VOL 7, ISSUE 3 - SEPTEMBER-OCTOBER 2023

MODERN MANUFACTURING INDIA

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The Official Magazine of
Indian Machine Tool Manufacturers' Association

In Association with
Modern Machine Shop

CATALYZING INDIAN SPACE GROWTH STORY

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AEROSPACE

ENERGY

DEFENCE

INFRASTRUCTURE

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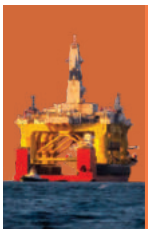
TEXTILE



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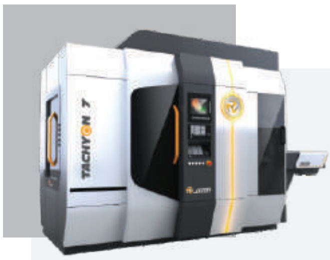

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MACHINE TOOLS DRIVE CAPITAL GOODS AND ECONOMIC GROWTH

Source: BFW

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

Sustained demand, Government spending, and PLI initiatives are the drivers of growth, enabling the Machine Tool industry players to manufacture globally competitive products which will help them scale, innovate, and increase exports and growth.

It gives me great joy to inform readers that the Indian Machine Tool industry posted an increase in production growth figures in FY 2022-23. As per provisional estimates, the Indian Machine Tool industry production was around ₹12,328 crore (US$1.5 billion) and domestic consumption was around ₹24,536 crore (US$3 billion).

Machine tool production for the Q1 (April to June) of 2023-24 increased by 9 percent year-on-year, reaching around ₹2,100 crore (about US$264 million). Orders booked during the period witnessed a growth of about 14 percent, totaling around ₹3,200 crore (about US$390 million).

I see immense scope for the Indian Machine Tool industry which presently ranks 9th in Production and 7th in Consumption globally according to Gardner Intelligence's 'World Machine Tool Survey 2022' to cement its position further in the global rankings.

Sustained demand, Government spending, and PLI initiatives are the drivers of growth, enabling the Machine Tool industry players to manufacture globally competitive products which will help scale, innovate, and increase exports and growth. The time has come that we look outward in a much larger way to be part of the global competition.

Indian Machine Tool Manufacturers' Association (IMTMA) is participating in EMO Hannover 2023 to represent the Indian Machine Tool industry. Over 40 Indian companies, including IMTMA members, are participating in EMO Hannover 2023 to showcase products and capabilities. The exhibition is an opportunity for these participants to look outward and tap some of the niche markets, identify the needs, and build customized products.

In terms of building the domestic market and reaching out to Tier-2 and Tier-3 cities within India, IMTMA has initiated regional expos to bring technologies to the doorsteps of MSMEs in these regions. The recent Delhi Machine Tool Expo 2023 was a success with around 13,500 visitors from various user sectors from India's northern, western, and eastern regions.

IMTMA will be organizing Machine Tool Connect - Kolhapur in Maharashtra on October 8 and 9, 2023. The event aims to create a B2B environment in Tier-2 and Tier-3 cities across regions. The expo would be an economical model for exhibitors to promote their brands and reach out to the untapped markets.

We would continue with our endeavors to bring informed articles to MMI magazine to stay abreast with the latest developments.

Happy reading.

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

Dear Readers,

India has made a monumental stride in space technology with the successful launch of Chandrayaan 3. The world is now considering India as one of the leading countries in space technology. Along with advancing scientific research, India is also expanding its commercial operations in the Space sector involving the launching of satellites, joint exploration of resources on the moon and other planets, and providing space-related services to various nations.

The Indian space ecosystem is expanding with the Indian Space Research Organisation (ISRO) planning to bring in private players to build satellites and launch vehicles. It is safe to presume that there are significant opportunities in store for Indian machine tool builders to contribute to the growth of the Space sector.

The Indian space ecosystem is expanding with the Indian Space Research Organisation (ISRO) planning to bring in private players to build satellites and launch vehicles. It is safe to presume that there are significant opportunities in store for Indian machine tool builders to contribute to the growth of the Space sector.

The current edition of Modern Manufacturing India (MMI) focuses on the Space sector and the opportunities that would emerge for the Machine Tool industry to engage more closely with the Indian Space sector. I hope that the articles published in this edition of MMI will bring new knowledge and perspective to you. And, as always, I seek your valuable feedback which will help us to improve further.

Happy reading!

REACHING BEYOND THE SKY

SOUMI MITRA
Editor-in-Chief
Modern Manufacturing India
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With the phenomenal success of Chandrayaan-3 making a soft landing on the surface of the Moon, India has become the first country to land a spacecraft near the lunar south pole. India stands fourth globally to have achieved this milestone in lunar exploration, after the US, China, and Russia.

According to the latest updates from the Indian Space Research Organisation (ISRO), the Vikram lander soft landed on the Moon again and exceeded its mission objectives. It successfully underwent a hop experiment. On command, it fired the engines, elevated itself by about 40 cm as expected, and landed safely at a distance of 30-40 cm. The mission's success attests to India's emergence as a space powerhouse.

Continuing its endeavor to make strides, ISRO has been achieving success in its missions at a fractional cost incurred by its global contemporaries. It has scripted history once again by launching its first Sun mission, Aditya-L1, with the aim to comprehend the coronal heating and solar wind acceleration.

By next year, ISRO is slated to launch a three-day crewed mission into the Earth's orbit. Plans are afoot for a joint mission with Japan to send another probe to the Moon by 2025 and an orbital mission to Venus within the next two years.

The blueprint of ISRO's future missions confirms that opportunities will be galore for the private players in space technology as well as the manufacturing and machine tool sector to contribute towards the country's space economy. The Indian machine tool industry is growing steadily both in terms of production and consumption.

With EMO Hannover 2023 just a few days away, Indian machine tool builders and manufacturers are all prepped up to showcase their innovative and cutting-edge technologies and products that they are confident will soon be in demand globally. The platform will be of significant help in connecting with the right consumers.

> *"This is not just India's success, but a success for all of humanity. And this achievement is not just ours but is dedicated to the world. All of mankind will benefit from it."*
>
> ***– Hon'ble Prime Minister of India, Narendra Modi***

Following our tradition, we have filled the current MMI issue with real-time content that resonates with the industry trends. We will bring in more stories from EMO Hannover Fairground online as well as in print.

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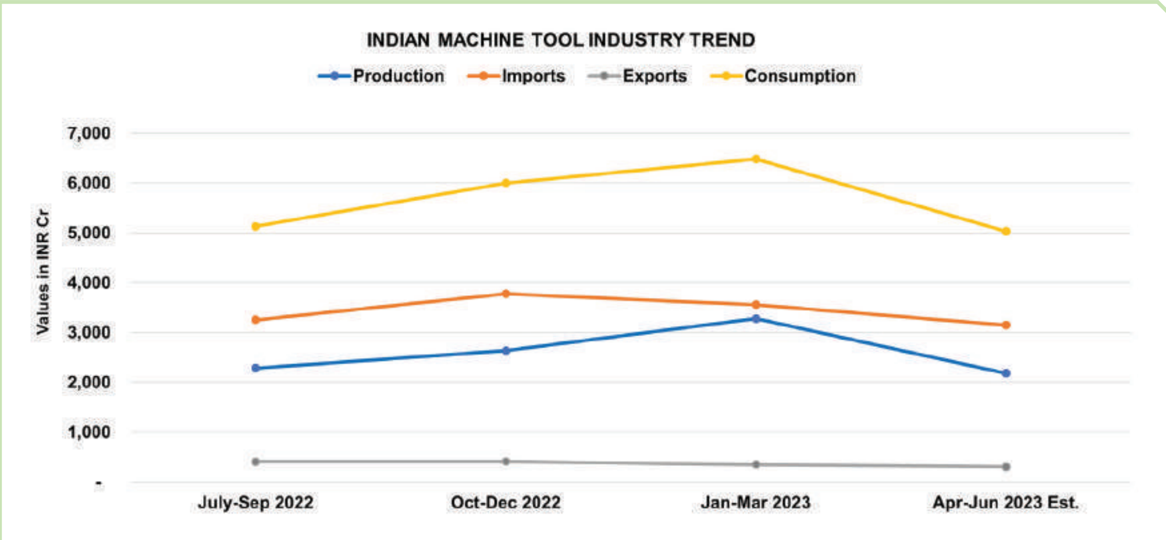
GROWING AMID GLOBAL UNCERTAINTIES

Amidst the backdrop of global uncertainties, India's economic landscape demonstrates its agility to adapt and grow.



Source: IMTMA

Table 1. Indian Machine Tool Industry Trend

India's Purchasing Managers' Index (PMI) for June 2023 indicates that the Manufacturing and Services sectors remain strong at 57.8 and 58.5, respectively, maintaining a growth trend for a continuous two years.

In May 2023, there was a marginal increase in Net Foreign Portfolio Investment (FPI) inflows, reaching US$ 5.5 B, alongside strong Foreign Direct Investment (FDI) inflows. However, global crude prices dipped to an 18-month low of US$ 73.3 per barrel in June 2023, leading to concerns about a potential global growth slowdown.

In the face of the potential global impact of Chinese deflation pressure, India's economic strength shines, concurrently offering growth prospects for other ASEAN countries. The Organization for Economic Co-operation and Development (OECD) projects global GDP growth to ease to 2.7 percent, and India's growth to 6 percent in 2023. The International Monetary Fund (IMF) recently revised India's growth projection to 6.1 percent for FY2024.

While the Indian economy sets a dynamic course, the Machine Tool industry resonates with growth. In FY2022-23, Indian Machine Tool production grew by 32 percent to INR 12,328 crore (US$ 1.5 B) and consumption increased by 55 percent to INR 24,536 crore (US$ 3 B). Production for the April to June quarter of 2023 increased by 9 percent year-on-year, reaching INR 2,182 crore (US$264 M). Moreover, orders booked during the same period witnessed an impressive growth of 14 percent, totaling INR 3,240 crore (US$ 392 M). The industry's import landscape from April to June 2023 saw a rise of 2 percent year-on-year, amounting to INR 3,151 crore (US$384 M). China, Japan, and Germany emerged as the top countries for imports, contributing 58 percent of the total machine tool imports. Presses, Lathes, and Vertical Machining Centers (VMCs) were the top machinery imported valued at INR 1,119 crore (US$ 136 M) at about 36 percent of total machine tool imports.

Exports also demonstrate a positive trend, exhibiting a 3 percent growth for the April to June quarter of 2023, amounting to INR 303 crore (US$37 M). Russia, China, and the USA emerged as the top export destinations, accounting for 33 percent of total machine tool exports. Lathes and Machining Centers were the top machinery exported valued at INR 118 Cr (US$ 14 M) at about 39 percent of total machine tool exports. The Indian machine tool market continues to expand, with consumption reaching INR 5,030 crore (US$ 608 M) from April to June 2023.

As we delve into July 2023, the Machine Tool sector's imports grew by 5.5 percent year-on-year, reaching INR 1,124 crore (US$137 M), with China, Japan, and Taiwan dominating the landscape. On the other hand, exports faced a 35 percent decline, totaling INR 108 crore (US$13 M), with China, Japan, and Taiwan remaining key export destinations.

India's economic growth demonstrates the nation's ability to navigate complex global uncertainties. As demand rises from user industries and emerging sectors, coupled with ongoing infrastructure and mobility advancements, the Machine Tool industry is poised for growth.

The continued expansion of Capital Goods and Machine Tool industries highlights India's strength in global manufacturing, paving the way for a future characterized by both stability and innovation.

Source: Data & Policy Group, IMTMA

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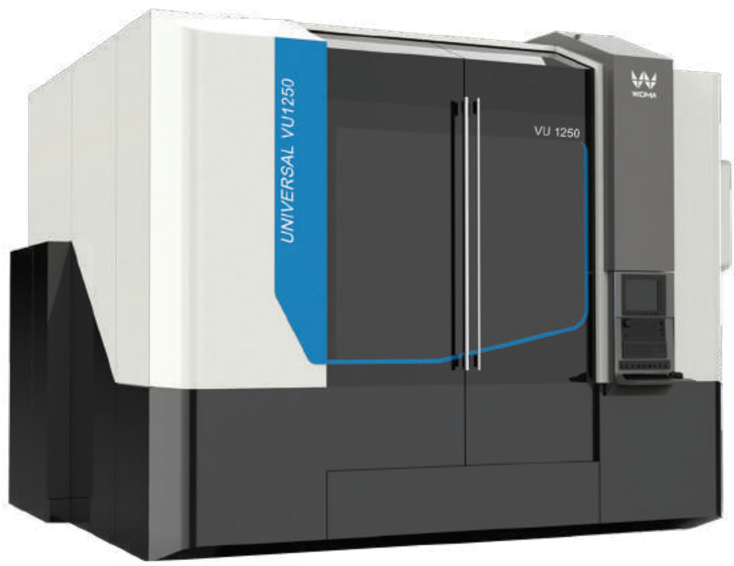

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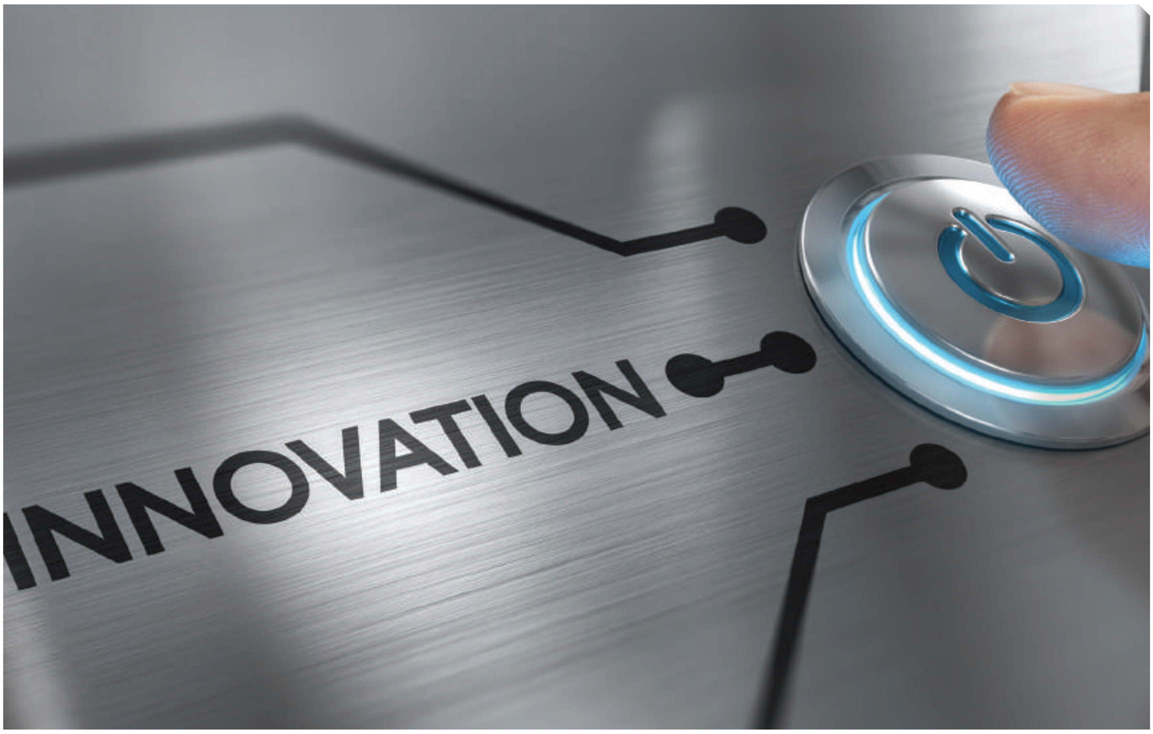
FOSTERING R&D AND INNOVATION IN MACHINE TOOLS

To achieve the goal of self-reliance in a wholistic way the Indian space sector needs to play a transformative role in Indian manufacturing, and in this journey to excellence, the machine tool industry needs to work in tandem with the space sector to emerge as a global power of precision machining and tooling, leveraging R&D and innovation.



Source: Magic Wand Media

August 23, 2023, will forever be remembered in the annals of space odyssey, earmarking India as the first nation to successfully soft-land on the south polar region of the moon riding Chandrayaan-3. Vikram Lander's soft landing on the moon marks India's scientific and technological prowess and its emergence as a space superpower.

Back when India launched its first rocket on November 21, 1963, from Thumba near Thiruvananthapuram, the country had taken its baby steps. Today, with the soft landing on the moon, the launch of foreign satellites through space missions and over 100 startups registering with IN-SPACe, the Indian Space sector has definitively evolved as one of the best in the world.

According to the Government of India data, the Indian Space sector is forecasted to reach US$13 billion by 2025. India and the US recently discussed the possibilities of commercial collaborations in space with larger private participation.

Opportunities abound for MT industry

As the Space industry moves towards launching commercial satellites involving private players and rolls out other planetary missions and manned missions to the moon, new challenges will emerge in the manufacturing of the indigenous parts, components, and equipment segment. These challenges need to be addressed by the Indian Manufacturing industry where the Machine Tool industry would play a seminal role.

Source: IMTMA

This would provide immense scope for the Machine Tool industry to explore new business opportunities in the Space and allied sectors, and the opportunity to introduce innovative products and solutions. It is paramount that to become an 'AatmaNirbhar Bharat' (self-reliant India), the Indian Space sector needs to explore opportunities and work closely with the Indian machine tool manufacturers for solutions that are unique, innovative, customized, and cutting-edge. This demand from an ever-expanding Space sector would trigger the Machine Tool industry to take its technology and production to the next level.

