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Indian Machine Tool
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EVENT PREVIEW
EMO Hannover 2023 Press Preview

54



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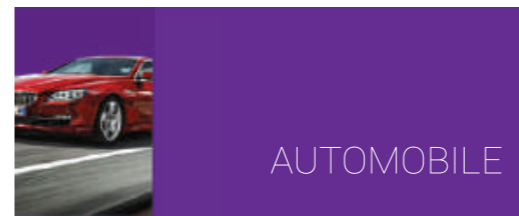
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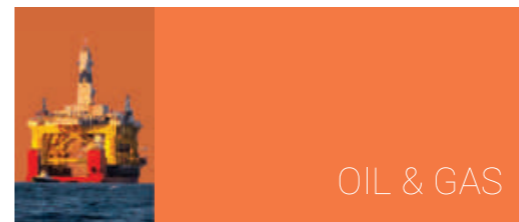
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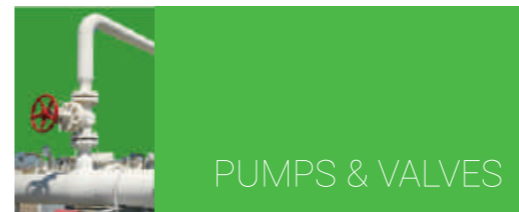
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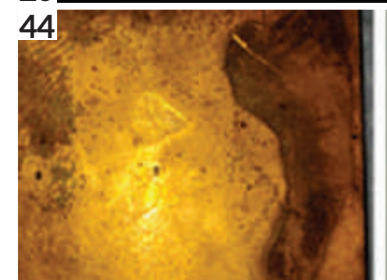
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CONTENTS

VOL 7, ISSUE 2 - JULY-AUGUST 2023



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| | |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 06 FOREWORD | 30 BIG INTERVIEW From Strength to Strength |
| 08 PUBLISHER'S NOTE | 34 MANUFACTURING SOFTWARE Optimizing Production Processes |
| 10 EDITORIAL | 38 MSME - SME SUCCESS Empowering with Digital Innovation |
| 12 IMTMA 75 YEARS CELEBRATIONS A Tribute to Naval P. Godrej, Architect of IMTEX | 42 STARTUP Revolutionizing Recycling |
| 14 INDUSTRY OUTLOOK Resilient and Accelerated | 44 ACADEMIA - R&D Combating Corrosion Causes |
| 16 IMTMA'S DESK Why Machine Tool Exports Are Crucial | 46 CURTAIN RAISER DMTX 2023: An Opportunity to Explore the Cutting-Edge |
| 18 AMTDC Developing the Much-Needed Technologies | 48 DMTX 2023 - PRODUCT SHOWCASE |
| 20 TECH TALKS James Nasmyth: 'Shaping' the Industrial Revolution | 54 EVENT PREVIEW EMO Hannover 2023 Press Preview |
| 22 OPED Tapping Opportunities in Emerging Sectors | 56 COMPANY INDEX & ADVERTISER INDEX |
| 26 COVER STORY Creating Smart Factories with AI | 66 SUBSCRIPTION FORM |

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PUBLISHER
DIRECTOR GENERAL, IMTMA

EDITORIAL
Editor-in-Chief
Soumi Mitra

Chief Copy Editor
Poonam Pednekar

Senior Sub-Editor
Sovan Tudu

Senior Correspondent
Murali Sundaram

Design
Magic Wand Media

SALES & MARKETING
Indian Machine Tool Manufacturers' Association (IMTMA)
Murali Sundaram, Magic Wand Media Inc
murali.sundaram@magicwandmedia.in

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INDIA'S FINEST RANGE OF CNC MACHINES

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TOWARDS A FORWARD-LOOKING JOURNEY



Source: BFW

Ravi Raghavan

RAVI RAGHAVAN
PRESIDENT
INDIAN MACHINE TOOL
MANUFACTURERS' ASSOCIATION
(IMTMA)

The Indian Machine Tool industry performed well in 2022-23, overriding the global downward trend caused by supply chain disruptions.

According to provisional estimates, Indian machine tool production is estimated to have reached around ₹11,300 crore, and the consumption is estimated to have reached around ₹23,508 crore. The World Machine Tool Survey 2022 by Gardner Intelligence ranked the Indian Machine Tool industry 9th in machine tool production and 7th in consumption, globally. India is among the countries alongside Brazil and Russia that reported a marginal increase in production growth figures.

As it expands domestically, it is time for the Indian Machine Tool industry to look more closely at global markets. It needs to look outward and find niche markets, identify the needs, and build customized products. Of course, the journey isn't an easy one.

As it expands domestically, it is time for the Indian Machine Tool industry to look more closely at global markets. It needs to look outward and find niche markets, identify the needs, and build customized products. Of course, the journey isn't an easy one.

To augment its global positioning, the industry needs to produce high-performing, niche machine tools matching that of competing global players. Innovation and new product development, support infrastructure for showcasing products, and support services would enable the industry to achieve

this objective. I am sure that the Indian Manufacturing sector will reap the benefits of this technological growth and move towards becoming a self-sustaining global contributor in the years to come.

Happy reading.

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JIBAK DASGUPTA
DIRECTOR GENERAL & CEO
INDIAN MACHINE TOOL MANUFACTURERS' ASSOCIATION

Dear Readers,

The Year 2022-23 can be termed as satisfactory for the Indian Machine Tool industry in terms of business growth. With the Government of India's big push to drive the economy through infrastructure development and numerous other initiatives, there was a surge in demand for machine tools.

The current issue of Modern Manufacturing India (MMI) focuses on how the Indian Machine Tool industry is building its future through the development of new technologies and growing its trade and exports through various initiatives with rich insights from the industry.

To strengthen indigenous manufacturing through homegrown technologies, institutions like Advance Manufacturing Technology Development Centre (AMTDC) at IIT Madras

and other entities are doing active research, either through self-funded or government-funded schemes. As this happens, industries will be able to manufacture unique and novel products having good build quality that would find domestic and global acceptance.

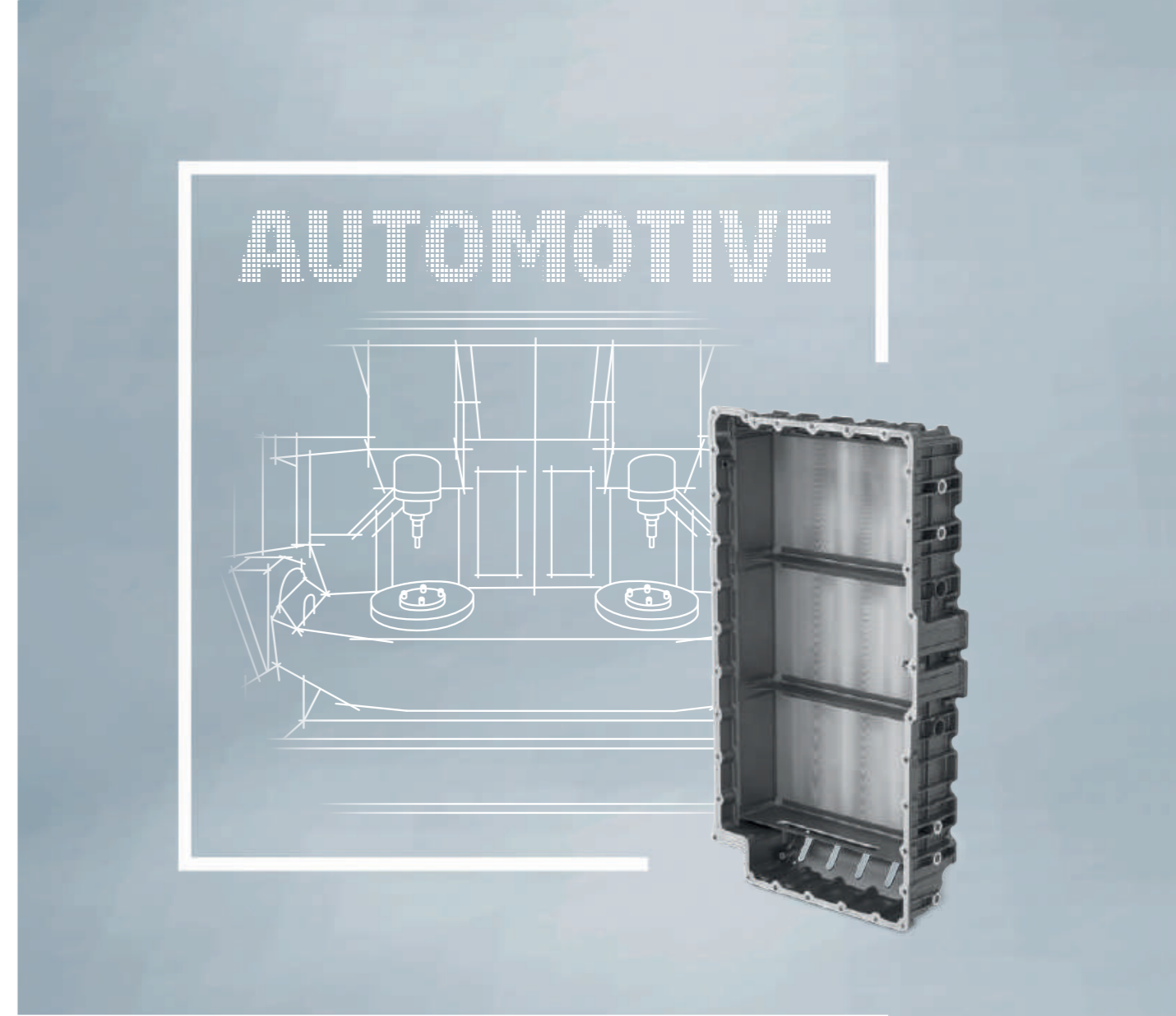
As part of its core objectives, Indian Machine Tool Manufacturers' Association (IMTMA) has been

extending its support to its member companies to find avenues in overseas markets. Towards this, the Association has encouraged companies to participate in leading global exhibitions. This has sharpened the competitive edge of the Machine Tool industry both in terms of its exposure to technology and business. IMTMA carries out market research about prospective countries having good potential to source Indian machine tool products. This helps member companies get an understanding of the market needs in overseas geographical regions.

I sincerely believe that all the articles and chapters in this issue along with other thought-provoking stories on manufacturing technologies would keep readers engaged. Also, I urge readers to share their valuable feedback which will help us in understanding your needs better and improve accordingly.

Happy reading!

IMTMA carries out market research about prospective countries having good potential to source Indian machine tool products. This helps member companies get an understanding of the market needs in overseas geographical regions.



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Soumi Mitra

SOUMI MITRA
Editor-in-Chief
Modern Manufacturing India
soumi.mitra@magicwandmedia.in

TOGETHER WE RISE

With an aim to be a major space power, India has successfully launched Chandrayaan-3, its third moon mission, and embarked on a lunar soft landing, marking the country's rapid progress in space exploration. The mission is slated to establish India as the fourth country in the world to successfully land a spacecraft on the moon's surface.

No feat can be accomplished in silos. This milestone achievement is the result of a public-private partnership. It is a marvel in itself the way the country's national space agency Indian Space Research Organisation (ISRO) created a new spacecraft in conjunction with several Indian companies.

Larsen and Toubro (L&T), Hindustan Aeronautics Ltd (HAL), Bharat Heavy Electricals Ltd (BHEL), Paras Space and Defence Technologies, Godrej Aerospace, New Space India Ltd, Walchandnagar Industries Ltd, Centrum Electronics, MTAR Technologies, Himson Industrial Ceramic, Ananth Technologies Ltd, and a few more have worked closely with ISRO to make this mission a success. The key components supplied to ISRO by these Indian companies clearly prove India's capabilities and potential in the global space market.

The collaborations between Government agencies and private organizations for manufacturing critical parts for satellites and their launchers have accelerated the space mission and paved the way to attract investments and boost India's private space sector.

The Government has earmarked US\$ 137 billion for the Department of Space in the Union budget of 2022-23. Presently, India contributes 2-3 percent to the global space economy, which is expected to rise to 10 percent by 2030.

"So many of our dreams at first seem impossible, then they seem improbable, and then, when we summon the will, they soon become inevitable."

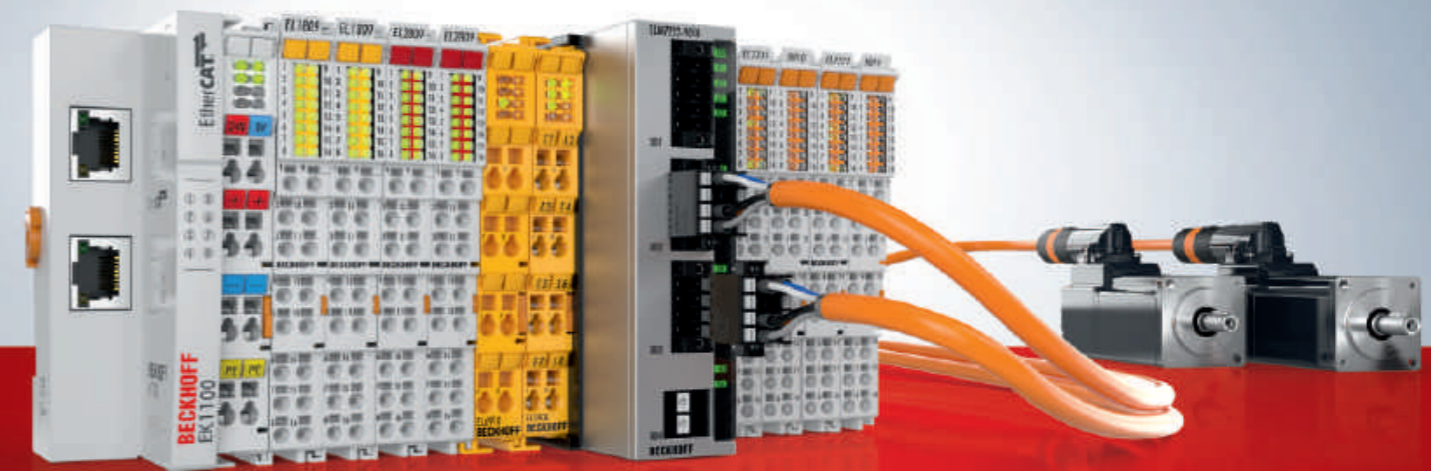
- Christopher Reeve

Having said that, the successful launch will witness many developed and developing countries approach ISRO for building cost-effective satellites and offering affordable satellite launching services to other countries.

On that note, we wait with bated breath to see India accomplish the first mission ever to successfully soft-land in the vicinity of the lunar south pole.

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A TRIBUTE TO NAVAL P GODREJ, ARCHITECT OF IMTEX



Mr Naval P Godrej in his office at the Machine Tools Division, Vikhroli, Mumbai

Source: Godrej & Boyce Archives

About the Series

For decades, the Indian Machine Tool Manufacturers' Association (IMTMA) has been working to develop the Indian machine tool industry for serving the needs of manufacturing industries in India and abroad. Also, IMTMA has been striving to establish and strengthen the global positioning of India's machine tool manufacturers. Since its inception in 1946, IMTMA has seen significant contributions from several prominent industrialists who have played stellar roles in expanding the scope and scale of IMTMA so that it could be better placed to fulfil its objectives. We, at Modern Manufacturing

India (MMI), have decided to pay a tribute to these luminaries for their contributions to the machine tool industry through a series of articles.

In this third feature of the series, we bring to light the contribution of the late Naval Pirojsha Godrej, an exemplary industrialist and visionary who was the architect of IMTEX, the flagship event of IMTMA.

Naval Pirojsha Godrej

Naval, a self-taught engineer, was gifted with an intuitive sense of all things mechanical. He was deeply interested in understanding how things were made. The engineering enterprise that his father, Pirojsha

Godrej, had built provided a conducive environment for his inquisitive nature. Early in his career, he realised that machine tools were the key to manufacturing various kinds of products of high quality in India so that the country could become progressively more self-reliant. The Second World War posed serious challenges to India's manufacturing industries as machines needed for the manufacture of goods were simply not available in the country. Given the prevailing conditions, they could not even be imported. Wanting to spur the growth of the manufacturing sector in India, Naval invested much time and energy in the building of machine tools - he created a pathbreaking line of machines and laid the foundation for manufacturing indigenous metal-forming and metal-cutting machines.

As the President of IMTMA from 1971 to 1973, Mr Naval Godrej continued to work assiduously to elevate the cause and stature of India's machine tool industry. Always ready to take up new challenges, he believed in doing different things differently and inspired his peers to adopt newer technologies for the growth of the industry. In recognition of his contributions to advancing trade and commerce in India, Naval Godrej was honoured with the Padma Bhushan in 1976.


Mr. Godrej wasn't alone in his enthusiasm and endeavour; he forged close relationships with veterans like Vinod Doshi of Premier Automobiles, S L Kirloskar from the Kirloskar group and many others who were thinking along similar lines. At

the confluence of decades of untiring effort, global aspirations and, thus, a need to promote a stronger Indian machine tool industry, the idea of a platform to showcase the progress and the prowess of the Indian machine tool industry was born.

IMTEX & Godrej

An all-India machine tool exhibition was a concept of immense relevance for India as the five-year plans of the Government of India were focused on industries where manufacturing capability and capacity would be created through new units and expansions. The year, 1968, was a turning point for the Indian machine tool and manufacturing industries. It was the year in which IMTMA organized a Machine Tool pavilion at the Indian International Trade and Industries Fair in Chennai (formerly Madras). Seeing the response, it was decided that there should be an exhibition exclusively for machine tools. IMTMA moved quickly in planning and organizing its first exhibition, then called the All-India Machine Tool Exhibition (AIMTEX) with Naval as the chairman of the organizing committee.

