

TAGMA TIMES

NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

Volume: XXIX / No. 09

(Private Circulation for Members Only)

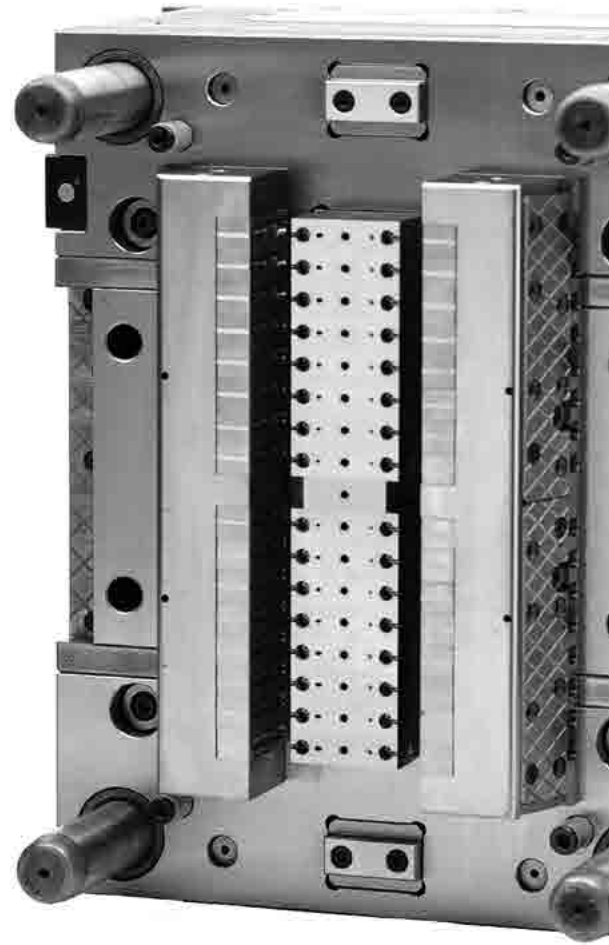
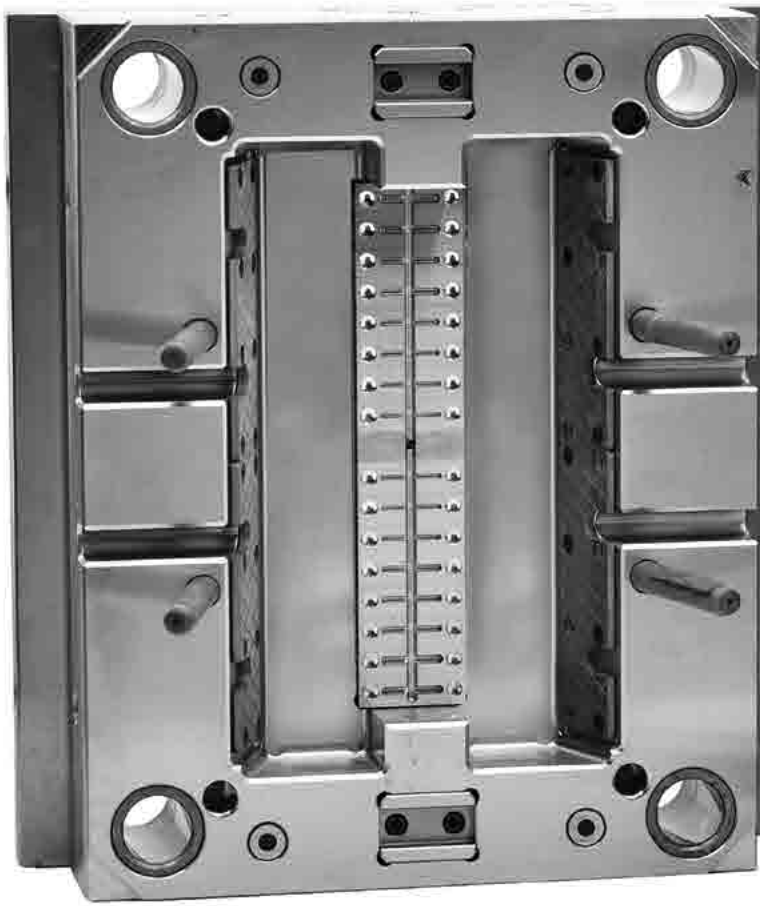
May 2023

Tool Steel: Raising the Bar



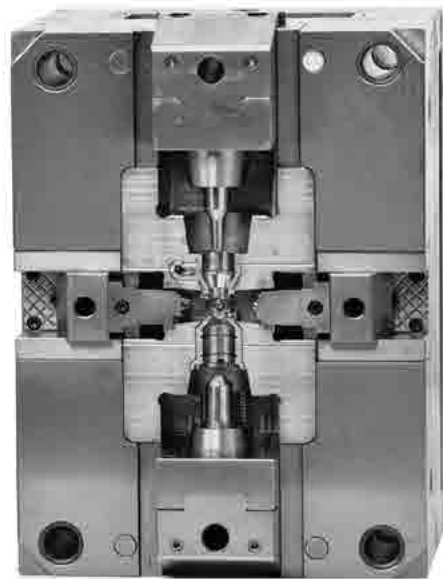
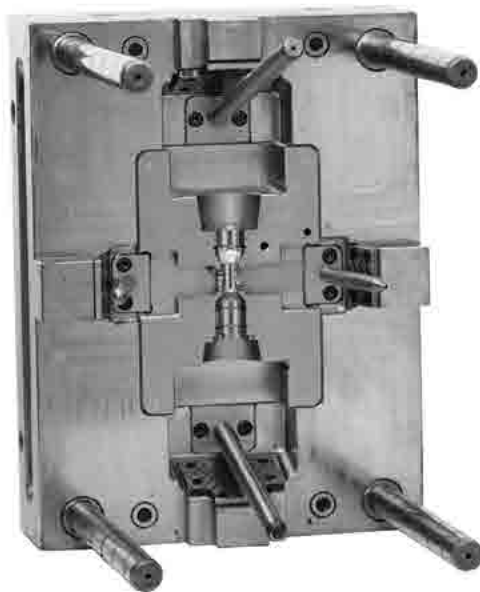
TOOLTALK:
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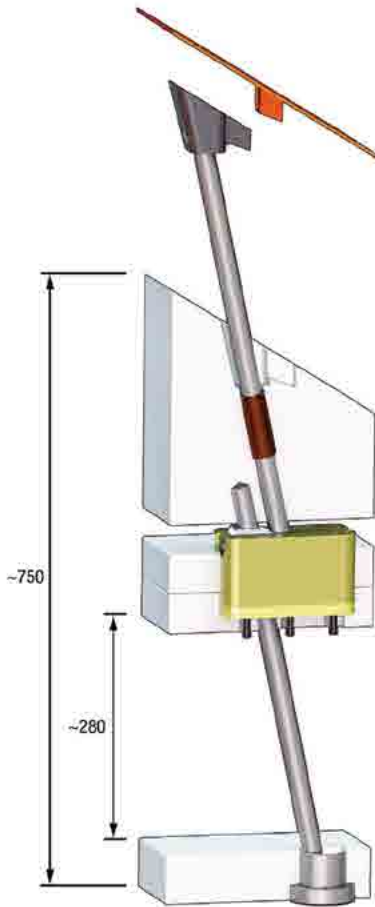
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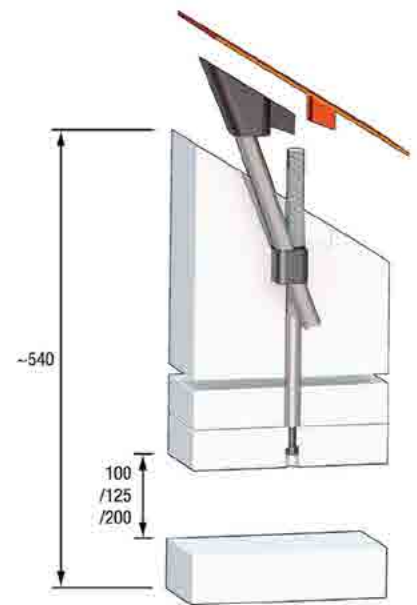
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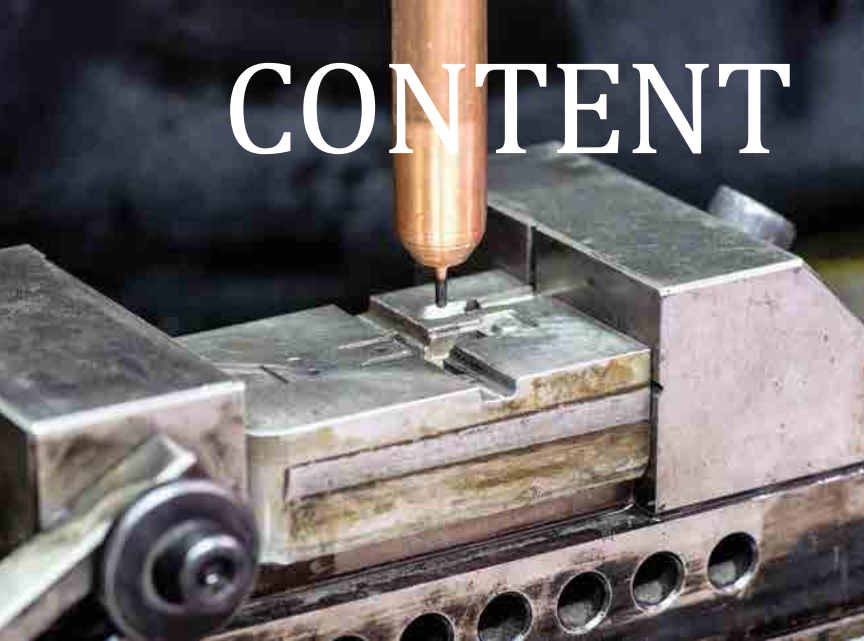
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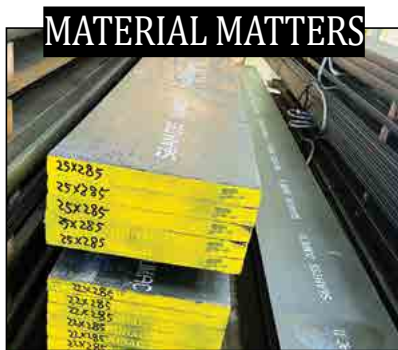


CONTENT



IN FOCUS

20 Steel the deal



MATERIAL MATTERS

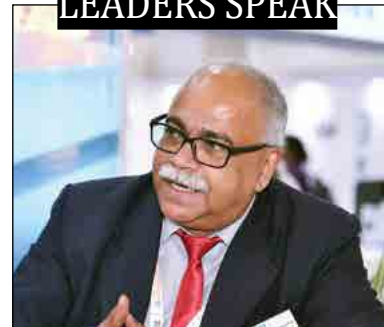
26 Tool Steel: Navigating the changing landscape of the industry

TOOL TALK



32 Mallikarjuna T. M.,
ABB India Ltd

LEADERS SPEAK



38 T. S. Gopalakrishnan,
Multiple Special Steel
Pvt. Ltd.

TAGMA EXECUTIVE COUNCIL.....	4
EDITORIAL.....	6
INDUSTRY UPDATE.....	8
CASE STUDY- HURCO.....	40
CASE STUDY- BLUM.....	44
S&P GLOBAL INDIA MANUFACTURING PMI®	48
EVENT REPORT: ACMA'S 9 TH MSME SUMMIT.....	52
EVENT LIST	53
INDEX.....	54



◀ **THRUHARD SUPREME HH** ▶

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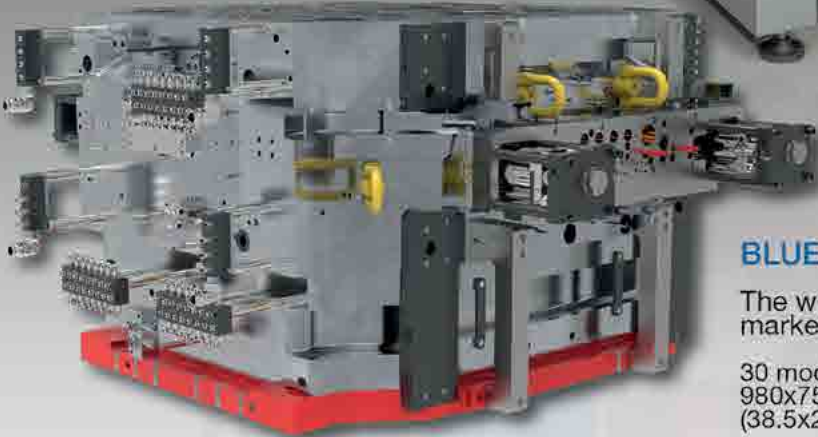
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Edited & Published By: DM Sheregar for TAGMA INDIA at
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Do you know what caught my attention when I first read about tool steel? It's a 'wonder alloy' that offers abrasion and deformation resistance; it can withstand high temperatures and even heavy loads!

Interestingly, tool steel has been used in the production of tools and dies for centuries. The initial "versions" of tool steels were created by introducing carbon to iron. The results were astounding. Iron gained new properties – increased hardness and wear resistance. In the early 1900s, alloying elements like tungsten, chromium, and vanadium were incorporated into tool steels, which further enhanced their strength and wear resistance.

Over the years, tool steel has undergone a remarkable transformation to adapt to the evolving demands of various industries. Today, a wide range of tool steels is available, each specifically designed for particular applications. For instance, high-speed steel is ideal for tools that require exceptional temperature resistance, while hot-work tool steel is suitable for tools operating under high temperatures and pressures. Cold-work tool steel, on the other hand, is specifically crafted for tools enduring high pressures.

The significance of tool steel, with its outstanding strength, durability, and versatility, cannot be overstated in shaping the industrial landscape. Its role remains pivotal in enabling innovation and excellence across multiple sectors.

In this issue of TAGMA Times, we embark on an extensive exploration of this captivating world of tool steel – a fundamental component that serves as the backbone of modern manufacturing. As the tooling industry continues to grow, the future of the tool steel industry appears promising. The demand for tool steel is expected to experience significant growth in the forthcoming years, driven by the expanding manufacturing sector.

We take great pride in presenting an in-depth analysis of this fascinating realm of tool steel in this edition. Join us as we delve into the intricacies and nuances of this essential element, crucial to the success of contemporary manufacturing.

Happy Reading!

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MAKING TECHNOLOGY AFFORDABLE

Airbus wins order for two ACH160 helicopters in India

Airbus Corporate Helicopters has won an order for two ACH160 helicopters in India – the first sale of the type in the region.

The helicopters will be delivered with the ACH160 Exclusive configuration for business use by the customer, who is an experienced helicopter operator. Under the terms of the contract, Airbus Corporate Helicopters will provide a turnkey solution to ensure smooth entry into service of both the helicopters.

Olivier Michalon, EVP - Global Business, Airbus Helicopters, said: "We are proud to announce this milestone contract for two ACH160 helicopters for our Indian customer. We thank them for their pioneering vision and I am confident that the entry into service of this helicopter will set a new benchmark for helicopter operations in India, especially for private aviation and premium charters."