Machines play an important role in the manufacturing of spacecraft and satellites needed for space exploration, aviation, and defence. The Machine Tool industry helps by producing composites, high-precision and complex parts, lightweight parts, propellants, tubes, ducts, sheet metals, etc. It also plays a critical role in producing precision turning and milling machines, hard tuning machines, diamond tuning, laser cutting machines, presses, welding and joining machines, water jet machining, special purpose machines, and the like. Furthermore, the launch vehicle, rocket, casings, nose, cone, tail part, exhaust venturi, etc. are developed through metal forming, joining, and welding processes besides machining. Additive manufacturing technology brings a new dimension to the manufacturing of parts and components during space missions.

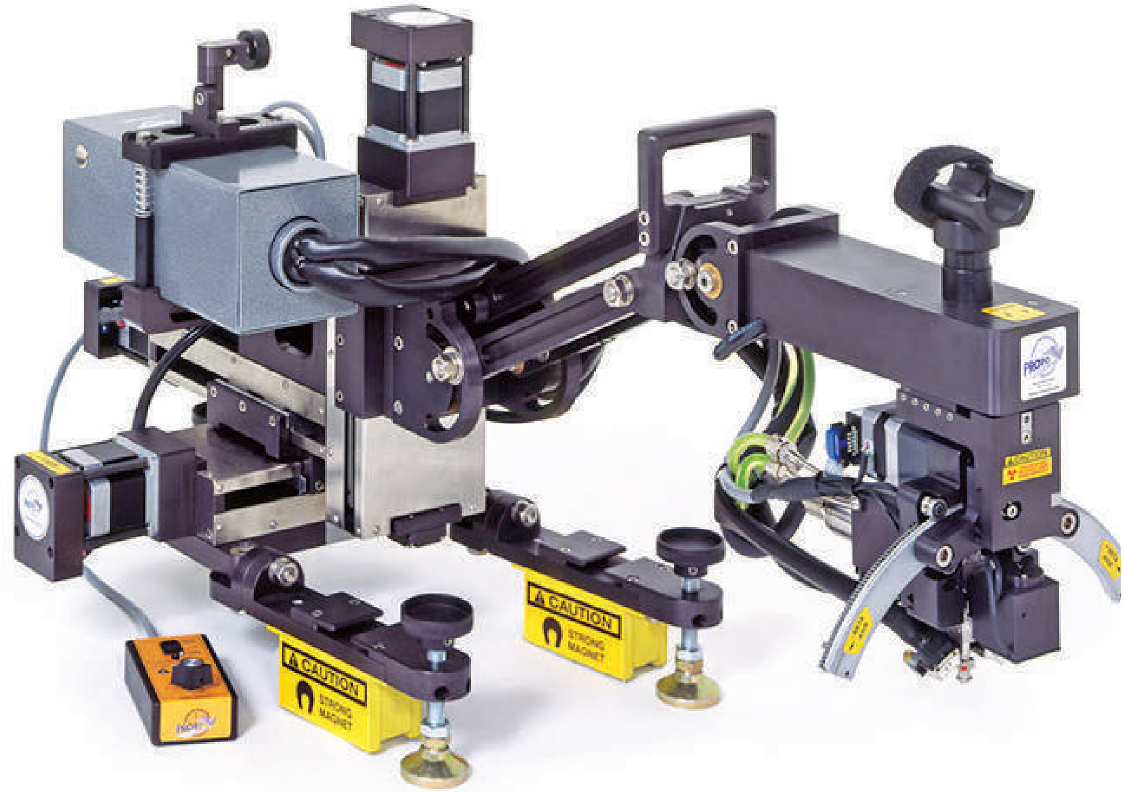
With technology transfer as well as the creation of better technologies involving large companies and MSMEs, the Machine Tool industry can move to the next level and this would percolate to other domains, vastly improving the machine tool and manufacturing sectors.

Summing up, to achieve the goal of self-reliance in a wholistic way the Indian Space sector needs to play a transformative role in Indian manufacturing, and in this journey to excellence, the Machine Tool industry needs to work in tandem with the Space sector to emerge as a global power of precision machining and tooling, leveraging R&D and innovation.

Machines play an important role in the manufacturing of spacecraft and satellites needed for space exploration, aviation, and defence. The Machine Tool industry helps by producing composites, high-precision and complex parts, lightweight parts, propellants, tubes, ducts, sheet metals, etc.

BENEATH THE SURFACE

In the realm of manufacturing and engineering, precision and reliability are paramount. The machine tool industry plays a pivotal role in achieving these goals, enabling the creation of intricate components that form the backbone of various industries. One often overlooked factor that significantly influences the performance, durability, and quality of machine tool products is residual stress.



Source: AMTTF

Unlike externally applied forces, which are temporary and disappear once the load is removed, residual stress is an intrinsic property of the material and exists even in the absence of external loads. Residual stress can arise from a variety of processes, including Machining, Casting, Welding, Heat Treatment, Forming etc. Residual stress plays a vital role in shaping the mechanical properties of materials present in the components.

Connection between residual stress and the performance of machine tool components

- Machine tool components, such as Beds, Columns, Guideways and Spindle Housings, etc., require high dimensional accuracy to ensure precise machining operations. Residual stress can cause distortion and warping during manufacturing processes, leading to deviations from the intended dimensions;
- Machine tool components experience dynamic loads and vibrations during operation. Residual stress can significantly impact fatigue life – the number of load cycles a component can withstand before failure;
- Machine tools must maintain structural integrity to ensure safe and reliable operation. Residual stress-induced distortions can compromise the alignment of the structural assembly, leading to reduced stability and precision.

Source: AMTTF

Need for residual stress measurement

It has been observed that many castings and structures start cracks and lose their strength prematurely during various stages of processing or usage.

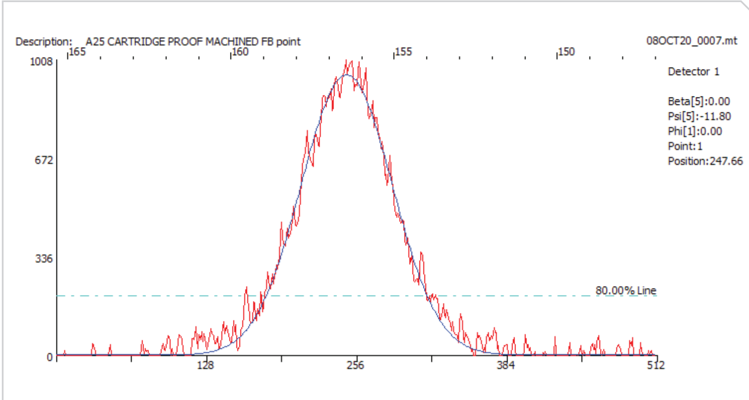
Knowingly or unknowingly, one spends a fortune on stress-relieving processes without understanding whether it is required or not and whether the heat treatment cycle is optimized or uniform throughout the structure or not.

Most of the stress-relieving heat treatment cycles are done based on some thumb rules or based on some age-old procedures the heat treatment cell follows. How to quantify the stresses and say that the stresses on the components are completely relieved? The answer is through measuring the residual stresses.

Residual stress measurement using XRD

Today due to the advancement in measurement technology, non-destructive portable X-Ray Diffraction-based systems are available to quantitatively measure residual stress on components and castings to qualify the manufacturing/heat treatment process.

X-Ray Diffraction method exploits the ability of the X-Ray to measure the distance between atomic planes (d-spacing) in the materials. It works using the principle of Bragg's law. When the material is under compressive or tensile stress conditions, the d-spacing will reduce or increase respectively. XRD equipment uses this change in d-spacing to quantitatively measure the value and direction of residual stresses.



Source: AMTTF

The Advanced Machine Tool Testing Facility (AMTTF) houses portable XRD equipment which can help manufacturers to understand the changes in residual stress during different processes of manufacturing like, as casted, after rough machining, after stress relieving, after finish machining etc.

Case Study 1: Structural Integrity of Machine Components

In collaboration with a machine tool builder, AMTTF investigated residual stresses in critical components such as Casting beds and Columns. By analyzing XRD data, the change in the pattern of residual stresses during different processes of manufacturing was identified and, subsequently, the heat treatment processes were optimized to ensure that the components met rigorous reliability and performance requirements. This data-driven approach minimized the risk of dimensional instability and misalignments on the machine over a period of time.

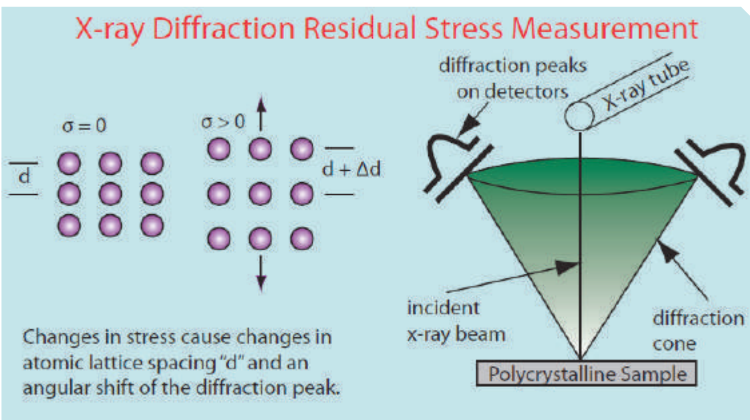
Case Study 2: Increasing Fatigue Life and Reliability of Machine Components

In collaboration with a machine tool builder, AMTTF has carried out a residual stress study on critical components of the tool clamping/de-clamping mechanism. Subsequently, manufacturing processes were optimized to increase the life of the mechanism multifold by improvising the residual stresses on the critical components.

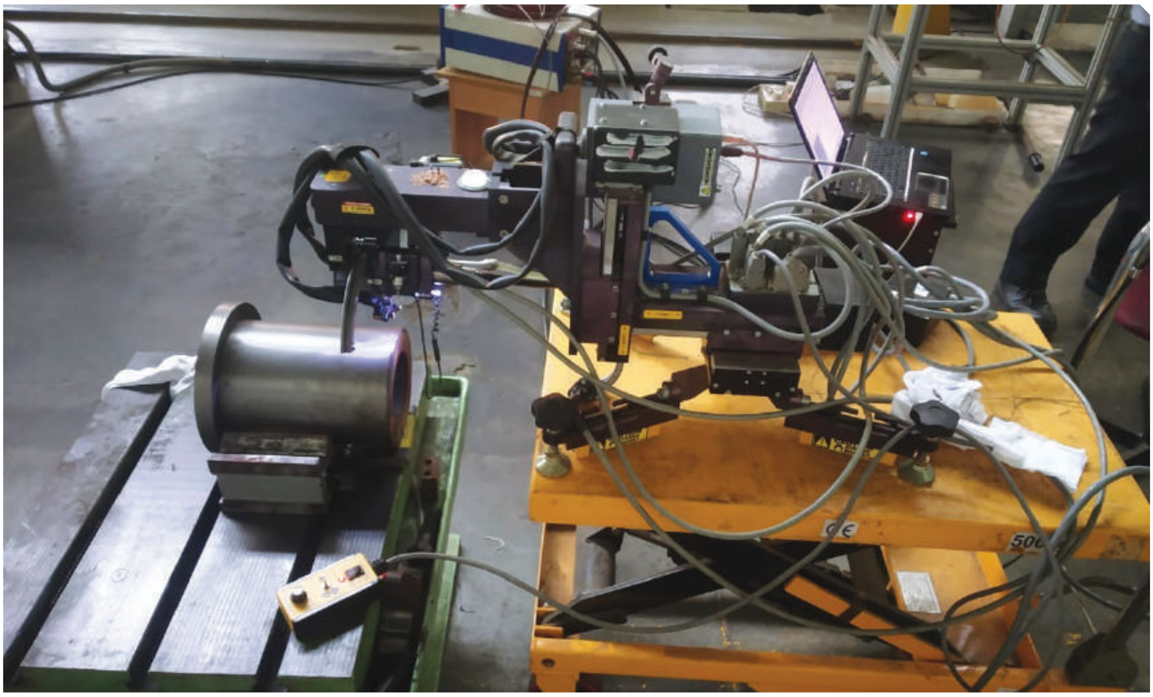
Knowing AMTTF

AMTTF in Bangalore, India, is a state-of-the-art facility that specializes in providing testing and calibration services for Machine Tools and other Engineering industries. The facility is established in the year 2011, as a joint project by the Government of

The primary objective of AMTTF is to support the Manufacturing industries across India by providing accurate and reliable testing and calibration services for Machine Tools, in particular, and generally for other Engineering industries.



Source: AMTTF


Source: AMTTF

The primary objective of AMTTF is to support the Manufacturing industries across India by providing accurate and reliable testing and calibration services for Machine Tool and other Engineering industries.

India, Indian Machine Tool Manufacturers' Association (IMTMA), Industry partners, and Central Manufacturing Technology Institute (CMTI).

The primary objective of AMTTF is to support the Manufacturing industries across India by providing accurate and reliable testing and calibration services for Machine Tools, in particular, and generally for other Engineering industries.

The vast list of customers includes major Machine Tool builders like ACE Designers, AMS, BFW, MGTL, Precitec, UCAM, Kennametal, etc., and Defence and Aerospace companies like HAL, NAL, L&T, Boeing, BFL, Poeir Jets, etc., and Auto companies like ARAI, Ather Energy, Bosch, Brakes India, Hero Motors, Wheels India, TVS, Mahindra, Mahle, Musashi, TAFE, Rane, etc. and other institutes and companies like PSG College, IIT-Madras, NIT-K, GE, Lam Research, Timken, Triveni Turbines, TUV, Wipro etc.

AMTTF offerings

- Non-destructive method of stress measurement;
- Trend-based analysis of residual stresses on one's component during various processes of manufacturing;
- Sub-surface stress measurement by chemical etching and measurement;
- No limitation on the size and weight of the job and no need for sample preparation.


Source: AMTTF

Conclusion

From precision machining to fatigue and crack resistance, thermal stability, and beyond, residual stress can either elevate or undermine the performance of machine tools. By integrating advanced residual stress measurement techniques, manufacturers can gain valuable insights into these hidden stress patterns, enabling them to optimize processes, enhance quality, and ensure the long-term reliability of machine tool components. Embracing the power of residual stress analysis is not just a choice; it's a strategic investment in achieving excellence in the Machine Tool industry.

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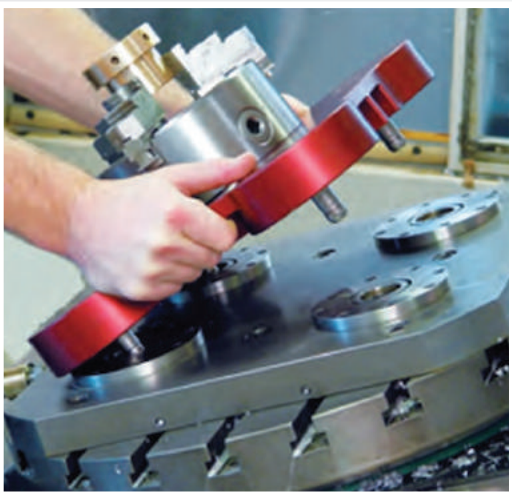

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HERE COMES THE SUN

Reji Varghese explores how companies are using Laser Technology to harvest the power of the Sun…

Source: Magic Wand Media

REJI VARGHESE
MD
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fngreji@gmail.com

The term 'photovoltaic' comes from the Greek word 'phos', meaning 'light', and from 'volt', the unit of electromotive force, the volt. Voltaic is also a word that relates to electricity produced by chemical reactions in a battery.

The 'photovoltaic effect' is a phenomenon that converts light to electricity using semiconducting materials. The photovoltaic effect is commercially used for electricity generation and as photosensors.

Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current results that can be used as electricity.

The evolution of photovoltaics

The photoelectric effect was first studied by French physicist Edmund Bequerel in 1839, who found that certain materials would produce small amounts of electric current when exposed to light. In 1905, Albert Einstein's Nobel Prize-winning research described the nature of light and the photoelectric effect on which Photovoltaic technology is based. But it wasn't until 1954 when the first photovoltaic module was built by Bell Laboratories as a 'solar battery', but it was far too expensive to gain widespread use commercially.

In the 1960s, the Space industry began to make the first serious use of the technology to provide power aboard spacecraft. Through the space programs,

"In modern organic thin film solar cells, laser micro-texturing of surface enhances the absorption of solar radiation and thin anti-reflection layer reduces the reflection loss, both contributing to increased efficiency of solar cells. Such layers are created by means of ultra-short pulsed lasers precisely and selectively removing the material from thin organic layers.**"**

Dr N Ramesh Babu
Professor Emeritus
V Balaraman Institute Chair
Department of Mechanical Engineering
IIT-Madras and Systems Engineering ISST

the technology advanced, its reliability was established, and the cost began to decline.

During the energy crisis in the 1970s, photovoltaic technology gained recognition as a source of power for non-space applications. A photovoltaic system generally employs multiple solar modules, each comprising a number of solar cells, which generate electrical power. They are generally made from semiconductors like silicon and are also referred to as 'photovoltaic cells' which means 'producing a voltage when exposed to radiant energy such as light'.

Governments and companies around the world are investing in Photovoltaic technology in a big way to mitigate the negative effects of climate change. Solar PV has specific advantages as an energy source. Once installed, its operation does not generate any pollution or any greenhouse gas emissions.

Dr N Ramesh Babu, Professor Emeritus, V Balaraman Institute Chair, Department of Mechanical Engineering, IIT-Madras, says, "With the reduction in costs of PV modules and the increased efficiency of solar cells, photovoltaic systems are now becoming price competitive with fossil fuels."

The technology also shows scalability with respect to power needs, and silicon has large availability in the earth's crust. Solar power has experienced the highest growth rates of all renewable energies in recent years, and its potential in the future is immense.

Commercial production of photovoltaics

Solar energy is indispensable for the future but to ensure that photovoltaic systems are able to compete with conventional fossil fuels, production costs of PV modules must be reduced and the efficiency of solar cells increased.

