that cuts exactly what you want. That's a solution that you'd want to save to your toolpath strategy library for the future. If you come across a similar undercut in the future, you won't have to spend any time recreating a machining approach. You can simply apply the old one and tweak it if need be. Keeping an updated and thorough toolpath strategy library could mean the difference of hours of programming. ♦

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National

ITS 2023

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

Date: August 24-25, 2023

Venue: Hotel Sheraton Grand (Brigade Gateway)

Organiser: TAGMA India

Contact: 96534 27396

tagma.mumbai@tagmaindia.org

GDCTech Forum

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

Date: December 1-3, 2023

Venue: Chennai Trade Centre, Chennai

Organiser: GDCTech

Contact: gdctech@arkeycell.com / 09764711315

Plastvision India 2023

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

Date: December 07-11, 2023

Venue: Bombay Exhibition Centre, Mumbai

Organiser: The All India Plastic Manufacturer's Association

Contact: +91 99303 55494

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International

Saudi Plastics & Petrochem

The Saudi Plastics & Petrochem 2023 trade exhibition is the largest event of the year in the Kingdom of Saudi Arabia, aspiring to bring innovation and sustainability to the plastics and petrochemicals industry in the Kingdom.

Date: June 12-15, 2023

Venue: Riyadh International Convention & Exhibition Center

Organiser: Riyadh Exhibitions Company Ltd.

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Moulding expo 2023

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

Date: June 13-16, 2023

Venue: Messe Stuttgart

Organiser: Landesmesse Stuttgart GmbH

Contact: +49 711 18560 0 / info(at)messe-stuttgart.de

Taimold

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

Date: August 23-26, 2023

Venue: Taipei Nangang Exhibition Center, Taipei

Organiser: Chan Chao International Co., Ltd

Contact: +886 2-26596000 (ext.176)

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

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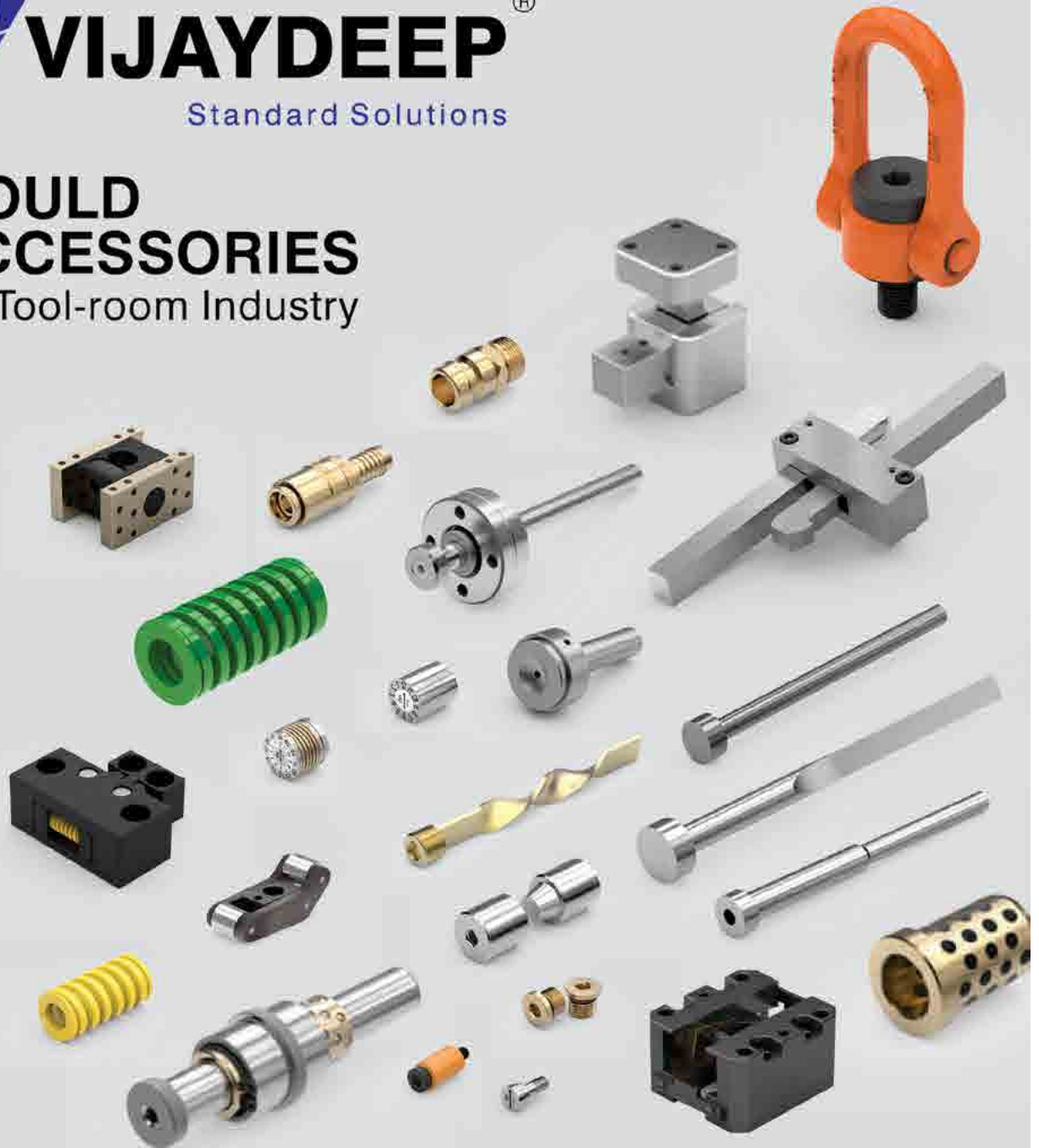