Airbus Helicopters is proud to be a key contributor to the Indian government's 'Aatmanirbhar Bharat' mission. "This new order – the first in India for any helicopter in the H160 range – further reinforces our commitment to the Indian market, where already more than 120 Airbus helicopters are flying," added Olivier Michalon.

The ACH160 is the latest member of the ACH family and is the world's most technologically advanced helicopter, with 68 new Airbus patented technologies.



Image Courtesy Airbus

It provides 20% greater volume per passenger compared to previous generation medium twin helicopters and 35% larger windows than its competitors, resulting in the brightest cabin in its class.

The ACH160's advanced air conditioning technology allows precise temperature control and optimal cabin air quality with highly efficient air exchange. In the ACH160 Exclusive version, mood-lighting contributes to reduced fatigue. ♦

EV sales across categories see yearly rise in April, shows FADA data

Though the retail sales of electric two-wheelers, three-wheelers, passenger vehicles and commercial vehicles saw an increase in April compared to the same time last year, all categories saw a degrowth on a month-on-month (MoM) basis following uncertainties in the FAME subsidy.

According to data shared by the Federation of Automobile Dealers Associations (FADA), passenger vehicles saw 159 per cent increase year-on-year (YoY) from 2,252 units to 5,824 units when compared with April 2022, while on a monthly basis it came down by 32 per cent from 8,566 units in March. On a monthly basis, Tata Motors sales came down by 38 per cent and, despite the slowdown, Mahindra and Mahindra more than doubled its sales.

For two-wheelers, on an annual basis, sales increased 25 per cent to 66,466 units. However, the MoM numbers dipped 23 per cent from 85,793 units in March. Except for Ola Electric, all other manufacturers, such as TVS Motor, Bajaj



Image used for representation only. Courtesy Envato Elements

Auto, Okinawa Autotech, and Hero Electric saw a decline in sales during the month.

In the three-wheeler segment, sales increased 75 per cent to 38,008 units in April, as against 21,759 units in April last year. MoM sales dipped 16 per cent from 45,229 units in March.

Commercial vehicle sales increased 20 per cent to 266 units in April, but slipped 24 per cent on MoM basis. ♦

Courtesy Business Standard

HIGHLIGHTS**BÖHLER M310**
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Along with innovative solutions for sustainable mobility, the materials used play a crucial role. No other material is recycled as effectively as stainless steel, in unlimited cycles and with no loss of quality. About 80 percent of all steel that has ever been produced is still being used today, making it an ecologically exemplary material.

As an innovation leader in the development and production of tool steels we have made sustainable production processes and responsible use of resources an inherent part of our corporate philosophy for decades. With over 150 years of experience, we are able to provide material solutions of the highest quality for any application. One example is BÖHLER M333 ISOPLAST, an plastic mold steel with excellent corrosion resistance, improved thermal conductivity, exceptional toughness, and optimal mirror-finish polishing characteristics for high-tech products that require the highest quality surface finish.



Makino inaugurates new technology centre in Pune

Makino India recently inaugurated a new technology centre in Bhosari, Pune, to support its rapidly growing customer base in the western region of India. The construction of the facility, which started in 2019, was completed in the subsequent year, is now officially opened through an Inaugural Open-house on April 27th, 2023. The new technology centre in an acre campus, with a built-in facility of over 25,000 sq. ft.

The three-day event kicked off with a welcome address by Mr. Raghava Badhya T. V., President & Director of Makino India. Other senior Makino executives including Mr. Neo Eng Chong, CEO & President of Makino Asia; Mr. Ramakrishnan S., Vice President & Director of Makino India; Mr. Shrikant M. Narvekar, Regional Head (West) of Makino India; and Mr. Hidehiko Yamamoto, Die-mold Specialist from Makino-Japan graced the occasion. The event was attended by over 80 CEOs, Managing Directors, Vice Presidents, and General Managers of renowned manufacturing companies in the western region and business partners of this event.

Speaking at the inauguration ceremony, Mr. Raghava Badhya, said: "As we inaugurate our new technology center in Pune, Maharashtra, we mark a significant milestone in our journey of customer-centricity and technological innovation. By bringing ourselves closer to our valued customers in western India, we aim to deepen our relationships, understand their unique needs, and provide tailored solutions that drive their success. This state-of-the-art facility serves as a testament to our commitment to excellence and strengthens our presence in this dynamic region. Together with our dedicated team, we are excited to showcase the latest advancements in machine tool technology, empowering our customers to embrace the future



of manufacturing. We look forward to forging new partnerships, fostering growth, and contributing to the industrial development of India."

After the inauguration ceremony, a session on 'Makino's solutions towards manufacturing transformation' was presented by Mr. Ramakrishnan, followed by a presentation by Mr. Yamamoto on 'Global Die-Mold Industry Trends'.

Chief Guest Mr. Neo in his key note address said, "Undoubtedly, this Makino 'Technology Center' in India stands out as one of our finest globally. Personally, I thoroughly enjoy my visits to India and truly appreciate the unwavering energy and enthusiasm exhibited by our Indian colleagues. Makino is a truly global company, serving customers from diverse backgrounds across the world. We are privileged to leverage our global experience here in India, enabling us to provide superior service and support to our valued customers."

At the event, a dozen Makino business partner companies of this event also showcased their unique solutions, including automation, cutting tools, and tool holders. By inviting these partner companies

to participate, Makino successfully demonstrated the benefits of leveraging the right technologies on the shop floor to achieve rapid return on investment.

Makino India Private Limited is a wholly-owned subsidiary of Makino Asia Pte Ltd., Singapore (a subsidiary of Makino Milling Machine Co., Japan). Makino India has been operating in India since 1995, with its manufacturing operations commencing in Bengaluru in 2002. In 2013, Makino established its second Fixture Factory in Coimbatore, and due to its growth, the company is expanding its fixture factory in another location within Coimbatore to significantly increase its capacity.

Over the years, Makino India has successfully established fully-fledged technology centers in key Indian cities including Bengaluru, Delhi, Chennai, and Pune. Furthermore, a dedicated 'Service Management & Training Center' has been established in Bengaluru. Additionally, Makino India has set up a distinctive corporate social responsibility initiative called the 'Technical Training Center' in Bengaluru, which has played a pivotal role in nurturing and transforming more than 765 young students into skilled engineering professionals. This initiative has not only contributed to the growth of Makino as an organisation, but has also benefitted its valued customers and the wider manufacturing industry. ♦



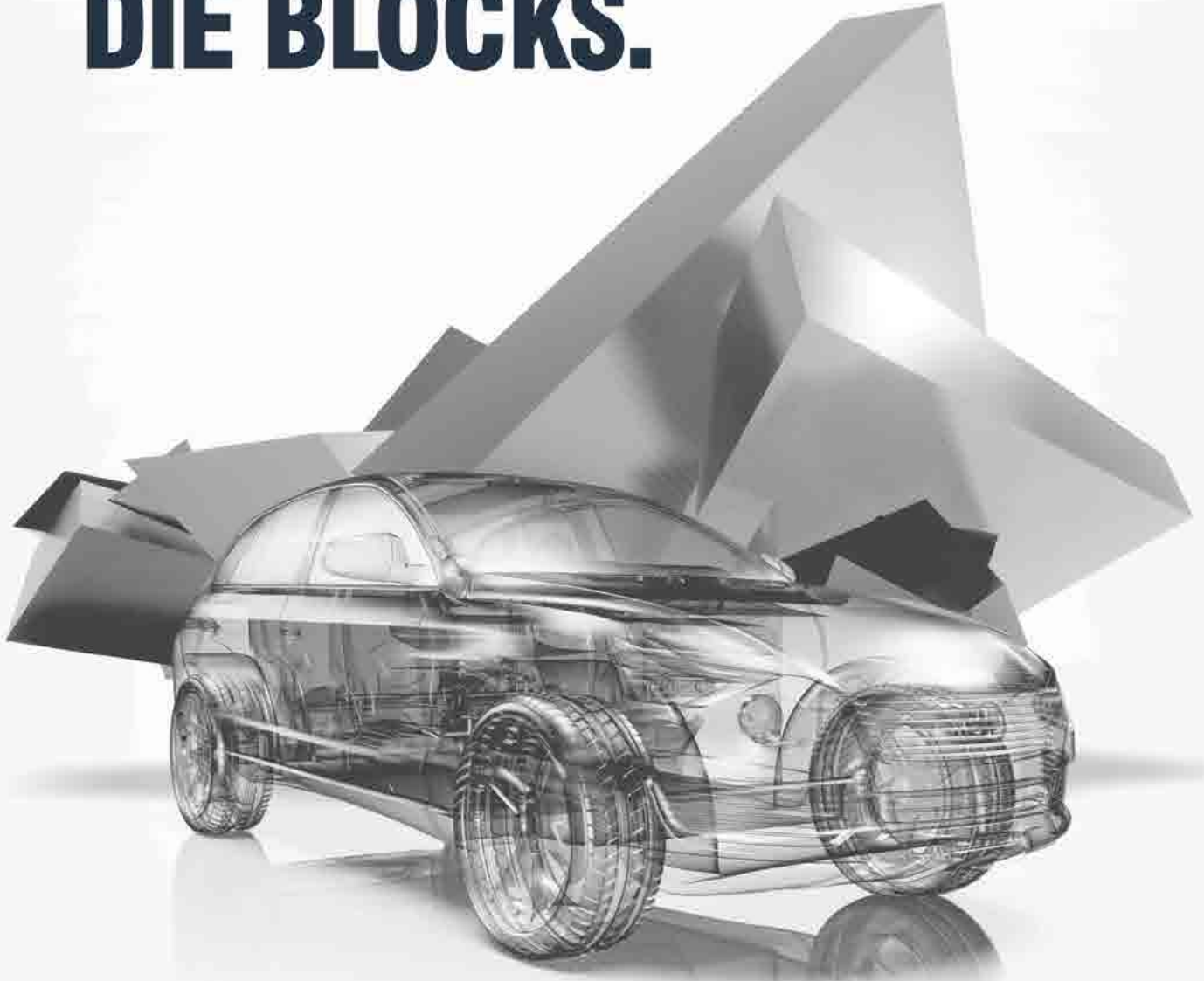
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GDCTech Forum and Forging Technology Forum Unite to Present the Ultimate Die Casting and Forging Technology Event in Chennai

GDCTech Forum and Forging Technology Forum are joining forces to organize a remarkable event at Chennai Trade Centre, Chennai, a prominent hub for Automotive OEMs and auto component ancillaries. Taking place from December 1-3, 2023, 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.

Alongside the exhibition, a concurrent conference will be held, featuring theme-based technical sessions and insightful panel discussions. Renowned speakers have already confirmed their presence, shedding light on new technologies and upcoming challenges. With expectations of over 350 delegates attending the conference and 1000+ visitors to the exhibition, this event promises to be a hub of collaboration, networking, and innovation.

"We are thrilled to announce the upcoming event, GDCTech Forum and Forging Technology Forum, dedicated to the die casting and forging industry. This



December event will provide industry professionals with a unique platform to gather, exchange knowledge, and showcase the latest advancements in our field. Our aim is to foster collaboration, facilitate networking opportunities, and drive innovation within the industry. We invite everyone to join us as we come together to shape the future of die casting and forging," said Mr. R. T. Kulkarni, Vice President, GDCTech Forum. ♦

India to become export hub for Skoda Auto from next year, says company official

Czech car maker Skoda Auto has said India will become an export hub for the company, as it is set to commence exports of vehicle kits for assembly in Vietnam from next year. The company, which posted a whopping 125 per cent year-on-year surge in its vehicle sales at 53,721 units in 2022, also sounded hopeful of growing into double digits this year as well.

Similarly, Volkswagen Group sales grew 85.48 per cent year-on-year at 1,01,270 units in the previous calendar year. The Group is present through Skoda Auto, Volkswagen, Audi, Porsche and Lamborghini brands under Skoda Auto Volkswagen India Pvt. Ltd. (SAVWPIL).

"India is an absolutely important market as part of our regional strategy of Skoda Auto, and India will become an export hub for Skoda," Petr Solc, Brand Director at Skoda Auto India told PTI in an interaction.

Volkswagen is already exporting vehicles from India to Mexico and South Africa, while Skoda Auto is exporting to

the Middle East and North Africa. From next year, we will start exporting vehicle kits for assembly in Vietnam, Solc stated.

Export is already an important part and will continue to be an important part of the strategy for Skoda and Volkswagen, he stated.

Noting that Skoda Auto India for the first time delivered more than 50,000 cars in the domestic market last year, he said we would like to grow with the market or even faster and our ambition is to grow into double digits.

On the company's EV foray in the Indian market, Solc said it depends on the development of the segment in the country. He said that the company is discussing which models it should bring in the future to India as an EV. "I cannot say

necessarily what the percentage will be. But if the market is going towards more than 20 per cent of the electric vehicles of the total market, we would like to penetrate within the EV segment," Solc added. ♦