Prasanth Sakhamuri, Director, ASM-HHV Engineering, a joint venture between Hind High Vacuum company and ASM Technologies that supplies key equipment required for the manufacture of solar cells, says, "Lasers play a significant role in various aspects of solar cell production, aiding in efficiency enhancement, precision manufacturing, and quality control. They are used extensively in cell manufacturing and module manufacturing. In cell manufacturing, they are used for dicing, patterning, texturization, contact generation, and quality control to name a few. The uses are increasing rapidly as the efficiencies are being pushed to the limit with hybrid manufacturing techniques."

"Lasers offer precision, flexibility, and the ability to work at small scales, making them very useful tools in the production of solar cells," he adds.

"The volatile energy generated by solar heating plants demands the use of storage systems. In order to connect these storage systems with power supply systems, TRUMPF Hüttinger develops and delivers the heart of every solar power system—innovative bidirectional inverters. They help charge and discharge the battery system efficiently. Thanks to the modular design, they can be used in storage solutions in the most varied power classes.**"**

Pradeep Patil
Managing Director
TRUMPF India

Mohammed Hidayath, Director, Sales, TRUMPF India, says, "TRUMPF offers customized solutions for this industry of the future and is opening up new opportunities for solar cell manufacturers and system constructors. TRUMPF lasers structure and interconnect the cells on the solar module and ensure through targeted de-coating that the modules have the necessary insulation resistance. TRUMPF Hüttinger is an industry leader in providing stable and precise process power supplies for coating solar cells. The vertical-cavity surface-emitting laser (VCSEL) heating systems from TRUMPF Photonic Components also open up advantages in solar cell production. For example, by removing energy barriers with targeted burning in of the contacts on the solar cell as well as with regeneration

Governments and companies around the world are investing in Photovoltaic technology in a big way to mitigate the negative effects of climate change. Once installed, its operation does not generate any pollution or any greenhouse gas emissions.

processes to reduce defects by intensive irradiation of the cell, thus increasing efficiency."

Energy conversion

To protect thin-film solar modules from external influences, short and ultrashort pulse lasers remove the layer system at the edge of solar cells to a width of around a centimeter, so that it can be covered with film lamination. Lasers also impress during selective ablation of passivating layers on crystalline solar cells and when performing accurate drilling tasks in silicon. Lasers improve conversion efficiency and ensure a high-performance level.

Structuring silicon solar cells for increased efficiency

To exploit the energy potential of solar radiation, anti-reflection layers on silicon solar cells are used to reduce reflection and increase absorption on solar cells.

Professor Ramesh Babu says, "In modern organic thin film solar cells, laser micro-texturing of surface enhances the absorption of solar radiation and thin anti-reflection layer reduces the reflection loss, both contributing to increased efficiency of solar cells. Such layers are created by means of ultra-short pulsed lasers precisely and selectively removing the material from thin organic layers."

Energy storage

The volatile energy generated by solar heating plants demands the use of storage systems. Pradeep Patil, Managing Director, TRUMPF India, says, "In order to connect these storage systems with power supply systems, TRUMPF Hüttinger develops and delivers the heart of every solar power system – innovative bidirectional inverters. They help charge and discharge the battery system efficiently. Thanks to the modular design, they can be used in storage solutions in the most varied power classes. In addition, they can be easily integrated in existing battery storage systems and can be combined with PV plants to create a future-oriented system. TRUMPF lasers are also used for welding electrical contacts. The locally limited, low heat input ensures high-precision distortion-free seams."

With an average of about 300 clear and sunny days in a year in India, the calculated solar energy incidence on India's land area is about 5,000 trillion kilowatt-hours (kWh) per year, which exceeds the possible energy output of all of the fossil fuel energy reserves in the country.

"The Government of India in recent times established several initiatives and policies aimed at promoting the manufacturing of solar panels and supporting the growth of the solar energy sector. It launched the PLI scheme to encourage domestic manufacturing of solar photovoltaic (PV) modules. Under this scheme, manufacturers are incentivized based on their production capacity and the efficiency of the modules they produce. This initiative aims to boost manufacturing capacity and increase domestic production."

Prasanth Sakhamuri
Director
ASM-HHV Engineering

Coating

In the production of silicon wafers and thin-film solar cells, the quality of the layers applied plays a crucial role. Layers with thicknesses fewer than one hundred nanometers are extremely sensitive and can easily degrade or lose their functionality. The reasons for this can be particle debris or delamination of irradiated layers, thermal damage of neighboring areas and other layers, as well as the generation of bulges in the outer areas of the ablation. The better the application of layers, the greater the ultimate module efficiency.

Patil says, "TRUMPF Hüttinger's high-tech generators significantly influence the quality of the layers as they precisely control the energy input in the coating processes of the Solar industry. Renowned system constructors rely on the precise, stable process power supplies from the market leader for solar generators."

Plasma coating - Creating the thinnest layers

An essential process step during production of crystalline silicon solar cells is their coating with an antireflective and passivation layer. Amorphous hydrogenated silicon nitride (SiN) layers, deposited under vacuum by PECVD (Plasma Enhanced Chemical Vapor Deposition), have been demonstrated to be—besides good antireflection layers—excellent means for surface and bulk passivation on solar cells.

Hidayath says, "Modern coatings are predominantly applied in vacuum processes, either using physical vapor deposition (PVD) or chemical vapor deposition (CVD). The coating requires excitation of a suitable starting material. This can be done by thermal heating, e.g. evaporation. However, a variety of applications require electrical gas discharge or plasma for excitation. To generate these requires appropriate power supplies. The most important plasma coating processes are plasma-enhanced chemical vapor deposition (PECVD) and magnetron sputtering. A challenging variant of the latter is reactive sputtering to produce dielectric insulating protective layers. The high power impulse sputtering (HiPIMS) process also opens up new application options."

India's sunrise industry

With an average of about 300 clear and sunny days in a year in India, the calculated solar energy incidence on India's land area is about 5,000 trillion kilowatt-hours (kWh) per year. The solar energy available in India in a single year exceeds the possible energy output of all of the fossil fuel energy reserves in the country.

Realizing this enormous potential, India is issuing 40 gigawatts (GW) tenders for solar and hybrid projects for the current fiscal. India has also established nearly 42 solar parks to make land available to the promoters of solar plants and the International Solar Alliance (ISA), proposed by India as a founder member. India has also put forward the concept of 'One Sun One World One Grid' and 'World Solar Bank' to harness abundant solar power on a global scale.

Supportive policies by the Indian Government are propelling PV manufacturing in India. According to a recent report by the Institute for Energy Economics and Financial Analysis (IEEFA) and JMK Research, India's solar PV module capacity is set to reach 110 GW by 2026. At that point, India will attain self-sufficiency and be able to target the export market aggressively. The Government also promoted local manufacturing of PV modules through its production-linked incentive (PLI) scheme, with a total outlay of approximately US$3.2 billion over two tranches.

"TRUMPF offers customized solutions for this industry of the future and is opening up new opportunities for solar cell manufacturers and system constructors. TRUMPF lasers structure and interconnect the cells on the solar module and ensure through targeted de-coating that the modules have the necessary insulation resistance."

Mohammed Hidayath
Director, Sales
TRUMPF India

Sakhamuri says, "What we would like to see is the Government's initiative to institutionalize the technology in the country. Currently, all the manufacturing technology is imported either in the form of process or equipment. It would be best if the equipment and the process is developed in India either in the form of joint ventures with the companies with the technology and Indian manufacturing companies or a definitive indigenization program being offered by the turnkey supplier."

The results of the policy measures by the Indian Government are already visible. For example, the capacity for PV cells and modules in India has more than doubled to reach 6.6 GW of cells and 38 GW of modules in 2023, even though they operate at only 50-60 percent capacity.

Sakhamuri adds, "The Government of India in recent times established several initiatives and policies aimed at promoting the manufacturing of solar panels and supporting the growth of the solar energy sector. It launched the PLI scheme to encourage domestic manufacturing of solar photovoltaic (PV) modules. Under this scheme, manufacturers are incentivized based on their production capacity and the efficiency of the modules they produce. This initiative aims to boost manufacturing capacity and increase domestic production."

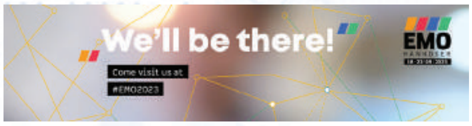
"The Government provides various anti-dumping duty protection and support to protect and enhance domestic manufacturing. These exemptions are intended to make the domestic players cost competitive against any possible dumping from China," he further adds.

The PLI scheme will likely play a vital role in the coming years to drive the growth of India's entire PV manufacturing ecosystem. Apart from attaining a module manufacturing capacity of 110 GW by 2026, India is also expected to have a significant presence in all aspects of PV manufacturing, including cells, ingots/wafers, and polysilicon.

The sun seems to be shining bright on the future of India's Solar PV Manufacturing sector. With continued Governmental support, the Photovoltaics industry in India has the opportunity to become a key cog in the world's future energy supply chain.

The PLI scheme will likely play a vital role in the coming years to drive the growth of India's entire PV manufacturing ecosystem. Apart from attaining a module manufacturing capacity of 110 GW by 2026, India is also expected to have a significant presence in all aspects of PV manufacturing.

Tech Talks is a column by industry veteran and journalist Reji Varghese that talks about the latest advancements in Machine Tools, provides snippets from history, interesting facts, etc. about the Machine Tool industry.



INDIA @ EMO HANNOVER 2023

The premier global for Production Technology, EMO Hannover, is scheduled to run from September 18-23, at Hannover Fairground. A remarkable number of Indian companies are participating to showcase their innovations to the global market. It is a matter of utmost pride that India, with its strong economic presence and promising prospects, has emerged as a key country within the realm of machine tool technology.

Source: Magic Wand Media

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Chief Copy Editor
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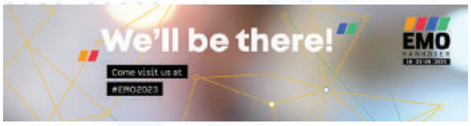
Aligned with the fair's theme, 'Innovate Manufacturing', Indian Machine Tool Manufacturers' Association (IMTMA) in collaboration with the German Machine Tool Builders' Association (VDW) and German Engineering Federation (VDMA) India is hosting the EMO 'India Opportunities – Growth and Potential of the Indian Machine Tool Market' Conference this year. The aim is to highlight the enormous opportunities offered by India's industries and to pave the way for business partnerships.

A brief insight into how a few Indian veteran EMO participants are all set to present their much sought after technologies in this edition.



Chennai Metco Pvt Ltd | Hall & Stand: 3/D-02

C Renganathan
Managing Director
Chennai Metco Pvt Ltd

At EMO Hannover, we will be displaying specialized automatic cutters for cutting carbide rods. We would also be displaying specialized cutters for sectioning LM Guides, Ball Screws, Chrome Rods, etc. Instead of displaying generic machines, this time we are focusing on displaying exclusive solutions that are provided by selected companies. These would be cost-effective solutions for specialized needs.

EMO being the most visited fair in manufacturing, we are hoping to have potential customers for these machines at our booth. Apart from direct customers, our focus will be on identifying dealers for these specialized machines. We work with dealers who handle generic machines, but when it comes to specialized machines, we will have to collaborate with specific dealers located in industrialized countries. Our goal at this EMO event is to connect with these specialized dealers.

We currently serve a wide range of European countries, with Germany, France, the UK, Italy, and Spain being our primary markets. Additionally, we receive orders from countries such as the Czech Republic and Slovenia, among others.

We already have a solid presence in Europe. The products we are showcasing at EMO are highly specialized, and we anticipate a substantial market in the more industrialized regions of Europe. Our primary focus for dealer development will be on Germany, Italy, France, and Spain. However, we are confident that customers from numerous European countries will be eager to procure our machines and benefit from our competitive pricing.

Jyoti CNC Automation Ltd | Hall & Stand: 14/D-46

Parakramsinh G Jadeja
Chairman & Managing Director
Jyoti CNC Automation Ltd

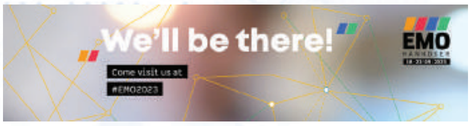
EMO, being the world's leading trade fair for metalworking technology, highlights the latest advancements in metalworking machinery, tools, and technologies. It is a platform for manufacturers, suppliers, and professionals in the metalworking industry to come together, exchange ideas, and showcase their products.

At our booth, one will be exploring AX 200 MY and DX 200 nvu from our Turning Centers series; Fast Drill-Tap Center Series Tachyon with advanced technology options; RDX 20 and VX 12 from VMC Series; newly developed Blade Machining Center ABX 40; under HMC Series HP 500 with advanced features; and a few newly developed 5-axis Machines with cutting-edge technologies finding their applications in Aerospace, Die-Mould, Telecommunication, and General Engineering Sectors.

Furthermore, our booth will be equipped with cutting-edge technologies aimed at advancing artificial intelligence, digitalization, and smart manufacturing solutions seamlessly integrated with Industry 4.0 tools.

Since 2007, we have had a consistent presence at various machine tool hubs in Europe. France, Germany, Italy, and Turkey are the prime locations where we cater with our subsidiary Huron Graffenstaden and through a dealer network.

However, there are several untapped regions in Europe where we can establish a presence. We intend to expand our operations into these areas through channel partners. We are also looking forward to collaboration within dealer networks. It's worth noting that Indian machine tools are gradually gaining acceptance, and European countries have expressed a strong interest in partnering with us for technologically advanced products.



Rajamane Industries Pvt Ltd | Hall & Stand: 7/A-02

Rajendra Rajamane
Managing Director
Rajamane Industries Pvt Ltd

Rajamane has been in the industry for five decades and offers various series of coolant pumps, starting from Low-pressure, Low-flow to High-pressure, Multistage series with more than 150 models for various applications in the Machine Tool industry.

EMO 2023 is an ideal platform to feature our best technologies and products. We have showcased a newly introduced series with CE marking, IE3/IE4, and UL-certified pumps in RV, RK, and RKM models, incorporating varied conditions of voltage, current, power, speed, and pumping performance to suit global requirements.

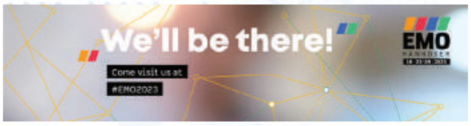
The newly-introduced RSP series pumps are self-priming Monoblock coolant transfer pumps available in RSP 200, 300, and 400 models. These are ideally designed for specialized applications, such as efficiently handling the transfer of contaminated coolant with chip particles up to 5 mm in size, even when dealing with hot liquids at temperatures of up to 90°C. These products are extensively used in the OEM segment of the Automotive, Aerospace, Machinery, and Electronics industries, and these are the segments we are focusing on at EMO 2023 to enhance our business prospects.

We have successfully served a substantial number of offshore customers in the United States, Japan, the Middle East, Korea, and China with our global product line. We are confident that EMO Hannover 2023 will serve as a pivotal milestone in our journey to become a global source for coolant pumping solutions. While we have established partnerships with some customers in Germany and France, we are eager to expand our presence across Europe. This region, particularly in the manufacturing segments of Milling, Drilling, Turning, and Grinding machines, leads the industry with advanced technologies and innovations, driving growth.

UCAM Pvt Ltd | Hall & Stand: 12/D-82

Indradev Babu
Managing Director
UCAM Pvt Ltd

We are eagerly preparing to be part of EMO Hannover, with the goal of enhancing UCAM's brand visibility, engaging potential clients, and establishing valuable industry connections.
Our showcase will feature our extensive range of manufacturing solutions, such as CNC Rotary Tables, CNC Tilting Tables, Large Size Rotary Tables, and Value Added Accessories. A particular focus is on our latest innovation, the Q series range, which stands out due to its high-precision and enhanced accuracy with higher clamping torque which significantly reduces cycle time.
We are also showcasing solutions for machine tool manufacturers like the Table in Table (Rotary Table Inside machine bed) which is directly integrated into the CNC machine.
Nimble Electric, the business vertical of UCAM, showcases high-precision Torque Motors and Direct Drives, represented by the ORION series.
This event also serves as an incredible opportunity to engage in insightful discussions with OEMs to establish valuable connections, exchange ideas with industry leaders, and demonstrate our cutting-edge technological advancements and top-tier innovations.
Currently, UCAM has established its presence in European countries, including Germany, Italy, Poland, the UK, France, Spain, and Czech Republic. We aim to strengthen our existing presence in these countries. We are actively pursuing a strategy for further expanding our footprint in Europe while exploring opportunities to reach new geographies for emerging applications and industries.



Micromatic Grinding Technologies Pvt Ltd | Hall & Stand: 11/C-67

Kapil Dhand
Managing Director
Micromatic Grinding Technologies Pvt Ltd

At EMO Hannover, Micromatic Grinding Technologies is set to captivate visitors with its showcased technologies. The 'PLUTO 18', a CNC External Grinding Machine, offers a space-saving design, a user-friendly CNC screen, and impressive performance. The 'ECO 200U' stands out as a versatile Hydraulic Universal Grinding Machine, ideal for small to medium production batches. With options for External, Internal, or Universal configurations in both semi-automatic and automatic versions, it promises to be a mini grinder with expansive capabilities. These innovations will certainly entice professionals from various industry sectors, including OEMs and suppliers.

Micromatic Grinding Technologies has firmly established its global presence, successfully catering to diverse manufacturing needs in several European countries. Our solutions have been embraced by industries in Sweden, Poland, Russia, Germany, France, Switzerland, Italy, and the United Kingdom, underscoring our commitment to delivering innovative grinding technologies across the European continent.

Continuing our growth trajectory in Europe remains a key strategic objective. We are dedicated to bolstering our market presence, forging partnerships with industry peers, and meeting evolving customer demands. Our mission is to persistently provide state-of-the-art grinding solutions and exceptional assistance throughout Europe, solidifying our stature as a prominent player in manufacturing technology, especially renowned for our leadership in India.