AIMTEX was held at the Vikhroli campus of Godrej & Boyce Manufacturing Company in Mumbai (erstwhile Bombay) in 1969, barely a year after the decision taken in Chennai. Mr Godrej placed one of his plants at the disposal of IMTMA and extended full support in planning, design and organizing AIMTEX, including the arrangement of dedicated manpower at the facilities. Interestingly, until then, India had never had an industrial exhibition showcasing live, working equipment. But, this one was to be different. The Godrej Plant at Pirojshanagar was fully equipped with electrical circuits, water pipes and other facilities, making it the ideal venue for showcasing machines *in situ*, at work. Such a unique display of working machines was very impressive and aided the decision-making process of buyers, several of whom placed on-the-spot orders for machines. The first AIMTEX concluded successfully with a record value of orders received by participants. That exhibition, albeit small back then, set a benchmark for the contours and culture

at future editions of IMTEX. Mr Godrej's unwavering commitment to IMTMA was evident through his full support in hosting the first seven IMTEX exhibitions consecutively, from 1969 to 1989. Since then, IMTEX has grown by leaps and bounds keeping pace with global developments in the exhibition of machine tools and manufacturing technologies. Beyond doubt, IMTEX continues to be one of the most outstanding industry exhibitions in India. IMTMA has been fortunate to have been guided by luminaries like Naval Godrej and others in its journey and its good fortune continues. His son, Jamshyd N. Godrej, has been instrumental in the creation of the IMTMA - Naoroji Pirojsha Godrej International Exhibition and Conference Complex that is popularly known as the Bangalore International Exhibition Centre (BIEC). This Centre is the permanent venue for IMTEX. Jamshyd continues to mentor IMTMA and BIEC in their endeavour to fulfil their objectives. Such is the legacy of Mr Naval P Godrej in uplifting the stature of the machine tool industry in India, and, for India. 

As the President of IMTMA from 1971 to 1973, Mr Naval Godrej continued to work assiduously to elevate the cause and stature of India's machine tool industry.

Source: Godrej & Boyce and IMTMA

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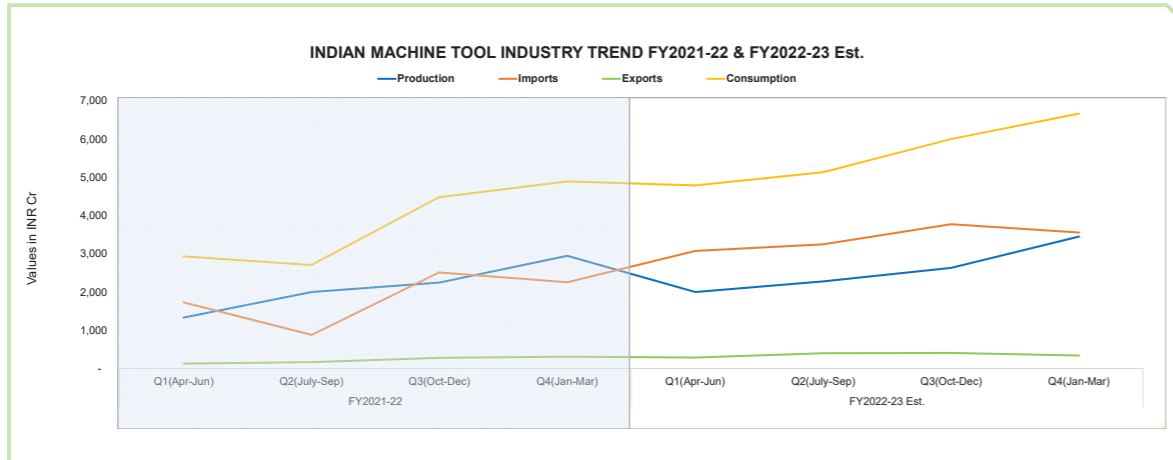


Manufacturing Technology Training

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RESILIENT AND ACCELERATED

India's economy demonstrates remarkable resilience and rapid growth, positioning the nation for continued success in the global landscape.



On the export front, total machine tool exports for April and May in FY2023-24 were estimated at ₹111 crore (US\$14 million) and ₹99 crore (US\$12 million), respectively. While April exports showed a significant 53% growth, May exports experienced a 5% year-on-year decline.

India's economic performance in the fourth quarter of FY23 exceeded expectations, with real GDP and GVA growth improving to 6.1 percent and 6.5 percent, respectively. The annual real GDP growth for FY23 reached 7.2 percent, surpassing the earlier projection of 7 percent and indicating a positive momentum in the country's economic landscape. The Manufacturing PMI reached a 31-month high of 58.7, while the Services PMI was at its second-highest level in close to 13 years at 61.2 in May 2023. These indicators demonstrate the expanding scope of economic activities and job creation in the country. The recovery in manufacturing output led to a 4.2 percent growth in the Index of Industrial Production in April 2023, compared to 1.7 percent in March 2023. This rebound in industrial production showcases the strength of India's Manufacturing sector. The Reserve Bank of India (RBI) retained the repo rate at 6.5 percent in its June 2023 monetary policy review, supporting investment and consumer spending.

Indian machine tool industry outlook: A beacon of hope amid global challenges

The latest World Machine Tool Survey report by Gardner Intelligence, released in June 2023, reveals a global decline in machine tool consumption and production. However, amidst this backdrop, the Indian Machine Tool industry has showcased promising growth. India secured the 9th rank globally in production, with a 5.5 percent year-on-year increase, reaching US\$1.4 billion in 2022. In terms of consumption, India ranks 7th globally, experiencing a record-high growth of 30 percent on year-on-year basis, reaching US\$2.8 billion in 2022. India's performance in machine tool imports and exports further demonstrates its strength in the global market. Import-wise, India ranks 6th globally, with imports valued at US\$1.6 billion in 2022, experiencing a substantial year-on-year growth of 71 percent. Impressively, Indian machine tool exports recorded a year-on-year growth of 78 percent, reaching around US\$182 million. Moving forward to the current fiscal year, machine tool imports

in April and May of FY2023-24 were estimated at ₹1,002 crore (US\$122 million) and ₹1,137 crore (US\$122 million) respectively. While April imports declined by 8 percent, May imports showed a notable improvement with a 44 percent year-on-year growth. China, Japan, and Germany were the top three countries in terms of machine tool imports to India, accounting for 56 percent of total imports in April and May 2023. Presses, Vertical Machining Centers, and Lathes were the top three machinery types imported, comprising 36 percent of the total imports. Russia, US, and China emerged as the top three destinations for Indian machine tool exports, accounting for 30 percent of total exports in April and May 2023. Horizontal Machining Centers, Vertical Machining Centers, and Lathes were the top three machinery types exported, representing 34 percent of the total exports. Analysis of the economic trends reinforces India's position as a competitive player in the international market. The country's Machine Tool industry is poised to make significant strides in the years to come.







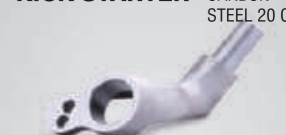




Source: Data Analytics & Policy Group IMTMA

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WHY MACHINE TOOL EXPORTS ARE CRUCIAL

Exports serve as a catalyst for economic activity, fostering innovation, and bolstering business confidence. Furthermore, they contribute to a stronger competitive edge within domestic markets, leading to job creation and encouraging consumer confidence in Indian products. Here's knowing the export scene in the context of Indian machine tools and learning ways to bolster it...

Exports play a vital role in boosting the growth, competitiveness, and reputation of an industry. When it comes to merchandise exports, India has been doing significantly well in the Electrical and Electronics sectors and the Machine Tool industry needs to emulate this. Successful exports can reinforce India's brand as a formidable nation in the field of machine tool manufacturing.

For the calendar year 2022, global machine tool consumption was around US\$ 79.5 billion, with China (US\$ 27.4 billion), USA (US\$ 10.1 billion), and Italy (US\$ 5.7 billion) occupying the top three rankings, according to the World Machine Tool survey published by Gardner Intelligence, the research department of Gardner Business Media Inc. (USA). As per the report, China (US\$ 27.1 billion), Japan (US\$ 10.5 billion), and Germany (US\$ 10.2 billion) occupied the top three positions in the global rankings of machine tool-producing nations. India, with a production of around US\$ 1.4 billion, was alongside Brazil among the countries that reported a marginal increase in production growth figures. Our consumption for the year 2022 stood at US\$ 2.8 billion.

Exploring new opportunities India, with a global ranking of 9th in production and 7th in consumption, has immense scope of aug-



Source: Magic Wand Media

menting its position further and becoming a leader in machine tool exports including supply chain. This is possible when the Indian Machine Tool industry creates the demand initially at the domestic level by building cost-effective standard products and creating a strong supply chain. Once it aligns itself with global standard compliances, such as CE marking, the industry will gain the necessary confidence to venture into untapped markets and explore new opportunities for growth. The Indian Machine Tool industry currently exports about 10 percent of what it produces to international markets. We have a long way to meet the size of global markets in Asia, Europe, and America. There are numerous challenges such as having a continuous presence, skilled

human resources, and strong liaison with distributors, dealers, and local players. For example, India must compete with products manufactured by Germany that are technologically superior and simultaneously compete with those from China that are highly cost-competitive. So how do we chart out a growth path for exports? What is expected of companies in terms of capital investments, creating a strong presence overseas, and serving customers in those regions seamlessly? TK Ramesh, Managing Director, Ace Designers Ltd, offers his two cents on developing a strategy to enhance exports:

Identification and Adaptation Increasing the share of exports is an involved process that begins with understanding the global

market and adapting to its needs. The Indian Machine Tool industry needs to identify potential export markets where there is demand for the types of machines that are manufactured locally. It is important to analyze competition, pricing, and customer preferences in those target markets. Another way is to customize machines to meet the specific needs of target markets. This may involve modifying features, sizes, or functionalities to align with the local industry standards or regulations.

Determining Products' Export Potential

A universal approach to evaluating the export potential of homegrown machines is to first test them domestically. When such products have features that will be difficult to replicate overseas then one is highly likely to find success. A crucial first step in planning is to develop a broad consensus on the company's goals, objectives, capabilities, and constraints.

Demographic Potential

Enhancing exports is a long-term process that needs unwavering dedication, adaptability, and responsiveness to market dynamics. Regularly evaluating export strategy, monitoring results, and making necessary adjustments are key to maximizing success. Capacity and cost competitiveness, global competition, staying abreast of technological advancements, and navigating past complex trade barriers, customs regulations, and compliance requirements are the primary challenges. Nevertheless, it is important to look for opportunities in markets that are either stable or emerging and promising. China, Europe, and US markets are stable while Mexico, Brazil, and Vietnam are emerging and hold promise. Many African nations are experiencing economic growth.



"The Indian Machine Tool industry needs to identify potential export markets where there is demand for the types of machines that are manufactured locally. It is important to analyze competition, pricing, and customer preferences in those target markets. Another way is to customize machines to meet the specific needs of target markets."

TK Ramesh
 Managing Director
 Ace Designers Ltd

Countries such as Nigeria, South Africa, Kenya, and Egypt have a growing demand for machine tools in various sectors. Countries in Latin America, including Mexico, Brazil, Argentina, and Chile offer opportunities for the Indian Machine Tool industry. Some of the Eastern European nations like the Czech Republic, Poland, Hungary, and Romania are emerging as potential markets with lower production costs while also investing in developing and building expertise in specific areas of manufacturing. Central Asian republics such as Kazakhstan, Uzbekistan, and Turkmenistan are undergoing industrial growth and infrastructure development. Exploring these markets can offer Indian machine tool manufacturers access to new customers and projects in sectors like Oil & Gas, Mining, and Construction.

Role of the Government

The Government needs to address industry-specific challenges like trade barriers, customs regulations, compliance require-

ments, tariffs, import restrictions, and so on. Industries need to look out for Government programs and incentives that encourage exports such as trade missions, export financing, tax benefits, and export credit insurance.

Brand Building Exercise

The Indian Machine Tool industry can enhance its brand image, establish a strong global presence, and gain recognition for its capabilities through different endeavors. Some of these are building a strong value proposition, showcasing industry expertise, establishing strategic partnerships, strengthening after-sales support, developing case studies and testimonials, investing in R&D, and other measures.

While it is essential to explore market potential continuously, it is also important to have a comprehensive region-based marketing strategy to raise awareness about machines. Utilizing numerous channels like trade shows, online platforms, industry publications, social media channels, and other means of outreach such as networking with distributors and agents who have knowledge of target markets will pay rich dividends.

A Holistic Approach

IMTMA, with the help of the Government and Industry, can establish India Tech Centers on a lease or rental basis in prospective countries and these can be used for marketing, service, and support, which will help in stabilizing the growth of Indian industries and trigger export growth. Developing competitive products, having a continuous presence in global markets, and a focused approach and strategy for exports by individual companies can enable the Indian Machine Tool industry to capture the export market significantly in the coming years. 

Utilizing numerous channels like trade shows, online platforms, industry publications, social media channels, and other means of outreach such as networking with distributors and agents who have knowledge of target markets will pay rich dividends.

DEVELOPING THE MUCH-NEEDED TECHNOLOGIES

A center of excellence on machine tools and production technology at IIT-Madras in Chennai, Advanced Manufacturing Technology Development Centre is a vital facility for the development of manufacturing technologies in India. Here's knowing more about it...



Source: AMTDC

Supported by the Ministry of Heavy Industries, Government of India, Advanced Manufacturing Technology Development Centre (AMTDC) is working on various aspects including the smart manufacturing platform for production processes. As a one-of-its-kind research and development center working to arm the Indian Manufacturing industry with the latest technologies, AMTDC exemplifies what can be possible when the industry and academia join hands. The center successfully develops advanced tech-

nologies for the Capital Goods sector in collaboration with industry partners.

Forces must come together

Many developed nations like the USA, Germany, UK, Japan, etc. have artfully leveraged the collaborative Government-Academia-Industry model to remain at the top of the technology development value chain. Realizing the need for such a system in India, the Indian Machine Tool Manufacturers' Association (IMTMA) took the lead in creating a similar module. IIT-Madras took a plunge

in 2008 to create one such ecosystem and, finally in 2012, had a proposal sanctioned by the Office of the Principal Scientific Adviser (OPSA) to the Government of India to develop a Next Generation High Precision Grinding Machine in collaboration with an industrial partner.

As the project progressed, the confidence in academia-industry collaboration strengthened in the minds of IIT-Madras and IMTMA. As a result, in 2013, IMTMA and IIT-Madras jointly convened a meeting with IMTMA's members to deliber-

ate on the need for Centers of Excellence that could develop the fledgling ecosystem. The positive deliberations in the meeting helped IMTMA to push the case with the Union Government. Meanwhile, the Government's own study through the Planning Commission and Department for Promotion of Industry and Internal Trade pointed out the need to promote such schemes for the development of the Capital Goods sector in India, and thus AMTDC came into existence finally in 2016.

Projects coming to fruition

AMTDC has successfully completed some critical projects such as hydrostatic guideways and spindles, low-cost machine tending robots, orbital motion

mechanism for abrasive cutting, grinding process intelligence, thermal compensation strategy for CNC lathes, multi-station grinders and polishers, 5-axis universal machining centers, ultra-precision micro machining centers, 5-axis CNC multi-tasking machines, direct drives for the abrasive cut off machines, 5kw axis drives and 25kw spindle drives for machine tool applications, CNC setup for μ -plasma-based metal deposition, and automated system for the casting of reinforcement concrete structures.

Some projects under Phase II of the Capital Goods Scheme being developed at AMTDC include production-grade cylindrical grinding machines with indigenously developed hydrostatic systems, indigenous industrial

robots project details, thermally efficient 5-axis vertical machining centers, bearing superfinishing technology and machine tools, plano grinders for steel mills, hot cell sample preparation systems, and optoelectronics polishing machines.

AMTDC, which is established over an area of 9,000 sq ft in IIT-Madras Research Park, primarily focuses on machine tools besides Industry 4.0, automation and mechatronics, motion control, and robotics. With its proven expertise in developing large, complex projects, the center is working to generate high-quality human resources for the Manufacturing industry, create opportunities for the incubation of new technologies, and promote business development for MSMEs. 

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JAMES NASMYTH: 'SHAPING' THE INDUSTRIAL REVOLUTION

Scottish engineer and inventor James Hall Nasmyth's is celebrated even today for his work in inventing the steam hammer and the shaper machine.



Source: Magi, Wand Media

Early Life

James Hall Nasmyth, a Scottish engineer and inventor, was born on August 19, 1808. Nasmyth is best known to historians of technology for inventing, or at least perfecting, the steam hammer, which became indispensable for forging large workpieces, and for inventing the shaper machine. While still in school in Edinburgh, Nasmyth showed an extraordinary mechanical inclination for building successful steam engine models. For two years he worked in the legendary Henry Maudslay's machine shop in London and subsequently moved to Manchester, where rapid industrialization was in progress. In 1836 he began to build his own foundry near the junction of the Bridgewater Canal with the newly opened Liverpool and Manchester Railway.

Inventing the steam forging hammer

Nasmyth revolutionized the Forging industry by harnessing the power of steam. His invention of the steam-powered forging hammer brought about a revolution in the Forging industry. This groundbreaking innovation allowed for the forging of significantly larger workpieces compared to the conventional mechanized hammers that were previously utilized.