Courtesy PTI News



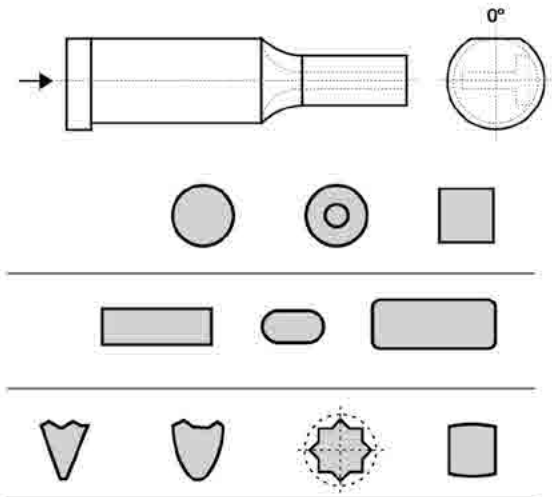
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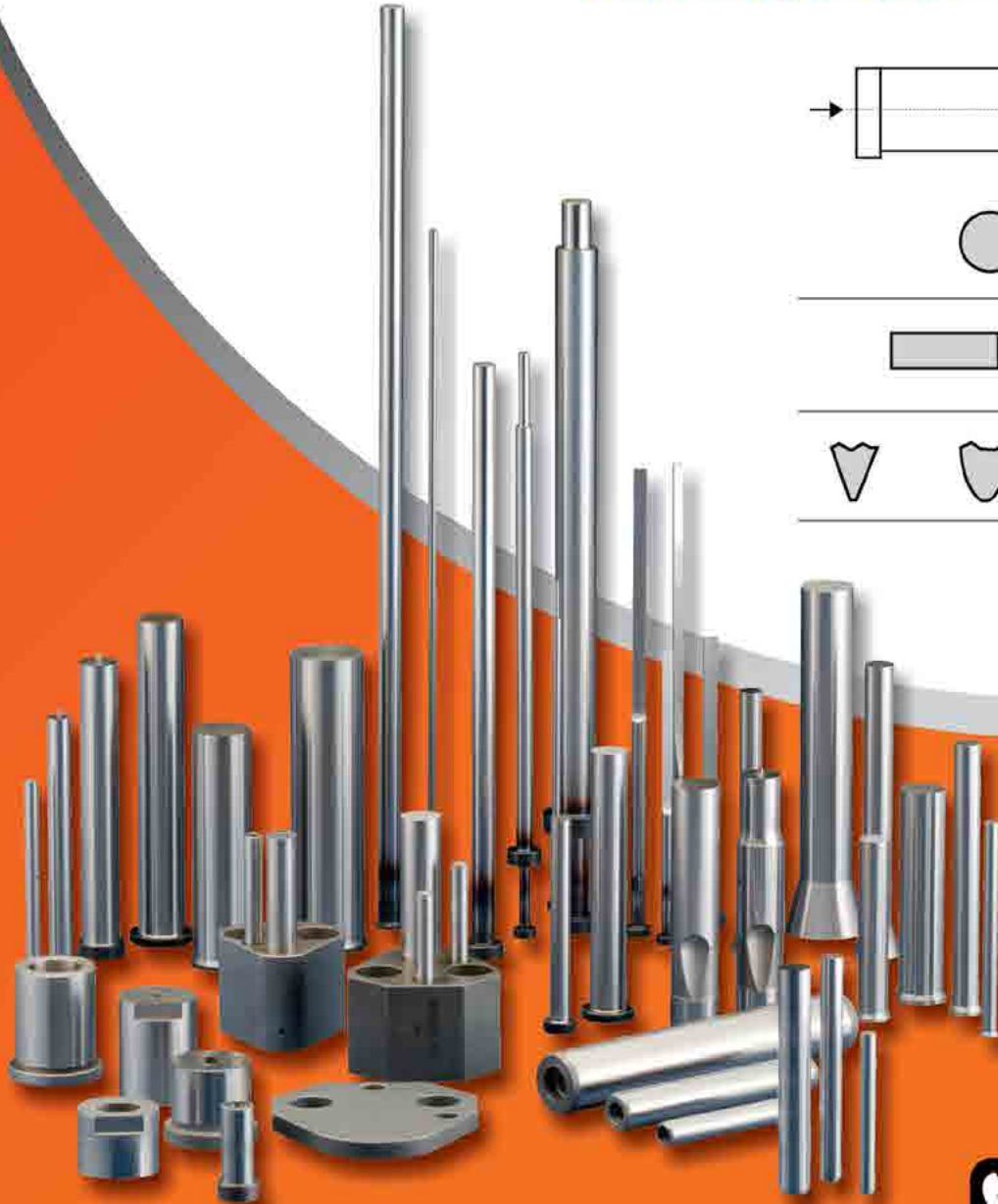
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Karnataka ranked the most 'innovative' state by the National Manufacturing Innovation Survey

A survey on the degree of innovation among manufacturing firms found that Karnataka, overall, is the most "innovative" state, followed by Dadra and Nagar Haveli, Daman and Diu (DNH&DD), Telangana, and Tamil Nadu.

Telangana, Karnataka, and Tamil Nadu had the highest share of innovative firms at 46.18%, 39.10% and 31.90%, respectively, with Odisha, Bihar, and Jharkhand reporting the lowest share of such firms at 12.78%, 13.47% and 13.71%, respectively.

Nearly three-fourth of the 8,000-odd firms surveyed, most of them MSMEs, neither made any innovative product nor business process innovation during the survey period of financial years 2017-2020. However, nearly 80% of the firms that did reported significant gains such as expanding markets and reducing production costs.

The most frequent "barriers to innovation" were the lack of internal funds, high innovation costs, and lack of financing from external sources. Gujarat and DNH&DD reported the highest frequencies of barriers to innovation, despite being among India's most industrialised states.

The findings are part of the National Manufacturing Innovation Survey (NMIS) 2021-22, a joint study by the Department of Science and Technology (DST) and the United Nations Industrial Development Organization (UNIDO), to



Image used for representation only. Courtesy Envato Elements.

evaluate the innovation performance of manufacturing firms in the India. The NMIS 2021-22 study was conducted as a two-pronged survey that examined the innovation processes, outcomes, and barriers in manufacturing firms, and also studied the innovation ecosystem that affects innovation outcomes in these firms. The exercise is a follow-up of the DST's first National Innovation Survey held in 2011.

"The NMIS survey shows that innovation is not yet common in manufacturing but has proved to be profitable for firms. Focus on manufacturing innovation is needed in addition to expanding production," said René Van Berkel, Representative & Head, Regional Office in India, UNIDO. ♦

Courtesy The Hindu

Meusburger at the Moulding Expo with a new campaign

The Moulding Expo, the most important European event for the mould and die making industry, will take place in Stuttgart from June 13-16, 2023. Meusburger will be there again. In addition to its new products and a comprehensive range for injection moulders, the standard parts manufacturer will be presenting its latest campaign on cavities. Visitors will also be able to find out about standardised and customised solutions for hot runner systems. At the Meusburger stand E41 in hall 1, guests can even watch lunch boxes be produced live on an injection moulding machine from ENGEL.

One of the highlights that the standard parts manufacturer Meusburger will present at this year's Moulding Expo is its latest campaign. You can find out about the different products available in the range for cavities and how Meusburger can provide you with the best advice. The company has packaged the core message 'Our heart beats for your cavity' in two creative videos. Thanks to its many years of experience, the standard parts manufacturer offers the right product for every application – whether it's ejectors, slides, sprues or marking stamps. The standardisation of their products means you can benefit from consistently high availability and save time and costs.



In addition to the campaign, Meusburger will present its comprehensive range for injection moulders at the Moulding Expo. Two things are essential for reliable and smooth operation: the use of high-quality moulds and the fast delivery of replacement parts. Meusburger offers a wide range of over 96,000 items of high quality and functionality. ♦



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Absolute Machine Tools offers the AccuteX AP Series Ultra Performance Wire EDM for maximum rigidity during high-speed cutting operations

The AccuteX AP Series Ultra Performance Wire EDM, offered by Absolute Machine Tools, is comprised of a high-rigidity Meehanite cast honeycomb-type base designed using Finite Element Analysis to ensure high-rigidity during even the most high-speed operations. The machine's X-axis table and Y-axis column move independently, with the centre of gravity lying between the two linear guideways of the X-axis table, resulting in improved maximum loading weight up to 1,100 kg with a bi-directional repeatability of less than 2.5 µm after 5 times laser inspection. Also included is the precision workpiece-mounting table of hardened stainless steel designed as a standard clamping system for setting a range of workpieces quickly and accurately. The worktable can also accommodate any additional commercial clamping systems. This combined with 20 mm C1 Class U-V ball screws provide the high precision and maximum flushing pressures necessary for high-speed cutting. Additionally, the oversized U-V axis mechanism is placed in the cabinet above the working



area for best operation.

The AP Series machines are equipped with an annealing, fully automatic wire threading system with scrap wire disposal unit with patent-pending intelligent servo-control wire threading technology. Coupled with multi-detectors, it is an incredibly fast and reliable automatic wire threading system when threading at wire break point. ♦

Efficient high-speed cutting at 30,000 min-1

DMG MORI components like the machine tool manufacturer's extensive spindle portfolio make a significant contribution to quality and reliability in machining. Many years of experience and technical know-how flow into the products developed and manufactured by DMG MORI – as in the case of the speedMASTER 30k. The new high-speed spindle achieves a speed of up to 30,000 min-1.

speedMASTER spindles are designed for high-speed milling applications and are used in horizontal and vertical machining centers such as the NHX 4000/5000 3rd Generation and NVX 5000 2nd Generation as well as the monoBLOCK series. The previously available spindle range already reached speeds of up to 15,000 min-1 or 20,000 min-1. With the new speedMASTER 30k, DMG MORI enables even faster milling and shorter machining times.

The speedMASTER 30k is an optimal spindle for users, who want to implement high-speed milling over



long machining sequences on tool and mould parts. In addition, the high-speed spindle shows its strengths when tools with small diameters are used. This allows small, complex workpieces to be machined highly efficiently and with optimum quality – for example, when drilling semiconductor components. Existing machines can be easily upgraded to the speedMASTER 30k, as it has the same mounting interface as the 15,000 min-1 and 20,000 min-1 spindles. ♦

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Kennametal's new tooling innovations deliver enhanced machining performance & versatility

Kennametal Inc. is expanding its metal cutting tools and solutions portfolio with eight new products that offer improved performance, wear resistance and productivity for a wide range of applications across end markets including aerospace, medical, energy and transportation and general engineering. "Our latest product expansion includes best-in-class features and advanced technology for metal cutting applications. We're focused on designing and delivering solutions that combine industry-leading innovation and shop floor perspective to bring new levels of efficiency, productivity and performance to our customers," said Vice President of Global Product Management Scott Etling.

The launch includes eight products that expand on and support existing platforms in delivering superior performance across multiple applications as well as address common machining challenges:

- Drill Fix PRO™ is an upgrade to Drill Fix—an existing indexable milling platform. Designed for extended tool life and smooth drilling at high metal removal rates, Drill Fix PRO delivers high-volume coolant flow with a wiper included in every outboard insert.
- KenDrill™ Deep HPR is a material-specific, deep-hole drill with broad diameter ranges and length variations. Made specifically for drilling steel and iron, KenDrill Deep HPR boosts performance, productivity and tool life.
- KenDrill™ Micro is Kennametal's first comprehensive micro drilling portfolio for short- and deep-hole



applications. This versatile tooling set offers the best process reliability and longevity in small-part machining applications.

- Face milling operations are enhanced with the expansion of Kennametal's Dodeka™ series, featuring super-high positive inserts with 12 true cutting edges per insert.
- Combining proprietary coating technology with next-generation wear and oxidation resistance, Kennametal's new solid end mill grade KCSM15A offers new levels of reliability and output.
- Kennametal's new stainless steel and high-temp alloy indexable drilling grades KCMS40 and KCMS35 are compatible with the new Drill Fix PRO™ platform and feature higher adhesion wear resistance.
- Complementing another existing platform, Kennametal's Mill 4™-12KT, are new HD geometry and fine-pitch cutters that serve as performance boosters for highly interrupted cuts.
- KenShape™ MaPACS (brazed) and MaxPACS (indexable) countersinks deliver maximum performance for manual CFRP countersinking applications. ♦

The Methods MV 600H: A vertical machining center workhorse

Methods Machine Tools, the foremost supplier of high-quality, high-precision CNC machine tools and automation in North America, recently released the Methods MV 600H, a three-axis vertical machining center (VMC).

The MV 600H's compact design, high-end features, expansive workpiece envelope, and powerful torque work in harmony to create an all-purpose machine tool that can handle any job, any material, for any industry.

Designed with more features than any other machine tool in its class, the MV 600H's standard features include:

- A 24-capacity automatic tool changer
- 19 hand-scraped surfaces for long-term precision and fluid movements

- A BIG-PLUS, dual-contact, 40-taper spindle for improved tool life, surface finishing, and rigidity

The readymade versatility of the MV 600H positions shop owners to accept a wider range of jobs across a wider customer base with consistent machining experiences.

"Job shops must have every inch of floor space pulling its weight," said Darren Wall, Product Manager for the Methods product line. "We realised there was an underserved need in the market for flexible, compact machines. That's why we introduced the MV 600H. It's packed with sophisticated features and leading design principles, but small enough to fit in any corner of your shop so it can start adding to your bottom line immediately." ♦

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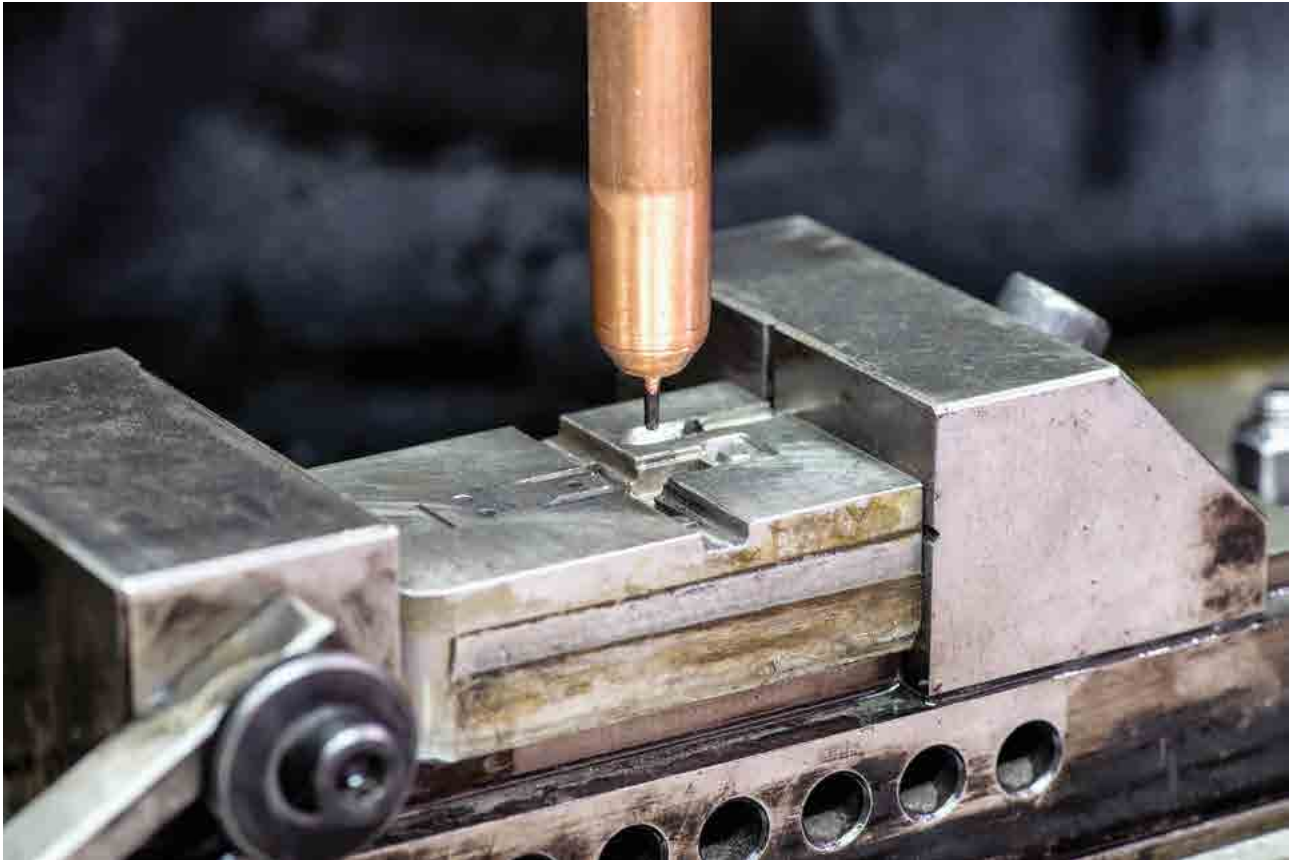
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MAKING TECHNOLOGY AFFORDABLE



Courtesy Envato Elements.