Furthermore, to enhance our commitment to the European market, 'AceMicromatic International (AMI)', a subsidiary of the AceMicromatic Group that caters to the export market, has established a dedicated office in Germany. This strategic presence in Germany allows us to provide even more localized support and tailored solutions to our European customers.

Nickunj EDM Wires & Consumables Pvt Ltd | Hall & Stand: 6/C-19

Mishal N Shah
Managing Director & CEO
Nickunj EDM Wires & Consumables Pvt Ltd

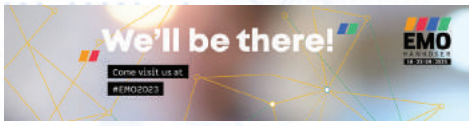
We will be showcasing our OEM-specific high-speed and productivity EDM Wires. We hope to draw visitors from EDM Wirecut machine OEMs, distributors, and end-users from Die & Mold, Autocomp, Aerospace Component, and other industries that are involved in Electric Discharge Machining and are currently using European/Japanese-made wires at EMO Hannover. Presently, we serve Germany, Austria, and Croatia in Europe. Our goal is to establish partnerships with dealers, agents, distributors, and customers in every European country.

VT Tools Pvt Ltd | Hall & Stand: 5/D-102

Om Prakash Chhabra
Managing Director
VT Tools Pvt Ltd

At EMO Hannover 2023, we are proud to showcase a comprehensive display of cutting tool specifications, including External Tool Holders, Internal Tool Holders, Cartridges, Threading Tool Holders, Grooving Tool Holders, U-Drills, and a wide range of spare parts and accessories.

Currently, we have a presence in Germany and Canada, and we are actively seeking opportunities to expand our customer base, especially within European countries. We are committed to enhancing our dealer network to ensure that our high-quality products are easily accessible to customers across the region.



Accurate Gauging & Instruments Pvt Ltd | Hall & Stand: 6/A-35

Vikram Salunkhe
Managing Director
Accurate Gauging & Instruments Pvt Ltd

"This year, we are excited to showcase our Shop Floor CMM for Smart Factory 3D CMM and Advanced 5-Axis Probing System at EMO Hannover, highlighting our commitment to technological advancement and industry leadership.

We specialize in providing cutting-edge measurement technologies across a broad spectrum of industries. From Automotive and Aerospace to Manufacturing and Electronics, our precision gauging solutions ensure optimal quality control, increased productivity, and streamlined operations.

We have emerged as a distinguished global player in precision measurement solutions. Together with our experienced partners, we proudly serve numerous European countries, including USA, Germany, Italy, Poland, Middle East, etc.

With an extensive and experienced after-sales service team, we are recognized for delivering advanced gauging technologies to our customers.

Our global footprint reflects our commitment to excellence and client fulfillment. Catering to diverse industries, we consistently offer reliable measurement tools that enhance operational efficiency and product quality. Accurate Gauging's established global standing underscores our role as a dependable partner for businesses seeking top-notch metrology solutions across the world.

Driven by a vision of global excellence, we seek to expand our presence in Europe. The region's diverse industries and technological advancements align with our commitment to providing cutting-edge measurement solutions. By establishing a stronger footprint, we aim to collaborate closely with European partners, foster innovation, and meet evolving market demands. This expansion allows us to contribute our expertise in precision measurement to a wider audience, strengthening partnerships and driving mutual growth while advancing industry standards on an international scale."

Birla Precision Technologies Ltd | Hall & Stand: 4/E-104

Ritesh Krishna
General Manager – International Business
Birla Precision Technologies Ltd

"EMO Hannover presents an exceptional platform for us to share our latest technological advancements and precision cutting tools with a global audience. Our commitment to innovation and excellence drives us to consistently redefine what's possible in precision engineering.

Birla Precision Technologies Ltd has demonstrated its prowess in engineering cutting tools and tool holding devices, setting new standards for efficiency, precision, and performance. Our High-Speed Steel (HSS) and Solid Carbide tools have emerged as game-changers in the field of cutting and machining, enabling industries to achieve exceptional results and stay ahead of the competition. We will be showcasing our latest technological advancements, including HSS and Solid Carbide tools, including Twist Drills, End Mills, Reamers, Milling Cutter, Taps, Tool Bits tailored for the Industrial & Hardware industry at EMO Hannover. The new range of high-performance Solid Carbide Drills and End Mills has been launched under the 'Carbomach' brand.

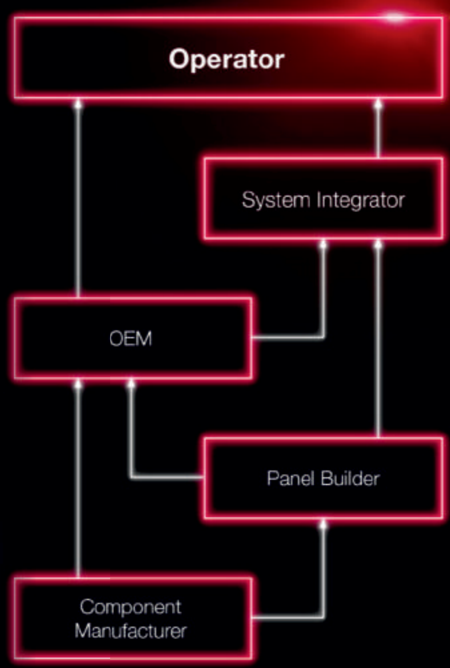
BPT Machining Centre Tooling and Work Holding Devices are recognized to be the most cost-efficient for VMC and CNC lathes globally.

We are proud to announce our strategic expansion into the European market with the establishment of a new company and a state-of-the-art warehouse facility in Germany. This significant move reinforces Birla Precision's commitment to providing swift and efficient services to our valued European customers in the cutting tools and tool holder product segment.

The new warehouse facility is equipped with cutting-edge technology to ensure optimal storage conditions for cutting tools and tool holder products. This ensures that products remain in pristine condition until they reach customers' hands, maximizing their performance and longevity."

EPLAN

efficient engineering.



EPLAN Digitalised Process for Water and Wastewater Treatment

Our world's limited resources make sustainable water supplies and wastewater management imperative. Along with environmental policy aspects, the industry is faced with a multitude of technical and economic challenges. Efficient engineering makes an important contribution in securing the water supply and wastewater treatment. From plant design to operation, you benefit from consistent data continuity and a high degree of standardization

EPLAN offers you field-tested, integrated solutions for water and wastewater treatment with the following added value:

- Connecting the fields of process technology, instrumentation technology and control technology with fluid power and electrical engineering
- Smooth workflows – from planning and design to service and maintenance of your plant systems
- Tools for planning service and maintenance work based on always up-to-date, real-time depictions of the plant systems

For further enquiries contact:

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FRIEDHELM LOH GROUP

POWERED BY Modern Machine Shop

MASTERING THE ART OF WRITING CUSTOM MACROS

Custom Macros empower users to unleash new capabilities within G-code programs, enabling them to code operations that were previously unattainable.

Source: MMS

Custom Macros enhance what can be done in G-code programs, giving you the ability to do things you may think to be impossible. The first step to doing anything, of course, is to know that it is possible.

Here, are five application categories for Custom Macro – five reasons why you should understand Custom Macro – and almost all companies have applications that fall into at least one of these categories.

Part families

1 Similar components making up a part family are often described on a single drawing with variable dimensions. You must refer to a chart on the drawing to determine the dimensions for a given part in the family. Even if each component is described on a separate drawing, you may be required to take one CNC program and modify it slightly to create a different CNC program for a similar workpiece. The more parts in the family, the more beneficial a part-family Custom Macro becomes.

Ideally, the machining process will be the same for all parts in the family – possibly even using the same cutting tools for multiple parts. If so, it is possible to write one Custom Macro program for all parts in the family. CNC operators could specify the values of changing dimensions (variables) at the machine between jobs – or each part could utilize its own 'calling program,' which will specify variable settings and then call the part-family Custom Macro.

One important benefit of a part-family Custom Macro is program maintenance. If anything changes that affects all parts in the family – possibly a design change or a process improvement – only the (one) Custom Macro program need be changed. Compare this to having to change every hard-and-fixed program if a Custom Macro is not used.

User-created canned cycles

2 CNC manufacturers provide canned cycles for commonly performed machining operations, such as hole machining operations on machining centers and roughing, finishing, and

MIKE LYNCH
Founder & President
CNC Concepts Inc.

threading operations on turning centers. Even if you utilize a CAM system to create G-code programs, the CAM system probably makes use of at least some control-based canned cycles.

Advantages of canned cycles include shortened CNC programs and simple, at-the-machine program modifications to improve or correct the way a machining operation is performed. With hole machining, for instance, it is very easy to switch from a standard drilling cycle to a deep-hole or a chip-break peck drilling cycle with just a couple of easy program edits.

CNC manufacturers only provide canned cycles for operations that comprise a great percentage of those their users perform. Your company surely performs other machining operations that cannot be commanded by a canned cycle, such as thread milling or face milling on machining centers or necking grooves or knurling on turning centers.

With Custom Macro, it is possible to write a canned cycle program to perform even the most obscure machining operation — it could be an operation that only your company performs — and you can command its execution with a user-defined G-code and even make it modal.

Utilities

3 A utility application enhances the way the CNC machine behaves. It could reduce setup or cycle time, improve safety or make the machine easier to work with. Frankly speaking, whenever you see a CNC operator struggling with a task, it is possible that a utility Custom Macro can help.

Utility applications are possible because Custom Macro provides access to certain CNC functions that are not accessible through normal G-code programming, such as access to machine position, offset registers, alarm generation, and more. With access to these CNC functions, it is possible, for instance, to create a setup-enhancing Custom Macro that helps with program zero assignment.

If a machining center does not have a touch probe, Custom Macro programs can be developed to use an edge finder to do just about anything a touch probe can do, including locating the program zero point and placing program zero assignment values into fixture offset registers. The only difference is that making the edge finder touch each surface must be done manually.

This just scratches the surface of what utility Custom Macros can do. The potential is limited only by your imagination and ingenuity. When asked if a given application is possible, my answer is almost always: 'Yes — now we just have to figure out how to do it.'

Complex motions

4 CNC manufacturers provide interpolation for basic motion types, such as linear interpolation, circular interpolation, and helical interpolation. While the standard interpolation types are adequate for most CNC users, you may need more.

Consider a taper-thread milling operation. While straight threads can be machined using helical interpolation, taper threads require a spiral motion. The X- or Y-axis radius changes as the thread milling cutter moves in the Z-axis. Most CNC manufacturers do not provide this kind of motion as an interpolation type. With Custom Macro, you can create spiral interpolation, making a tapered-thread milling cutter move as it should to machine a tapered thread.

Interfacing with machine accessories

5 Custom Macro is used to 'connect' a CNC machine to several kinds of complex accessory devices, such as touch probes, post-process gauging systems, and automatic loading systems. It is usually the accessory device manufacturer that provides the related Custom Macros, so end users are not involved. That said, there are simpler devices an end user could tackle, such as indexers and clamping systems. Knowing how it is done would save your company the cost of getting an outside vendor involved.

Custom Macro is used to 'connect' a CNC machine to several kinds of complex accessory devices, such as touch probes, post-process gauging systems, and automatic loading systems. It is usually the accessory device manufacturer that provides the related Custom Macros, so end users are not involved.

THE FUTURE IS NOW

There has never been a more favorable period for the Indian manufacturing industry, where all its advantages are operating at their utmost potential. Following are four key trends that, if embraced, can usher in a revolution in our industry.

Source: Magic Wand Media

Innovations in the Manufacturing industry could not have come at a more exciting time for India. As 'Make in India' completes a decade next year, the country is uniquely poised to take advantage of the computing trends that are transforming manufacturing. Here are four trends that are defining the once-in-a-century transformation of the Manufacturing industry, with the potential to unlock huge productivity gains, eliminate waste, conserve energy, and build more sustainable futures.

Connected workforce to power the factories of the future

The key to unlocking the full potential of the 'Intelligent factory' lies in having a connected workforce. As manufacturing rapidly adopts cloud-based technologies like Digital Twins, Mixed Reality, and the Industrial Metaverse, it's crucial that the workforce also collaborates seamlessly and securely, stays engaged, and is empowered to work in a hybrid environment.

According to Microsoft's Work Trend Index, 63 percent of frontline manufacturing workers are excited about the job opportunities that technology creates. And with technology set to transform every aspect of manufacturing – from the factory floor to the frontline – AI-enabled virtual agents can empower frontline workers to find intelligent answers within the context of their manufacturing applications. It's time to embrace the power of the connected workforce and lead the way to a brighter manufacturing future.

Avoid supply chain disruptions with AI

In today's fast-paced business environment, supply chain disruptions can spell disaster for companies. That's where generative AI comes in; it can provide predictive insights across materials, inventory, distribution networks, and more to prevent and minimize disruptions, making supply chains more resilient. And with a stronger supply chain, companies can prevent losses, scale up production, and boost output.

Leading companies have already embraced this technology with great success. Kraft Heinz implemented a ready-made command center to reduce risk across its supply chains. Likewise, high-performance computing solutions allowed semiconductor manufacturer STMicroelectronics to transform its supply

Source: Microsoft

chain to bring its products faster to market and scale up capacity.
But it's not just about technology. Automation and robotics can help in performing repetitive tasks faster and more accurately, improving efficiency and productivity. This, in turn, leads to better inventory management and reduces carrying costs. By embracing these solutions, companies can gain a competitive advantage and thrive in an ever-changing market.

With advanced cloud and AI capabilities, the future of manufacturing is quickly approaching and it promises to be the most transformative chapter since the industrial revolution. As manufacturers embrace cutting-edge technologies like the industrial metaverse, generative AI, and robotics, they will unlock new levels of productivity, efficiency, and sustainability.

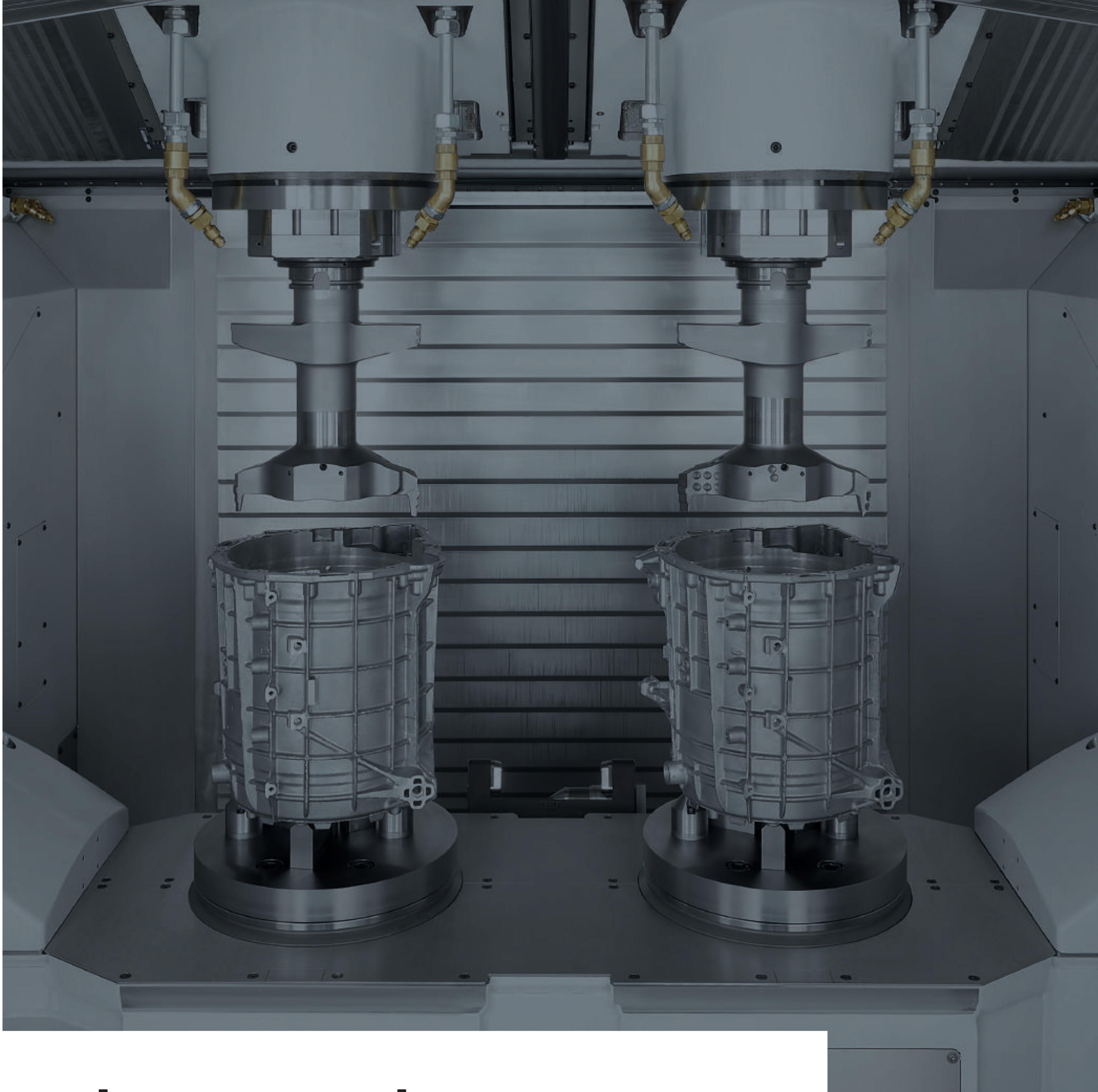
Building for sustainability

Leading manufacturers like STMicroelectronics are using technology to double their capacity by 2025 and become carbon neutral in the same year. Sustainability is now a key focus area for manufacturing firms that are adopting renewable energy sources and circular economy principles to reduce waste and optimizing production processes to minimize environmental impact.
Thanks to the cloud, it's now easier than ever to track, monitor and improve on sustainability goals as processes move to the cloud. But despite this progress, the hardest sustainability challenges still lie in chemistry and material science. To tackle these challenges, scaled quantum machines that leverage state-of-the-art cloud services are required. That's where supercomputing capabilities, along with AI, come into play, promising to accelerate chemical simulations with predictive modeling tools and workflows. By embracing cutting-edge technology, manufacturers can achieve their sustainability goals and lead the way to a more sustainable future.