Nasmyth and his French counterpart François Bourdon (1797-1865) invented the steam hammer independently but concurrently in 1839, both trying to solve the same problem of forging shafts and cranks for the increasingly large steam engines used in locomotives and paddle boats.

In Nasmyth's 1883 autobiography, he described how the need arose for a paddle shaft for the new

transatlantic steamship SS Great Britain, with a 30-inch diameter shaft, larger than any that had been previously forged.

He came up with his steam hammer design, making a sketch dated November 24, 1839, but the immediate need disappeared when the practicality of screw propellers was demonstrated and the SS Great Britain was converted to that design.

Bourdon came up with the idea of what he called a 'Pilon' in 1839 and made detailed drawings of his design, which he also showed to all engineers who visited the works at Le Creusot owned by the brothers Adolphe and Eugène Schneider. However, the Schneiders hesitated to build Bourdon's radical new machine.

Bourdon and Eugène Schneider visited the Nasmyth works in England in the middle of 1840, where they were shown Nasmyth's sketch. This confirmed the feasibility of the concept to Schneider and, in 1840, Bourdon built the first steam hammer in the world at the Schneider & Cie works at Le Creusot.

It weighed 2,500 kg (5,500 lb) and lifted to 2 m (6 ft 7 in). The Schneiders patented the design in 1841. Nasmyth visited Le Creusot, France in April 1842 and Bourdon took him to the forge department so he might, as Nasmyth said, 'see his own child'. And when he saw it, Nasmyth was said to have remarked 'there it is, in truth—a thumping child of my brain!'

After returning from France in 1842, Nasmyth built his first steam hammer in his Patricroft foundry in Manchester, England. In 1843, a dispute broke out between Nasmyth and Bourdon over the priority of the invention of the steam hammer. Nasmyth, an excellent publicist, managed to convince the industry that he was the first.

Inventing the shaper machine

Nasmyth is also credited with the invention of the shaper machine. He was inspired by the early planing machine which was invented in 1814-17 by Matthew Murray and Richard Roberts and intended for the economical machining of large components.

The planers' design was very basic: a bridge, carrying one or more toolholders and able to be elevated and moved from side to side was carried on uprights, bolted to a heavy cast iron base plate upon

which there was a slide and a table that carried the workpiece or workpieces.

The introduction of the planing machine into factories helped in perfecting and economizing the production of the larger parts for machine tool manufacture but a considerable proportion of the smaller parts were still manufactured by hand using chisels and files.


This used to result in parts that were both inaccurate and costly. Nasmyth designed a simple and compact machine. In a planer machine, the tool is stationary and the workpiece travels back and forth under the tool. He designed the shaper machine so that the workpiece is held stationary while the cutting tool moves back and forth across the work.

In the shaper machine, a single-point cutting tool is rigidly mounted on the toolholder, which is mounted on the ram. The workpiece is held rigidly in a vice or clamped directly on the table.

The ram reciprocates and, thus, the cutting tool held in the toolholder moves backwards and forwards on the workpiece. In a standard shaper, cutting takes place during the forward stroke of the ram and the backward stroke remains idle. The forward and backward motion is obtained by 'Quick Return Mechanism' and the depth of the cut is adjusted by moving the tool downwards towards the workpiece.

A versatile genius

Nasmyth's steam forging hammer and the shaper machine became an important part of the Industrial Revolution. Besides steam hammers and shapers, Nasmyth also manufactured more than 100 steam locomotives, many small high-pressure steam engines, and a variety of pumps, hydraulic presses, and other machine tools.

At the age of 48, he retired from the foundry in order to devote himself to his hobby, astronomy. Even in the field of astronomy, Nasmyth's genius shone through. He developed the Nasmyth telescope, also called Nasmyth-Cassegrain telescope. It was a reflecting telescope which was a modified form of a Cassegrain telescope, with light reflected sideways to an eyepiece. He also wrote a book on astronomy titled - The Moon: Considered as a Planet, a World, and a Satellite. 

Nasmyth's steam forging hammer and the shaper machine became an important part of the Industrial Revolution. Besides steam hammers and shapers, Nasmyth also manufactured more than 100 steam locomotives, many small high-pressure steam engines, and a variety of pumps, hydraulic presses, and other machine tools.

REJI VARGHESE
MD
RV Forms & Gears
fngreji@gmail.com



TAPPING OPPORTUNITIES IN EMERGING SECTORS

The Indian machine tool industry has recognized the electric vehicle, defence, and aerospace sectors as highly promising domains for expansion and progress. These sectors present significant prospects for the industry to actively contribute to their technological advancements and cater to their evolving needs. Let's explore how the industry titans are gearing up to grab the opportunities the sectors offer...



Manoj K Sundaram
Head - Business development
Carl Zeiss India (Bangalore) Pvt Ltd

Automation is the need of the hour

The Electric Vehicle industry is rapidly shifting towards light-weighting and design conversions to aluminum pace. Advancements such as sensor-embedded vehicles and ADAS (Advanced Driver Assistance Systems) are driving the development of cutting-edge tools and reshaping the industry to embrace technologies like the Internet of Things (IoT), robotics, and automation. The industry is now looking for localization of its products and expansion of its capacity to cater to the needs that are to emerge in the next decade. This necessitates significant greenfield investments, which are already being observed in the industry.



C Renganathan
Managing Director
Chennai Metco Pvt Ltd

Govt-Industry together in pursuit of growth

Thanks to the favorable policies of the Government, we are now witnessing a surge in the activities in the Aerospace, Defence, and Electric Vehicle sectors. The Indian Machine Tool industry has upgraded its precision capability to meet the high demands of the Aerospace sector. The good news is that the gap between Indian capabilities and that of developed countries is narrowing at a fast pace. The Indian Machine Tool sector is now in an advantageous position and is gearing up to meet the rising demands not only of the emerging local market but also of the international market with our cost-effective, high-performing machine tools.



Ramakrishna Edara
General Manager Marketing,
BD & IT Solutions
FIBRO India Precision Products Pvt Ltd

Holistic approach for sustained development

The Central Government has taken various measures to promote self-reliance in India (Atmanirbhar Bharat), boost domestic manufacturing (Making in India), and aim to increase the Indian economy from US\$3 trillion to US\$5 trillion by 2025. The Government is also promoting import substitution to protect local businesses and address trade imbalances. In the Automotive sector, the emergence of EVs has created new opportunities for the Sheet Metal industry, while there is also increasing demand from Agriculture, Consumer Goods, and General Engineering sectors, which is

driving growth in the Machine Tool industry. Additionally, sectors like Electronics, Semiconductors, Defence, Aerospace, and Railways are contributing to the overall growth of the Manufacturing industry. These developments not only attract significant investments but also foster a supportive environment for startups. Furthermore, the drafting of a new education policy emphasizes upgrading syllabi and modernizing equipment to address skill gaps. This holistic approach aims to uplift the Manufacturing sector and ensure its sustained development.



Sureshkumar V
Regional Head - Sales
Jyoti CNC Automation Ltd

Developing products to cater to the needs

The Defence and Aerospace sectors require high-precision machines with advanced technology, which were previously being fulfilled primarily by foreign manufacturers. However, Jyoti CNC has consistently led the way in providing some of the finest products and solutions for the A&D sector for over a decade. With the acquisition of HURON GRAFFENSTADEN S.A.S in France, JYOTI CNC now has access to cutting-edge European machine tool building technology. As a result,

Jyoti CNC is now uniquely positioned among all Indian MTBs (Machine Tool Builders) to meet the complete requirements of the A&D sector, at par with any foreign supplier. Additionally, Jyoti's extensive existing product range is well-suited to cater to the needs of EV manufacturers and other emerging sectors.



Indraneel Bhattacharya
VP Sales & Marketing
Lakshmi Machine Works Ltd

Investing in precision machining technologies

The Indian Machine Tool industry has been witnessing key developments to cater to Electric Vehicle, Defence, and Aerospace sectors. The industry has been adapting to manufacture specialized components required for EVs, including precision machining of electric motor components such as stators, rotors, under chassis parts like brakes, suspension, and steering. The Defence industry requires advanced manufacturing technologies to meet its stringent requirements. Since there is strong emphasis on indigenous manufacturing in the Defence sector, Indian machine tool manufacturers are developing capabilities to produce defence-specific components and equipment domestically. This reduces the dependence on imports and strengthens the

country's defence manufacturing ecosystem. The Machine Tool industry in India is investing in precision machining technologies to meet the demanding requirements of aerospace components. This includes high-precision CNC machining centers, multi-axis machining, and advanced tooling systems. These technologies enable the production of complex aerospace parts with tight tolerance and high accuracy.



AV Srinivasan
CEO
Meiban Engineering Technologies Pvt Ltd

Industry making suitable developments

The Indian Machine Tool industry is in the process of moving towards manufacturing EV parts and making developments accordingly to meet these requirements. Although the number of parts in 2-wheeler or 4-wheeler vehicles has come down drastically, a few moving parts in transmission and steering, etc., are still the same. The Indian Machine Tool industry has already incorporated Industry 4.0 and is offering high-end solutions for Defence and Aerospace sectors. In addition, the industry is actively investing in research and development to further enhance its capabilities and meet the evolving demands.





Yogasundaram M
Regional Head - Operations
(Tamil Nadu)
Micromatic Machine Tools Pvt Ltd

Addressing challenges with apt solutions

The Indian Machine Tool industry has been gearing up to address various challenges coming in from new industry sectors like Electric Vehicle, Aerospace, and Defence. The current focus has been to augment machine

tool efficiency, precision, and automation.

Typically, these sectors have exposed the Machine Tool industry to component materials like super alloys, aluminum alloys, and composites. These new materials address the lightweighting requirements. The Indian industry has been developing machine tools that can handle these new materials while ensuring high precision as well as reducing energy consumption. MCV Series from AMS addresses this requirement by having structural components made of Cast Iron and designed to perform under demanding working conditions and component complexities. Complex components required in Electric Vehicle, Aerospace, and Defence sectors also require intricate geometries. This requires machine tools to

have multiple axes to machine such components. 4+1 Axes machines like Ace Designers AMT-i 1500S have a B-axis capability with a swivel of +/- 120 degrees with a minimum indexing increment of 0.00010. They are developed to enable simultaneous machining from multiple angles, reducing set-up times and improving accuracy. Other needs like high-speed machining, integration of machine tools with automation and robotics, incorporating advanced control systems such as adaptive control and machine learnings, application of Industry 4.0 concepts or integration of additive manufacturing with subtractive manufacturing like AMS-make Wire Arc Hyb-AM 850V machine, are some of the other needs which are being addressed by the Indian Machine Tool industry.

Efforts toward a green future


A noteworthy advancement in the Indian Machine Tool industry is the dedication to enhancing the quality of the machining process and strengthening machine structures. In sectors such as Electric Vehicle, Defence, and Aerospace, it is essential to achieve exceptional surface finish, dimensional accuracy, and geometric precision in machining operations. Machine tool manufacturers have been concentrating on reducing vibrations, improving damping capabilities, and augmenting

the rigidity of machine structures to minimize any deviations during machining.

As a result of these developments, high-quality components for electric vehicles, defence equipment, and aerospace applications can be produced more efficiently. Furthermore, with the implementation of energy-efficient technologies, the optimization of production processes, and the incorporation of sustainable materials, we aim to minimize greenhouse gas emissions throughout the machine's lifecycle. Our efforts align with global initiatives to-



T Venkatesan
Vice President
S&T Group

ward a greener and more sustainable future. 



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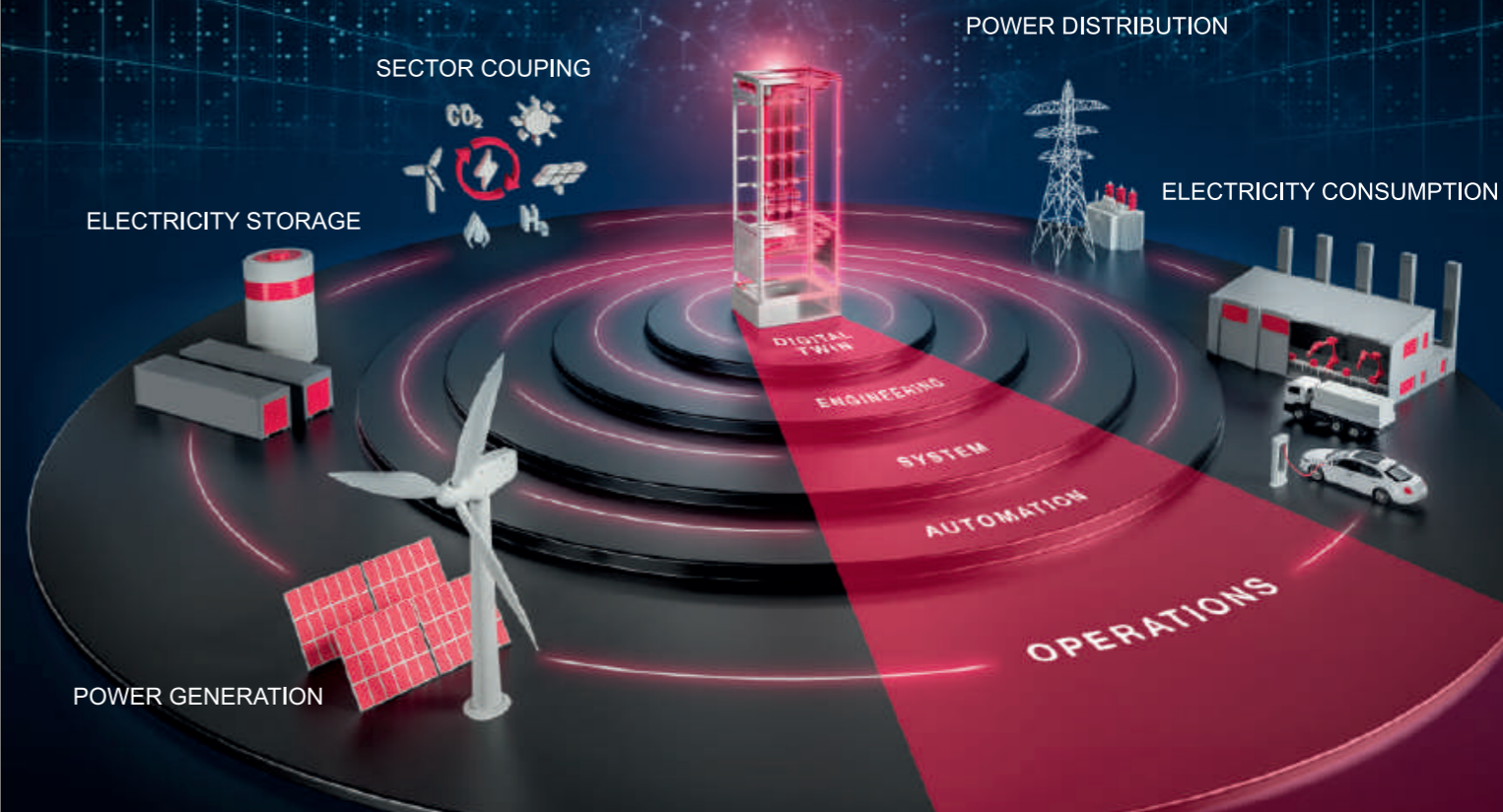
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CREATING SMART FACTORIES WITH AI

Artificial intelligence (AI) can make production machines self-optimize and learn from their mistakes. It also makes it possible for them to acquire know-how from other machines, leading to greater productivity, lower costs, improved quality, and reduced downtime.

DANIEL SCHAUBER



The AI trend is taking hold in the industry. Machine tool manufacturer Weisser Söhne GmbH & Co. KG, for example, relies on AI models that enable predictive maintenance of its lathes. "Predictive maintenance uses AI to forecast when a machine will require servicing to prevent it from breaking down," explains Dr-Ing Robin Hirt, CEO & Founder, Karlsruhe-based startup Prenode GmbH. The software company helps machine builders equip their plants with customized AI-based features.

Modern production machines can self-optimize with the help of artificial intelligence, says Hirt. "They generally use so-called machine learning methods for this. These enable the machines to recognize patterns and correlations in the production data and automatically derive improvements from them." In many cases, it is also possible for them to learn from their mistakes and adopt know-how from other machines.



"The so-called AI solution catalog, for instance, is being developed as part of the IIP-Ecosphere project. This is a platform for discovering and analyzing existing AI solutions to production-related problems."