Steel the deal

Did you know that Robert Forester Mushet, a British metallurgist and businessman, was credited with inventing the first commercial tool steel in 1868? Called R Mushet's Special Steel (RMS), this tool steel was made by adding a small amount of tungsten to molten steel, which made it much harder than traditional steel. This allowed RMS to be used to make tools that could cut and shape harder metals than was possible before. RMS is considered one of the most important contributions to metallurgy in the 19th century. Today, tool steel has revolutionized the manufacturing industry, which now boasts of stronger, more durable, efficient and long-lasting machine tools, blades, drills, and milling cutters.

Kimberley D'Mello

The COVID-19 pandemic had a substantial impact on the tool steel market. The sudden drop in manufacturing activities and the disruption in supply chains resulted in decreased demand for tool steel. In some cases, a shortage of the alloy was reported. With manufacturers not being able to get the required supply, they were forced

to decrease their production or even shut down their operations. However, as the "new normal" began to define the manufacturing world, the demand for tool steel began to increase.

Owing to increasing demand from the automotive, aerospace & defence, machinery, tooling, and shipbuilding, among other industries, the tool steel market is expected

to improve and grow in the coming years. In fact, a Polaris Market Research report published in March 2023 revealed that the global tool steel market, which was valued at US\$ 5.03 billion in 2022, is expected to grow at a CAGR of 5.2% during 2023-2032. Additionally, developing new alloys and heat treatment processes, among other technological

advancements in the production tool steel are set to ring in tremendous growth opportunities for the tool steel market.

Why it's the ideal choice?

Tool steel is made using various carbide-forming materials. The prominent ones are tungsten, vanadium, molybdenum, and chromium. Based on the type of application, there have been instances of cobalt or nickel also being used to make tool steel.

This adaptable metal alloy is used in moulds for plastic injection moulding machines, blades for lathes, cutting tools, punches and dies, etc. Its properties like high wear resistance and increased strength when heated at high temperatures have made it popular. Besides, tool steel has minimal trace elements, good tolerance limit, and is adaptable to comply with etch-graining and polishing.

"When used in plastic moulding applications, tool steels offer excellent machinability, polish ability, homogeneity, low Sulphur content, and a good photo etching ability. They also exhibit better toughness and weldability than other counterparts. They also have a high material removal rate, thus making them ideal for usage in high cavity designs," stated the Polaris Market Research report.

In addition, tool steel is easy to machine, which makes it a cost-effective material to use in manufacturing. All these factors have broadened the scope for tool steel.

Tool Steel in Manufacturing

Based on the specific production needs, tool steel manufacturers help their clients make informed choices about "selecting the most suitable and efficient tool steel that will minimize progressive damage caused by cyclic mechanical loading and other factors. These companies offer various tool steel grades to address failure mechanisms such as abrasive



Courtesy Envato Elements.

wear, adhesive wear, breakage, and chipping. By doing so, they help clients to enhance their overall manufacturing process and increase productivity by minimizing the occurrence of failure mechanisms", explained the Polaris Market Research report.

Tool steel is used in a variety of sectors. Let's take a look at some of them:

➤ **Automotive:** Tool steel is used in the manufacturing of a variety of automotive components because of its ability to be strong, durable, wear-resistant, heat-resistant, and corrosion-resistant. It is used to manufacture:

- Pistons, crankshafts, camshafts, and connecting rods, among other engine components
- Gears, shafts, and bearings, among other transmission components
- Rotors, calipers, and pads, among other brake components
- Springs, shocks, and linkages, among other suspension components
- Pipes, mufflers, and catalytic converters, among other exhaust system components.

➤ **Aerospace:** Aerospace components need to be strong, lightweight, and resistant to high temperatures, fatigue and corrosion. This makes tool steel the perfect material to manufacture:

- Turbine blades, compressor blades, and combustion chambers, among other engine components
- Landing gear, fuselage, and wings, among other airframe components
- Circuit boards, connectors, and housings, among other avionics components
- Dies, moulds, and gauges, which are used to manufacture components of an aircraft.

➤ **Metalworking:** Tool steel is used to make tools and dies that are critical to manufacturing. These include saw blades, drills, and milling cutters, among others. Some of the benefits of using tool steel are:

- **High hardness:** It is resistant to wear and tear, which makes it suitable for tools and dies used to cut, shape, and form metal.
- **Toughness:** It can withstand



Courtesy Envato Elements.

impact and deformation, which is important for tools and dies used in high-impact applications.

- **Wear resistance:** It can last longer than other materials, which is crucial for tools and dies used in high-wear applications.
- **Machinability:** It is easy to machine, which makes it cost-effective to use in manufacturing.

➔ **Machinery:** Tool steel is an essential material used in the machinery sector. It is used in a variety of applications including:

- Gears such as spur gears, helical gears, and bevel gears
- Bearings such as ball bearings, roller bearings, and needle bearings
- Shafts such as axles, spindles, and couplings
- Crankshafts such as automotive crankshafts and industrial crankshafts
- Connecting rods such as automotive connecting rods and industrial connecting rods
- Camshafts such as automotive camshafts and industrial camshafts.

➔ **Shipbuilding:** Tool steel is known for its high strength, corrosion



Courtesy Envato Elements.

resistance, and machinability, which make it ideal for use in ship components, including:

- Propellers such as fixed-pitch propellers, controllable-pitch propellers, and folding propellers
- Rudders such as balanced rudders, semi-balanced rudders, and unbalanced rudders
- Steering gear such as hydraulic steering gear, electric steering gear, and manual steering gear
- Anchors such as stockless anchors, fluke anchors, and mushroom anchors
- Chain such as anchor chain, mooring chain, and towing chain.

Recent Developments

- In June 2022, Chicago based Ryerson Holding Corporation, a leading value-added processor and distributor of industrial metals, announced through a press release its acquisition of Ford Tool Steels, a tool steel processor based out of St. Louis, Missouri.
- According to a recent Polaris Market Research report, in September 2022, Pennsylvania Steel Company Inc. acquired Nivert Metal Supply to expand its global customers' base with providing its services for metals in northeast.
- The Polaris Market Research report also mentioned that in January 2021, Hitachi Metals Ltd. announced it had completed the acquisition of Teikuro Inc., a manufacturer of tool steel and other specialty steel products based in Japan.



Conclusion

Tool steel's exceptional properties make it ideal for use in a variety of applications – right from cutting tools to machine parts. Its strength, hardness, and ability to resist wear, abrasion, fatigue, corrosion and high temperatures make it an ideal choice to create durable and long-lasting tools as well as components. ♦



Courtesy Envato Elements.

6 factors to consider when choosing the right tool steel for your application

Choosing the right tool steel for a specific application is crucial for ensuring quality, durability, and productivity in tool and die manufacturing. Selecting the wrong tool steel can lead to premature failure, increased downtime, and decreased efficiency. Therefore, it is important to consider the following factors before selecting the right tool steel for your application.

Nishant Kashyap



Application requirements

The first factor to consider is the application requirements. This includes the type of material being moulded, the shape and size of the tool, and the expected production volume. Different tool steels have different properties that make them suitable for specific applications. For example, high-speed steels are best suited for high-volume production runs, while cold-work steels are better for smaller production runs. Similarly, the working environment can have a significant impact on the selection of tool steel. For instance, a corrosive environment may require a tool steel with high resistance to corrosion, while an application that involves exposure to extreme temperatures may require a tool steel with high temperature resistance.

Thus, it is essential to have a clear understanding of the specific requirements of the application

before selecting the tool steel. Factors to consider may include the type and size of the part to be moulded, the materials to be used in the moulding process, the expected service life of the mould, and the environment in which the mould will be used.

By taking into account the application requirements when selecting tool steel, mould makers can ensure that the final product will meet the necessary standards for quality, durability, and performance.

Hardness and wear resistance

The second factor to consider is hardness and wear resistance. These properties determine how well the tool steel can withstand the wear and tear of repeated use. Hardness is typically measured on the Rockwell C scale, with higher numbers indicating greater hardness. Tool steels with higher hardness and wear resistance are better suited for

applications that involve abrasive materials, high temperatures, or high stress.

Toughness and impact resistance

Toughness and impact resistance are important factors to consider when selecting tool steel for mould manufacturing. Moulds are subjected to high stresses and strains during the manufacturing process, and it is essential that the tool steel used has the necessary toughness and impact resistance to withstand these stresses without cracking or breaking.

Toughness is the ability of a material to absorb energy and deform plastically before fracturing. Impact resistance, on the other hand, is the ability of a material to resist fracture under high-stress impact loading. These properties are critical for moulds that are used in high-impact applications or where the moulded parts are subjected to

heavy loads or impacts.

When selecting tool steel for mould manufacturing, it is important to choose a steel with high toughness and impact resistance. This will ensure that the mould can withstand the high stresses and strains that it will be subjected to during the manufacturing process, without fracturing or breaking. Additionally, steel with high toughness and impact resistance will have a longer service life, reducing the need for frequent replacement and maintenance of the mould.



Corrosion resistance

Corrosion resistance is an important factor to consider when selecting tool steel for mould

manufacturing. Moulds are often exposed to a variety of chemicals and environmental conditions during operation, which can cause corrosion and degrade the mould's performance over time. Corrosion can lead to pitting, cracking, and other forms of damage, ultimately reducing the lifespan of the mould and increasing the risk of failure.

The selection of tool steel with high corrosion resistance can help to mitigate these issues and ensure that the mould maintains its performance over time. Stainless steels are a common choice for moulds that will be exposed to corrosive environments, as they offer excellent resistance to both oxidation and corrosion. Other materials such as nickel-based alloys and titanium can also offer good corrosion resistance properties,

although they may be more expensive than stainless steels.

It is important to note that the selection of the appropriate tool steel for a specific application depends on the specific environmental and operating conditions of the mould. Factors such as temperature, humidity, and exposure to chemicals and abrasive materials must be carefully considered to ensure that the chosen tool steel will provide the required level of corrosion resistance.



Machinability

Machinability is an important factor to consider when selecting tool steel for

mould manufacturing because it affects the ease and speed of the machining process. Tool steel with good machinability can be machined quickly and easily with less tool wear and lower energy consumption, resulting in reduced manufacturing time and cost.

If a tool steel has poor machinability, it can lead to longer machining times, more tool wear, and increased energy consumption, resulting in higher manufacturing costs. Additionally, poor machinability can lead to reduced tool life and lower quality finished products due to the increased risk of tool breakage and dimensional inaccuracies.

Therefore, selecting a tool steel with good machinability is crucial for optimizing manufacturing processes and achieving the desired

quality and efficiency of mould production. The machinability of tool steel can be influenced by factors such as chemical composition, microstructure, and heat treatment. So, it is important to consider these factors when selecting the appropriate tool steel for a specific mould application.



Cost

The cost of tool steel is an important factor to consider when

selecting the right material for mould manufacturing. Different types of tool steels have varying costs, and the selection of a specific type of tool steel may depend on the budget and the expected production volume of the mould.

While it may be tempting to opt for a lower-cost material to save on expenses, it is important to consider the potential long-term costs of using a cheaper material. Cheaper tool steels may have lower performance and durability, leading to increased wear and tear, frequent repairs, and eventual replacement of the mould. This can result in higher costs in the long run, including lost production time and revenue.

On the other hand, higher-cost tool steels may offer superior performance and durability, leading to longer tool life, reduced maintenance and repair costs, and less downtime for replacement. This can result in lower costs over time and a better return on investment.

Conclusion

In conclusion, selecting the right tool steel for a specific application requires careful consideration of the application requirements, hardness and wear resistance, toughness and impact resistance, corrosion resistance, machinability, and cost. By considering these factors, a mould maker can select a tool steel that will provide the necessary performance and durability for the given application. ♦

Selection of the appropriate tool steel for a specific application depends on the specific environmental and operating conditions of the mould. Factors such as temperature, humidity, and exposure to chemicals and abrasive materials must be carefully considered to ensure that the chosen tool steel will provide the required level of corrosion resistance.

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Tool Steel: Navigating the changing landscape of the industry

This article delves into the world of tool steel, exploring its basic concepts, the current business scenario, and the global landscape. It examines the impact of 'Make in India' initiatives and the role of BIS standards in shaping the industry. It also offers insights into the future outlook, discussing the challenges and opportunities that lie ahead. Read on as the intricacies of tool steel and its evolving significance in the dynamic world of manufacturing and technology unravel.



There's a quote by Albert Einstein, which states: 'If you can't explain it simply, you don't understand it well enough'. This quote holds a lot of relevance when trying to understand tool steel. But before we delve into the topic, let's first understand the concept of alloying.

Iron, a chemical element with the symbol Fe, is the major elemental component of steel. Alloys are added to the iron to improve its usability and ensure it has the desired properties. The easiest way to explain this is using the example of food. Let's take a look at the various stages.

To create a tasty meal, spices are added to enhance the flavours. And, in the world of alloying, carbon, silicon, manganese, molybdenum, chromium, nickel, vanadium, aluminium, tungsten, copper, cobalt,

etc., are added to enhance the properties of iron.

Sounds simple? There's more. Interestingly, each element has specific properties. Each element needs to be added in a specific quantity to ensure that the alloy exhibits the perfect properties. This brings me to the next concept – metallurgy. Let's understand metallurgy using the example of food. When you add excess salt to a particular dish, it becomes inedible. It's no different with alloys. Personally, I believe that vanadium is the salt of the alloys. Adding excess of it has the potential to ruin an alloy.

But is combining all the ingredients sufficient to prepare a meal? Not necessarily! One has to also cook them, i.e. heat the combined ingredients to enhance the flavours and ensure that the meal

is ready to eat. Likewise, with alloys, it is the heat treatment which steel undergoes that helps enhance its properties. Then comes the finishing touch. Once a dish is ready, it's usually garnished to make it look appealing. Surface treatment or coatings are given to steels to make them look appealing.

So, tool steels are a result of the science of metallurgy and the perfect art of cooking.

Tool steel: Over the years

As a fresh graduate from BITS, Pilani, I joined my father in his tool steel business in 1995. I was very curious about why he liked dealing with tool steel. I still remember his response. "This job is for lazy people. You sell small quantities, work less and can be home by 6 pm. Those in this business can lead a relaxed life." His words

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unfavourable. This is largely due to our dependence on the outside world for oil. Balancing this deficit is of prime importance for the government. For any industry to grow and flourish, the working conditions need to be ambient and comfortable. 'Make in India' is a great endeavour to encourage the production of tool steels in India. Besides, the government has introduced licence and BIS to restrict imports of tool steels. The impact of these initiatives are likely to yield positive results. But the full impact may be realized after 10-15 years. This transition period will create a difficult phase for the tooling industry, which will have to deal with hurdles like inflation in prices and limited specifications to choose from owing to the lack of options.