Factories of the future

The future of the industrial ecosystem relies on a common virtual space where everyone can visualize and interact with complex processes using real-world data, in real time. The industrial metaverse, which encompasses AI, Digital Twins, Mixed Reality, Machine Learning, and Cloud-to-Edge technologies, is revolutionizing manufacturing with remote operations, robotics, automation, and autonomous operations.
It is making product engineering more collaborative and closer to the final product, significantly squeezing time-to-launch. Coupled with enterprise-level security, industrial metaverse technologies like HoloLens are offering immersive experiences and changing the face of manufacturing.
Leading manufacturers such as Siemens are already using generative AI to help industrial companies drive innovation and efficiency across the design, engineering, manufacturing, and operational lifecycle of products. Others such as Rockwell are integrating robotics and AI technologies to empower companies to optimize their field service workers and asset management in factories.
With advanced cloud and AI capabilities, the future of manufacturing is quickly approaching and it promises to be the most transformative chapter since the industrial revolution. As manufacturers embrace cutting-edge technologies like the industrial metaverse, generative AI, and robotics, they will unlock new levels of productivity, efficiency, and sustainability. The future of manufacturing is full of promise, and we're just getting started. With the right tools, technologies, and mindset, we can revolutionize the industry and unlock its full potential for the benefit of all.

Source: Magic Wand Media



CATALYZING INDIAN SPACE GROWTH STORY

India now stands on the cusp of building a space ecosystem with ISRO being the guiding body, large enterprises and conglomerates diversifying into the sector, pulling up the value chain, and small and medium-sized enterprises (SMEs) producing sub-assemblies. With startups and technology innovators, India can now evolve as a space startup hub for the world.

Source: Dassault Systèmes
SatSearch

The engagement of Indian industry with the Indian Space Research Organisation (ISRO) dates back to as early as the 1970s, when private players started providing manufacturing support for the production of certain products for satellites and rockets. The initial space capabilities and missions involved high risk, large capital expenditure, and expert training necessary to handle such technologies, coupled with relatively low production volume requirements.

To navigate these constraints, ISRO invested mainly in generating the necessary Intellectual Property (IP) in-house, and engaged with the industry where they could, to provide manufacturing support for the production of several components needed for their missions. In the process, ISRO supported the industry by providing training and also put in place guarantees such as buy-back arrangements to guarantee procurement and mitigate commercial risk.

Recent growth of the Indian space ecosystem

Over the last decade, India's Space sector has grown rapidly. Initially, India conducted an average of 1-2 launches every year, leading to a couple of satellites being placed in orbit. ISRO is now targeting up to 24 launches a year with the plan to bring tens of satellites into operation annually. Today, there are over 150 industry partners contributing to ISRO's space missions and several hundred more who contribute to the growing space program. More recently, NewSpace is also taking hold in India, with over 50 new startups having emerged from the fledgling ecosystem within the last decade. The Government of India has kicked off systematic reforms to encourage activities undertaken by private industry in India's Space sector. These reforms are set to transform the Indian industry, enabling the private sector to serve both the local and the global markets with innovative products/services. With the changing landscape alongside growing opportunities in the sector, an understanding of the capabilities across the value chain within India becomes essential for stakeholders (both local and global) to be able to engage with the ecosystem.

Indian space ecosystem mapping

As there is little international understanding of India's Space industry capabilities or the contributions of individual organizations to the missions undertaken by ISRO, this project conducted by SatSearch focused on systematically capturing core insights pertaining to organizations across the value chain. As a part of the effort to map the Indian space ecosystem, 281 organizations were identified as contributors to the value chain. For each of these organizations, pertinent data about the size,

"With the space economy in India estimated to reach US$13 B at a CAGR of 6% by 2025, the new space era is thriving both in terms of innovation and business. Today, several companies in India, both SMEs and startup are leveraging cutting-edge technologies to develop innovative space solutions in India. Additionally, the sector is playing a crucial role across a wide range of end-user application areas. By integrating virtual twin into development, organizations can rapidly innovate, manage costs, and achieve first-time-right results sustainably."

Tanuj Mittal
Senior Director
Customer Process Experience
Dassault Systèmes India

scale, and scope of work were curated. Specifically, their location (city and state), line of work/expertise, position within the value chain (OEM, tier 1, etc.), indication of annual revenues, and number of employees were captured.

Size and scale analysis

Out of the 281 Indian space organizations identified during this project, the majority of them are privately owned, small and medium enterprises (SMEs) with typically less than 200 people

The recent reforms being instituted by the Government of India clearly have the ability to accelerate the growth of the private Space sector in India.

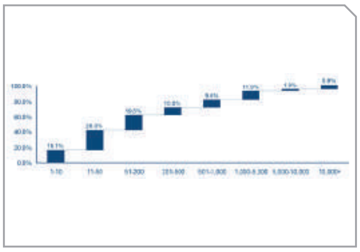


Figure 1: Breakdown of Indian space organizations by number of employees

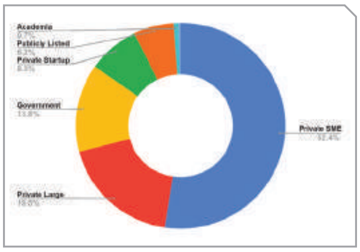


Figure 2: Breakdown of Indian space organizations by type

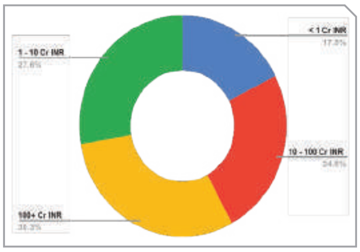


Figure 3: Breakdown of Indian space organizations by annual revenue

employed. In fact, 60 percent of the 281 organizations are small organizations that have carved out a niche for themselves within the space program.

Just over 8 percent of the organizations were identified as start-ups that have been established within the last 5 years and employ less than 50 people. This is perhaps a key indication of the interest and enthusiasm of space entrepreneurship developing in India. Fourteen percent of the organizations were identified as state-run institutions, which support specific requirements that may be too risky or too capital-intensive for the private sector to invest in. These include organizations such as Hindustan Aeronautics Ltd (HAL), BrahMos Aerospace, and Bharat Dynamics Ltd (BDL), which cater to key requirements in the aerospace and defence segment. Their expertise is relied on for critical subsystems, materials, or processes for either satellites or rockets, that are developed by ISRO.

"A foundational understanding of the supplier landscape has become increasingly important, as reforms to open up space activities to Indian private industry are being undertaken by the Government of India (GoI). To this end, there is significant scope to build a knowledge base that canvasses the supplier landscape, based on which the status of participation of the suppliers and their ability to scale with growing requirements for national and commercial purposes can be understood."

Dr Narayan Prasad
Chief Operations Officer
SatSearch

Academic institutions and publicly traded companies are a small minority that were identified during the study, contributing to specific research or manufacturing areas. Interestingly, about 19 percent of the companies identified are large private companies that employ over 200 people and contribute to various ISRO centers. Private companies, both large and SMEs, tend to work across sectors, also contributing to the aerospace and defence requirements within the country (given they have the expertise to meet some of the stringent performance requirements for space).

Figures 1 and 2 show the breakdown of Indian space organizations identified in this study by the number of employees and organization type. As a part of the size and scale analysis conducted during this study, an effort to map their annual revenues was undertaken. Reasonable estimates from about 80 percent of the overall 281 organizations were collected. The breakdown is presented in Figure 3.

Only 30 percent of these organizations have revenues of INR 100 crore (€8,250,000) and above. Of these, about half of them are state-owned enterprises such as Antrix Corporation, Bharat Electronic Ltd (BEL), Hindustan Aeronautics Ltd (HAL), etc., and the rest are private sector SMEs/large enterprises. Forty five percent of the organizations fall within the bracket of having revenues of below INR 10 crore (€825,000). This raises the question of how precarious the industrial base is, and how well it can handle external shocks, like changes in macroeconomic factors.

There is tremendous potential for NewSpace actors who intend to produce end-to-end launch vehicles and satellites, to integrate the foundation that has built up over five decades of space activities driven by ISRO.

Key Clusters of Space Suppliers

There is tremendous potential for NewSpace actors who intend to produce end-to-end launch vehicles and satellites, to integrate the foundation that has built up over five decades of space activities driven by ISRO.

This could be the silver lining for many of the SMEs within the ecosystem, to add both velocity and volume of orders, given their deep expertise in specific technologies, manufacturing processes, or other such facilities that can be utilized by these NewSpace actors.

Cluster and value chain analysis

The location of the organizations brings an interesting cluster insight to this survey (see Figure 4). The locational mapping revealed that a little more than 1/3rd of the organizations are located in Bangalore alone. Almost 2/3rd are located in the south of India, which is also the case with the majority of the ISRO centers as well.

There is evidence of strong clustering of companies around ISRO centers. The clustering becomes much stronger amongst NewSpace actors, with almost 2/3rd of them based in Bangalore and almost all the other startups also being based in cities such as Chennai, Hyderabad, and Mumbai. This could very well be due to the deep expertise available among ISRO personnel, as well as the SME base that supports several of these centres that are already clustered around Bangalore, Hyderabad, and Chennai.

The study also tried to assess the involvement of the organizations within the space value chain (see Figure 5). For the sake of the ease of segmentation, just three categories were chosen. The first being Original Equipment Manufacturers (OEM) who typically have the capacity (or in the case of some of the NewSpace startups are targeting) to manufacture end-to-end space missions. ISRO remains the central prime/OEM for all space-related missions in India. Approximately 6 percent of the organizations mapped are OEMs within the larger aerospace and defence landscape, who also contribute to the Space sector. About half of these are newly established startups that are looking to produce their own space missions (be it launch vehicles or satellites).

Over 2/3rd of the organizations mapped in the survey deliver products or services that can be classed as Tier-2 or lower. This phenomenon may match some of the other prominent Space sector value chains in geographies such as Europe or the US, where SMEs bring in their deep technology expertise in delivering particular subsystems for space missions. There is a definite increase in the number of private companies involved in offering subsystems for various space missions in India.

"India has the required provisions, evolving infrastructure, and young talented minds to master this cusp of space technology and evolve into a global leader in the sector. We need to ensure that we enable emerging companies with accurate know-how, profound knowledge, and expertise experience to close the gap between two worlds by unlocking new prospects with new stellar V+R technologies.**"**

Arun Rao
Senior Sales Director - Asia Pacific South (ASEAN & ANZ)
Dassault Systèmes

About 19 percent of the organizations surveyed contribute to the final delivery of subsystems for satellites, rockets and ground systems.

The upward mobility of companies from Tier-2 to Tier-1 and from Tier-1 to OEM is extremely challenging in a sector such as space, where both the size and scale of the organizations and the risk and investment needed to move up the value chain are significant barriers. Both the

Today, digital technologies are not only embedded in product development but also in the entire manufacturing process for components that fly on space missions.

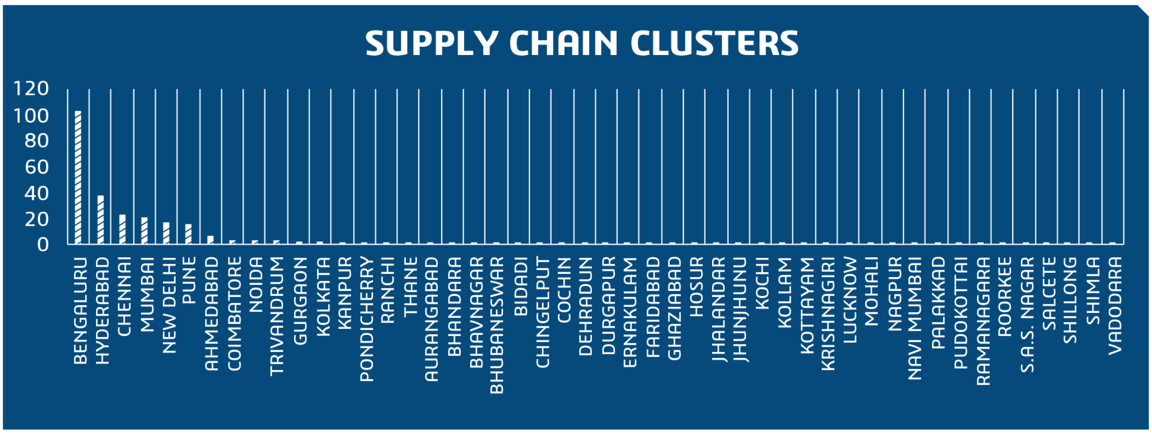


Figure 4: Breakdown of Indian space organizations by city location

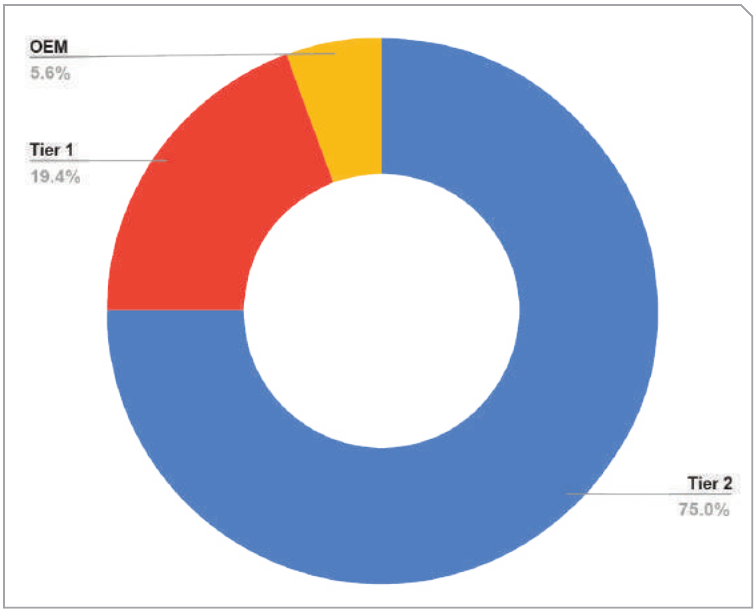


Figure 5: Breakdown of Indian space organizations by value chain position

There is a significant opportunity to mature the level of digitalization in the Indian space ecosystem, thereby supporting IP development for new space products and services that address commercial, scientific, and government needs globally.

size and scale analysis, as well as cluster and value chain analysis, conducted during this study indicate that the SME/large private industry segment will primarily target meeting growing volume requirements within government-driven missions, and will look to support the emerging NewSpace actors, by sharing their deep expertise in specific, space-relevant capabilities.

Role of digitalization in the Indian space sector

Digital technologies form the foundation of being able to produce original IP in the Space industry. Digitalization has the capability to empower organizations to produce state-of-the-art, innovative products and services. One of the markers of innovation in the Space sector is the use of digital technologies by organizations around the world, to catalyze the development of new products and services.

To understand the competencies of India's Space industry to produce such cutting-edge products, a survey was conducted to assess how these suppliers use digital technologies and tools to streamline the generation of new space products and services that meet strict precision, reliability, and quality standards.

Hence, the goal of the survey was to bring into view the degree of adoption of digitalization within the Indian space ecosystem.

Adoption of digital technologies

As a part of this survey, 93 respondents self-reported the level of expertise in digitalization within their organization (see Figure 6). Thirty-one percent and 35 percent of them reported that their use of digital technologies within their organization is at a beginner level and intermediate level respectively. Only 21 percent of them reported themselves as being at expert level.

How can NewSpace companies accelerate rocketry and satellite design and manufacturing with digital capabilities?

How exactly can NewSpace companies begin to drive the new frontier of satellite technology? The answer lies in the right business platform that helps them shorten rocketry and satellite development time to achieve first-time-right quality for successful launches.