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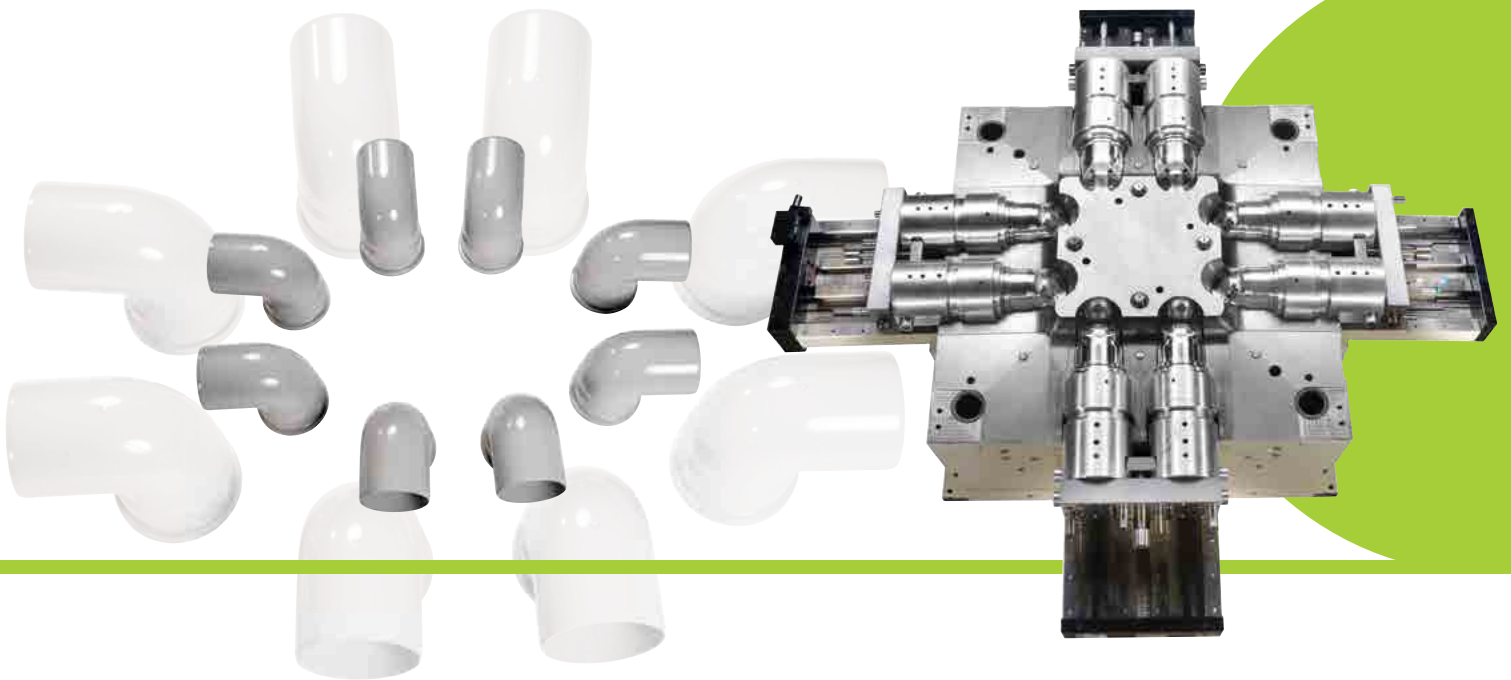
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