Globally, the number of organized tool steel production units can be counted on one's fingers. When it comes to serving India, there are approximately 12-15 reliable suppliers of tool steels. There is a reason why all mills don't produce tool steels. It requires significant research and development (R&D) to develop new grades. The quality requirements for tool steels are distinct from those of production steels. The batch sizes for tool steels are usually low in volume, but the number of specifications and size ranges is extensive. Therefore, it is more practical for distributors to serve the retail market. As a general rule, for every 1000 kilograms of carbon steel, only 1 kilogram of tool steel is used. This is why most mills prefer to focus on higher volumes, and tool steel is not a primary focus for most of them. Selling tool steel also requires sharing and discussing a significant amount of technical information regarding its applications and properties.

Selling tool steel has become a highly skilled job that requires extensive metallurgical knowledge to understand and recommend the right steels to users. As a company, we are working diligently to keep pace with

technology and utilize it to the best of our abilities in order to offer a wide range of options to end users. Most tool steel mills are already considered to be above average compared to regular mills, providing customers with a diverse selection.

Countries like South Korea, despite their smaller size compared to many Indian states, are world leaders in competitive moulds and steel. Similarly, Taiwan excels in machine building. We should learn from their expertise and concentrate on our core business rather than attempting to do everything. Whether being a Jack of all trades or a Master of one is better is uncertain, but we believe that both the tooling industry and the government should remain focused on their core business.

Looking ahead, we anticipate significant growth in the tooling industry over the next decade, projected at an annual rate of 10-15%. Our own internal demand will contribute to this growth. We also believe that restricting tool steel imports would result in a limited availability of high-quality steels for toolmakers. The Indian steel mills are still at a nascent stage and may not be able to meet the actual demands of the market.

Like any service industry, tool steel suppliers, options, and value additions will continue to expand. This trade is evolving into an industry due to the high level of technicality involved. There are constant advancements in steel production, heat treatment, and surface treatments. Tooling is improving, machines are becoming faster, demands are becoming more stringent, and the competition is intensifying. Let us strive to be at our fittest and best in response to these challenges.

Caution ahead

The world is undergoing rapid changes at a pace beyond our imagination. What used to take 10 years to change is now happening

within 2. We have witnessed the disappearance of many products in recent times, and the same can happen to the tooling industry and tool steels. Additive manufacturing and 3D printing pose immediate threats, and once they become economically viable for mass production, it could significantly alter the landscape of tooling and demands.

Artificial intelligence (AI) has the potential to render many jobs redundant and diminish our capacity for critical thinking and innovation. Overcoming this comfort zone is a topic that everyone should closely monitor. The automotive industry and component industry are also on the brink of significant transformation. The future is unpredictable but undoubtedly interesting. The old must make way for the new, and with every new era, a new generation emerges with fresh ideas.

Despite the challenges and uncertainties, we have successfully navigated the tooling industry for 50 years, and we hope to continue thriving for the next 50 years as well. ♦

Mr. Pankaj Goel is the Managing Director of Goel Special Steels & Engineering Pvt. Ltd.

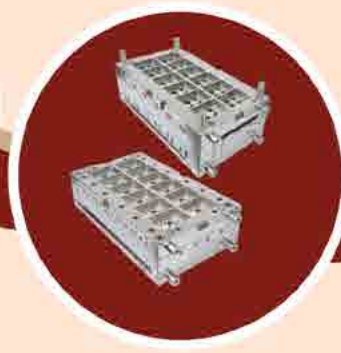
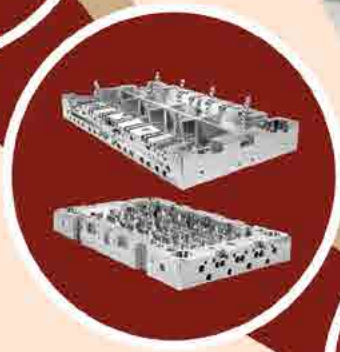
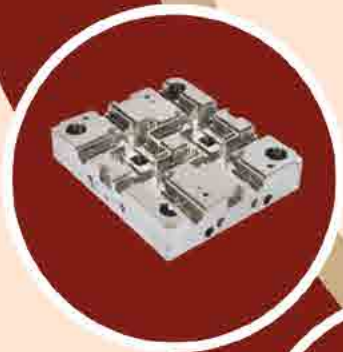
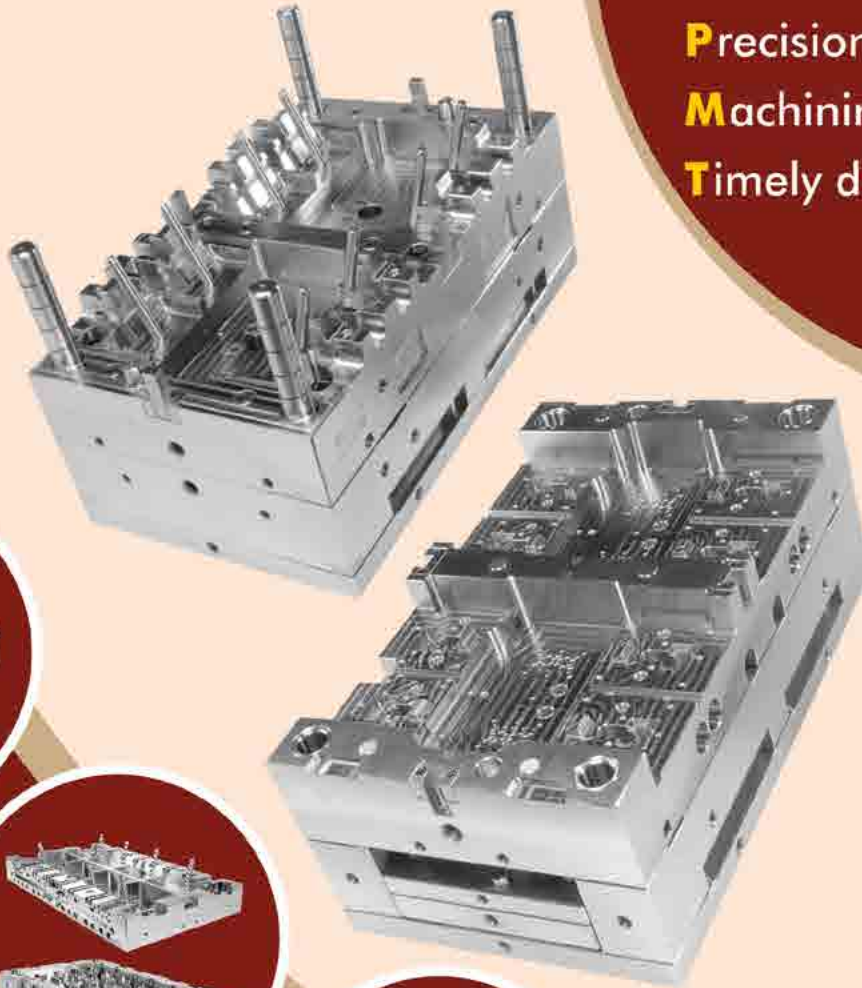


He leads the operations with a rich experience spanning nearly 3 decades. Mr. Goel holds a postgraduate degree from BITS, Pilani. His expertise is in tool steels, vacuum treatment, surface treatment, and toolmaking. With extensive knowledge of the global and Indian steel business, he has garnered insights from top steel mills worldwide, including those in Europe, Japan, and South Korea.

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'If we can consistently deliver high-quality, we can certainly compete globally'

"The prevailing power crisis and rising manufacturing costs in Europe have prompted companies to explore alternative options, including India. This situation has opened up opportunities for Indian toolmakers, as global counterparts increasingly source from India. This trend has positively impacted our vendors, providing them with substantial business opportunities," says Mallikarjuna T. M., Head - Process and Product Engineering, Smart Power India, ABB India Ltd.

Nishant Kashyap

Q Can you briefly describe the Electrical Division of ABB and its tooling activities?

I belong to the Smart Power Division of ABB, a large conglomerate. Our division specialises in manufacturing various electrical products, including air circuit breakers, moulded case circuit breakers, contactors, relays, and its accessories. For switchgear production, we primarily utilise plastics and sheet metals as key commodities. We work with both thermoset and thermoplastic materials in our plastic manufacturing processes.

Our manufacturing facility is located in Bengaluru. We have around 150 domestic business partners who are supporting our operations and out of this, around 50 are from the tooling industry. We strongly believe in localisation and maintain close collaboration with local toolmakers to meet our requirements. It's important to note

that we do not manufacture any tools or components ourselves; instead, we rely on our trusted business partners to do so.

Q The electrical industry has been growing rapidly in India over the past few years. What opportunities could local toolmakers reap from this growing industry?

It's evident that various industries in India are experiencing rapid growth, contributing significantly to the country's economy. Our business, in particular, is also on a high-growth trajectory, and our vendors are growing alongside us. In line with this growth, we are currently engaged in the development of more than 80 moulds and approximately 45-50 press tools, all within India. This continuous project flow highlights our commitment to localisation. Localisation is crucial for us to remain competitive in the market.

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

Every industry has unique demands and challenges. In the automotive industry, the focus is often on larger, simpler moulds, although complex tools are also used. However, in the electrical industry, we deal with smaller, intricate parts and work with extremely close tolerances. The precision of machining and design in the electrical industry plays a vital role. Additionally, since certain electrical components are manufactured in millions, the tools we use must be robust and capable of providing consistent results. The stringent requirements in terms of tolerances, complexity, and part size make the electrical industry unique and demanding in terms of tooling and manufacturing processes.

Q Can you elaborate on this with a use case? If I own a small tool room with all the necessary infrastructure to carry out tooling activities and serve the automotive industry, what do I need to venture into the electrical industry in terms of skills, infrastructure, know-how, etc.?

First and foremost, having experienced designers is crucial. As I mentioned earlier, design plays a vital role. After all, a robust design leads to excellent output. A well-designed tool facilitates smoother manufacturing operations and allows shopfloor technicians to create appropriate inserts accordingly.

Another critical factor is assembly and workmanship. In the past, inserts were forcefully inserted into cavities, often requiring impact methods. Nowadays, the design of cavities and inserts enables effortless fitting with a simple thumb press. This approach not only enhances the manufacturing process but also aids in maintenance. Ensuring high-quality workmanship is essential.

Additionally, it's important to have the right mindset. One must understand that the tools being created will be used to manufacture parts that may have a global reach. Therefore, extra care should be taken to avoid any deviations in the manufacturing process.

Efficiency and quality improvements are paramount. Over the course of my 25 years in the industry, I have witnessed toolrooms equipped with both conventional and CNC machines. Owing to advancements in technology, now, numerous tools and software solutions are available to enhance tool quality and improve efficiency. For example, spark EDM (Electrical Discharge Machining) has significantly reduced the time required to manufacture certain components from 5 hours to 2.5-3 hours. Investing in the right machines

and software can yield a 50% time savings, thereby increasing efficiency and attracting more orders.

Q What is the eligibility criteria for a toolmaker to become your supplier? What skill set and infrastructure would you look for?

To meet our requirements, we seek toolmakers that can deliver high-quality tools within the specified timeframe and cost. However, with numerous toolmakers available, we evaluate potential suppliers based on the following criteria:

- Technical capability and competency levels: We assess the supplier's technical expertise and competency in tool manufacturing.
- Designer experience and design platform: We consider the experience of the supplier's designers and the design platform they utilise.
- Machinery and manufacturing capabilities: We examine the range of machinery and equipment available at the supplier for tool production.
- Past development projects: We review the types of moulds the supplier has developed in the past to gauge their experience and expertise.
- Customer base: We inquire about the supplier's existing customers to understand their reputation and track record.
- Shopfloor safety measures: We evaluate the safety measures implemented on the shopfloor

It's important to have the right mindset. One must understand that the tools being created will be used to manufacture parts that may have a global reach. Therefore, extra care should be taken to avoid any deviations in the manufacturing process.

to ensure a secure working environment.

- Quality check policies: We assess the supplier's quality control policies and procedures to ensure consistent delivery of high-quality tools.

By evaluating toolmakers based on these factors, we aim to identify a supplier that meets our requirements and can provide us with tools that align with our expectations in terms of quality, timeline, and cost.

Q ABB is been sourcing most of its tools from Indian toolmakers. Did ABB face any challenges in the process? How did the company overcome them? If possible, could you share some management practices you've applied in your system?

Currently, we are in the process of developing approximately 80 moulds and 50 press tools, a similar volume to what we undertake each year. In the past, we encountered challenges wherein vendors would overcommit or face difficulties during manufacturing operations, requiring them to redo the core and cavities. These setbacks not only delayed our projects but also undermined the purpose of localising production, which should ideally result in faster turnaround times.

To address this issue, we have implemented a collaborative approach with our vendors. We have highly qualified toolmakers, who work closely with vendors, providing assistance whenever they encounter obstacles. We closely monitor the progress of each project on a weekly basis to ensure alignment with the designated timeline. If any obstacles arise, we intervene promptly and provide support to help our vendors overcome them.

In my opinion, the timely completion of projects was the most significant challenge we faced. We successfully tackled this situation by



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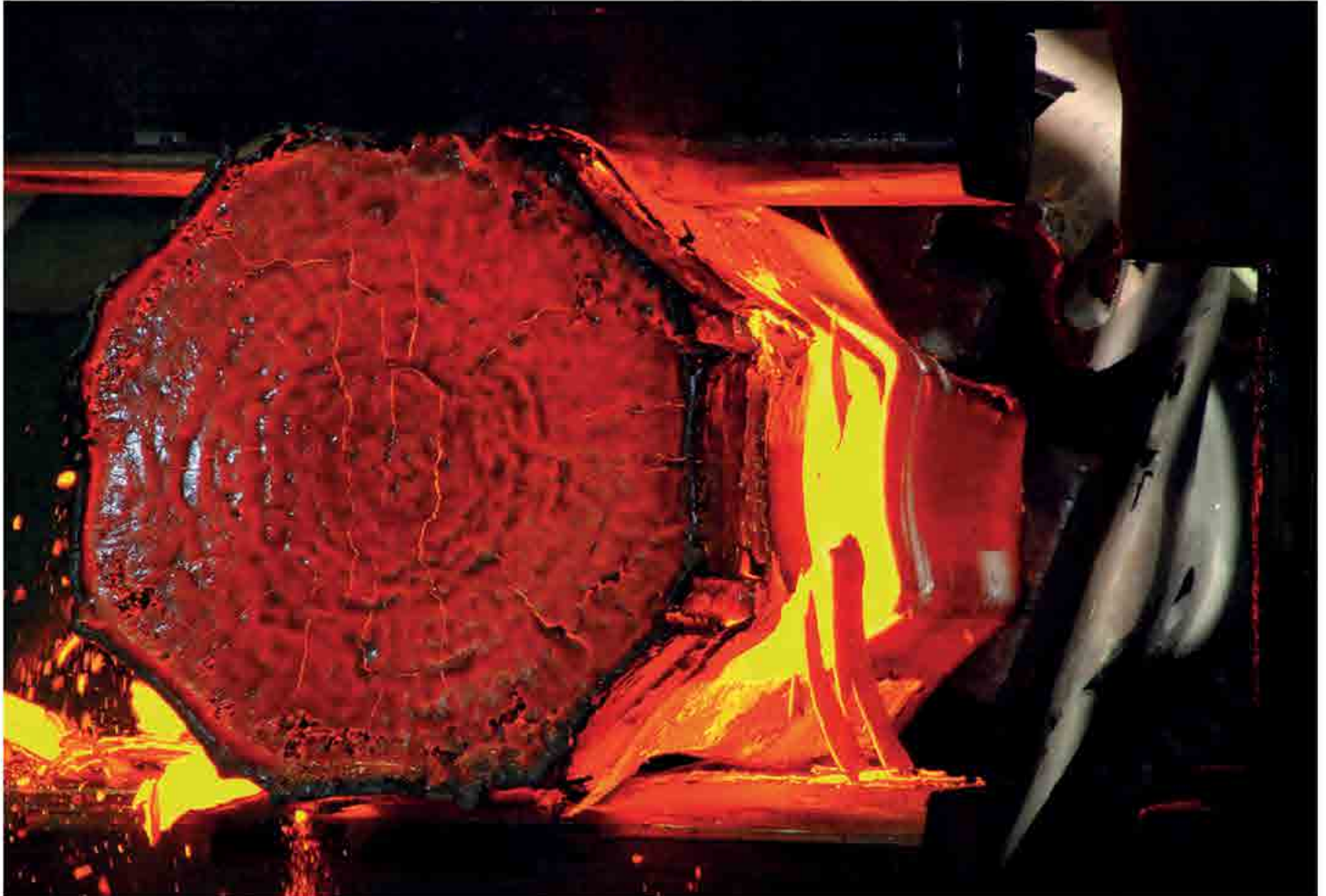
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fostering close cooperation with our vendors. This approach has allowed us to mitigate delays and maintain a steady pace in our localisation efforts.