The right business platform enables all of this by integrating different departments and

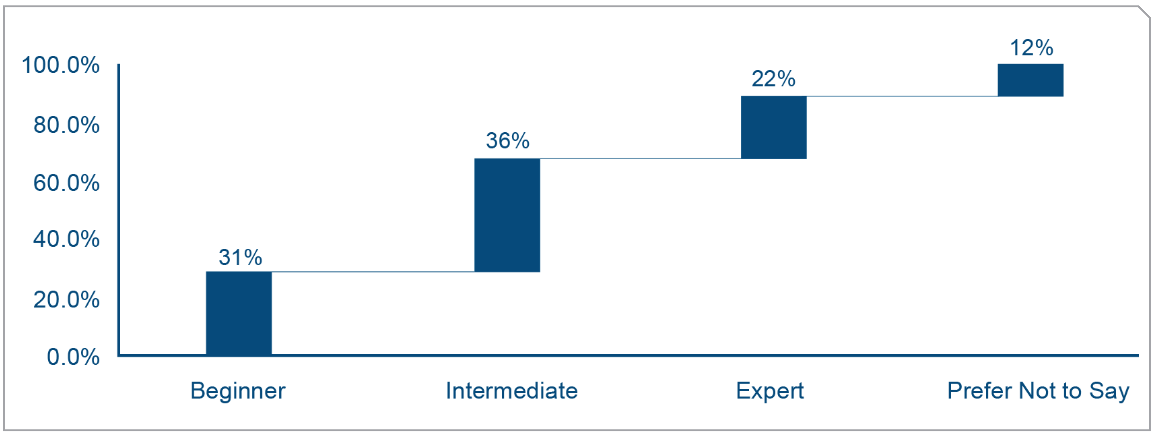
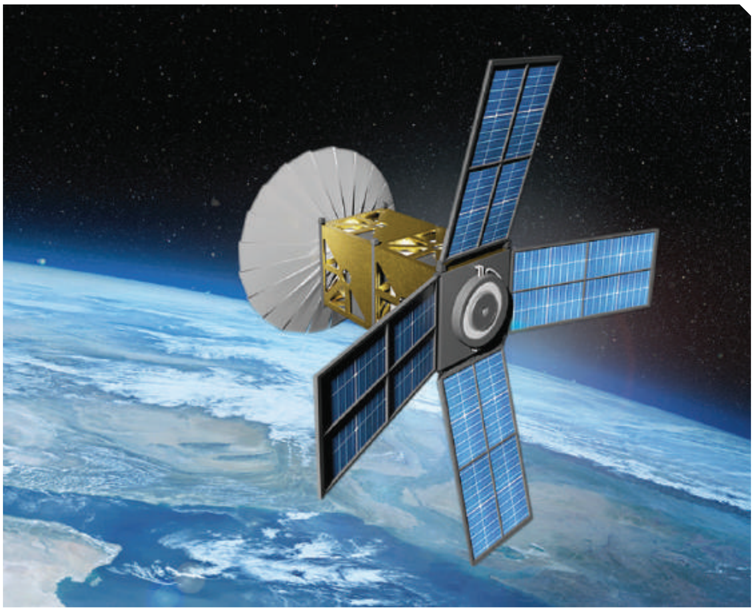


Figure 6: Breakdown of digitalization expertise within Indian space organizations



information while providing digital capabilities to accelerate design and manufacturing. When it comes to rocketry and satellite design, the right business platform offers digital mission engineering with the capability to reuse data and models from past projects instead of starting from scratch. Stakeholders can collaborate with a real-time overview of designs in development to achieve innovative, sustainability-focused results faster.
Then, advanced virtual simulation capabilities allow companies to accelerate the testing and validation process. When they are equipped with multi-scale and multi-physics simulation capabilities that can rapidly reproduce complex space systems, they can explore more options and address quality issues and launch risks earlier.
Because rocketry and satellite manufacturing involves customized production, agility becomes a crucial competitive edge. The business platform not only enables companies to optimize production plans but also allows them to respond quickly to changes. They can rely on a Virtual Twin of their physical operations to rapidly evaluate the impact of different decisions before implementing any plans or plan adjustments.
This ensures that they can stay on track for the best results on the shop floor and ultimately increase manufacturing speed without sacrificing quality.

Solution for faster and better satellite technology outcomes

The cloud-enabled 3DEXPERIENCE® platform is the integrated solution that NewSpace players need to succeed in the new frontier of satellite technology. It hastens their ability to design and manufacture sustainable first-time-right rocketry and satellite systems with the required quality at lower costs, and ultimately speeds up the delivery of satellites into orbit.
By integrating technology into product development, companies can accelerate the product lifecycle from concept to take-off and gain a critical first-to-market advantage. This is possible through a suite of powerful digital capabilities that include real-time collaboration, virtual simulation, optimized planning, and the virtual twin experience. The virtual twin experience is an accurate and executable virtual model of the physical operations that allows companies to evaluate multiple what-if scenarios with ease and speed.

Bottom line

India's Space industry has credible capabilities but needs exposure to international supply chains, to integrate into the global market. One of the crucial aspects to address in the coming years is the ability of suppliers to move from being the backbone of manufacturing to being able to design and develop their own IP. This is a necessary step for the Indian Space sector to be able to produce new, innovative, industry-relevant products and services that address both domestic and international needs.
One way to achieve this may be by incentivizing suppliers with specific (financial) instruments that can enable competition between them to produce original IP for specific technologies that are required for the next generation of space missions. Suppliers can also be provided with clear visibility into the procurement of specific state-of-the-art products & services locally, to enable investment locally or through Foreign Direct Investments (FDI), Joint Ventures (JVs), etc. The recent reforms being instituted by the Government of India clearly have the ability to accelerate the growth of the private Space sector in India. The rise in NewSpace in India is especially interesting and has the ability to propel companies that can start providing end-to-end products and services that cater not only to local demand but are also globally competitive.

The adoption of digital technologies will be the backbone of the evolution of the supplier landscape in India (for both the traditional and NewSpace segments) from manufacturing partners to product and service owners.

HELPING BUILD THE NATION

Chirag Doshi, Managing Director & CEO, Walchandnagar Industries Ltd (WIL), in a highly insightful interview with MMI's Editor-in-Chief Soumi Mitra, shares an overview of the company, its pioneering achievements in the Indian Engineering industry, contribution to nation-building activities, journey of the company's involvement in the moon missions, and the interesting initiative of building an industrial township for its personnel.

Source: WIL

Chirag Doshi, Managing Director & CEO, Walchandnagar Industries Ltd

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

Kindly provide a brief overview of Walchandnagar Industries Ltd and the key industries and markets the company operates in.

Walchandnagar Industries Ltd (WIL) is a 115-year-old diversified heavy engineering and manufacturing company that has a strong presence in various core sectors, including Aerospace, Defence, Nuclear Power Plant Equipment, and industrial products like Gearboxes, Castings, Centrifugal Machines and Crushing & Grinding Equipment (for industries like Cement, Chemicals, etc). WIL was founded by the patriotic industrialist Seth Walchand Hirachand, who was among the very few captains of the industry in pre-independence India. Continuing his legacy and work, WIL constantly strives to play its role in India's nation-building process. WIL has three manufacturing locations in India with the mother plant located at Walchandnagar (130 km from the city of Pune).

WIL is known for pioneering achievements in the Indian Engineering industry and for its contribution to nation-building activities. Please tell us about your 50+ years of association with DAE, NPCIL, BARC, ISRO, and the Ministry of Defence.

WIL's association with many of the strategic Government agencies mentioned dates back to about five decades ago. This association has been a prime example of Public-Private Partnership (PPP) followed by select

Government bodies in India like the ones mentioned. WIL has worked with these agencies during an era when access to technology was a big constraint. The manufacturing of such niche equipment – hardware for launch vehicles (SSLV, PSLV, GSLV); equipment for nuclear reactors; marine gearboxes for naval frigates, corvettes, submarines, missile hardware/launchers, etc had an element of trial and error involved both in terms of design development as well as manufacturing practices (welding, fabrication, machining, etc). WIL has displayed a deep commitment to the philosophy of nation-building by partnering with these agencies since its inception and is deeply embedded as a strategic partner today. Some of the major equipment/sub-assemblies supplied by WIL are as follows:

Aerospace: Solid Propellant Motors, Nozzle End Segments, and Strap-On Motors.

Missiles: Motor-casings for tactical and strategic missiles.

Defence: Mobile Missile Launchers, Mobile Bridges, Containers and Launchers.

Nuclear: Heat Exchangers, Calandria, End Shields, and Shield Tanks.

> "Walchandnagar Industries is privileged to have been associated with the prestigious space missions of Chandrayaan-1, Chandrayaan-2, and Mangalyaan and shared the moments of glory. WIL's key contribution to these prestigious missions is the S139/S200 booster motor casings and the strap motors of the launch vehicles used in these missions."
>
> ***Chirag Doshi***
> ***Managing Director & CEO***
> ***Walchandnagar Industries Ltd***

Kindly take us through the journey of your involvement in the Maiden Moon missions 'Chandrayaan-I,' 'Chandrayaan-II,' 'Chandrayaan-III,' Mars Orbital Mission Mangalyaan, and India's Intercontinental ballistic missile (ICBM) program 'Agni V'.

WIL feels honored to be a trusted partner for various strategic and critical components of ISRO that it has been supplying over five decades for all space programs since SLV-3.

Our journey of involvement in the Indian space mission fills me with a deep sense of pride and gratitude. We, at WIL, are proud of our association with DRDO and our modest contribution towards many ambitious programs at various stages of development like the Agni series.

This path that we have walked together with ISRO/DRDO is marked by dedication, and unwavering teamwork coupled with trust, support and guidance from our valued customers.

Walchandnagar Industries is privileged to have been associated with the prestigious space missions of Chandrayaan-1, Chandrayaan-2, and Mangalyaan and shared the moments of glory.

WIL's key contribution to these prestigious missions is the S139/S200 booster motor casings and the strap motors of the launch vehicles used in these missions.

Please help us understand the critical components your company provided for each project and how you were equipped to make such significant contributions.

To give an overview, the core stage of the launch vehicle PSLV used in Chandrayaan-1 and the MOM mission is the S139 Booster which is augmented by solid rocket strap-on motors (PS0-XL) to augment the thrust provided by the first stage. Also, GSLV MKIII/LVM3 (used in Chandrayaan-2 & 3) has two S200 solid rocket boosters to provide the huge amount of thrust required for lift-off.

Talking specifically about the recent LVM3 Vehicle of Chandrayaan-3 mission, it was at WIL's exclusive facility that the critical booster segments S200 comprising of three segments namely the Head-end segment, Middle segment, and Nozzle end segment of 3.2 m diameter and totaling 20 m length were manufactured and then proof pressure tested. Other hardware that we contributed to this mission included Flex nozzle control tankages and S200 Flex nozzle hardware.

Our established state-of-the-art manufacturing facilities and robust quality systems help us give extraordinary service and experience while taking up large-sized jobs having complex geometry and meeting stringent customer specifications. What propels us to the future is our young team of passionate engineers with domain knowledge groomed to a continuous improvement culture in processes and manufacturing of Aerospace-grade materials.

Since our division's modest inception in the early 1970s,

WIL feels honored to be a trusted partner for various strategic and critical components of ISRO that it has been supplying over five decades for all space programs since SLV-3.

it's remarkable that we now have over 40 percent of our resources, including both personnel and machinery, dedicated exclusively to supporting India's space program. This commitment has enabled us to effectively manage production concerns and meet the rising demand.

The order from Vikram Sarabhai Space Centre of ISRO (Thiruvananthapuram) was a significant milestone for your aerospace business. It is reported that the order was worth ₹77.20 crore and was the second-largest single order from ISRO and the largest as far as the GSLV-M KIII launch vehicle is concerned. How does WIL stand tall in terms of R&D and engineering innovation?

While the order that you have mentioned was definitely a landmark achievement for WIL in terms of numbers, it was even more important since ISRO reposed faith in WIL as a strategic partner for its upcoming critical missions. This confidence stems from the fact that we have been ISRO's partner right since the inception of India's space program. In terms of engineering and innovation, WIL's contribution has been in the area of development of specific welding, fabrication and machining practices to suit the needs of exotic materials from which such space flight hardware is manufactured. Today, WIL has the capability of not just manufacturing critical launch vehicle components but also testing them at our in-house testing facilities (Proof Pressure Testing Facility). WIL has a Welding Development Section (WDS) whose mandate is to constantly evolve our fabrication practices to meet stringent needs. We place a strong emphasis on the qualification of welders and the training of new recruits to ensure the establishment of a robust skill pipeline. WIL is also cognizant of new materials like composites, which may increasingly start playing a bigger role in missile and space flight hardware. Understanding and absorption of nuances around forming, autoclave operations, etc is something we are constantly striving for.

Today, WIL has the capability to manufacture critical launch vehicle components and also test them at its in-house testing facilities. It also has a Welding Development Section (WDS) to constantly evolve its fabrication practices to meet stringent needs.

> "With factories in India and abroad increasingly working on the paradigm of 'interconnectedness', it is high time that sensors, granular capturing of operating, and ambient data be a defining feature of our machine tool manufacturers. Machine Learning and AI concepts like failure predictability, fine-tuning of maintenance schedules, etc would be the next wave of offerings."
>
> ***Chirag Doshi***
> ***Managing Director & CEO***
> ***Walchandnagar Industries Ltd***

Kindly provide us with comprehensive information about the industrial township of Walchandnagar. Please share its key features, infrastructure, industries present, and the overall development and significance of the township.

Walchandnagar has always been conceptualized as an industrial township since the inception of WIL, where talent from all across India could work and live together. Today, WIL has a total manpower strength in excess of 2,000, and most of our staff members and workmen stay within the township that has a solid infrastructure to cater to the living, safety, social and recreational requirements of its inhabitants. All modern amenities including a large central parade ground, sports facilities (tennis, badminton, swimming, etc), ample walking spaces and cycling tracks, etc make the township an ideal place to live a balanced and secure life. English and Marathi medium schools, which are known for their academic reputation and extra-curricular reputation, ensure that the children of all staff and workmen get the best possible academic facilities comparable to urban centers. A spirit of community and social welfare has always been inculcated since inception, and it is in the same spirit that all major national events and festivals are celebrated with a lot of fanfare. In order to ensure good health of its inhabitants, the township is equipped with a state-of-the-art hospital as well.

Apart from the township, the entire town has also seen the development of a supportive ancillary industry to cater to the needs of the mother plant. MSME units like fabrication and welding units, and machine shops are qualified facilities that ensure a steady augmentation of capacity and smoothening of man/machine requirements from time to time. This has also led to employment opportunities in the area. All in all, the mother plant at Walchandnagar and the township are a classic example of a progressive and socially conscious manufacturing ecosystem.

> "Most domestic manufacturers prefer Indian brands of machine tools for their capital requirements. This has been true to a larger extent for WIL as well. We foresee substantial capacity addition going ahead given the fact that our order book in core sectors – Defence, Nuclear, Aerospace, and Crushing & Grinding is slated to increase and our preference will always be Indian brands that are renowned for their versatility, robustness, and exacting manufacturing standards."
>
> ***Chirag Doshi***
> ***Managing Director & CEO***
> ***Walchandnagar Industries Ltd***

As an industry expert in the manufacturing industry, how do you see the growth of the Indian Manufacturing sector, with a particular focus on the Machine Tools sector?
The direct correlation between manufacturing activity and capital goods demand (especially machine tools) is very well understood. As India strives to increase the share of manufacturing in its present GDP pie, there is no doubt that the Machine Tools sector will see a concomitant growth. Sectors like Automotive (E-Vehicles in particular), General Engineering (Pumps/Valves/Compressors/Gears), Electronic Hardware Manufacturing/Assembly, and Heavy Engineering (Defence /Other Core Sector Equipment) are all seeing multifold increase in investments and captive demand. This will invariably lead to an increase in the requirements of machine tools. The overall policy with enabling steps like Production Linked Incentive (PLI), ever increasing budgetary allocation to infrastructure development, etc., also seems to be moving in the right direction. As has been commonly seen post pandemic India has found its place under the sun as a reliable manufacturing partner. In general this should augur well for the Machine Tools sector.

Could you please provide us with insights into the trends, challenges, and opportunities prevalent in the machine tools manufacturing landscape? How does your company contribute to the advancement and growth of the Machine Tools sector in the country?
One of the basic advantages for the Machine Tools sector in India would be its very high captive consumption. Unlike other traditional machine tools manufacturing powerhouses that manufacture such equipment primarily for exports, India presents a tremendous captive base given its projected growth in manufacturing. Most domestic manufacturers prefer Indian brands of machine tools for their capital requirements. This has been true to a larger extent for WIL as well. WIL itself contributes significantly to the value chain of Indian machine tools manufacturers by supplying heavy CI castings from its Foundry unit. Some of the biggest names in the domestic Machine Tools industry – BFW, Micromatic, and LMW happen to be our esteemed customers. Even in this part of the value chain, we see a discernible shift away from erstwhile sources like China and a much deeper preference for India instead.

We would like to hear your perspective on the capabilities of machine tools players in India. From your experience and interactions in the industry, what is your assessment of their strengths and areas for improvement? Are there any changes or advancements that you believe are crucial for the growth and competitiveness of the Machine Tools sector in India?
Indian machine tools manufacturers have already evolved a great deal as far as contemporary requirements of manufacturers are concerned. I would, however, personally be delighted to see them making a much deeper mark in value-added features like Internet of Things (IOT). I would also like to see Indian machine tools manufacturers gradually contributing to additive manufacturing so that we have a footprint in 3D printing which represents a diametrically opposite philosophy to the traditional role of a machine tool, i.e., the removal of excess material. As the world moves towards manufacturing, which will involve faster prototyping and optimum usage of resources, it is these technologies that need to be embedded in our products going ahead.

> **Unlike other traditional machine tools manufacturing powerhouses that manufacture equipment primarily for exports, India presents a tremendous captive base given its projected growth in manufacturing.**

LEAVING A MARK ON THE MOON

amace solutions, an emerging Indian manufacturer of metal 3D printing machines and part of the AceMicromatic Group which is one of the largest machine tool conglomerates in the country, is proud to have worked alongside the Indian Space Research Organisation (ISRO) in leaving an indelible mark on space exploration.

Source: amace solutions Pvt Ltd

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The first images from the Chandrayaan-3 mission, India's ambitious lunar venture came in recently and filled our nation with an immense sense of pride. This was amplified by the visuals showing the Pragyaan rover leaving imprints of the national emblem and the ISRO logo as it clambered on along the moon's surface. amace solutions is proud to have 3D printed this national emblem or 'India's Signature on the Moon' that sits on the wheels of the Pragyaan Rover on its indigenously developed metal 3D printing machine, the STLR 400.

The Chandrayaan-3 mission is the third lunar exploration mission undertaken by the Indian Space Research Organisation (ISRO). Following the remarkable successes of Chandrayaan-1 and Chandrayaan-2, ISRO set its sights on Chandrayaan-3 with renewed determination. One of the distinctive aspects of this mission was ISRO's aspiration to employ emerging technologies from within the country, thereby showcasing India's ability to contribute cutting-edge solutions to space exploration.

From being a consumer to solutions provider

The integration of the national emblem on the rover's wheels might seem like a mere symbolic gesture, but it encapsulates a significant milestone for India's space exploration narrative. By harnessing amace solutions' advanced 3D printing technology and many other advanced homegrown innovations, ISRO aimed to showcase the nation's ability to leverage cutting-edge homegrown technologies in space missions. This initiative underscores India's shift from being solely a consumer of technology to becoming a producer of innovative solutions.