Markus Spiekermann
Head, Data Economy Department
Fraunhofer Institute for Software
and Systems Engineering ISST

Decentralized data used to generate a common AI model

The federated learning technique is often used, as the data obtained from a single lathe is often insufficient as the basis for an accurate AI model. Federated learning facilitates the 'training'

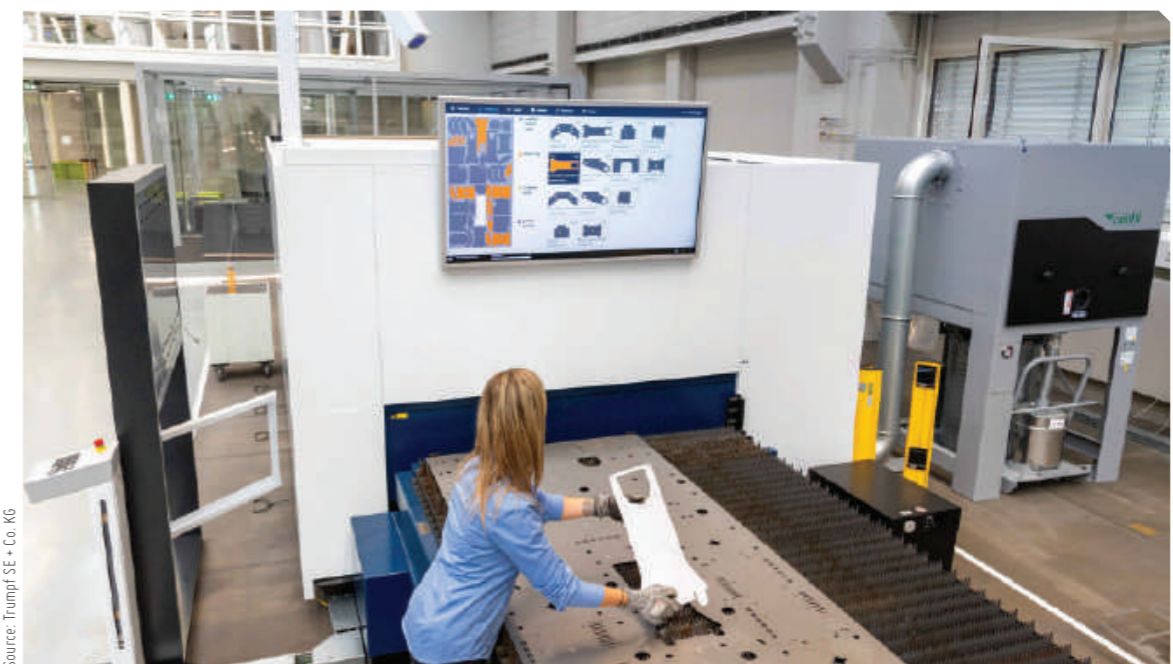
of a common AI model with data stored in a decentralized form but with no direct sharing of data. The individual data, therefore, remains on the respective machines and does not have to be stored centrally in one place (such as in the machine manufacturer's cloud).

The AI models use ongoing lathe data to estimate the present status of the plant and then forward this to the operating personnel. Deep learning neural networks are used for this.

Smart sorting assistant from Trumpf

Artificial intelligence is also used to operate the Sorting Guide, a system created by laser specialist Trumpf in Ditzingen, Baden-Württemberg, Germany, that helps sort produced parts and, thus, increase machine utilization levels. The Sorting Guide is a camera-based assist system that relies on decentralized machine learning. The main components of the AI system are a high-resolution camera, a large screen, an industrial

Artificial intelligence is also used to operate the Sorting Guide, a system created by laser specialist Trumpf in Ditzingen, Baden-Württemberg, Germany, that helps sort produced parts and, thus, increase machine utilization levels.



Source: Trumpf SE + Co. KG

Trumpf's Sorting Guide uses artificial intelligence to sort sheet metal parts quickly and easily. The AI system uses self-learning image processing to recognize the individual parts and then display a sorting recommendation on the screen.

Researchers at the Technical University of Kaiserslautern have developed a method that 'trains' the system using real process and measurement data in order to obtain a reliable prediction of the wear condition and, thus, optimize cutting processes.

PC, and intelligent software for image processing.

"Decentralized machine learning involves linking together several machines to form an AI system," says Prenode CEO Hirt, explaining the principle. These machines continuously collect local data about their work processes. An AI model is developed for each machine, which is then centralized. "These models are then merged in a central cloud and transferred back to the individual systems," Hirt continues. The AI system can then draw locally on the experience of all the other machines without ever having to share sensitive raw data. "This allows the machines to run their processes more efficiently and achieve greater productivity," Hirt promises.

Trumpf's Sorting Guide works as follows: The Sorting Guide uses existing master data and self-learning image processing to recognize the individual parts. It then issues a sorting recommendation on the screen. The manufactured parts are shown in different colors on the screen, coded by customer order or subsequent work steps such as bending, deburring, lacquering, or shipping, for example. This makes aspects such as the time-consuming recounting of parts, manual confirmations, and accompanying documents things of the past. Machine operators can see at a glance which parts are ready for further processing and whether post-production is necessary or not. This speeds up the sorting process and helps avoid errors, allowing the machine to return to production more quickly. AI and manufacturing go hand in hand, as humans and machines need to work closely together in the industrial production environment.



Source: Prenode GmbH

"Decentralized machine learning involves linking together several machines to form an AI system. These machines continuously collect local data about their work processes. An AI model is developed for each machine, which is then centralized. These models are then merged in a central cloud and transferred back to the individual systems. The AI system can then draw locally on the experience of all the other machines without ever having to share sensitive raw data. This allows the machines to run their processes more efficiently and achieve greater productivity."

Dr.-Ing Robin Hirt
CEO & Founder
Prenode GmbH

Optimized machining based on data analysis

A new method that analyzes tool wear in machining processes such as drilling or milling also relies on artificial intelligence. It is important to be able to use expensive tools for as long as possible. It is, therefore, also crucial to be able to estimate the remaining service life accurately. Tool breakages

and the destruction of expensive workpieces, or even damage to the machine tool, must be avoided at all costs.

Up until now, these conflicting objectives have been resolved by replacing the tools prematurely after a given number of operations (based on experience) in order to avoid any loss in quality or even expensive downtimes due to tool breakages. However, tool replacement is costly and time-consuming, which is why it pays to optimize the change cycles.

This is where AI comes into play. Researchers at the Technical University of Kaiserslautern have developed a method that 'trains' the system using real process and measurement data in order to obtain a reliable prediction of the wear condition and, thus, optimize cutting processes. In practice, it works like this: Process-related parameters first need to be identified in order to predict the wear condition of cutting tools. These include the different machining forces, the vibrations of the machine, and the power requirements of the machine axes. Data taken from continuous measurements of the tool and the workpiece is collected. The biggest challenge is then to identify correlations in the data collected.

Search for patterns

In order to achieve this, the researchers are training the

Artificial Intelligence at EMO Hannover

When machines link up and share their knowledge, they become ever smarter. Artificial intelligence makes it possible. In industrial production, machine learning plays a crucial role in raising efficiency levels. Deep learning neural networks are used for this. At EMO Hannover, numerous companies will be presenting equipment, systems and components that can optimize manufacturing through the use of data-based models.



Source: Trumpf SE + Co. KG

The Sorting Guide from machine tool manufacturer Trumpf uses artificial intelligence to help employees pick out laser-cut sheet metal components. Man and machine can thus work together efficiently.

AI-supported system. This uses machine learning methods to detect possible patterns and derive conclusions about the state of wear. It should also be able to predict which process parameters companies need to use in specific cutting processes in order to keep the tool reliable for a given service life. The data the system needs to learn from is collected from five partner companies, including both global players as well as small and medium-sized enterprises. Different variants are trialed with regard to tool and material types or process parameters, for example. A broad database is thus collected over the entire service life, up to and including the failure of the tool.

Artificial intelligence is already pretty intelligent, but it is still far from perfect. The processes are too different in the individual use cases. Machine learning, therefore, supports the tool change decision. The aim is to make the system better through so-called transfer learning. Here, knowledge from previously learned related tasks is used to train machine learning models more quickly for new (yet related) tasks.

IIP-Ecosphere for low-threshold access

Nevertheless, in the case of industrial manufacturing, the benefits of artificial intelligence are not always obvious, especially for small companies. Many are concerned about handing over their production data for in-depth analysis by computers.

For manufacturing companies that are still unsure about the added value of AI, the IIP-Ecosphere project, on which the Fraunhofer Institute for Software and Systems Engineering (Fraunhofer ISST) is collaborating, aims to provide low-threshold access to vendor-independent AI solutions for complex production problems. The goal of the project is to establish a new type of ecosystem and for all the different players—including universities and research institutions, industrial companies, and AI solution providers—to promote the use of AI in manufacturing. Artificial intelligence thrives on the networking of knowledge. The result is to create the 'Ecosphere for Intelligent Industrial Production', or IIP-Ecosphere for short.

A platform for discovery

Markus Spiekermann, Head, Data Economy Department, Fraunhofer Institute for Software and Systems Engineering ISST, explains: "The so-called AI solution catalog, for instance, is being developed as part of the IIP-Ecosphere project. This is a platform for discovering and analyzing existing AI solutions to production-related problems." In addition to facilitating access to information on existing solutions, the catalog offers targeted filters based on use cases and shows the added value of the solutions. "Individual AI applications can then be implemented directly using the open-source IIoT platform also developed in the project," says Spiekermann.

Knowledge represents power in the struggle to survive among the fierce international competition, but so does data. In comparison to rivals in the USA and Japan, is Germany ahead of the game in the development and use of artificial intelligence in industrial production technology? The jury is still out on this. "As far as I can tell, we don't currently have a development lead over the competition, which would allow us to rest on our laurels," says Fraunhofer expert Spiekermann. "Indeed, in terms of AI, we're actually lagging behind the international providers, including in industrial production technology," says Spiekermann. Conversely, the Fraunhofer expert also states: "Nevertheless, we are still ahead of the game in terms of optimizing domain-specific processes. What data is available and needed for specific use cases? What are the pitfalls, and what exceptions need to be considered? If we can rapidly improve our professional and technological AI expertise, we can carve out a major lead for ourselves in Germany with this domain know-how." 

Artificial intelligence thrives on the networking of knowledge. The result is to create the 'Ecosphere for Intelligent Industrial Production', or IIP-Ecosphere for short.

FROM STRENGTH TO STRENGTH

Dr Jairam Varadaraj, Managing Director, Elgi Equipments Ltd, in this thoroughly insightful interview with MMI's Editor-in-Chief Soumi Mitra, shares the company's evolution, highlights its key milestones and expanding global footprint, underlines the importance of innovation, R&D, and sustainability, and applauds the technology team, helping us gain a deeper understanding of the company and its trajectory.



Dr Jairam Varadaraj, Managing Director, Elgi Equipments Ltd

SOUMI MITRA
Editor-in-Chief
Modern Manufacturing
India
soumi.mitra@
magicwandmedia.in



With 63 years of experience in manufacturing air compressors, Elgi Equipments is a global leader in providing sustainable compressed air solutions. How has the journey been so far?

Dr Jairam Varadaraj: Elgi Equip-

ments was established in 1960. Typical of companies that grew in that era, we grew horizontally. The licensing system was such that we got a license to make products only of a certain quantity. The minute we

hit that capacity, we had to make another product. Up until the 1990s, the markets in India were protected, and there were high import duties for all products. In 1990, when the whole transformation happened in

India with the dismantling of the licensing system, and when India got integrated into the rest of the world, we had to reflect on what our core business would be as we could not sustain multiple businesses. We had to rethink our strategy. So, in the early '90s, we decided to focus on air compressors and the automotive equipment business and sell or shut down the other 8 to 9 different products then.

Kindly tell us the role Elgi plays in the joint venture with Sauer Compressors Group. What is the objective of the new manufacturing facility opened by Elgi Sauer Compressors Ltd in Coimbatore, India?

Dr Jairam Varadaraj: The joint venture between Elgi and Sauer Compressors Group was established in 2008, bringing advanced technology and a wider product range to the Indian Navy, marine, and related special applications. Over the past 14 years, the partnership has established a strong presence in the high-pressure market in India and neighboring countries, offering customized solutions and

"The goal for the company is to expand its business globally, and we have already identified the markets we want to expand in, which are North America, Europe, India, Indonesia, Thailand, and Australia. These markets constitute close to 90 percent of our revenue and 70 percent of the global opportunity. We will continue to invest in these markets to reach our goal of US\$1.6 billion by 2035-36."

Dr Jairam Varadaraj
Managing Director
Elgi Equipments Ltd

indigenization prospects that enhance competitiveness.

The new facility represents a significant milestone in Elgi Sauer Compressors' journey towards market leadership and sustainable business growth. With increased capacity and agile operations, the company aims to consolidate further the engineering, indigenization, and product support capabilities of both constituent entities, expand into new markets, and support its customers effectively by creating a solid af-

termarket network. The 50,000 sq ft facility in Kallappalayam, Coimbatore, Tamil Nadu, will manufacture state-of-the-art high-pressure compressors, pressure-reducing stations, and portable breathing air compressors for India's industrial, commercial shipping, naval, and offshore markets.

Please provide insight into Elgi's global presence and manufacturing facilities. You began your expansion into Europe four years ago with significant investments. How is your current market penetration in Europe?

Dr Jairam Varadaraj: Our strategy for growth in global markets has included both organic and inorganic initiatives. We have expanded our global footprint by acquiring Rotair in Italy, Pattons Inc, Pattons Medical, and Michigan Air Solutions in North America, Pulford Air & Gas, and Advanced Air Compressors in Australia. Today, Elgi has manufacturing operations in India, Italy, and North America, with subsidiaries and offices in Australia, Brazil, the Middle East, Europe, North America, India, Thailand, Malaysia, and Indonesia.

Elgi Equipments offers customers a complete range of compressed air solutions, from oil-lubricated and oil-free rotary screw compressors, oil-lubricated and oil-free reciprocating compressors, and centrifugal compressors, to dryers, filters, and downstream accessories.



Source: Elgi Equipments Ltd

Today, Elgi has manufacturing operations in India, Italy, and North America, with subsidiaries and offices in Australia, Brazil, the Middle East, Europe, North America, India, Thailand, Malaysia, and Indonesia.

Since establishing our European subsidiary in 2019, we have expanded and strengthened our footprint across Europe, significantly growing our sales and service organization to support an increasingly robust network of channel partners while building strong partnerships with customers across the region. Our team has grown from just two individuals to 120 people currently. Today, our European customers face a steady rise in energy costs, regulatory and value chain demands, and lower emissions amid the continued need to improve operational costs and energy efficiency. While air compressors consume approximately 10 percent of Europe's industrial electrical energy demand, over 70 percent of a compressor's life-cycle costs comprise the energy used during operations.

The global opportunity for air compressors was significant; thus, we invested in the backend, focusing on technology and processes to build world-class products. This also helped us remain relevant in India. It took us almost 20 years to do this. We started to build markets outside India. We looked at highly focused markets in North America, Europe, Australia, India, Indonesia, and Thailand and gained confidence that the markets accepted our products and that the value propositions we gave to our distributors and customers were quite compelling. From 2012 onwards, we started expanding globally.

Today, we are doing business in over 120 countries worldwide with over 2,000 employees and manufacturing facilities spread over India, Italy, and the USA. We offer customers a complete range of compressed air solutions, from oil-lubricated and oil-free rotary screw compres-



Source: Elgi Equipments Ltd

"Today, 50 percent of the students in our vocational school are women. Over the next three years, 35 percent of the employees on the shop floor will be women. We anticipate welcoming more women to our shop floor as we recognize their immense potential and the value they bring to their roles."

Dr Jairam Varadaraj
Managing Director
Elgi Equipments Ltd

sors, oil-lubricated and oil-free reciprocating compressors, and centrifugal compressors, to dryers, filters, and downstream accessories. India contributes approximately 40 percent of our business, and the remaining comes from the rest of the world. To strengthen our position in markets worldwide, including India, we continue to focus on developing compressed air solutions that drive down the total cost of ownership with class-leading energy efficiency, process improvements, new products, and processes.

How does Elgi prioritize innovation and R&D to stay ahead of competitors in the industry?

Dr Jairam Varadaraj: Innovation and Research and Development (R&D) form one of the fundamental strategic pillars of Elgi. We have focused on innovation and forging fruitful research and business partnerships that

have resulted in the development of indigenous compressors and related components. Over the years, we have remained committed to delivering on the evolving needs of our customers across different business segments and countries.

Today, our technology team, comprising over 130 highly skilled specialists and engineers, is the driving force behind our advancements. They possess expertise in diverse subsystems and specialized technical skills, through which we deliver products of high efficiency and reliability.

We have further invested in R&D by establishing our state-of-the-art research center in Bangalore, India. Equipped with cutting-edge technology and utilizing simulation as a foundation for design thinking, this center serves as the hub for creating innovative products that cater to future needs.

Many companies are committed to reducing their carbon footprint and mitigating the impact of their operations on the environment. Can you explain the energy-saving solutions offered by Elgi? Also, please update us on your focus on resource-neutral operations and circularity.

Dr Jairam Varadaraj: We are committed to addressing our customers' needs for a step change in energy efficiency. In the journey towards net-zero operations, customer requirements are evolving from lower energy consumption to thorough life cycle cost assessments. One of the biggest portions of the life cycle costs of a compressor is electricity consumption. If we can keep improving the efficiency of our product, then we reduce the energy footprint for the customer and, in turn, contribute

to a greener environment. We have continuously improved our compressor's energy efficiency over the last 20 years. The second goal is the elimination of oil. A compressor is more environmentally friendly when you don't have oil in the system. We developed and introduced a water-injected compressor four years ago. Today, a significant portion of our air compressors have been certified as Green Products, demonstrating that environment-friendly processes have been followed at every stage of the product lifecycle, from sourcing raw materials to designing and manufacturing and ending with disposal. Besides, our screw compressors have large premium efficiency air-ends equipped with in-house developed ηV profile rotors. These air-ends are designed to run at slow speeds with re-

"At Elgi, we firmly believe that innovation and R&D are the keys to staying at the forefront of our industry. We remain committed to pushing the boundaries of technology, delivering exceptional products, and providing solutions that help our customers achieve their productivity goals."