Q Are Indian die and mould manufacturers fully equipped to serve the demands of the electrical industry?

I would like to emphasise that Indian toolmakers are fully capable of meeting not only the demands of the Indian market but also catering to exports. In fact, we have successfully exported tools manufactured in India to ABB's overseas plants. It's important to understand why companies choose to source from India. They seek cost competitiveness without compromising on speed and accuracy. If we can consistently deliver high-quality tools within the timelines and with competitive pricing, we can certainly compete globally.

The prevailing power crisis and rising manufacturing costs in Europe have prompted companies to explore alternative options, including India. This situation has opened up opportunities for Indian toolmakers, as global counterparts increasingly source from India. This trend has positively impacted our vendors, providing them with substantial business opportunities. I hope Indian toolmakers can leverage this advantageous position to further expand their presence in the global market.

Q How do you analyse the quality or the dimensional issues and take corrective measures in sheet metal and plastic parts?

Let's consider the scenario of a sheet metal part. In a continuous production run, suppose the first batch supplied to us is free from issues. However, when the second batch is delivered, cracks are observed in the components. In such cases, it becomes crucial to analyse

the root cause of the problem, which could be related to the tool, material, or the manufacturing process itself.

Initially, we would consult the toolmaker to confirm if there are any tool-related issues. If they confirm that the tool is fine, we shift our focus to analysing the manufacturing process. We examine if there are any deviations or flaws that could contribute to the development of cracks in the components. If the manufacturing process is deemed satisfactory, we investigate whether the same material was supplied for both batches. Even a slight variation in material properties can result in deviations in the final product.

Allow me to share an incident from about 16 years ago. We had manufactured electrical covers that were transparent, producing millions of them without any issues. However, in one particular lot, complaints started arising about cracks appearing within 20-25 days of use. It was puzzling since the covers were supplied by the same vendor, and the material used was identical. Despite extensive analysis, we were unable to identify the root cause. Eventually, we decided to compare the material we used with what our competitor supplied to the same customer, and we found no issues with their covers. This led us to realise that the raw material used in the problematic batch had been exposed to water during transportation. This water exposure had adversely impacted the properties of the material. It was an expensive lesson that taught us the importance of being vigilant about the quality of raw materials.

Q As someone, who has spent years in the tooling industry, what suggestions would you want to give Indian toolmakers?

I would like to recommend that toolmakers focus on the following:

Quality: In today's world, quality is crucial in any product or service. Therefore, striving for a high-quality

product should be the primary focus. Implementing process checkpoints and a thorough qualification process for tools are essential. Shortcuts should be avoided and a comprehensive tool qualification process should be followed. Involving cross-functional teams, such as process engineers, during the tool-building stage is beneficial. The process engineer responsible for running the tools and manufacturing the parts possesses valuable insights into potential problems that may arise. By involving them early on, issues can be addressed proactively.

Documentation: I strongly recommend that toolmakers maintain detailed documentation throughout the tool-building process. This documentation should include the history of the tool's construction, highlighting any challenges faced and the solutions implemented. This serves as a valuable resource when shipping the tool to the customer, allowing them to understand the tool's journey and the problem-solving approach employed. These documents also serve as a reference for future learning, providing a clear understanding of what went wrong and what strategies were successful.

Skill development: It has come to my attention that skill development is often neglected by toolmakers due to their daily operational demands. However, investing in skill development brings long-term benefits. Training employees and workers across all levels of the hierarchy to upgrade their skills is vital. This not only enhances productivity but also encourages innovative ideas from employees. By investing in skill development, toolmakers can continually improve their efficiency and output.

By focusing on the abovementioned suggestions, toolmakers can not only enhance their capabilities, deliver superior products, but also drive productivity and innovation within their organisation. ♦

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'In India, we still have some catching up to do compared to other parts of the world'



“As the global focus shifts towards India as a favourable destination for quality and cost-effective tooling, it would make sense for European tool steel manufacturers to establish their manufacturing operations in India. The Indian government is actively promoting this and has even included tool steel manufacturing under their PLI scheme,” says **T. S. Gopalakrishnan**, Director – Marketing, Multiple Special Steel Pvt. Ltd. in conversation with Nishant Kashyap.

Q How has tool steel technology evolved over the years?

The origin of tool steel can be traced back to the 1800s. During that period, the first alloy steel was developed. Initially, manganese was added to create the alloy to significantly improve its wear resistance. Over the years, other alloying elements such as chromium, nickel, tungsten, cobalt, vanadium, molybdenum, and boron were incorporated to enhance specific properties related to these elements.

Originally, tool steel was classified into two categories – low-carbon steel and high-carbon steel. Low-carbon steels were initially considered as case-hardening steels. EN-353, EN-36, 20MnCr5, and 16MnCr5 are some examples of it. High-carbon steels, on the

other hand, were known for their direct hardening capabilities. Some examples of it are OHNS grade, 1% carbon grade, and HCHCR-D3 and D2. There was also another group of tool steels with a medium-carbon range known as the British EN series, which included grades such as EN-8, EN-9, EN-19, EN-24, and EN-31, among others. The EN series nomenclature was widely used until World War II. During this period, significant advancements were made to improve and develop new tool steel grades for specific purposes.

Q That’s interesting! Can you highlight some of the latest developments in tool steel?

The emergence of the automotive industry played a crucial role in driving the development of

specialized tool steel grades tailored to meet the specific demands and requirements of various industrial applications. For instance, high-speed steels like M2, M35, and M42, which were introduced for cutting, drilling, and machining applications, offered enhanced performance and durability. Additionally, valve steels were designed to withstand elevated temperatures within combustion engines. These steels were specifically engineered to meet the demanding conditions of high-temperature environments.

Over time, the classification of tool steels evolved to align with their specific usage segments and intended applications. The segments fell under the below categories:

1) To make pressing and forming tools (including cutting and drilling):

Vanadium steels, high-speed steels, high-carbon steels, 1% carbon steels, etc.

2) To make die casting tool steels:

Hot-die steels (or HDS): H10, H11, H12, H13, H14, H15, H16, H19, etc. (Chromium steel grades)

As per DIN: 1.2365 / 1.2343 / 1.2606 / 1.2344

Hot-die steels (or HDS): H20, H21, H22, H23, H24, H25, H26, etc. (Tungsten steel grades)

Hot-die steels (or HDS): H41, H42, H43

3) To make (hot and cold) forging tool steel applications: Mainly die block steels like DB5 and DB6

As per DIN: 1.2714

4) To make plastic mould tool steels (pre-hardened grades called P20 range)

They are classified as: 1.2311, 1.2312, 1.2378, 1.2711 - 1.2083, 1.2085, 1.2316

In fact, there is an intriguing story behind the conception

of the P20 grades of tool steels. In the 1970s, the development of 'carbides' emerged as a significant advancement. Prior to that, for plastic moulding applications, tool steels such as EN-19, EN-24, EN-31, along with HCHCR and HDS, were commonly used. To promote the utilization of carbide tools, these developers convinced steel mills to introduce a range of pre-hardened tool steel grades. These grades could be supplied by the mills in a heat-treated condition, enabling them to be machined (using carbides, of course) for manufacturing core and cavity inserts for plastic moulds, as well as mould bases. This was achieved by maintaining the chemistry of these new grades as closely as possible to that of EN-19 (without nickel) and EN-24 grades (with nickel).

5) The latest trend of powder metallurgy through Electro Slag Remelting (ESR) and Vacuum Arc Remelting (VAR) processes culminating in 3D-produced critical parts

This is out of reach economically because of not being able to mass produce.

Q What factors need to be kept in mind while selecting tool steel grades for specific applications?

First and foremost, one needs to acknowledge and accept the inherent limitations of tool steel. Factors such as toughness vs. hardness, cost vs. corrosion resistance, and pre-hardened vs. to-be-hardened must be considered. It is unrealistic to expect a tool steel that offers high toughness at extremely high hardness levels, or a steel that is inexpensive, highly corrosion-resistant, and easily machinable at elevated hardness levels. Therefore, the selection of tool steel must be based on the desired end result:

- High hardness will be low toughness & vice versa.
- High corrosion resistance will be low machinability & vice versa.
- High hardness will give high wear resistance & vice versa.

Q What role do coatings and surface treatments play in tool steel applications?

Coatings and surface treatments were developed not only to enhance the performance of tools made from tool steels but also to compensate for design and production limitations, as well as potential misuse of the tools.

Traditionally speaking, I personally consider these coatings and surface treatments to be necessary and somewhat unavoidable expenses. They are employed to overcome the performance limitations of tool steels. Fortunately, now there are various coatings and surface treatments available that cater to specific end requirements, such as high wear resistance, improved corrosion resistance, and maximizing the output of the tools.

Q What are some of the challenges that the tool steel industry is facing?

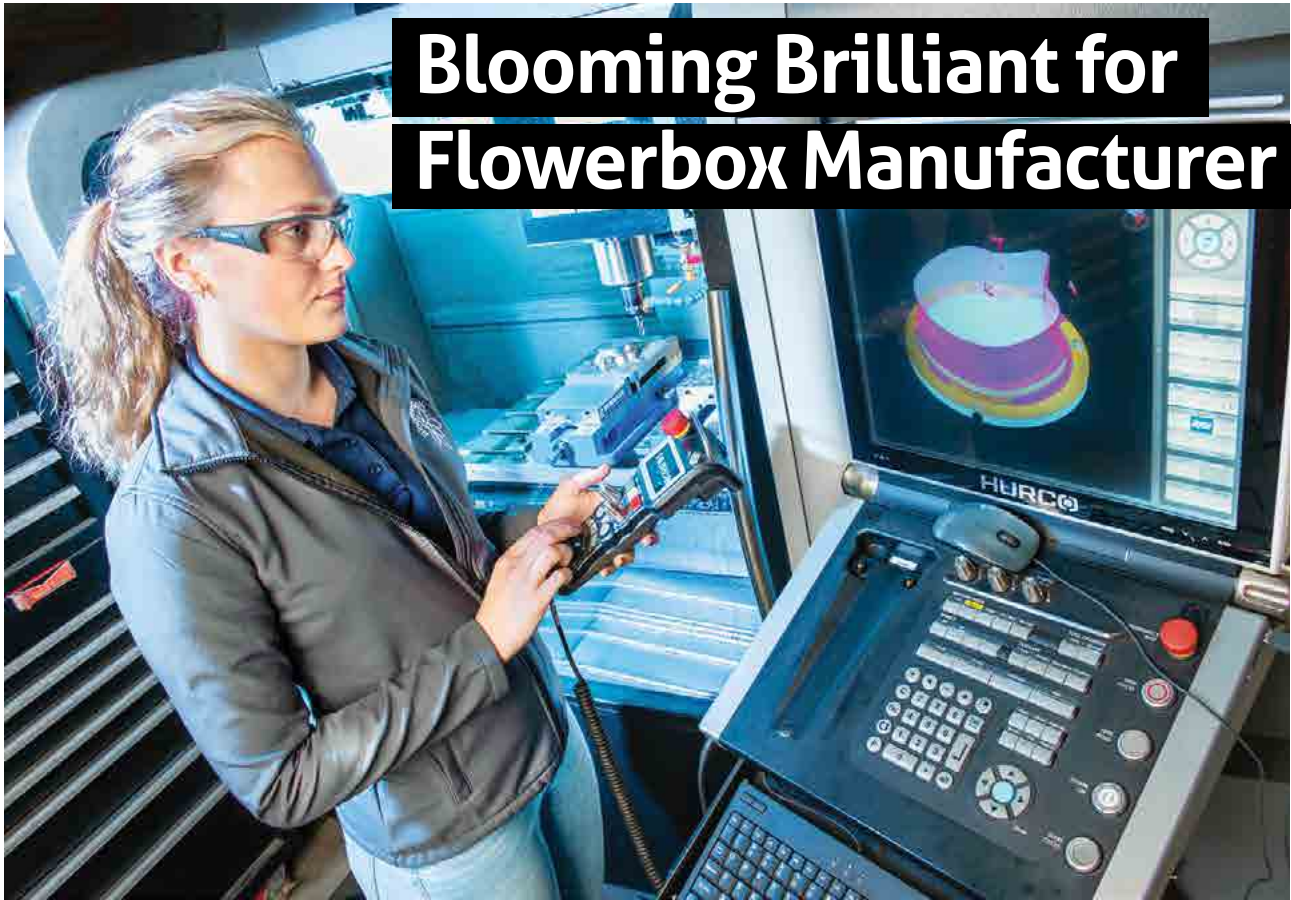
As I mentioned earlier, tool steel, like any material, has its limitations. Expecting excessive performance from tool steel can lead to disappointment and failure. What may be suitable for one application could prove disastrous for another. In an attempt to reduce production costs and sell products at lower prices, a trend of cutting corners, particularly in the quality of inputs, has emerged. This practice has put a significant strain on the performance of even well-established tool steel grades. To address this issue, extensive research has been conducted to explore ways to protect tool steel from substandard production and improper usage when

manufacturing tools.

Q How do you foresee the future of tool steel technology and business in India?