For the team at amace to be associated with this historic mission in any capacity is a matter of great pride, and it is something that each and every member of the team amace holds very close to their hearts. The team at amace, under the guidance of the team from ISRO, meticulously crafted a replica of the national emblem that met the stringent requirements for space travel. The material used was carefully chosen for its durability, resistance to extreme lunar conditions, and adherence to stringent weight restrictions. The 3D printing process allowed for intricate detailing and precision,

Source: amace solutions Pvt Ltd

“The team at amace, under the guidance of the team from ISRO, meticulously crafted a replica of the national emblem that met the stringent requirements for space travel. The material used was carefully chosen for its durability, resistance to extreme lunar conditions, and adherence to stringent weight restrictions.**”**

Dr Vishwas R Puttige
Business Head
amace solutions Pvt Ltd

ensuring that every facet of the emblem was faithfully recreated.

Advantage 3D printing

This successful collaboration between ISRO and amace solutions exemplifies the profound impact of merging emerging technologies with space exploration. 3D printing, once considered a niche technology, has rapidly evolved to find applications in various sectors, including Aerospace. Its ability to manufacture complex geometries, reduce material wastage, and facilitate rapid prototyping makes it an ideal fit for crafting components meant for space missions.

As India’s signature now adorns the moon’s surface through the 3D-printed national emblem on the Pragyaan rover’s wheels, it stands as a testament to the nation’s scientific acumen and technological prowess. The Chandrayaan-3 mission not only extends India’s footprint on the lunar landscape but also signifies the country’s readiness to embrace emerging technologies to achieve its ambitions.

Source: amace solutions Pvt Ltd

Team amace solutions will be present at EMO Hannover from September 18–23, 2023 in Hall 16 Booth D 33 at Hannover Fairground.

FORTIFYING DEFENCE CAPABILITIES

Innovation in materials has emerged as a critical enabler in achieving several national objectives such as self-reliance and innovation in the defence sector and ensuring the safety of soldiers. CUMI, with its focus on material science, nanotechnology, and polymer chemistry and commitment to research and development, is pushing the boundaries of material technology and creating new-age materials that hold the potential for breakthroughs in defence applications.

Source: CUMI

SUBBU VENKATACHALAM
Head of Marketing
Carborundum Universal Ltd

The Ministry of Defence in India recently approved the fourth Positive Indigenisation List (PIL), thereby underscoring the nation's commitment to self-reliance and innovation in the Defence sector. This list, consisting of more than 900 defence components and sub-systems, marks a significant stride towards reducing dependence on imports and fostering indigenous manufacturing, technology, and job creation.

In the face of an ever-changing and volatile world, ensuring the safety of soldiers stands as a paramount concern. Innovation in materials has emerged as a critical enabler in achieving these objectives.

Role of material science in defence

From personal armor that protects soldiers from high-velocity projectiles and explosive devices to advanced ceramics and ballistics solutions in vehicle armor, materials science is a lynchpin in enhancing protection, performance, and battlefield advantage.

The landscape of defence materials has evolved significantly, driven by the demand for tough, lightweight, and specialized solutions. Innovations in armor, stealth, and nanotechnology-enabled materials have revolutionized the capabilities of defence equipment, paving the way for advanced protection and resilience against emerging threats. Materials like silicon carbide and alumina have elevated the lethality and payload capacity of missiles, while carbon fiber reinforced polymers (CFRP) have transformed the agility and maneuverability of unmanned aerial vehicles (UAVs). The ability to develop and harness these materials is central to achieving superiority on the global stage.

CUMI's innovations and performance in defence

With a focus on material science, nanotechnology, and polymer chemistry, CUMI has

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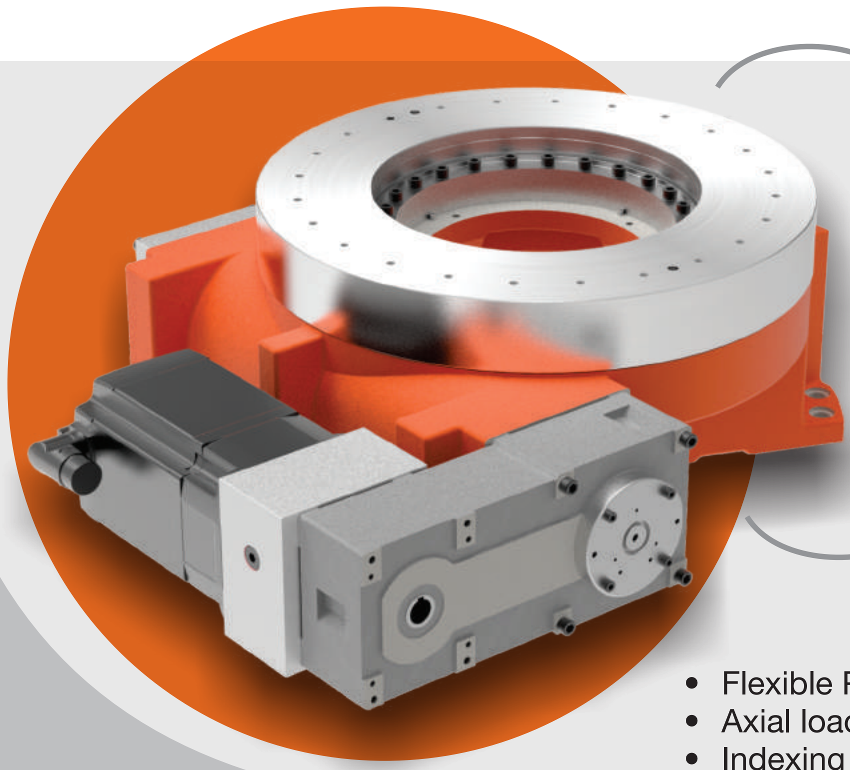
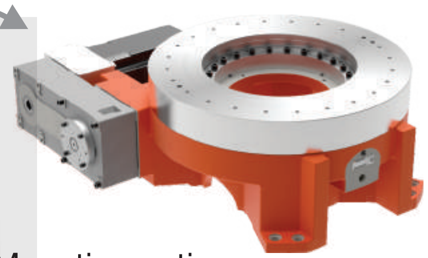
NEW

SOLUTION FOR NEXT GENERATION AUTOMATION SYSTEM

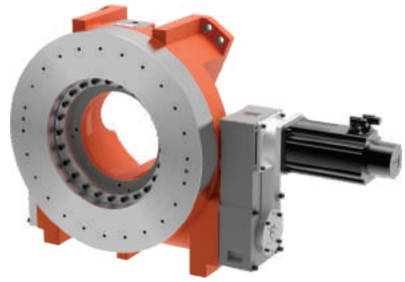
FIRBOTOR VR.NC ROTARY TABLE

MORE PRECISE, **STRONGER,** *FASTER*





Mounting option
Horizontally & Vertically



- Flexible Positioning
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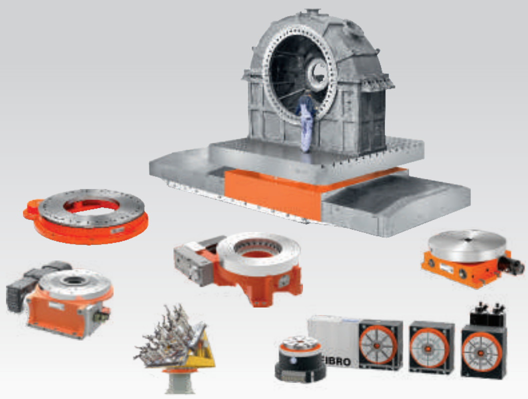
Standard Parts for
Die & Mould Making



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emerged as one focusing on creating new-age materials that hold the potential for breakthroughs in defence applications. CUMI's dedication to research and development aligns seamlessly with the nation's drive for self-reliance and indigenous manufacturing.

CUMI's contributions extend beyond research, encompassing collaborations with academia and industry. These partnerships serve as crucibles for innovation, harnessing the collective expertise of both sectors to push the boundaries of material technology. Initiatives like the Centre of Excellence at the Digital University of Kerala exemplify CUMI's commitment to exploring the transformative potential of materials like Graphene and propelling India's leadership in cutting-edge materials.

Initiatives like the Centre of Excellence at the Digital University of Kerala exemplify CUMI's commitment to exploring the transformative potential of materials like Graphene and propelling India's leadership in cutting-edge materials.

Applications of innovative materials in defence

The integration of advanced materials into various defence applications is redefining the capabilities of armed forces:

Personal armor

Personal armor, fortified with ultra-fine silicon carbide, high-strength aramid fibers, and zirconia-toughened alumina, disperse and absorb energy from threats, ensuring the safety of soldiers. CUMI produces high-purity, ultra-fine silicon carbide sub-micron powders, essential for their advanced ceramic compounds. These powders are a crucial element in CUMI's dependable ballistic solutions. Unlike traditional heavy metal armors, CUMI's modern alternatives utilize lightweight ceramic materials, such as alumina, silicon carbide, and zirconia-toughened alumina in the form of tiles/segments/panels, etc. These ergonomic solutions are customizable in size and shape, providing effective and comfortable protection.

Vehicle armor

In vehicle armor, advanced composites are revolutionizing protection by safeguarding against blasts and ballistic threats, enhancing the mobility and survivability of troops. CUMI specializes in ballistic protection for vehicle floor and side panels, as well as offering hybrid composites for safeguarding vehicle undercarriages against blasts. The advanced lightweight ceramic materials are engineered to provide unparalleled ballistic and blast-proof protection for armored vehicles. CUMI's ceramic product line for battle tanks encompasses hatches, top deck covers, side plates, and fuel tank covers.

Source: CUMI

Unmanned aerial vehicles

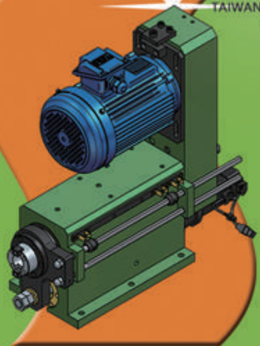
Unmanned aerial vehicles (UAVs) owe their agility and maneuverability to CFRP, which offer exceptional strength-to-weight ratios. CFRP not only extend flight performance and operational range but also reduce power consumption, increase payload capacity, and enhance stealth capabilities. With a rich legacy spanning over fifty years, CUMI's Composites Manufacturing Division boasts extensive expertise in designing, manufacturing, and testing composites. From landing gears to payload holders, CUMI leverages state-of-the-art composite technology for Unmanned Aerial Vehicles (UAVs). Its offerings encompass a range of solutions, including CFRP tubes, sheets, and tailor-made composite structural components designed specifically for UAVs.

CUMI also recently partnered with drone maker ideaForge Technology to develop nanomaterial-reinforced composite parts for drones. These materials offer features such as higher mechanical strength, greater toughness and stiffness, better electrical and thermal conductivity, superior fire retardancy, and higher barrier to moisture and gases. Nanocomposites also offer unique design possibilities, which offer immense potential in creating materials with desired properties for specific applications. The use of the appropriate nanomaterials can help build drones that are smaller, lighter, stronger, and more durable, among others.

HANN KUEN
MACHINERY & HARDWARE

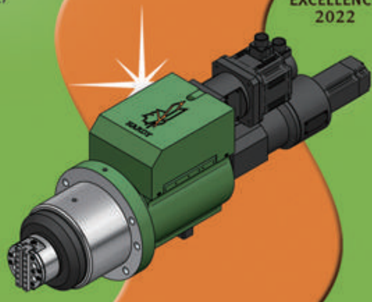
HARDY

TAIWAN EXCELLENCE 2017



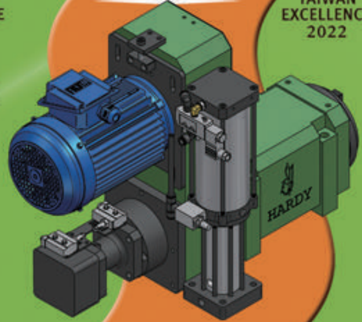
Servo Type Drilling / Tapping
Spindle Head Unit

TAIWAN EXCELLENCE 2022



Built-in Motor Facing Head Unit - Flange Type

TAIWAN EXCELLENCE 2022



Boring/Milling Head Unit with ATC

TAIWAN EXCELLENCE 2020

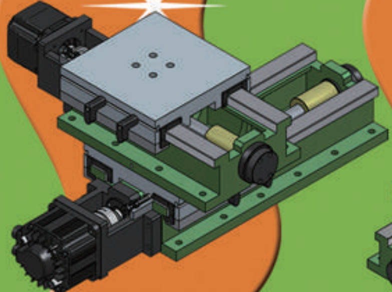
Built-in Motor Spindle Unit

Built-in Spindle

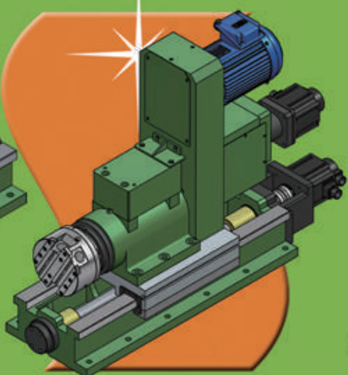
Belt Driven Spindle

Belt Driven Spindle Coolant

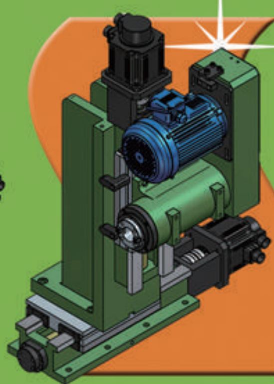
Direct Drive Spindle



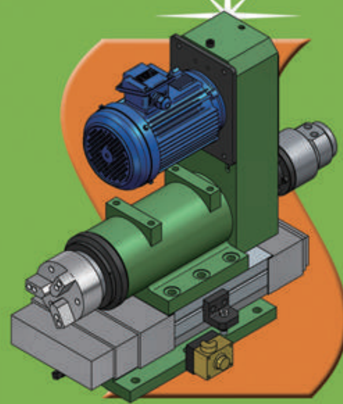
XY Servo Hardness Slide Unit



Servo Facing Head +
Servo Ball Screw Slide Unit



XYZ Servo Slide Table + Milling Head



3-Jaw Chuck Spindle + Slide Unit

HARDY

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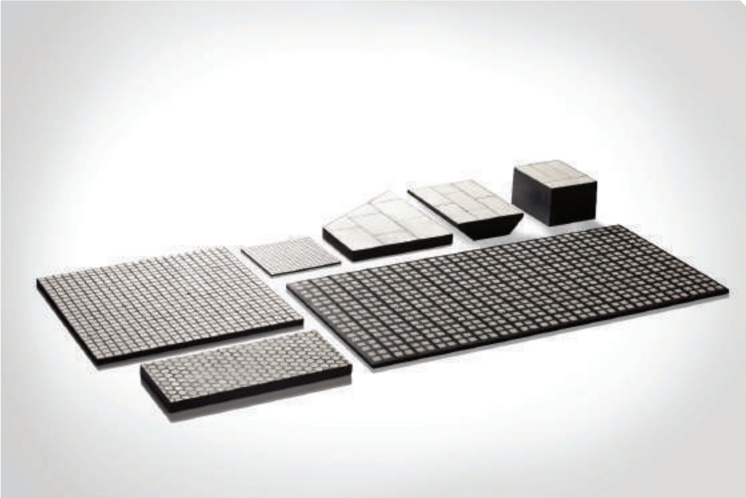
Missiles

Modern defence relies on advanced ceramics in missiles for precision targeting and enhanced capabilities. Advanced ceramics offer strength, hardness, and temperature resistance, enabling lightweight yet potent missile systems. Aerospace and Defence sectors experience progress with microwave ceramics, driven by leaders like CUMI. Ceramic radomes protect critical electronic equipment from extreme temperatures during the flight of the missile. Other innovations span structural ceramics for crucial missile parts, metallized ceramics for triggered spark gaps, and vital spare components like ceramic fasteners, highlighting ceramics' transformative role in these industries.


Source: CUMI

Unlike traditional heavy metal armors, CUMI's modern alternatives utilize lightweight ceramic materials, such as alumina, silicon carbide, and zirconia-toughened alumina in the form of tiles/segments/panels, etc.

Futuristic materials: Graphene and Phase Change Materials

The trajectory of material science innovation extends beyond the horizon, encompassing futuristic materials, like Graphene and Phase Change Materials (PCMs). Graphene, a single layer of carbon atoms arranged in a hexagonal lattice, boasts extraordinary properties that promise revolutionary advancements in various industries, including Defence. Its exceptional strength, thermal conductivity, and electrical conductivity make it a potential game-changer in lightweight armors, energy storage systems, and even advanced electronics for military applications.

PCMs, with their ability to store and release thermal energy, offer intriguing possibilities for enhancing soldiers' comfort and survivability in extreme conditions. By absorbing excess heat during periods of high temperature and releasing it when temperatures drop, PCMs can contribute to innovative clothing and gear, enabling soldiers to operate effectively in diverse environments. PCMs are also being used to build barracks for soldiers serving in areas with extreme weather conditions.


Source: CUMI

Towards self-reliance and innovation

In the dynamic arena of defence, the role of material science remains paramount in ensuring the safety, efficacy, and superiority of armed forces. The recent strides made by India in pushing for the indigenization of defence materials reflect a commitment to self-reliance and innovation. CUMI's innovations in material science underscore the nation's potential in creating cutting-edge solutions for defence challenges. The applications of innovative materials, from advanced ceramics for missiles, lightweight ceramics for personal armor to composites for UAVs, have reshaped the landscape of defence capabilities.

As we peer into the future, the evolution of material science holds immense promise. Graphene and PCMs offer a glimpse of the transformative potential that lies ahead. By nurturing collaborative efforts between the Government, private sector, and academia, India is poised to solidify its position as a leader in cutting-edge materials, fortifying its defence capabilities and securing a safer tomorrow for its citizens.