Dr Jairam Varadaraj
Managing Director
Elgi Equipments Ltd

duced pressure losses, offering high volumetric efficiency and lower energy consumption.

Some of Elgi's energy-efficient compressed air solutions that ensure efficient energy consumption and lower our customers' energy costs are:

EG Series Oil-Lubricated Screw Air Compressor

AB Series Oil-Free Screw Air Compressor
Elgi's Heat Recovery System (HRS)
OF Series Oil Free Screw Air Compressor
EG Premium Oil Lubricated Screw Air Compressors
The Elgi LD Series

Please share the blueprint of the company's strategies for future growth and expansion.

Dr Jairam Varadaraj: The goal for the company is to expand its business globally, and we have already identified the markets we want to expand in, which are North America, Europe, India, Indonesia, Thailand, and Australia. These markets constitute close to 90 percent of our revenue and 70 percent of the global opportunity. We will continue to invest in these markets to reach our goal of US\$1.6 billion by 2035-36. 

Equipped with cutting-edge technology and utilizing simulation as a foundation for design thinking, Elgi's state-of-the-art research center in Bangalore serves as the hub for creating innovative products that cater to future needs.



Source: Elgi Equipments Ltd

ELGI Sauer New Plant Inauguration

OPTIMIZING PRODUCTION PROCESSES

An interesting case study on how SINAR Sheetmetal Solutions accelerated sheet metal laser-cutting machine development with Dassault Systèmes' software application SOLIDWORKS mechanical and electrical design solutions.



Source: SINAR Sheetmetal Solutions

SINAR Sheetmetal Solutions Pvt Ltd is a leading Indian manufacturer of sheet metal fabrication and processing machines, which is backed by a team with more than 40 years of experience in machine tool design and production. The company was founded in 2019 with the goal of becoming not only the top sheet metal laser-cutting, bending, and welding machine solutions manufacturer in the Indian market, but also a leading exporter of sheet metal fabrication machines around the world. SINAR designs and manufactures laser-cutting, bending, and welding machines to meet international industry manufacturing standards, as well as special-purpose machines for unique applications. The company is committed to pro-

viding its customers with innovative, comprehensive solutions that are competitive with or exceed the capabilities of other manufacturers. This commitment to quality is one of the reasons that SINAR chose the Dassault Systèmes' software application SOLIDWORKS 3D product development system when the company was launched in 2019, according to Dr Laxmikant K, Technical Director, SINAR Sheetmetal Solutions. "As a startup, we wanted 3D modeling software that was easy to learn and use. So we selected SOLIDWORKS," he explains. "Moreover, the features included with our SOLIDWORKS Premium license helped us do motion analysis and also basic FEA (finite element analysis), which makes the design process

quick, reliable, and efficient. We have also procured SOLIDWORKS Electrical Schematic and SOLIDWORKS Electrical 3D software, which are proving to be beneficial." In addition to choosing Dassault Systèmes' software application SOLIDWORKS solutions for its user-friendly GUI and requiring shorter learning curve, SINAR values the software's large-assembly design capabilities, which have no performance lag; integrated Dassault Systèmes' software application SOLIDWORKS Visualize photo-realistic rendering tools, which support customer demands for 4K raster images for approval; and the Dassault Systèmes' software application SOLIDWORKS Toolbox Library, which enables the drag-and-drop of fasteners

Challenge:

To successfully enter the sheet metal laser-cutting, bending, and welding machine markets by quickly and cost-effectively developing innovative, automated solutions for fabricating sheet metal parts.

Solution:

SINAR Sheetmetal Solutions implemented Dassault Systèmes' software application SOLIDWORKS Premium 3D mechanical design, SOLIDWORKS Electrical Schematic design, and SOLIDWORKS Electrical 3D design solutions.

Results:

- The company
- Reduced design time by 20%
 - Cut time to market by 30%
 - Decreased development costs by 20%
 - Improved quality, minimized scrap and rework by 20%.

and other components directly into assembly models. Dassault Systèmes, the 3DEXPERIENCE® Company, is a catalyst for human progress. It provides businesses and people with collaborative virtual environments to imagine sustainable innovations. It brings value to more than 3,00,000 customers of all sizes, in all industries, and in more than 150 countries.

Integrated mechanical and electrical design save time and money

Using integrated Dassault Systèmes' software application SOLIDWORKS design tools to develop both the mechanical and electrical aspects of its sheet metal fabrication machines, including electrical schematics, SINAR is saving substantial amounts of time and money. "Overall, we have reduced both our machine development cycles and costs by 20 percent since implementing SOLIDWORKS software, enabling us to cut product time to market by 30 percent," Dr Laxmikant notes. "SOLIDWORKS mechanical design software helps us quickly develop the many assemblies in our machines, and SOLIDWORKS Electrical allows us to simplify and accelerate the creation of electrical schematics due to its integration with SOLID-

WORKS software and intuitive interface," he adds.

Developing large assemblies quickly and easily

SINAR sheet metal fabrication machines require the development of large assembly designs. Its laser-cutting machine includes 20 subassemblies, and the company's designers were able to create large assemblies in Dassault Systèmes' software application SOLIDWORKS quickly and easily because of the software's fast performance and interference detection tools. "We found top-down assembly design to be a very intuitive approach and one of the reasons that we became interested in SOLIDWORKS software," says Bharath NJ, Product Designer, SINAR Sheetmetal Solutions. "SOLIDWORKS also has no lagging performance issues when working with large assemblies," Bharath continues. "SOLIDWORKS large-assembly and interference-detection tools were really helpful in resolving some complex issues in assemblies, as were SOLIDWORKS motion analysis capabilities, which helped us select the appropriate motor (rpm and torque), drive components, and belt length and thickness for driving pulleys. Sheet metal design and weldments capabilities



Source: SINAR Sheetmetal Solutions

"SOLIDWORKS large-assembly and interference-detection tools were really helpful in resolving some complex issues in assemblies, as were SOLIDWORKS motion analysis capabilities, which helped us select the appropriate motor (rpm and torque), drive components, and belt length and thickness for driving pulleys. Sheet metal design and weldments capabilities also helped us develop our design efficiently. All of these tools enabled us to maintain high levels of quality, resulting in a 20 percent reduction in scrap and rework."

Dr Laxmikant K
Director
SINAR Sheetmetal Solutions Pvt Ltd

also helped us develop our design more quickly. All of these tools enabled us to maintain high levels of quality, resulting in a 20 percent reduction in scrap and rework," reiterates Dr Laxmikant.

Improving design visualization, cost estimation, and sourcing

Also contributing to SINAR's efficiency in developing its laser-cutting machines were additional tools within Dassault Systèmes' SOLIDWORKS Premium software that support design visualization, production cost estimation, and online component sourcing via 3D ContentCentral®, a free online library of thousands of high-quality 3D CAD models from hundreds of suppliers. "With SOLIDWORKS Visualize, we can quickly create 4K raster images for design reviews, client approvals, and marketing purposes," Bharath stresses.

Also contributing to SINAR's efficiency in developing its laser-cutting machine were additional tools within Dassault Systèmes' SOLIDWORKS Premium software that support design visualization, production cost estimation, and online component sourcing via 3D ContentCentral®, a free online library of thousands of high-quality 3D CAD models from hundreds of suppliers.

POONAM PEDNEKAR
Chief Copy Editor
Magic Wand Media Inc
poonam.pednekar@
magicwandmedia.in






Source: SINAR Sheetmetal Solutions

SINAR designers rely on Dassault Systèmes' software application SOLIDWORKS large-assembly design tools to quickly and easily create large assemblies because of the software's fast performance and interference-detection tools.

"By adopting SOLIDWORKS Costing, we learned the actual price of the product, including all operations defined for manufacturing, which saves a lot of time in terms of cost

estimating," he shares. "With the help of SOLIDWORKS 3D ContentCentral, we quickly chose the motor and brand that works best for our design and directly import the mod-

el into our assembly. SOLIDWORKS gives us a range of capabilities that we need to succeed in the highly competitive sheet metal fabrication machine market." 



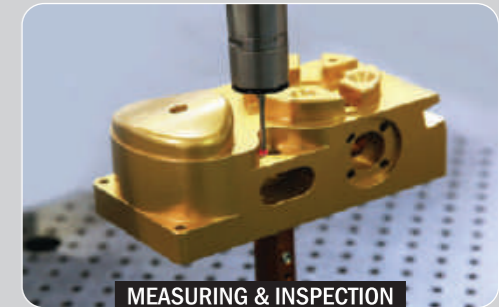
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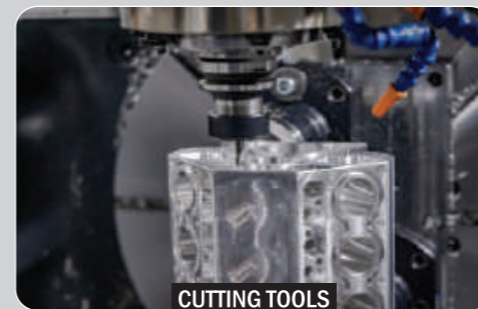


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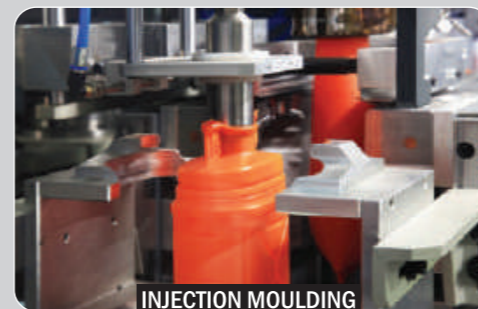


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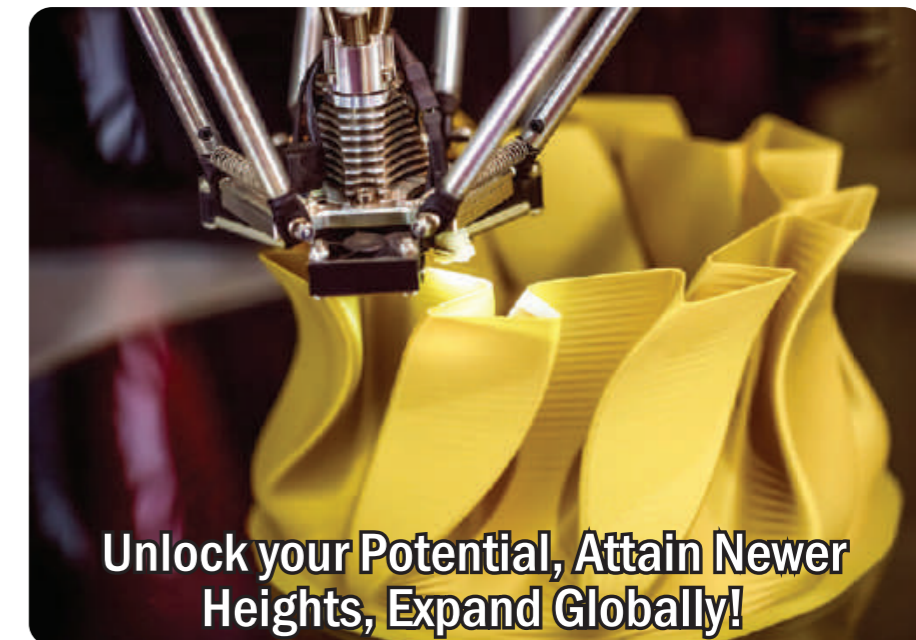
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FOR DETAILS



EMPOWERING WITH DIGITAL INNOVATION

Coimbatore-based Maxbyte Technologies provides intelligent solutions for real-world business challenges and helps its industrial customers solve key enterprise business challenges to achieve their goals. Backed by a proven track record of its commitment to sustainably providing quality products and services, the technology company has the right moves planned for its highly successful future...



One-day Awareness and Foundation program on Industry 4.0 - Sharjah Research and Innovation Park, UAE

With the aim to 'digitize, robotize, and decarbonize 1,000 industrial enterprises by 2030', Maxbyte Technologies is committed to making a difference in the future of industries for sustainable development around the world with significant product and service offerings. Ramshankar CS, CEO, Maxbyte Technologies, explains, "Maxbyte is an industrial digitalization, robotization, decarbonization, and tech adoption solutions provider to enable smart connected industrial enterprises for flexibility, productivity, sustainability, and growth." Founded in 2015, the company today has five regional offices,

has completed over 150 industrial digital transformation projects for over 40 industrial customers, and is supported by more than 100 techies. Maxbyte Technologies offers eight industry 4.0 products and services, which include Digital, Robots, Training, Insights, Industry 4.0 Readiness Report, and Transformation Tools, catering to six industrial verticals.

Revolutionizing industries with byteFACTORY

The company provides byteFACTORY, a suite of digitalization apps that aids in the smart and connected operation of the industrial enterprise value chain. Ramshankar emphasizes the difficul-

ties that engineering, production, and aftermarket services confront, such as low transparency, manual data entry, hidden operational expenses, and inflexibility in meeting client requests. Enterprises can enhance productivity, eliminate downtime, deploy real-time data-driven manufacturing, elevate customer experience, and increase aftermarket service revenue using byteFACTORY's manufacturing and aftermarket foundation apps.

Job card scheduling, real-time OEE and downtime management, paperless quality and audit systems, paperless preventive maintenance, real-time condition monitoring, energy monitoring, and

fire prevention systems are just a few of the essential areas covered by these apps. He informs, "Apps included are real-time remote monitoring, paperless preventive services, digital service work instruction, AR remote assistance, and digital spare parts management." Remarkably, byteFACTORY offers reasonable and flexible subscription price plans, "starting from ₹500 to ₹5,000 per machine per month or per user per month," says Ramshankar, making it accessible to businesses of all sizes.

The company's other key products and services for successful industrial digital transformation include ADAM - AI SaaS: an AI-based search engine and chatbot for high-impact insights; XR Services: AR, VR, and MR services for customer experience and manufacturing operations health and safety service procedures; and XR Services: AR, VR, and MR services for customer experience and manufacturing operations health and safety service procedures.

Factory Science to empower leaders

Maxbyte Technologies, in collaboration with IMTMA (Indian Machine Tool Manufacturers' Association) Training, recently conducted 'The Factory Science Industry 4.0 Foundation Program' in Bengaluru for regional industrial communities, business owners, and manufacturing professionals. According to



Source: Maxbyte Technologies

"If the Government can support SMEs with incentives and grants to learn and implement Industry 4.0, the latter can adopt these emerging technologies faster and leverage the benefits to grow their businesses, which will also help the economy in terms of increased job opportunities, productivity, and exports."

Ramshankar CS
CEO
Maxbyte Technologies

Ramshankar, the program's goal is to equip industrial business leaders with the knowledge and resources they need to successfully embark on their Industry 4.0 journey. Recognizing the need for comprehensive smart manufacturing education, the program provides participants with critical insights and practical guidance, enabling them to effectively deploy disruptive Industry 4.0 solutions.

Strategic alliances for growth

Maxbyte Technologies continues to achieve great progress through strategic collaborations and partnerships. Ramshankar shares the company's successful joint venture with OBR Cooling Towers, Inc, "The aim is to help the cooling towers operators in the US market in improving their performance, uptime, operational efficiency, and energy efficiency. We will be leveraging OBR's deep domain capabilities and expertise and Maxbyte's industrial digital and automation solutions like byteFACTORY IIOT and workflow software, data analytics, AI, AR/VR, cloud, and robotics solutions to jointly develop cooling tower digital twin solutions."

Additionally, The Abu Dhabi Department of Economic Development, in collaboration with Maxbyte Technologies, successfully completed the first cohort of the Industry 4.0 Championship Program to equip employees of 10 food manufacturing factories in Abu Dhabi with Industry 4.0 skills. Maxbyte was selected to provide an experiential, interactive, and outcome-oriented lifelong learning program. "The graduation ceremony of the first cohort was held at the first edition of the Abu Dhabi Industrial Talent Majlis in May. This championship program motivates industries to inspire, implement, and adapt to the smart and sus-

Maxbyte Technologies, in collaboration with IMTMA Training, recently conducted 'The Factory Science Industry 4.0 Foundation Program' in Bengaluru for regional industrial communities, business owners, and manufacturing professionals.

SOVAN TUDU
Senior Sub-editor
Magic Wand Media Inc
Sovan.tudu@
magicwandmedia.in



Source: Maxbyte Technologies

e& enterprise and Maxbyte Technologies have partnered to accelerate the adoption of Industry 4.0 Solutions in the MEA market



Maxbyte Facility for Innovation and Training in Coimbatore, Tamil Nadu

tainable manufacturing transformation. The certified champions expressed their appreciation and interest in applying the knowledge and skills they learned during the program to accelerate the transformation of their enterprises to Industry 4.0.

Maxbyte Technologies has also recently signed a tripartite MoU with Guidance Tamil Nadu, the Government of Tamil Nadu's nodal agency for investment promotion and single window facilitation, and the Department of Technical Education. Under the terms of the agreement, Maxbyte will establish four centers of excellence for Industry 4.0, which will be accessible to students and faculty at four Government Colleges of Engineering in Tirunelveli, Salem, Trichy, and Vellore.