Tool steel technology has reached a plateau. Ongoing research aims to maximize performance within the limitations imposed by the inherent properties of respective tool steel grades. However, in India, we still have some catching up to do compared to other parts of the world, particularly Europe, Japan, Taiwan, Korea, and now China, in terms of utilizing tool steel technology to achieve optimal results in tool insert production. The same applies to the manufacture of quality tool steels within India.

Interestingly, Carpenter Technology Corporation, USA, had collaborated with Kalyani Steels to manufacture P20 grades in India. Unfortunately, this partnership did not take off as anticipated. However, as the global focus shifts towards India as a favourable destination for quality and cost-effective tooling, it would make sense for European tool steel manufacturers to establish their manufacturing operations in India. The Indian government is actively promoting this and has even included tool steel manufacturing under their PLI scheme. ♦



Blooming Brilliant for Flowerbox Manufacturer

Founded in 2000 by a father and son team, Bloom in Box was initially set up as an injection moulding business applying its combined 50 years of experience a handful of manual machine tools. Move forward 22 years and David Reardon has taken the reigns from his father, been joined by his children and the company now manufactures a complete range of its own product lines utilising its expertise in injection moulding, toolmaking and design.

In its infancy, the Burscough business was working like every toolmaking business – making products for customers in a B2B environment. Now, the company produces scoops and measures for the food & health industry, security fencing and wall spikes, laundry pegs, face visors and of course the floral range of bottle bouquets and the Bloomie living vases from where the company gets its name – it is also developing new medical and PPE

product lines. All product lines are produced from recycled materials and are manufactured in-house at the Lancashire facility with support from Tamworth cutting tool manufacturer Industrial Tooling Corporation (ITC).

The small family-run business produces more than half a million scoops and measures a month, and receives more than 300 orders a day for its security spikes and laundry products and that's before considering the extremely popular floral side of the business and other projects like run-flat systems for cars. One challenge the company had was with its cutting tool supply. Recalling this, Owner and Co-Founder of Bloom in Box, Mr. David Reardon, says: "We were a small business with a Hurco VM10i machining centre and we used a couple of different and well-known tooling suppliers, none of which supported us fully as a small business. It was around 5-6 years ago, we upgraded the machine to a larger

Hurco VM20i 3-axis and we still had several sales reps that would suggest tools that would never fully resolve our issues – until we met Gary Murrey from ITC."

It was the attention to detail and the time spent supporting and trialling the tools at Bloom in Box that really impressed David, as he continues: "Gary visited us and he helped us with tool set-ups, trials and advice – he put the effort into customer support. The attention to detail and picking the right tools for our applications yielded huge benefits for our business, it wasn't just the ITC service that was far superior to other companies, it appeared the products were on a different level too."

Predominantly machining P20 tool steel, Bloom in Box initially trialled the Widia M1200 face milling platform for rough machining. With impressive tool life and metal removal rates on rough machining



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applications, the tool proved a major success and the company adopted both the 32 and 40mm diameter variants with 7mm inserts. This paved the way for the next tool to be implemented at the environmentally conscious business that has a 40kW solar panel facility on the roof to run the majority of equipment in its machine shop.

Progressing from the Widia M1200 face mills, the family business was recommended the Widia VXF high-feed milling line. Recalling this intervention, David continues: "We were spending a considerable amount on solid carbide tools and in the injection mould industry, everything is tapered. This meant that we were unable to engage the full tool flutes and we noticed a lot of wear, but we also noticed a lot of waste, as we weren't using the whole of the tool. To negate this issue, Gary suggested we try the Widia high-feed indexable series instead of solid carbide tools. We applied the VXF 07 16mm diameter and VXF 09 35mm diameter range and noticed a marked difference in performance and surface finishes with much higher feed rates and shorter cycle times, but more importantly, there was a huge reduction in our tooling consumption and costs."

Now, almost all of the cutting tools at Bloom in Box are supplied by ITC as well as the robust machine vices from Kemmler. As David continues: "We have standardised

our tool inventory in the machines now. This is mainly tools from ITC. The machines are set up for ITC tools with ITC's Kemmler vices and our Autodesk PowerMill CAM software has all the parameters of the ITC tools loaded into the tool library, this makes set-ups and programming very simplistic."

The company now applies a complete raft of ITC tools throughout the business with ITC's solid carbide 2162 ball-nosed end mill range proving perfect for profiling intricate parts. The company also uses ITC's 4052 taper ball nose tools, 6051 and 6071 end mills series, and the 2002 and the 2012 series of ball nose tools for aluminium alongside a multitude of Widia tools that include the GP end mills.

More recently, the company has also invested in the BIG KAISER HMC hydraulic power chucks. Referring to this, ITC's Gary Murrey says: "Bloom in Box is a company that machines injection mould tools that demand exceptional surface finishes. To improve the rigidity and stability of the tools, I recommended the BIG KAISER HMC power chuck and the BIG KAISER Mega 6S collet chucks to achieve the desired surface finishes and also improve tool life. Initially, David was sceptical, but after a short trial, he was hooked on the benefits of the HMC chucks."

Adding to this, David says: "Our secondary hand finishing reduced significantly after we adopted the BIG

KAISER HMC chucks and this saved us a lot of time and labour resources. We use a lot of tools with a long-overhang for reaching into cavities and difficult-to-reach surfaces, these applications are naturally less robust and stable. The BIG KAISER HMC chucks vastly improved the tool stability and run-out to deliver impeccable surface finishes."

With four Victor injection moulding machines, a FANUC injection moulding machine and three FANUC robots, the company runs its high-tech facility 24/7. Regardless of its around-the-clock running, Bloom in Box is aiming to become carbon neutral over the next 12-18 months. It works with all-electric machines to reduce power consumption and emissions. Investing in state-of-the-art production equipment and solar energy equipment, the company is currently calculating its carbon emissions at less than 10 tonnes of CO2 per year – the ultimate goal is net zero.

Furthermore, the company has developed innovative techniques to work with food-grade approved polypropylene, which is 100% recyclable. It is also exploring opportunities to work with compostable plastic. Concluding on this, David says: "We take our environmental responsibilities very seriously and we use recyclable materials in all our product lines as well as having a major drive to be carbon neutral. With regards to the machine shop, we run it from our solar power and have innovative products from ITC that help to reduce our machining times, power consumption and costs to improve our productivity and throughput – it's a huge help to our business." ♦

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BLUM touch probes in turning centres for the automotive industry

The automatic measurement of tools in turning centres for the automotive industry is challenging, as the measuring systems are constantly exposed to flying chips, coolant and vibrations. Achieving precise results in such environments is a job only specialists can do. That is why turning machine manufacturer Schuster from Denklingen in Bavaria, Germany, relies on the expertise of Blum-Novotest.



Machines from Schuster manufacture gear shafts, camshafts and balancer shafts as well as complex motor shafts for electric drives. The shafts are machined in several interlinked stations that are loaded and unloaded manually at the beginning and end of the line. The Bavarian machines always work with a vertically positioned workpiece spindle. Depending on the task at hand, the main spindle, counter spindle or a centre turning unit are used. Up to two revolvers or milling and grinding units are used per working area so that turning, milling and grinding processes can be conducted in one clamping set-up. The machines are always equipped with X- and Z-axes, which are in the spindle or the revolver/ unit depending on the machine type. The spindle typically also has a C-axis. The Y-axis is available as an option and thus, as is common in the turning sector, is not present on

many machines.

"Performing measurements in the working area is an integral component of our machining processes. In many production processes, a diameter is first pre-machined with an allowance and then ground or turned to the final dimension," reports Christian Moser, project manager at Schuster Maschinenbau. "That is why, it is necessary to automatically measure the current diameter between the two steps and adjust the grinding or turning process as required. So as not to measure any concentricity errors or the temperature curve of the machine, a two-point measurement – like with an outside micrometre – is necessary here." Since many Schuster machines are not equipped with a Y-axis, there is no way to probe the workpiece at two points at the front and back with a standard stylus to measure the current diameter.

Schuster found the perfect

approach for this unusual requirement with the TC61 touch probe and a specially designed stylus from its long-standing partner Blum-Novotest. What is special about the TC61 is the bidirectional measuring mechanism guided in two axes. In contrast to other typical touch probes, this allows not only pushing but also pulling measurements to be conducted with high precision. The extraordinary measuring unit makes it possible to equip the TC61 with sturdy styli, in this case a measuring bracket. If the diameter of a shaft must be measured, as is the case with Schuster, this can be done quite simply with a two-point measurement. To do this, the TC61 in the revolver is swivelled in horizontally and one pulling and pushing measuring movement is conducted via the X-axis. In addition, in some systems, a probe ball is attached to the outermost end of the bracket to make it

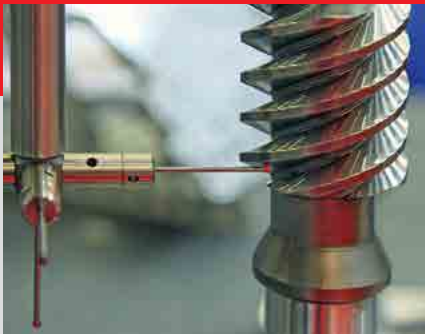
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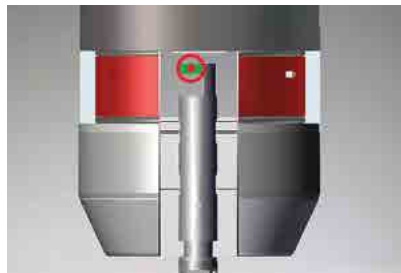


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Performing measurements in the working area is an integral component of our machining processes. In many production processes, a diameter is first pre-machined with an allowance and then ground or turned to the final dimension.

- **Christian Moser**, project manager at Schuster Maschinenbau

possible to measure lengths, zero points or steps, for example. BLUM offers measuring brackets from a maximum measuring diameter of 35 millimetres up to 73 millimetres in various increments. The brackets are made of steel up to 50 millimetres in nominal diameter; larger versions are made of aluminium.

Measuring the diameter during allowance grinding is required for maintaining the tight tolerances. High-precision glass scales are used on the X-axes to ensure the position of the probe is as precise as possible. The two-point measurement can be conducted very quickly; a repeat accuracy of 1.5 – 2 µm is achieved on the machine. Measurements with the BLUM probe allows for compensation of the temperature gradient as well as the unavoidable wear of the grinding wheel. There must be no scrap in series production. Every machining process must remain within tolerance for years and thousands of workpieces. This is only possible with continuous, in-process measurement.

The touch probe in the machining area is exposed to a harsh environment – after all, the coolant pressure reaches up to 60 bar. The touch probe is also exposed to chips and grinding dust. "The movement of the revolver itself, which is fixed in an interlock every time the tool is positioned, also generates considerable impact on the entire revolver and thus on the touch probe. However, the TC61 'tolerates' these without any problem and ensures highly precise measurement results with the newly developed measuring bracket," Christian Moser summarises. "The touch probes from BLUM have absolutely proven their worth for us under these adverse conditions. Our customers especially benefit from this, because they can manufacture with high productivity and the lowest scrap rates at the same time." ♦

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FOR DETAILS:



April sees unprecedented increase in input stocks as manufacturers seek to fulfil demand

Several PMI® indices pointed to more favourable operating conditions across India's manufacturing industry in April. Factory orders and production rose at the strongest rates in 2023 so far, more jobs were created and companies stepped up input purchasing owing to stock-replenishment efforts. Supported by a lack of pressure on supplier capacity, there was a record expansion in inventories of inputs in April. Meanwhile, input cost inflation reaccelerated, but the latest upturn was mild by historical standards. Output charges increased at a moderate rate that matched its long-run average.

Rising from 56.4 in March to 57.2 in April, the seasonally adjusted S&P Global India Manufacturing Purchasing Managers' Index® (PMI®) indicated the fastest improvement in the health of the sector in the year-to-date (calendar). With the exception of suppliers' delivery times, which is inverted before entering the calculation, all sub-components of the PMI made a stronger contribution to this month's figure.

New orders placed with goods producers rose at the quickest pace since last December. The rate of expansion was sharp and above its long-run average. According to panel members, the upturn was supported by favourable market conditions, demand strength and publicity.

Likewise, output increased at a sharp rate that was the most pronounced in four months. More than one-quarter (26%) of all survey participants reported higher

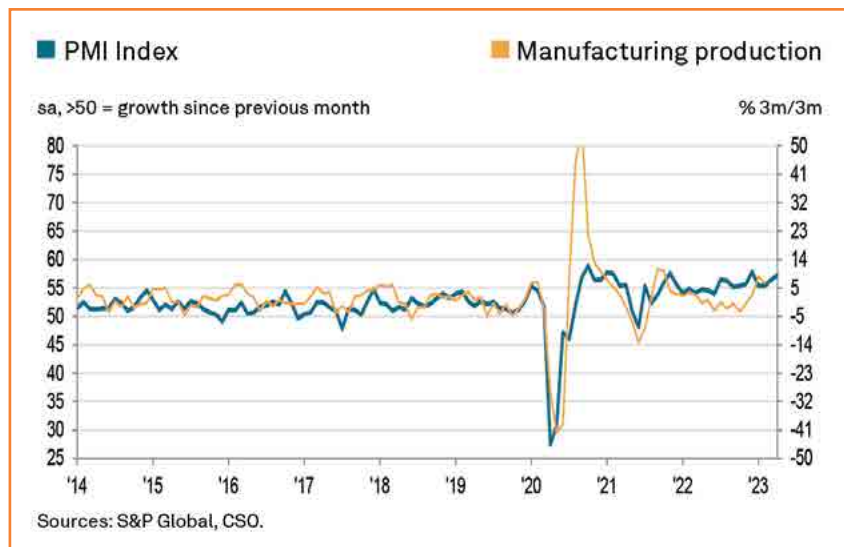
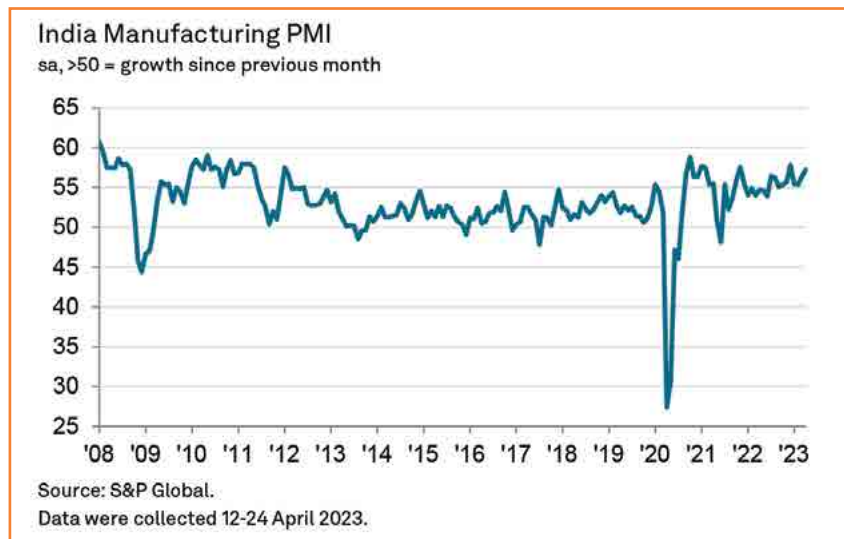
production volumes, citing sustained expansions in sales.

Robust new business growth and an associated increase in production requirements urged manufacturers to add to their input inventories in April. The rate of stock accumulation climbed to a survey peak.

The upturn in holdings of raw

materials and semi-finished items was facilitated by purchasing activity growth. Not only did buying levels expand for the twenty-second successive month, but also at a sharp rate that was the strongest since February 2021.

Despite the surge in purchasing activity, suppliers were able to



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deliver inputs in a timely manner during April. Vendor performance improved to the greatest extent in eight months, though only slightly overall.

In stark contrast to the trend for input stocks, holdings of finished products decreased in April. The pace of depletion was moderate, though the fastest in four months. Where a contraction was signalled, monitored firms mentioned that sales had been fulfilled from warehoused items.

Although manufacturers signalled higher operating costs in April — linked to fuel, metals, transportation and some other raw materials — the overall rate of inflation remained below its long-run average despite quickening since March.

Charge inflation also quickened in April, reaching a three-month high and matching its long-run average. That said, while 6% of companies hiked their fees since March, 92% left them unchanged.

Elsewhere, goods producers recorded a marginal increase in outstanding business volumes. Still, firms sought to expand capacities by taking on additional workers. Although only slight, the latest upturn in employment compared with a fractional reduction in March.

Indian manufacturers were confident that production volumes would be higher in 12 months' time, amid demand resilience, client enquiries, orders pending approval and marketing efforts. Moreover, the overall level of positive sentiment rose since March. ♦

Article and graphs courtesy S&P Global

Reflecting a robust and quicker expansion in new orders, production growth took another step forward in April. Companies also benefited from relatively mild price pressures, better international sales and improving supply-chain conditions. It seems like Indian manufacturers have abundant opportunities to keep powering ahead. Besides seeing the strongest inflow of new work in 2023 so far, capacities were expanded through job creation, input buying was lifted and pre-production inventories rose at a record rate. At the same time, stocks of finished goods need replenishing as some orders were reportedly fulfilled from warehoused goods. Manufacturers are certainly upbeat towards growth prospects, with optimism improving from March's eight-month low on the back of contracts pending approval, rising client enquiries, marketing initiatives and evidence of demand resilience.

- Pollyanna De Lima,
*Economics Associate Director at
S&P Global Market Intelligence*

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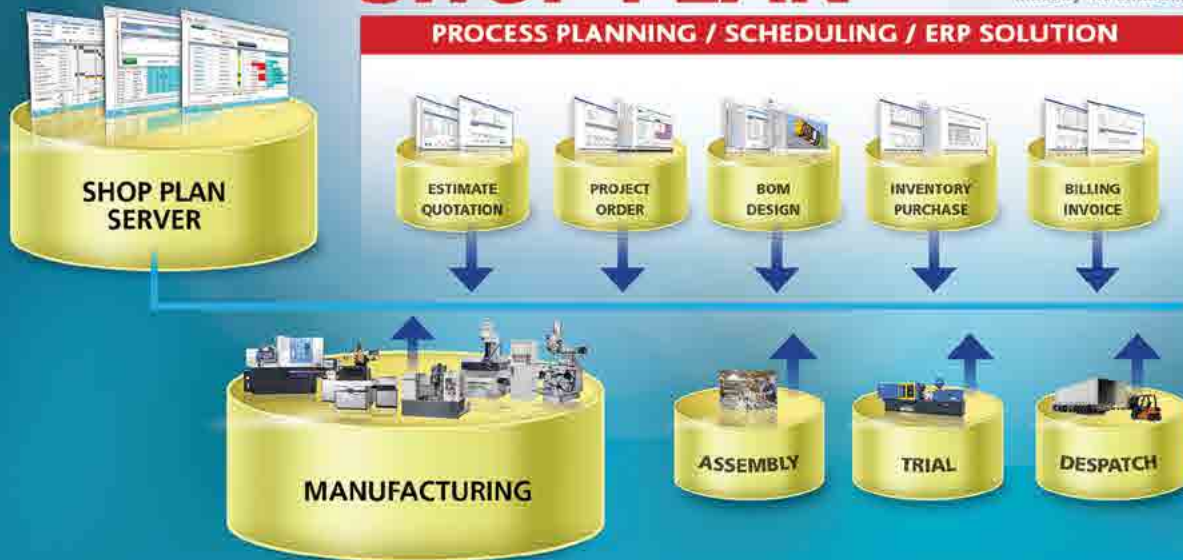
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ACMA's 9th MSME Summit highlights opportunities & challenges for SMEs in India's transformation

The Automotive Component Manufacturers Association of India (ACMA), the apex body of the Indian auto component industry, organised the 9th edition of MSME Summit, aimed to recognise the challenges and possibilities for MSMEs, at hotel Le Meridien, New Delhi, recently. The summit was attended by Mr. Sunjay J Kapur, President, ACMA and Chairman, Sona Comstar, Mr. Sreekant Somany, Chairman-MSME Committee, CII & CMD, Somany Ceramics Ltd., Ms. Shradha Suri Marwah, Vice President, ACMA and MD, Subros and Mr. Vikrampati Singhania, Chairman NR, ACMA.

The focus of the summit was centered around the theme, 'Bracing-up for Transformation – Opportunities & Challenges for SMEs', with an emphasis on the significant role that MSMEs will continue to play in the Indian economy, particularly in the automotive component manufacturing industry.

During the summit, Mr. Kapur spoke and highlighted the "unprecedented transformation happening in India, where MSMEs are at the forefront of this change. He stressed the need for MSMEs to invest in research and development and build capacity to stay competitive in the innovative and competitive auto component manufacturing industry. He applauded the Government of India's initiatives such as 'Make in India', 'Start-up India', and 'Aatmanirbhar Bharat', which are providing essential support to the sector".

Mr. Kapur also commended the "MSME Competitive (LEAN) Scheme under the MSME Champion Scheme, which is expected to enhance the



productivity and competitiveness of SMEs. As a representative of the auto component industry, Mr. Kapur expressed confidence that these initiatives would help the industry achieve world-class quality standards and pave the way for more significant success".

During the summit, four panel discussions were held on various themes, including 'Bracing-up for Transformation - Opportunities & Challenges for SMEs', 'Reinforcing Financial Confidence', 'Building

Credibility', and 'Managing Customer Expectations - Bridging the Gap'. These sessions highlighted some of the significant challenges facing SMEs and proposed practical solutions to overcome them.

ACMA, which is the apex body of the Indian auto component industry, represents over 800 auto component manufacturers, with 65% of them falling under the Small & Medium category. The association has launched several new cluster programs on Skilling & Mentorship, including a specialised program for SMEs that has received substantial subsidisation from the United Nations Industrial Development Organization (UNIDO) and the Ministry of Heavy Industries. ♦

Image Courtesy @ACMAIndia on Twitter

National

ACMEE 2023

ACMEE is India's premier International Machine Tool Show with exhibit range such as CNC Machines, CNC & PLC Controls, Cutting Tools and Accessories, Special Purpose Machines, Pneumatics, Hydraulics, Industrial Robotics & Automation, Instrumentation, Machinery & Machine Tools, Welding, Material Handling Systems, Sheet Metal Press, Laser Cutting, Cleaning Systems, among others.

Date: Jun, 15-19

Venue: Chennai Trade Centre, Chennai

Organiser: Ambattur Industrial Estate Manufacturers Association

Contact: +91 - 73052 82228
info@acmee.in

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

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.

Contact: +966 92 002 40 20 / info@recexpo.com

Moulding expo 2023

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

Date: Jun, 13-16

Venue: Messe Stuttgart

Organiser: Landesmesse Stuttgart GmbH

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

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: Aug, 23 - 26

Venue: Taipei Nangang Exhibition Center, Taipei

Organiser: Chan Chao International Co., Ltd

Contact: +886 2-26596000 (ext.176)
show@chanchao.com.tw

EMO Hannover 2023

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

Date: Sept, 18-23, 2023

Venue: Hannover, Germany

Organiser: VDW & CECIMO

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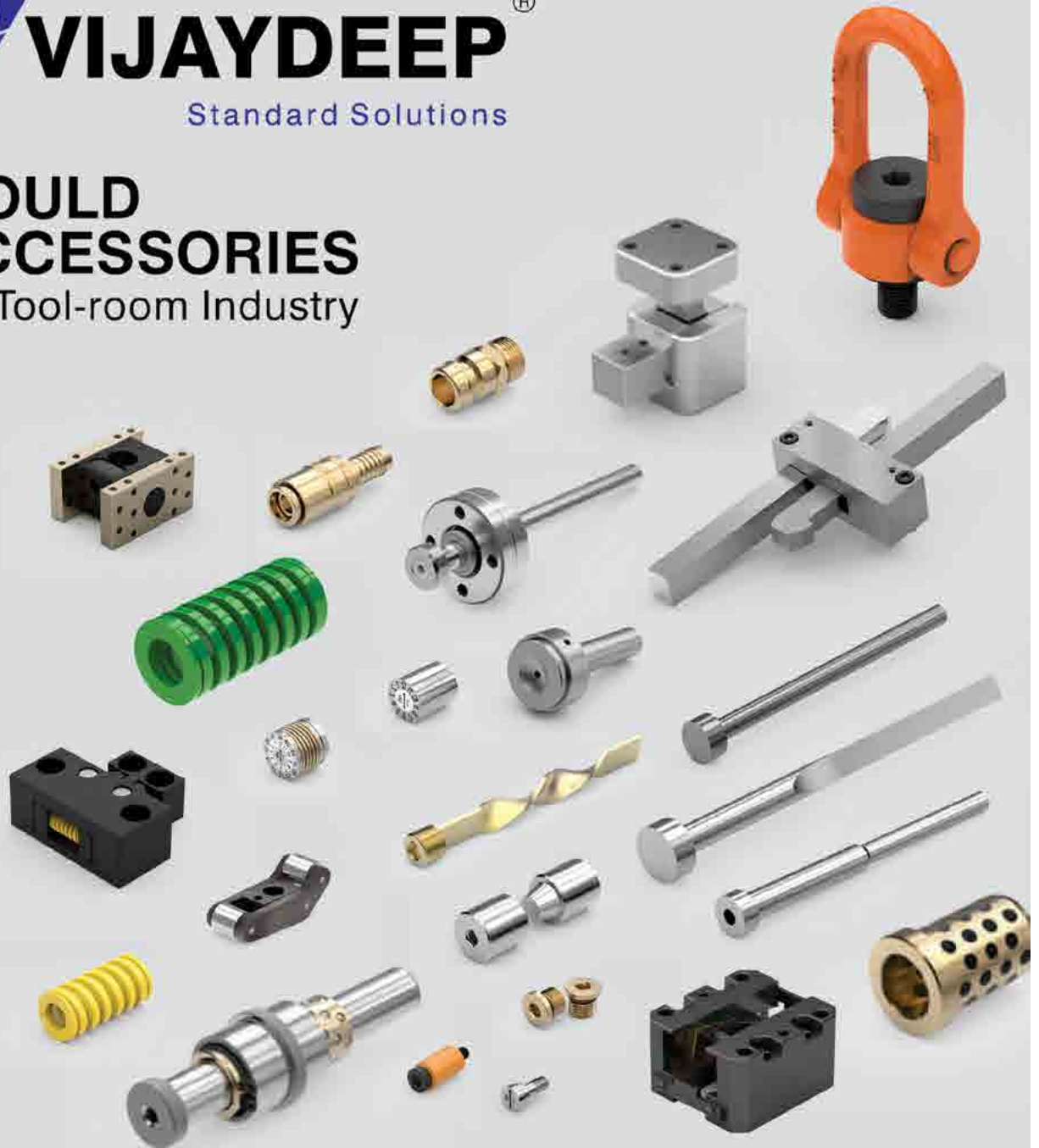
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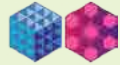
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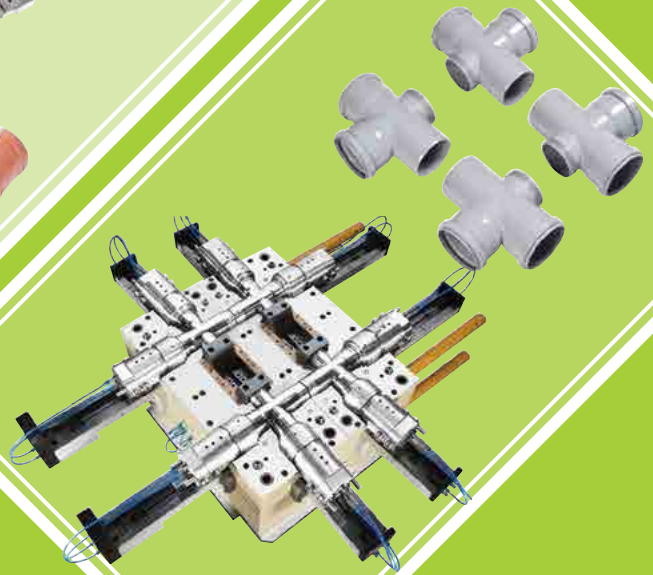
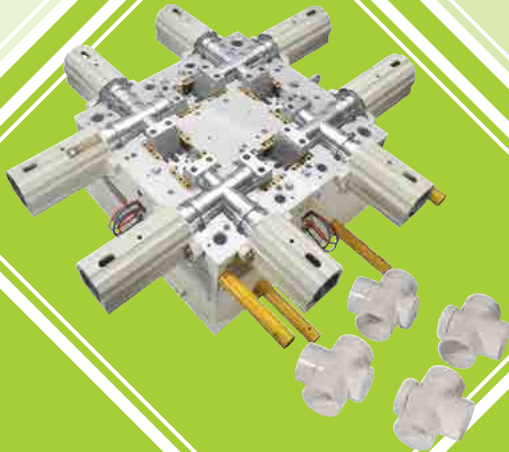
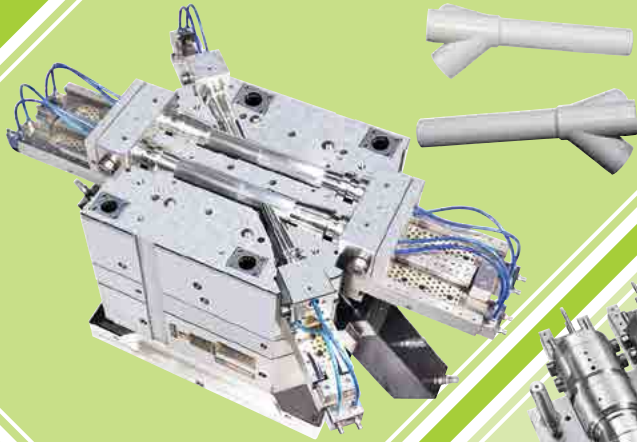
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