Ramshankar also mentions Marshall Machines and Maxbyte Technologies' recent partnership. Marshall Machines, a prominent machine tool manufacturer, aims to enhance its IIoT, data analytics, and AI strategies by adopting Maxbyte's byteFACTORY platform, bringing added value to its clients throughout the machine tool lifecycle. Gaurav Sarup, Managing Director, Marshall Machines, and Ramshankar inked the business plan and collaboration MoU agreement in Chandigarh, Punjab. "Thanks to Siddhant Sarup, Executive Direc-



Tripartite MoU between Guidance Tamil Nadu and Maxbyte Technologies for Industry 4.0 / Smart Manufacturing competency development for industries

tor, Marshall Machines, and Jenor Rex Antony S, Asia Regional Business Director, Maxbyte, who are the key to the success of this launch of a strategic partnership program," shares the Maxbyte CEO. "We are pleased to collaborate with Marshall Machines to make a difference in the Machine Tools industry."

Adoption of Industry 4.0 in India

Regarding the adoption of Industry 4.0 solutions in India, Ramshankar states, "Indian companies have a strong understanding of the concepts of Industry 4.0. Numerous companies have initiated pilot proj-

ects, and some are currently in the process of scaling up their Industry 4.0 initiatives. Despite the widespread hype around AI, according to assessments conducted by Maxbyte on over 1,000 industrial enterprises, a significant number of companies are still in the early stages of streamlining data collection or integrating operational technology (OT) and information technology (IT). These companies are essentially in the Industry 3.0 stage, where their primary focus is on connecting machines, materials, manpower, and methodologies. Therefore, it is crucial for companies to prioritize establishing data connectivity before fully embracing AI."

Lastly, he expresses his belief in the possibility of Government support for SMEs in adopting Industry 4.0 technologies, adding, "If the Government can support SMEs with incentives and grants to learn and implement Industry 4.0, SMEs can adopt these emerging technologies faster and leverage the benefits to grow their businesses, which will help the economy as well in terms of increased job opportunities, productivity, and exports." 

Marshall Machines, a leading machine tools manufacturer, has partnered with Maxbyte Technologies byteFACTORY for its IIoT, data analytics, and AI strategies to add value to its customers in the machine tools lifecycle.



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REVOLUTIONIZING RECYCLING

Metastable Materials, a pioneering company in the field of lithium-ion battery recycling, has been making waves for its groundbreaking efforts towards sustainability. Here's an insight into the company's remarkable journey, the team's motivation towards sustainability, proprietary technology, end-to-end waste management services, and plans for the future.



Source: Metastable Materials

Metastable Materials has had an impressive journey so far. "It all started with a simple research project that Shubham undertook during his time at IIT Roorkee. Looking at the industry standard processes of recycling lithium-ion batteries at that time, it was clearly evident that there was a pressing need for groundbreaking innovation in this field," shares Manikumar Uppala, Co-Founder & Chief of Industrial Engineering, Metastable Materials.

Hailing from a Materials Engineering background, Shubham Vishvakarma, Founder, Metastable Materials, developed a process that could extract all critical metals from lithium-ion battery waste without chemicals. This breakthrough was highly inspired by the philosophy that waste materials should not be treated as waste but rather like any other ore of

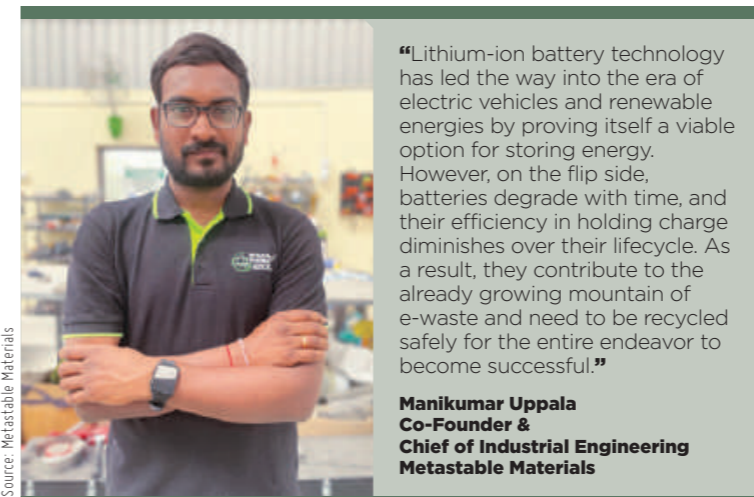
the metals that can be extracted out of these.

Vishvakarma, an IIT Roorkee graduate of Batch of 2018 with a bachelor's degree in Materials Engineering, conceived the idea of Metastable when he stumbled upon the processes that formed the basis of the technology the team used to establish the company. After graduating, he joined NBC's Jaipur facility, where Uppala had already been working for more than a year after graduating with a bachelor's degree in Mechanical Engineering from IIT Roorkee. Another alumnus, Saurav Goyal, with a master's degree, completed the core team. Their collaboration and shared vision were integral to the creation of Metastable Materials.

Uppala states, "It all fit perfectly for us, like puzzle pieces, and we were soon enough wholly invested in creating Metastable."

Why urban mining is crucial

"Lithium-ion battery technology has led the way into the era of electric vehicles and renewable energies by proving itself a viable option for storing energy. However, on the flip side, batteries degrade with time, and their efficiency in holding charge diminishes over their lifecycle. As a result, they contribute to the already growing mountain of e-waste and need to be recycled safely for the entire endeavor to become successful," adds Uppala. In addition to this, the resources required to build these Li-ion batteries are limited to only specific geographies. Therefore, it becomes even more crucial that whatever opportunities are available should be capitalized on to the fullest, he stresses. Metastable's pilot facility, currently under commissioning near Bengaluru, is slated to be one of India's largest in carrying



Source: Metastable Materials

"Lithium-ion battery technology has led the way into the era of electric vehicles and renewable energies by proving itself a viable option for storing energy. However, on the flip side, batteries degrade with time, and their efficiency in holding charge diminishes over their lifecycle. As a result, they contribute to the already growing mountain of e-waste and need to be recycled safely for the entire endeavor to become successful."

Manikumar Uppala
Co-Founder &
Chief of Industrial Engineering
Metastable Materials

out end-to-end recycling of lithium-ion batteries and associated waste materials. Its capacity of ~1,500 metric tonne per annum is expected to cater to 4-6 percent of India's recycling demand for lithium-ion batteries as of today. It is equipped with several state-of-the-art machinery and is designed entirely in-house to enable extraction of materials like copper, aluminum, lithium, and even plastics, with high purities so that minimal solid waste is generated and a maximum output of usable products is achieved.

Integrated Carbothermal Reduction™

Metastable Materials employs its patented process, Integrated Carbothermal Reduction™, for end-to-end lithium-ion battery recycling. This innovative technology involves multiple stages of material extraction and purification, enabling the recovery of metals like copper, aluminum, cobalt, nickel, and lithium in their most commonly traded commodity forms. The core focus is on sustainability and scalability to meet future demands. Uppala explains, "As the renewable energy and EV markets grow, the onus will be on the recycling industry to ensure that their growth does not have a

knock-on effect on the environment by generating more pollution and causing even more harm than good. Our chemical-free operations and ability to extract over 90 percent of the materials is a testament to this very idea."

Offering customers flexibility

Metastable Materials' recycling products and services provide its customers complete flexibility in using the precious metals as they wish to, from making steel to jet engines to new Li-ion cells. Uppala elaborates that the company's end products primarily comprise copper, aluminum, cobalt, and nickel in their metallic forms, created as fine powders and ingots, while lithium is produced as a white powder of its carbonate. Generating standard commodity forms of these metals allows the company to trade with an array of clients in the market looking to purchase the metals in their rawest forms to be used per their needs. Notably, nickel is predominantly utilized in steel production and alloy manufacturing, where its metallic form is an essential additive. Similarly, cobalt, copper, and aluminum find extensive application in various industries beyond lithium-ion batteries, where their native

metallic forms are highly valued for diverse purposes.

Prioritizing safety

A clean and safe supply chain of lithium-ion batteries has been an active part of the debate when it comes to recycling, especially when relatively unstable, end-of-life batteries are in question. As a result, the team at Metastable has been equally focused on developing solutions to safely transport the batteries from all across the country to the company's recycling facility. The outcome of that is a multi-layered packaging box that is both heat and fire-resistant. The packaging material ensures that any fire risks are mitigated during the transportation and storage of batteries, even in cases of thermal runaways from punctured and damaged cells. "We are unconditionally committed to leading the way in this regard and ensuring that no future incidents occur because of such gaps in the supply chain," assures Uppala.

Backed by the best

Metastable Materials is backed by some of the largest investors in the deep-tech and global investment community. "We have been entrusted and supported by the best people. Their expertise in company building and strategic insight have been truly valuable," comments Uppala.

The company is among the seven early-stage Indian startups of the eighth cohort of Sequoia Capital's accelerator program Surge. The recent funding round also saw participation from Speciale Invest; Theia Ventures; Climate9ers; and Archana Priyadershini, Co-founder, fwdSlash Capital. The funding will be used to commercialize the technology developed and to lay the groundwork for future expansion, including forming partnerships with OEMs, commercializing the company's pilot plant, and hiring a team.

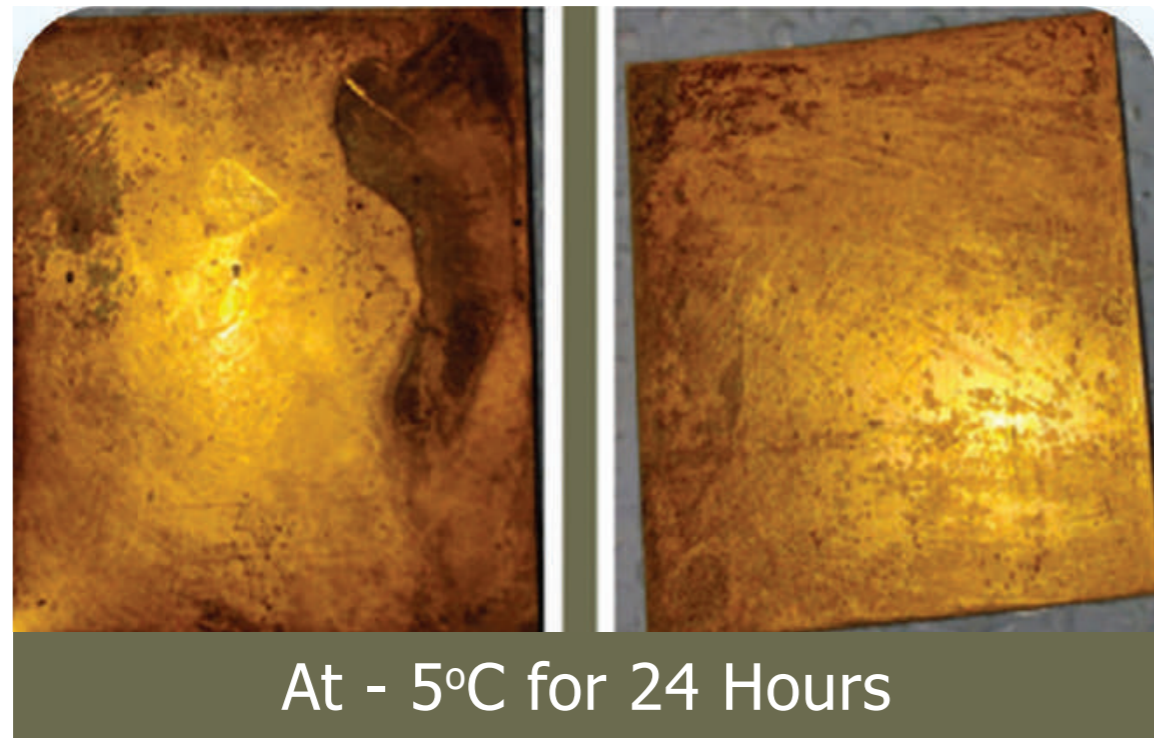
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POONAM PEDNEKAR
Chief Copy Editor
Magic Wand Media Inc
poonam.pednekar@
magicwandmedia.in



COMBATING CORROSION CAUSES

A peek into Professor D Senthilkumar and his research team's groundbreaking project of developing superhydrophobic surface textures using IoT systems.



Source: Sona College of Technology

Professor D Senthilkumar and his research team at Sona College of Technology are dedicated to the development of a groundbreaking project titled 'Developing Superhydrophobic Surface Texture by Using IoT Systems.' Their focus lies in addressing various challenges related to corrosion resistance in steel rods used in ocean bridge construction, construction steel rods, self-cleaning materials, defrosting frozen ice in fridges, and preventing corrosion in AC water separator tubes.

Validation of the problem

To validate the problem at hand, extensive data collection and analysis have been conducted. Through surveys and evaluation of research papers,

no claims have been found regarding IoT-based acid etching. The team emphasizes the following differences compared to earlier methods:

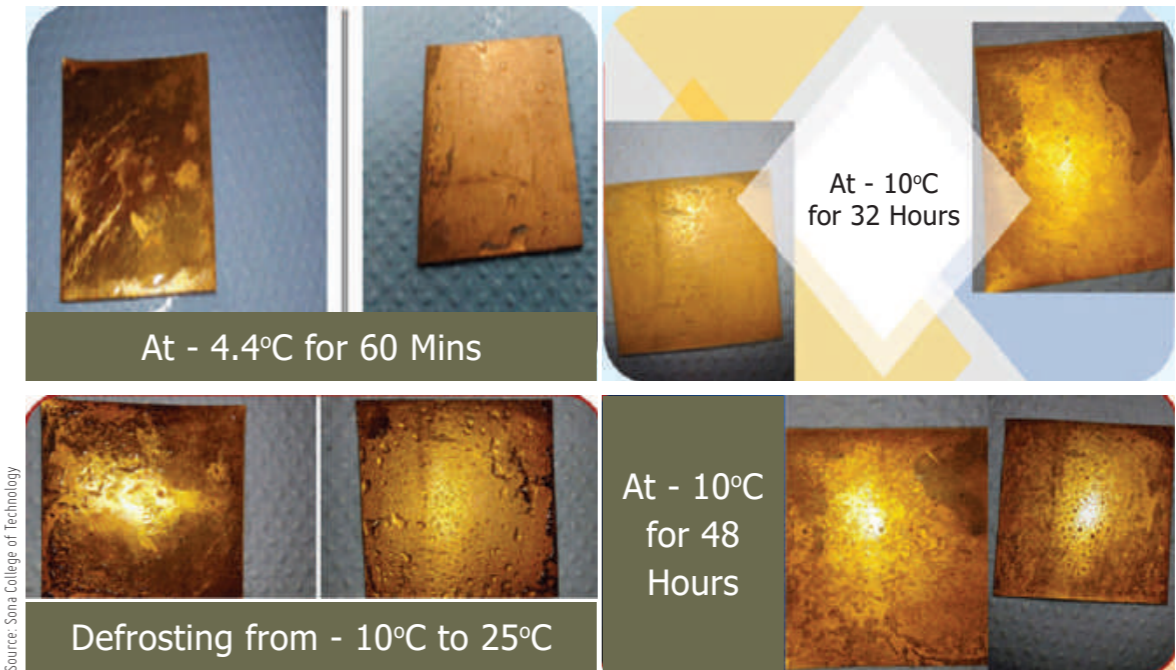
- A. Enhanced accuracy in surface finish;
- B. Notability of the process;
- C. Reproducibility of the coating, wherein the IoT-based and automated system ensures correct concentration levels based on predefined values. This system generates consistent and hydrophobic coating profiles, making it potentially patentable.

Solution to address the problem

The proposed solution revolves around introducing oxide/polymer-based superhydrophobic surfaces and coatings that ex-

hibit exceptional water repellence. The project begins with an exploration of hydrophobic and superhydrophobic behaviors, followed by the description of four phases of superhydrophobic technology. Various methods can be employed for structure development, such as acid erosion, laser cutting, EDM, vaporization of the layer surface, and focused ion beam machining. It is crucial to consider these factors to prevent destructive layer functionality and incomplete etching. Patentability does not apply to hydrophobic elements under acid etching. The project offers several benefits, including the construction of ocean bridge steel rods for pillars, corrosion resistance for steel gates and other applica-

Dr D SENTHIL KUMAR
Professor / HOD
Department
of Mechanical
Engineering
Sona College of
Technology
senthilkumard@
sonatech.ac.in



Source: Sona College of Technology

tions, corrosion resistance for AC water disposal tubes, and corrosion resistance for refrigeration cooling air supply tubes.

The foremost objective of the project is to manipulate IoT-based system for acid etching and to promote superhydrophobic sur-

faces with superior surface finish. The IoT system ensures precise and automated coating processes for the substrate.

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Hello visitors!

Welcome to the world's leading trade fair for production technology.

EMO HANNOVER
18-23/09/2023

Innovate Manufacturing.
www.emo-hannover.com

Eine Messe des A Fair by **VDW**



Source: Magic Wand Media

DMTX 2023: AN OPPORTUNITY TO EXPLORE THE CUTTING-EDGE

Indian Machine Tool Manufacturers' Association (IMTMA) is set to organize the highly anticipated 4th edition of the Delhi Machine Tool & Manufacturing Technology Expo from August 24 - 27, 2023, at Pragati Maidan, New Delhi. The event presents a significant opportunity for industry professionals to stay abreast of the latest technologies, expand their knowledge, and broaden their business networks.

After a four-year hiatus, Delhi Machine Tool & Manufacturing Technology Expo (DMTX) is making a triumphant return as a face-to-face show. Machine tool builders from Delhi-NCR and other prominent regions in North India will have a remarkable opportunity to acquaint themselves with the latest technologies and expand their business networks. From August 24 to 27, 2023, Pragati Maidan in New Delhi will be buzzing with industry professionals eager to stay updated on cutting-edge ad-

vancements and foster growth in their respective sectors. IMTEX, driven by IMTMA, is a major platform for machine tool builders which over the last five decades has positively contributed to pushing the evolving landscape of machine tools and the Manufacturing industry in India towards a technology-intensive one. "While industries consider it a must to attend the IMTEX show held in the south, there are numerous organizations from the medium to micro level who, due to many constraints, could not participate or

visit the IMTEX show at BIEC. In a move to reach out to these industries and bring technologies to their doorsteps, IMTMA organizes regional machine tool expos. The current edition of DMTX is yet another endeavor to reach out to the industry in the north and enable them to widen their business prospects," says Jibak Dasgupta, Director General & CEO, IMTMA.

Empowering regional industrial units

The expo will gather leading industry players, manufactur-

ers, and suppliers under one roof and serve as an ideal platform for machine tool builders and users to interact, exchange ideas, and explore innovative solutions that can enhance productivity, efficiency, and competitiveness within the Manufacturing sector.

Along with Delhi and NCR, the event will attract delegates and visitors from the Tier II and Tier III cities such as Jagadhri, Sangrur, Rudrapur, Chandigarh, Ludhiana, Jalandhar, Manesar, Faridabad, Panipat besides visitors from the neighboring states of Rajasthan, Uttar Pradesh, Himachal Pradesh, Uttarakhand, and others.

Highlighting the main objective of organizing DMTX, Dasgupta, says, "The aim is to enable India's regional industrial units to keep pace with changing technologies. The show gives an opportunity for manufacturing industries in the north to network with national and international machine tool builders and enhance their business prospects."

"DMTX is designed to play an enabling role in addressing the numerous requirements of OEMs and component manufacturers in Tier II and Tier III cities in the region. It gives industry players from micro to large access to new technologies and innovations, the latest and cutting-edge products and solutions, and high-precision multi-function machines in one place," he adds.

DMTX 2023 goes beyond a mere exhibition, offering a business-to-business (B2B) platform that attracts industry delegations from various sectors including Automobiles, Auto Components, Aerospace, Capital Goods, Defence Equipment, Electrical/Electronics and more. The expo provides an exceptional opportunity to initiate and foster business relationships, capitalizing on the projected growth within the Manufacturing sector.


Indian MSMEs' massive contribution

MSMEs contribute to India's



"DMTX is designed to play an enabling role in addressing the numerous requirements of OEMs and component manufacturers in Tier II and Tier III cities in the region. It gives industry players from micro to large access to new technologies and innovations, the latest and cutting-edge products and solutions, and high-precision multi-function machines in one place."

Jibak Dasgupta
 Director General & CEO
 IMTMA

manufacturing supply chain landscape hugely and it is paramount to cater to this segment of the industry effectively by providing them new opportunities. Through IMTEX and its regional versions like DMTX, IMTMA is ensuring that MSMEs in the Machine Tool and Manufacturing industry are given the utmost importance at the national and regional levels. To provide a rough estimate, around 45 percent of the exhibitors that register for DMTX comprise MSMEs. "IMTMA has always encouraged MSMEs in the Machine Tool industry to sync themselves with the best marketing strategies to enhance their business and foray into new markets. DMTX is one such opportunity where exhibitors, specifically MSMEs, get the opportunity to connect with numerous manufacturing industries in northern, and some parts of western, and eastern regions of India," informs Dasgupta. 

IMTMA also gives special attention to bringing trade delegations in DMTX from various sectors and PSUs, which is crucial for MSMEs.



HIGHLIGHTING MANUFACTURING PROWESS

Delhi Machine Tool Expo (DMTX) taking place from August 24-27, 2023, at Pragati Maidan in New Delhi, will showcase an exhaustive range of state-of-the-art technologies. Here's a sneak peek into the remarkable advancements in manufacturing that await visitors at the expo...

3D PRINTING SOLUTIONS

SNAPMAKER ARTISAN 3-IN-1 3D PRINTER

3idea Technology is an emerging company at the forefront of cutting-edge technology solutions and is a leading provider of 3D printing solutions in India.

The Snapmaker Artisan 3-in-1 3D Printer combines the functions of 3D printing, laser engraving and cutting, and CNC carving and cutting. It incorporates several notable features:

Industrial-grade transmission technology: Artisan's linear modules are embedded with steel guidrails made through CNC grinding at a micron level. This enhances precision, rigidity, and durability, resulting in a fast, accurate, and stable fabrication experience. Quick-swap platforms and tool heads allow for seamless shifting between the three functions within just one minute. The Artisan is equipped with a large 7 in. touchscreen interface for intuitive control and operation.

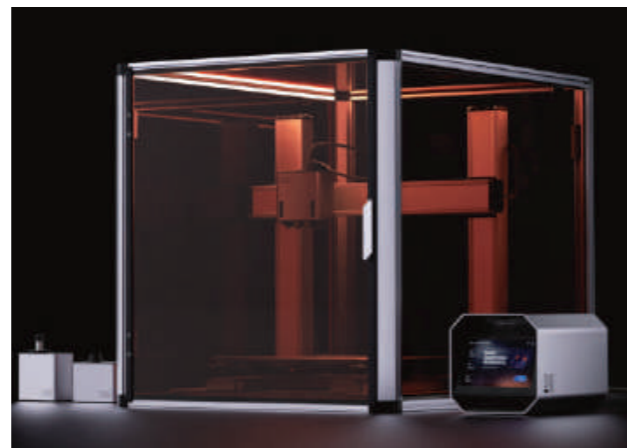
Specific capabilities of each function

3D Printing:

The glass build plate offers excellent flatness and improved adhesion for the first layer. It features a glossy glass surface on one side and PEI coating on the other, facilitating filament adhesion. The Artisan has a maximum build size of 400 mm x 400 mm x 400 mm with a single nozzle, or 350 mm x 400 mm x 400 mm with a dual nozzle. Users can select from nozzle diameters of 0.2 mm, 0.6 mm, and 0.8 mm. The nozzle temperature can reach up to 300°C, while the bed temperature can reach 110°C. The Artisan supports a maximum printing speed of 180 mm/sec.

Laser Engraving & Cutting:

The laser engraving and cutting function offers a work area of 400 mm x 400 mm. It utilizes a 450 nm-460 nm semiconductor laser. The machine achieves engraving speeds of up to 6000 mm/min. It can cut materials up



3idea Technology
www.3idea.in
 Hall & Stall: 11/C-125

to a maximum depth of 8 mm. The Artisan is equipped with a powerful 10 W laser module that enables faster and deeper cutting on various materials, while delivering refined laser engraving. The laser module features beam splitters and beam shaping optics, allowing for high-quality laser work with precise details. The Artisan comes with an enclosure that reduces the laser from Class 4 to Class 1, ensuring enhanced user safety.

Laser CNC Carving & Cutting:

The CNC carving and cutting function also offers a work area of 400 mm x 400 mm. It supports a spindle speed of up to 18,000 rpm. The Artisan includes a 200 W CNC module with a shank diameter ranging from 0.5 mm to 6.35 mm. The high-rigidity linear modules and high-speed spindle empower the CNC module to carve or cut smoothly on various materials, with a dimensional accuracy of up to 0.2 mm.

CAD/CAM SOFTWARE

MASTERCAM 2024

Mastercam 2024 improves machining with powerful toolpaths, faster setups, flexible tool motion, and its most intuitive interface. Top 10 new Mastercam 2024 features,

- **B-Axis Contour Turning:** Tool axis vectors, usable insert area, and stock function can now be manually edited.
- **Turret Mounted Angled Milling Heads:** Users can now create toolpaths on angled planes using turret-mounted angled milling heads in Mill-Turn operations.
- **Process Hole Improvements:** The process hole toolpath applies previously defined processes to a part's solid hole features, which consist of one or more hole-making operations' built-in functions library.
- **Holemaking Enhancements:** The hole-making and multi-axis toolpath dialog boxes now have a 'display graphical elements' button for more personalized control on a hole-by-hole basis or across the toolpath.
- **Dynamic Motion – Maximize Engagement:** The Dynamic Mill, Face, and Dynamic OptiRough toolpaths now include a Maximize engagement option that generates more nominal chips, reduces small chips, and prevents stand-alone material slivers.
- **Waterline Enhancements:** Waterline toolpaths now recognize undercut stock, improving toolpath motion and less air cutting.
- **Save/Load Toolpath Defaults List:** This enhancement lets users specify individual files and operations to load from/save to, making it easy to switch between default sets for different toolpath goals or transfer operational data between files.
- **Gview Cube – New On-screen Gnomon:** Mastercam's on-screen gnomon has been replaced by the more graphical Gview cube, which shows plane orientation.
- **Machine Group Setup Stock Updates:** Add from two corners, Add rectangular stock, and Add cylindrical stock are three new, simpler selection methods.
- **Solid Hole Enhancements:** Matching top and bottom edge treatments, modifying through hole directions, and creating new solid operations from a single hole operation.



Mastercam India Pvt Ltd
www.mastercamindia.com
 Hall & Stall: 12A/A-107

HORIZONTAL MACHINING CENTERS

HX SERIES FROM JYOTI

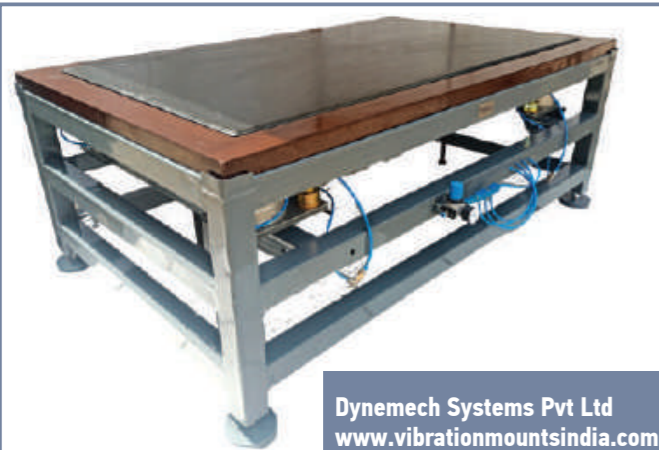
Jyoti has developed a state-of-art HX Series of Horizontal Machining Centers to match the demand of multiple face machining operations in a single set-up with high accuracy and precision for heavy components like Gear Box Casing, Engine Head and Engine Cylinder, Valve Body and Pump Body, etc.

The machines are equipped with a feature that enables the machining of components in multiple stacking, resulting in enhanced rigidity and productivity. Wider T- Base structure provides structural stability for moving columns and helps in vibration-free cutting. The column of the machine comprises step-up base construction, resulting in better load distribution.



Jyoti CNC Automation Ltd
www.jyoti.co.in
 Hall & Stall: 11/B-119

The 3-Point leveling system prevents deformation and twisting of the bed when subjected to a higher load condition. The triangular column construction supports the axis in an extreme position, ensuring high rigidity under demanding cutting parameters. The ATC of the machine has a servo-driven bi-directional magazine which takes the shortest path, resulting in the shortest overall machining time. The ATC is located outside of the machine area, which allows the operating machine and ATC simultaneously. With Geared Head as an option, one can perform large-size milling and heavy boring with high cutting parameters where high torque is required. Circular entry Auto Pallet Changer with load carrying capacity in the range of 400 to 800 kg and Rotary table with 1° indexing offers higher productivity. The machines are designed while taking care of TPM-friendly and ergonomic design concepts. The machines offer the possibility of online interfacing, providing flexibility with the choice of either hydraulic or pneumatic features. HX Series includes HX 400, HX 500, HX 510, HX 600, and HX 610 models under it.



Dynemtech Systems Pvt Ltd
www.vibrationmountsindia.com
Hall & Stall: 11/D-102

ANTI-VIBRATION TABLES

PROVIDING A STABLE SURFACE

An anti-vibration table, also known as a vibration isolation table or vibration-free table, is a specially designed table that reduces or eliminates the transmission of vibrations from the table's surface to its surroundings. These tables are typically used in scientific laboratories where sensitive equipment such as microscopes, balances, and precision measuring instruments need to be placed on a stable and vibration-free surface to ensure accurate results.

Series DIT-AM-W, low-frequency vibration damping with auto-leveling

Dynemtech anti-vibration table DIT-AM has a natural frequency in the range of 1.5-2 Hz, along with a self-leveling feature. Available self-leveling is +0.01 mm and +0.1 mm variants with minimum setting time. Membrane air springs damp most of the incoming vibration above 3 Hz. The table includes a granite insert to aid in measurement stability. The rigid, welded, sturdy table base is constructed with heavy-duty powder-coated steel with a wooden board top that can be used to keep tooling or assist in equipment working by a person. The central granite top, on which the instruments rest, is doubly isolated from traveling vibrations. The level difference on top of the granite surface due to load changes and the equipment is compensated in milliseconds. Casters are available as an option. The following applications benefit from the usage of this equipment: labs housing sensitive scientific and measuring instruments, metrology equipment, high precision weighing balances, analytical or control balances, electronic instrumentation in biological and environmental research, TGA, digital hardness testers, high-resolution microscopes, surface roughness testers, and biosafety cabinets.



NIKKEN

Indo Nihon Technologies
www.indonihon.co.in
Hall & Stall: 11/A-120

ROTARY TABLES

ENHANCING PRODUCTIVITY

The NIKKEN NCT200 is a compact rotary table offering an exceptional clamping torque of 900 Nm and a 25 percent increase in rigidity, without any premium expense. The NCT200 allows one to reduce operator intervention, finish components in significantly fewer operations, and maximize machine capacity to enhance productivity and quickly see the return on investment.

The CNC260PLUS is NIKKEN's latest rotary table with a completely reimagined and updated clamping system. This new internal design takes better advantage of standard pneumatic supplies, enabling various applications to be machined without the need for an additional hydraulic power pack. This table is commonly used on a wide range of vertical machining centers to provide 4th-axis capabilities at a minimal outlay while providing optimum NIKKEN reliability, making it a highly sustainable investment. The brake system can generate a clamping torque of 1430 Nm, which is 2.4x more powerful than the original CNC260 (1430 Nm is achieved from a 5-bar air supply with 1550 Nm being possible from a typical 6-bar workshop supply). The CNC260PLUS makes a great solution to maximize the use of one's machining center and can be mounted vertically or horizontally to suit any application.

SHOULDER MILLING CUTTERS

DOUBLE-SIDED INSERT TYPE SHOULDER MILLING CUTTER

WWX series includes high-performance shoulder milling cutters that achieve excellent finish machined surfaces, feature a uniquely developed proprietary 'X-type' insert for strength, and are also economical. The double-sided insert with 6 corners has a large R-wiper edge to achieve excellent surface finishes even when using standard inserts.

The main features of the WWX series include:

- Unique 'X Geometry' with 6 corners that can be used on both sides to achieve both lower costs and high quality;
- Optimal rake face shape and curved cutting edge suppresses the scattering of chips on the outer and inner surface achieving a good surface finish and markedly improved efficiency;
- The conical shaped seating surface secures a wide seating area, and the curved insert holder realizes highly reliable clamping;
- Although it is a double-sided type, it adopts an axial rake angle of 9°, which is the same as a single-sided type, to achieve low resistance and to suppress chatter even with thin workpieces;
- A thick 9 mm insert provides higher rigidity and excellent fracture resistance, eliminating the need for a seat shim which allows for securing large chip pockets and for incorporating a large number of teeth;
- Eight different insert grades are available to suit a wide range of materials and applications.



MMC Hardmetal India Pvt Ltd
www.mitsubishicarbide.com
Hall & Stall: 11/B-114

MULTISTATION ROBOTIC GRINDERS & POLISHERS

FOR THAT MUCH-DESIRED POLISH

This multi-station robotic automatic polisher is a compact automatic unit that combines a grinding and polishing station, automatic dosing system, ultrasonic cleaning station, and an integrated tank used in a laboratory to check the microstructure of the metals. It offers intuitive and easy operation via a PLC touchscreen and a user-friendly system.



Chennai Metco Pvt Ltd
www.chennaietco.com
Hall and Stall: 12A/A-105 & 106

In the case of automatic polishing, the sample is fixed in a sample holder and pressed onto the polishing medium (polishing paper, polishing cloth etc.) with a grinding and polishing head. The polishing medium sits on the top of a working disc. A series of grinding steps follow whereby each new step makes use of an even finer polishing medium to proceed step by step towards the grade of the polished surface desired. During the whole process, a lubricating and cooling fluid ensures that the sample is cooled, and the waste material is washed away.

The last scratches are polished by removing a final layer. This step is the most important with a diamond suspension in poly or mono for getting mirror finish polishing to check in microscopy.

Program control helps to record every process and give repeatable results at all times. Polishing is a vital step in the sample preparation process, aiming to attain a reflective flat surface while eliminating scratches and defects. This enables microscopic analysis and hardness testing for the final inspection of microstructural analysis.

Chennai Metco provides a diverse range of polishing machines that cater to customer requirements, including options for manual or automatic operation, single disc or double disc configuration, and individual pressure or central pressure systems. It also provides necessary consumables to achieve fine polishing using diamond discs, abrasive papers, polishing cloths, diamond suspensions, diamond pastes, aerosols and lubricants etc.



POWER CHUCKS

HIGH PRECISION, ULTRA-LARGE BR SERIES

Kitagawa Power Chucks have been selected by the world's leading machine tool OEMs for over 50 years. After many years of research and development, Kitagawa introduces its next-generation high-precision, ultra-large, through-hole BR Series Power Chucks. The gripping accuracy is 0.01 mm T.I.R. or less, providing a high level of precision. The Jaw-lift is minimized, resulting in improved performance. It is interchangeable with Kitagawa B-200 and BB200 series. When using the Tnut-Plus optional dedicated T-nuts, the repeatability of jaws during detachment and attachment is 0.01 mm T.I.R. or less.

Kitagawa India Pvt Ltd
www.kitagawa.global/in
Hall & Stall: 11/B-118

VERTICAL MACHINING CENTERS

NEW DNM SERIES

DN Solution Korea has launched its new DNM Series of machining centers (DNM 4500, 5700, 6700). These are the enhanced versions of its global bestselling DNM II Series that are designed to machine parts with even higher productivity and accuracy. The new DNM Series offers larger cutting space, table size, and maximum load while maintaining the same footprint as the previous DNM II Series, as well as a faster tool change time for improved productivity. The new DNM Series is equipped with direct-coupled type spindles (8000/12000 rpm, 18.5/11 kW) and a thermal error compensation system, which are essential for stable machining, as standard features. Furthermore, the lubrication of the axis travel system has been changed from oil to grease type, greatly reducing maintenance costs and improving the work environment.

Highest machining capacity of the class

The new DNM Series offers a cutting space 6 percent larger than that of previous models, with increased X and Y travel distance, for the same machine footprint. Table size has been enlarged by 14 percent to facilitate the processing of larger work pieces with more complex shapes and more space for additional rotary table, while the maximum table load has been increased by 25 percent to accept heavier workpieces. Increased spindle power and torque compared to the previous models boast maximized cutting capacity. In addition, the direct drive spindle provides improved acc/dec rates which reduce spindle start/stop time and improves the productivity of rigid tapping.

Standard direct-coupled spindle for higher productivity

The new DNM Series adopts the direct-coupled type spindle (8000 r/min, 18.5/11 kW) in place of the belt-driven type as a standard feature, greatly reducing vibration and noise from the spindle during high-speed operation. Tool change time is reduced by 14 percent compared to the previous models and idling time is further reduced with improved spindle and feed shaft acceleration and deceleration performance. Direct-coupled spindles can also reduce thermal displacement by about 40 percent, enabling more stable machining. In addition, Doosan's unique thermal error control system substantially reduces the influence of heat on machining accuracy.



Friendliness to the environment and the operator

Unlike previous models which used slideway oil, the new DNM Series employs the grease lubrication system, improving the work environment and reducing the annual maintenance cost by 55 percent. Dispensing with the inconvenience of oiling the machine every three days, users only need to grease it once every three months. In addition, since the slideway oil does not mix with the coolant, no oil skimmer is required and no unpleasant odors are generated.

The new DNM Series features the Auto Recovery function, thus resolving the problem of Changer Arm stoppage during operation and enhancing the operator's convenience. In addition, E.O.P (Easy Operation Package) function can be observed through pop-up windows, and the Multi Machine Monitor function is provided as a standard to maximize the operator's convenience.

Machine Tools India Ltd
www.mactool.com
Hall & Stall: 12A/B-102

INDUSTRIAL AUTOMATION & ELECTRICAL INSTRUMENTS

MULTISPAN OFFERS CUSTOM-MADE SOLUTIONS

Multispan is into the development and manufacturing of industrial automation instruments and electrical instruments like power analyzers. Brand Multispan has a wide presence in over 50 countries in the Asia and MENA region. The current sales team with over 25 people across India works closely with customers to deliver custom-made solutions.

Since 1986, Multispan is the manufacturer of:

- PID Controllers;
- Process Control Instruments: Isolators, Transducers, Scanners, Data Loggers, Flow Indicators, Load cell Indicators, Fault Annunciators;
- Programmable Digital & Analog Timers-Counters: Sequential Timers
- Power & Energy Meters: Panel Meters, MFM, Energy Meters;
- Protection Relays, APFC, ELR;
- Color Mark Sensors;
- Jumbo Display Indicators.



Multispan Control Instruments Pvt Ltd
www.multispanindia.com
Hall & Stall: 12/A-111

VOLTAGE STABILIZERS + TRANSFORMERS

VOLSET BRAND COMBO UNIT

Sai Enterprises, a leading manufacturer in Panchkula, Haryana, is focused on quality and, hence, has earned a significant position in the industry. The above-mentioned combo unit is a space-saving solution for CNC machine users. The servo voltage stabilizer and isolation step-down transformer are mounted in a single cabinet. Its salient features include an unbalanced type, micro control circuit, copper winding, digital display of voltage, MCB at input, high/low voltage protection through contactor at output, single phasing trip, overload trip, phase reversal trip, and options for energy meter and bypass switch. Its users include Mahindra and Mahindra Ltd, Yamazaki Mazak India Pvt Ltd, Sona Comstar, Hero MotoCorp Ltd, Sigma Automotive Materials Pvt Ltd, and Uno Minda Ltd. Other products from the company include Servo Voltage Stabilizers Air and Oil Cooled, Isolation

Transformers, and Single Phase Stabilizers. The company offers installations and service support across the country.



Sai Enterprises
www.volsetindia.com
Hall & Stall: 11/D-105

HOW TAIWAN'S SMART MACHINERY DRIVING THE WORLD

PRESS CONFERENCE SEP. 18

SEMINAR SEP. 19, 20

ELEVATOR PITCH SEP. 20, 21

Join us at
EMO 2023
HALL 16, G31

SCAN ME

GIVEAWAYS

THE HARBINGER OF CHANGE

Following its tradition of holding a global Press Preview before the show, VDW (German Machine Tool Builders' Association), the organizers of EMO Hannover trade fair, invited 70 journalists from 30 countries to Klassikstadt in Frankfurt on July 5, 2023. Modern Manufacturing India was privileged to be the only Indian trade publication to get an in-person sneak peek at the upcoming EMO Hannover 2023 Show.



L-R: Dr Wilfried Schäfer, Executive Director, German Machine Tool Builders' Association (VDW), and Dr Markus Heering, Managing Director, German Machine Tool Builders' Association (VDW), addressing the global trade press at EMO Hannover Press Preview

After a hiatus of four years, EMO Hannover is taking place at full throttle from September 18-23, 2023, at Hannover Fairground. Aptly hailed as the world's leading trade show on Production Technology, EMO Hannover has always stayed true to its epithet by featuring pioneering technologies for the Manufacturing sector. In this 2023 Press Preview edition, 31 participating companies presented their innovations exclusively to the trade press. "Held for the first time in Frankfurt, EMO Hannover Preview is the last stop of the EMO Hannover World Tour that covered 60 events in 40 countries, from Japan to Mexico and from Finland to South Africa. We have been presenting EMO

Hannover 2023 to the EMO community since the beginning of the year," stated Dr Wilfried Schäfer, Executive Director, VDW. Woven around the theme of 'Innovate Manufacturing', the focus area of EMO Hannover 2023 is 'The Future of Business', 'The Future of Connectivity' and 'The Future of Sustainability in Production'. Addressing the global press fraternity, Dr Markus Heering, Managing Director, VDW, elaborated that the EMO Hannover Press Preview clearly defines that production technology interests not only Research experts but also shows that the industry is doing its bit to solve the most pressing problems of our time. To this end, he added that ex-

hibitors are showcasing their impressive technical solutions at the Preview as well as at the fair in September.

Wide array of technologies

EMO Hannover 2023 is slated to bring together around 1,750 exhibitors from 42 countries, presenting a full spectrum of production technologies. The event will feature the latest smart manufacturing solutions to bring forth greater efficiency, more flexibility, better quality, increased accuracy, integration of Artificial Intelligence (AI), comprehensive factory-wide networking, and sustainable production methods. Attendees at the trade fair can witness the latest innovations in metal cutting and metal forming



"After a four-year break, EMO is returning to Hannover, with a new concept, a new look, and renewed energy. The mood is buzzing. VDW, along with its exhibitors, is looking forward to reconnecting with customers and business partners."

Dr Wilfried Schäfer
Executive Director
German Machine Tool Builders' Association (VDW)



"Under the banner of Innovate Manufacturing, we have decided to focus on three megatopics at EMO Hannover this year: The Future of Business, The Future of Connectivity, and The Future of Sustainability in Production."

Dr Markus Heering
Managing Director
German Machine Tool Builders' Association (VDW)

machine tools, manufacturing systems, precision tools, automated material handling, computer technology, industrial electronics & accessories, machining centers, lathes, cutting tools, clamping devices, measuring equipment, and control systems.

Since the profile of EMO Hannover visitors is vast, ranging from all major industry sectors such as machine and plant construction, automotive and auto component, aerospace, precision engineering and optics, shipbuilding, medical engineering, tool and mold making, steel, and

lightweight construction, the show aims to encompass all the technologies pertaining to these sectors and more.

To this end, various joint stands on Additive Manufacturing, Connectivity, Cobots, and Sustainability in Production, will be located at the show venue. Research institutes will also feature prominently on the stand, using it to present their sustainability projects.

Future of production technology

The trade show will feature all important topics related to the industrial value chain, display current state-of-the-art technologies, and highlight solutions for future development.

At EMO Hannover 2023, umati is back and bigger and more

comprehensive than ever before. More than 300 umati partners will demonstrate live how easily decentralized communication between machines, components and software works—and well beyond the machine tool in Hall 9, Stand F-24.

Sustainability in production aspects will also be covered in presentations. There will be discussions on e-mobility, climate-neutral production, the potential of circular business models, and best practices with regard to sustainability in production.

Encouraging startups

Additionally, there will be a special focus on the recruitment of skilled workers at the Special Training Stand. "The range of services offered by the Nachwuchsstiftung Maschinenbau (Youth Education and Development Foundation for Mechanical Engineering) has been expanded beyond initial vocational training to include ongoing training and development," shared Heering.

In a nutshell

The trade show paves the way for the exhibitors to position themselves in the international competition, connect with customers, and explore new business prospects. For visitors, EMO Hannover has always been a place to witness futuristic technologies that bring a sea change in production technologies.

Indian Machine Tool Manufacturer's Association (IMTMA), VDW, and VDMA India are jointly organizing a significant session titled 'India Opportunities' at EMO Hannover on September 20, 2023. This session is a must-attend for those seeking valuable insights into India's potential in the machine tools sector.



L-R: Dr Alexander Broos, Head of Research and Technology Department, VDW & MD, VDW Research Institute; Murali Sundaram, MWM; and Sylke Becker, Director, Press & Public Relations, VDW



Sylke Becker, Director, Press and Public Relations, VDW, orienting the global media fraternity at EMO Hannover Press Preview

SOU MI MITRA
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Modern Manufacturing
India
soumi.mitra@
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Company Index

| | | | |
|---------------------------------------------------------------------|----------------------------|------------------------------------------------------|----|
| 3idea Technology..... | 48 | Machine Tools India Ltd..... | 48 |
| Advanced Manufacturing Technology Development Centre..... | 18 | Mastercam India Pvt Ltd..... | 48 |
| Carl Zeiss India (Bangalore) Pvt Ltd..... | 22 | Maxbyte Technologies..... | 38 |
| Chennai Metco Pvt Ltd..... | 22, 48 | Meiban Engineering Technologies Pvt Ltd..... | 22 |
| Dassault Systèmes..... | 34 | Metastable Materials..... | 42 |
| Dynemach Systems Pvt Ltd..... | 48 | Micromatic Machine Tools Pvt Ltd..... | 22 |
| Elgi Equipments Ltd..... | 30 | MMC Hardmetal India Pvt Ltd..... | 48 |
| FIBRO India Precision Products Pvt Ltd..... | 22 | Multispan Control Instruments Pvt Ltd..... | 48 |
| Fraunhofer Institute for Software and Systems Engineering ISST..... | 26 | Prenode GmbH..... | 26 |
| Indian Institute of Technology Madras..... | 18 | RV Forms & Gears..... | 20 |
| Indian Machine Tool Manufacturers' Association (IMTMA)..... | 06, 08, 12, 14, 16, 18, 46 | S&T Group..... | 22 |
| Indo Nihon Technologies..... | 48 | Sai Enterprises..... | 48 |
| Jyoti CNC Automation Ltd..... | 22, 48 | SINAR Sheetmetal Solutions Pvt Ltd..... | 34 |
| Kitagawa India Pvt Ltd..... | 48 | Sona College of Technology..... | 44 |
| Lakshmi Machine Works Ltd..... | 22 | VDW (German Machine Tool Builders' Association)..... | 54 |

Advertiser Index

| | |
|--------------------------------------------------------------------------------------------------------------------|----|
| Beckhoff Automation Pvt Ltd – www.beckhoff.co.in | 11 |
| BOFT – www.trade.gov.tw/English/ | 53 |
| Chiron Group – www.chiron-group.com | 09 |
| DMTX 2023 – www.mtx.co.in | 57 |
| EMO Hannover – www.emo-hannover.com | 45 |
| EPLAN India – www.eplan.in | 25 |
| Gedee Weiler Pvt Ltd – www.gdweiler.com | 15 |
| Jyoti CNC Automation Ltd – www.jyoti.co.in | 03 |
| Lakshmi Machine Works Ltd – www.lmwcnc.com | 05 |
| MTX-Connect Kolhapur – www.mtx.co.in/mtx-connect | 58 |
| National Productivity Summit 2023 – www.productivity.imtma.in | 57 |
| Okuma India Pvt Ltd – www.okumaindia.com | 07 |
| Quaker Houghton – www.QHeMobility.com | 19 |
| RV Forms & Gears LLP – www.rvformsandgears.com | 59 |
| S&T Machinery (P) Ltd – www.stmcnc.com | 02 |
| TAGMA India – www.tagmaindia.org | 37 |
| Yamazaki Mazak India Pvt Ltd – www.mazakindia.in | 60 |
| ZCC Cutting Tools Co., Ltd – www.eng.zccct.com | 41 |

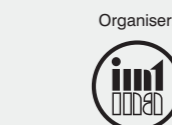
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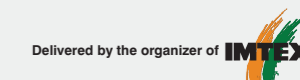
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| | | Prabhugouda Patil Mob: +91 9980432663 Email: prabhu@imtma.in |

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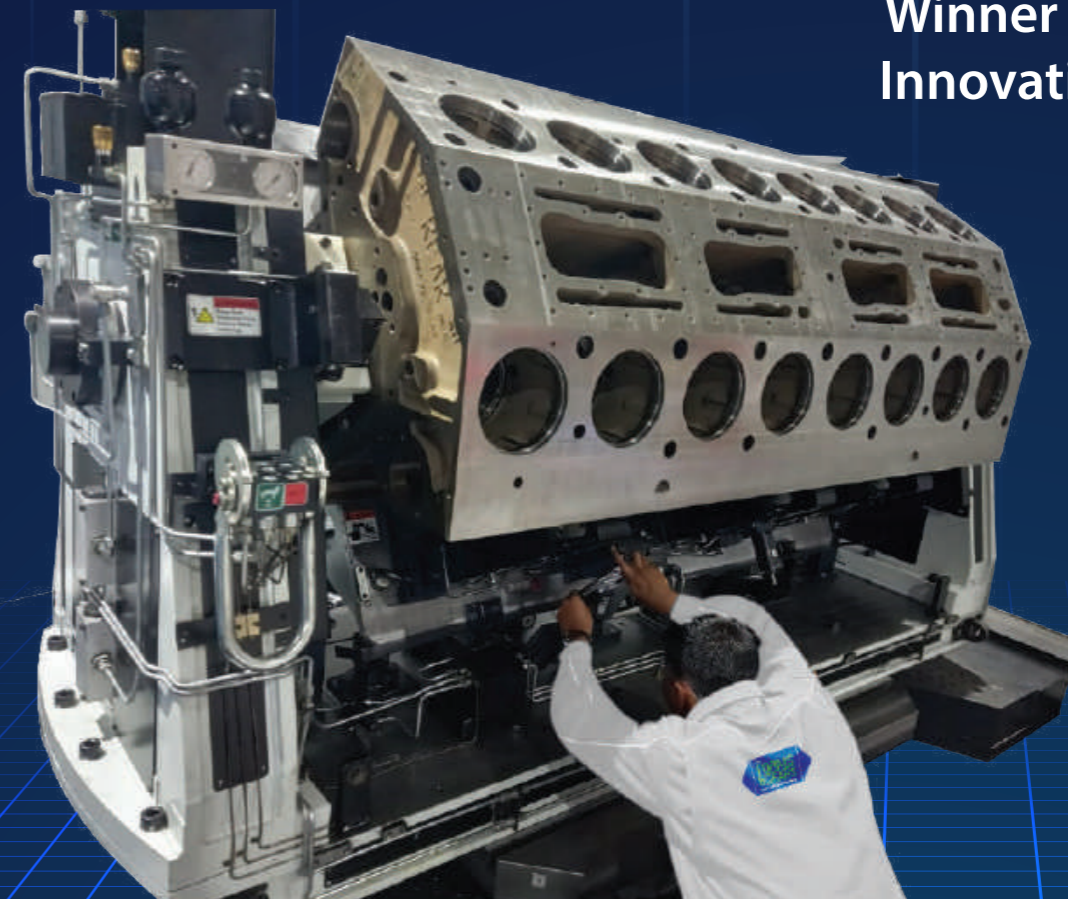




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| Tanvi Gupta Mob: +91 9871024956 Email: tanvi@imtma.in | Gaurav Singh Mob: +91 9922419036 Email: gauravsingh@imtma.in | Umesh Purohit Mob: +91 9822777164 Email: umesh@imtma.in |
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