ENGINEERING AN INDIGENOUS FUTURE

Renowned for being wholly indigenous, Electropneumatics & Hydraulics (India) Pvt Ltd embodies the spirit of 'Make in India'. Its transition from a company making pneumatic valves to one with a diversified product portfolio of sophisticated forming machines to missile launchers deserves acknowledgment as a significant contribution to national growth and advancement. Here's delving into its story and exploring its impact on the Indian industry….

All images source: Electropneumatics & Hydraulics Pvt Ltd

Electropneumatics & Hydraulics (India) Pvt Ltd (Electropneumatics) has grown to be a symbol of innovation, commitment, and indigenous excellence. The family-owned and managed enterprise is a renowned name in the realm of engineering. Located in Chakan, Pune, the company boasts a sprawling 65,000 sq mt land area, with a built-up space spanning 21,000 sq mt. Accredited by the Government as an R&D hub and holding certifications under ISO 9001:2015 and IATF 16949, the company has been 100 percent indigenous.

"From a modest beginning in 1972, by our late Founder Chairman, Antony Rasquinha, to a company of five business divisions, it has indeed been a journey of landmarks," says Ingrid Rasquinha, Joint Managing Director, Electropneumatics & Hydraulics. "Our growth from a company making pneumatic valves to one with a diversified product portfolio of sophisticated forming machines to missile launchers gives us a lot of satisfaction and a sense of pride. It has been a journey of progressive technology development and contribution to the Indian industry and the nation at large, especially the defence ecosystem."

Defining milestones

The journey of Electropneumatics has been punctuated by pivotal milestones that have sculpted its trajectory. "Being a company whose foundation is technology and indigenous R&D, the last 50 years have been

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> **"**Our growth from a company making pneumatic valves to one with a diversified product portfolio of sophisticated forming machines to missile launchers gives us a lot of satisfaction and a sense of pride. It has been a journey of progressive technology development and contribution to Indian industry and the nation at large, especially in the defence ecosystem.**"**
>
> **Ingrid Rasquinha**
> **Joint Managing Director**
> **Electropneumatics & Hydraulics (India) Pvt Ltd**

dotted with several milestones, with a large chunk of our products/technologies being India's first," notes Rasquinha, sharing the company's three noteworthy milestones:

Shift to Hydraulic Presses in the 70s: A decisive pivot from fluid power products to hydraulic presses was a big leap for Electropneumatics. "Starting out with simple hydraulic stamping presses, Electropneumatics introduced newer forming technologies and presses for deep drawing, powder and slurry compacting, honing, specialized forming, chassis and infrastructure building, and more year-on-year," she informs. Along with these products, there has been a constant indigenous upgradation of machine concepts from conventional hydraulics to servo hydraulics to servo mechanical and now even all-electric, along with varying degrees of automation, complexity, and Industry 4.0-friendly features.

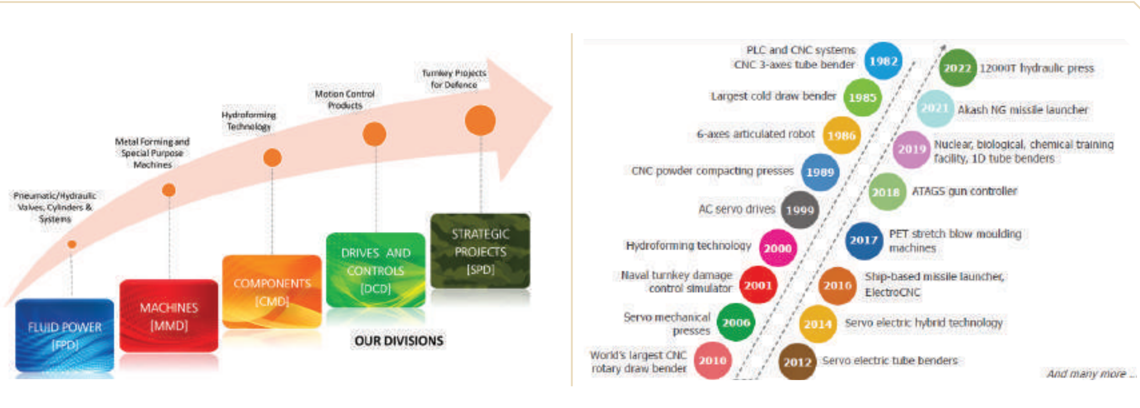
Self-Sufficiency in Electronics in the 80s: Recognizing the need for self-reliance in electronic components, the company embarked on the journey of developing its motion control products, including PLC/CNC systems. "In the 80s, the Indian industry, including our company, was facing a huge difficulty in procuring electronic items (like servo drives, PLC/CNC systems, etc.), and that was limiting our advancement into more sophisticated products," explains Rasquinha. Needing to be self-sufficient, the company took up the challenge of developing its own motion control products like PLC/CNC systems for the first time in the country. Today, it has a world-class facility and strong electronic expertise in-house that helps it develop intimidating products and technologies.

Foray into Defence in 2000: The company's foray into the Defence sector commenced with the supply of AC servo drives for Akash Surface-to-Air Missile launchers and a Damage Control Simulator for the Indian Navy. Presently, it offers comprehensive defence solutions, such as gun systems and support equipment, missile launchers, and turnkey projects, right from design concept to execution. "We have developed the requisite design and manufacturing capabilities in all engineering domains to meet our customers' stringent MIL norms," shares Electropneumatics Joint MD.

Honing strengths

Electropneumatics' comprehensive indigenous capabilities, encompassing mechanical, electrical, hydraulics, electronics, and software, form the bedrock of its ability to innovate across a spectrum of solutions. From fluid power products to hydraulic presses, motion control systems, hydroforming components, and even complete defence turnkey projects, many of which represent pioneering, import-substitute solutions for India.

> **The journey of Electropneumatics has been marked by key milestones, including a shift to hydraulic presses in the 70s, achieving self-sufficiency in electronics in the 80s, and a significant foray into the defence sector in 2000.**



Electropneumatics' strategy revolves around the principle that 'a happy customer is the best marketing strategy'. It prioritizes superior technology, quality products, and exceptional after-sales service, including AMC/PMC services.

The infrastructure encompasses:

- A proficient design and engineering team employing the latest 3D modeling, FEA, multi-body dynamics software for structural analysis, and advanced hydraulic, electrical, and electronic software for system design;
- A heavy fabrication shop capable of handling up to 100 T single-piece fabrications in all materials including MIL grade;
- A CNC machining facility to machine large structures, critical parts, and tools;
- Assembly and testing units for hydraulic cylinders, power packs, and electrical panels;
- An ESD-safe, clean manufacturing and testing facility for industrial and MIL grade servo drives, motors, and PLC/CNC systems;
- A well-equipped production and assembly facility for all its divisions with experienced personnel;
- Pan-India sales and service centers have trained engineers and technicians to cater to the company's customers' needs.

All for indigenization

Electropneumatics is a strong technology-oriented company with indigenization as a core value since its inception. Rasquinha elaborates on how being 100 percent indigenous has propelled continuous innovation in the company's newer technologies and products. "R&D is in our DNA and it is what drives us to constantly transform our products. We relentlessly scan the globe and brainstorm internally on how to upgrade/enhance our products so that we can provide our customers/the industry at large with world-class technologies at affordable prices, thus removing dependence on imports. Our focus is always 'Make-in-India' for India and for the world," she adds.

Electropneumatics has continuously focused on research and development. The company is a DSIR-recognized in-house R&D center.

Hydroforming is one such technology among the several that the company has pioneered in India over the last five decades. "Twenty years back, we identified this technology that we believed would be a game changer in the Automotive sector since the parts produced displayed increased strength-to-weight ratio that was needed to meet the demanding fuel economy and crash norms of the time."

It invested significantly in this and despite resistance to acceptance for almost a decade, pursued it because the company believed in its value to its automotive customers. "Finally, it got accepted and assimilated into chassis and structural and exhaust parts that could not be efficiently produced by other processes. Today, we supply a large number of parts in India and abroad," she shares.

Attuned to customers' needs

In an era marked by market volatility, Electropneumatics has honed a set of strategies to remain finely attuned to its customers' ever-evolving needs. As Rasquinha mentions, the company's approach centers on a fundamental principle: "A happy customer is the best

marketing strategy." At the heart of the company's strategy lies a two-pronged commitment: superior technology and quality products, coupled with an unwavering emphasis on after-sales service.

"We take responsibility for our products not just during warranty but for their life and also provide Annual Maintenance Contracts (AMC)/Preventive Maintenance Contracts (PMC) services," she points out. "We listen to the voice of the customer, take their complaints and requirements seriously, and keep working to make our products a delight to use and maintain."

Amidst evolving geopolitical dynamics and an emerging global scenario, Electropneumatics' one key focus area has been exports. The company has exported to over 30 countries and is intensifying its marketing efforts. "We are now concentrating on increasing business in a few target countries by participating in exhibitions, establishing local partners, and aligning our products with country-specific requirements," she informs.

Empowering communities

Electropneumatics goes beyond the realms of business to make a significant impact on the community by fostering skill generation and development.

Within the organization, the company prioritizes the growth of its employees. It implements individual road mapping, succession planning, and continuous skill assessment, enhancement, and exposure to best practices. "The idea is to empower people at every level for quick decision-making and progressive thinking on a continuous basis," stresses Rasquinha.

Electropneumatics also strongly believes in giving back to society and works for the welfare of the community by creating avenues and facilities for education, skill generation, community empowerment, etc. Its commitment to community welfare includes:

Pius Memorial School: The school has been established for educating not just the children of employees but also of local residents. There are a total of 2,500 children as of now. This initiative opens doors to quality English education for those who might not otherwise have had the opportunity. "To see our blue-collar employees' children today as engineers, chartered accountants, and well-placed in life, improving the living standard of their family brings us the greatest satisfaction," shares the Joint MD.

Rasquinha-Don Bosco Technical Training Centre: This center offers technical and vocational training to local communities and villagers in remote areas with limited access to education. It equips them with valuable skills, fostering self-sufficiency and deterring them from undesirable activities.

The company's commitment to innovation led it to pioneer hydroforming technology in India in 2000. Despite initial resistance, it persevered, and today, it supplies a significant number of parts both in India and abroad using this game-changing technology.

FANUC INDIA OPENS A NEW TECHNOLOGY CENTER IN CHENNAI

The new 67,000 sq ft facility, built on a 4-acre land in Sriperumbudur, Chennai, is equipped with all essential infrastructure and resources, and the building is designed to be earth-friendly.

Source: FANUC India

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FANUC India, a leader in Factory Automation, inaugurated its new Technology Center in Sriperumbudur, Chennai on August 4, 2023. The facility was inaugurated by Dr Yoshiharu Inaba, Chairman, FANUC Corporation. Headquartered in Bengaluru, FANUC India has been supporting the Manufacturing industries in the Indian subcontinent for more than 30 years.

FANUC India provides industrial automation solutions, ranging from CNC controllers, Laser CNC, Robots, Vertical Machining Centers, Electric Injection Molding machines and CNC Wire EDM. Coupled with the complete integration of factory automation systems, lifetime service support forms a one-stop solution for its three core businesses 'FA - ROBOT – ROBOMACHINE'. A global leader, FANUC has more than 260 offices in 107 countries.

Helping develop Indian industries

Since its founding 31 years ago, FANUC India has made great efforts in collaboration with the Manufacturing sector to develop industries in India. During this time, it has established more than 20 branches around India and has provided technical support and maintenance services to customers in each region.

"FANUC has been supporting India for more than three decades with made-for-India Factory Automation products. This Chennai facility is a reaffirmation of FANUC's endeavor to serve the Indian Manufacturing sector with a focus on Make-in-India and enabling the emerging sectors to be globally competitive. Technologies are advancing towards convergence, and FANUC is at the forefront of digitalization, among other exciting developments," Dr Inaba said.

Close connection with Chennai

Conforming to the spirit of 'Service First', FANUC provides lifetime maintenance for its products for as long as they are used by customers through its 21 service

locations supporting five countries in the Indian subcontinent.

Being the fastest growing economy in the world, India is an important market for every business house. The well-educated, skilled, and English-speaking young population makes India an even more attractive place for business. In that regard, the State of Tamil Nadu plays a highly crucial role.

"Famous for its tradition, culture, and hospitality, Chennai city is very dear and close to our hearts. In fact, the first Branch Office, after establishing our headquarters in Bangalore in 1993, was in Chennai in 1994. Since then, we have been serving the region by enhancing our services day by day," Dr Inaba added.

In addition to the advantages of its geographical location with a port and excellent infrastructure, Chennai has many talented engineers and experts with skills and has become a major industrial city in this country. This has attracted many major automotive manufacturers, which have set up production facilities here.

"There are approximately 5,000 companies in Chennai that are customers of FANUC India. More than 50,000 FANUC CNCs, ROBOTs, and ROBOMACHINEs are in operation in these factories. Exceeding our expectations, this region has developed extremely rapidly. In addition to the Automotive industry, other industries such as Smartphone, Household Appliances, FMCG, and Plastics have expanded into Chennai, increasing the city's importance even more," said, Yuki Kita, President & CEO, FANUC India.

"To reach out and serve the industries even better than in the past, we decided to establish our own facility in Chennai and purchased this piece of 4-acre land in Sriperumbudur and built a 67,000 sq ft facility, equipped with all essential infrastructure and resources," he informed. This is FANUC India's 4th Technology Center, after Bangalore, Pune, and Manesar.

Being the fastest growing economy in the world, India is an important market for every business house. The well-educated, skilled, and English-speaking young population makes India an even more attractive place for business.

"FANUC has been supporting India for more than three decades with made-for-India Factory Automation products. This Chennai facility is a reaffirmation of FANUC's endeavor to serve the Indian Manufacturing sector with a focus on Make-in-India and enabling the emerging sectors to be globally competitive."

Dr Yoshiharu Inaba
Chairman
FANUC Corporation

"There are approximately 5,000 companies in Chennai that are customers of FANUC India. More than 50,000 FANUC CNCs, ROBOTs, and ROBOMACHINEs are in operation in these factories. Exceeding our expectations, this region has developed extremely rapidly. In addition to the Automotive industry, other industries such as Smartphone, Household Appliances, FMCG, and Plastics have expanded into Chennai, increasing the city's importance even more."

Yuki Kita
President & CEO
FANUC India

Conscious of the environment

The new building is designed to be earth-friendly. Materials that are optimal for thermal and acoustic insulation have been used effectively. Exposed concrete and exposed walls feature compressed, stabilized earth blocks. Such a structure offers a comfortable office environment that suits the hot and humid climate of Chennai while being ecological.

FANUC is committed to supporting industries at every step in factory automation, technology advancement, and turnkey solutions. As a matter of policy, lifetime maintenance support is assured for FANUC Products.

The energetic team of 33 young, talented engineers is dedicated to serving the Chennai region and is well supported by FANUC India, Bengaluru, and FANUC, headquartered in Japan.

Source: FANUC India

PRACTICING PRECISION

In the bustling industrial hub of Bengaluru, Colton Weldtek Pvt Ltd stands tall as a pioneer in the welding machine industry. Since its foundation in 1978 by Clifford Oliver, the company has been an embodiment of innovation, reliability, and customer-centricity, and continues to reshape possibilities and redefine welding technology.

Source: Colton Weldtek Pvt Ltd

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Colton Weldtek Pvt Ltd (Colton), an SME in India, with an annual turnover ranging from INR 5-10 crore, has become synonymous with reliability and precision in welding machines. It manufactures a wide range of ARC welding machines, such as MIG/MAG, TIG/GTAW, MMAW, SAW, and PLASMA, that are used for joining or cutting a wide range of metals.

The company's commitment to mastering arc welding through advanced technologies and unwavering manufacturing experience has earned it accolades not only in India but also on the global stage. It has a legacy of over four decades in manufacturing welding machines and is now well-poised to be the best indigenous manufacturer.

Customer-centric approach

"We have always been customer-focused and developed products to suit the needs of customers," Carlton Oliver, Managing Director, Colton Weldtek Pvt Ltd. The company, that has a team of around 50 dedicated employees, has now ventured into the global market, exporting its welding machines to the Middle East, Africa, and South East Asia. This move not only showcases its technological prowess but reflects its understanding of diverse customer needs, norms, and preferences. "Although exporting welding machines can be a difficult undertaking, it is a fascinating opportunity as we engage with individuals from diverse countries with diverse norms, professional practices, customs, and preferences," notes Oliver.

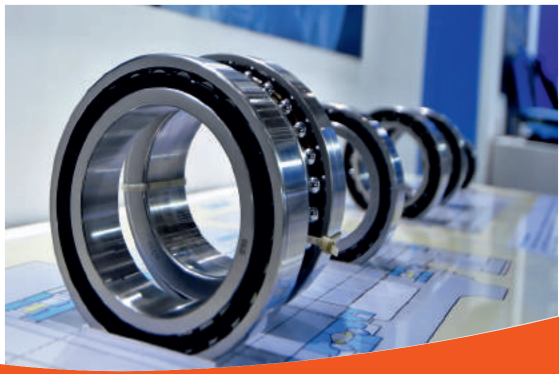
Reliability redefined

Reliability is the cornerstone of Colton's success story. Many customers have witnessed decades of trouble-free performance from the company's machines, often resulting in repeat orders. "It brings us pride to see some of our machines working for more than 20-25 years and the confidence in our customers," shares Oliver.

From design and development to fabrication, high-frequency transformer/inductor manufacturing, sub-assembly, quality control, wiring, and testing, every step of the manufacturing process is meticulously handled in-house. Equipped with a team of creative minds spanning multiple dimensions—mechanical, electrical, electronics, and software verticals—together, they orchestrate the future of welding technology.

Innovating for tomorrow

The company's commitment to innovation doesn't stop at reli-



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https://www.mtx.co.in/mtx-connect

ability; it extends to staying at the forefront of welding technology. It has currently invested in a technology transfer from Germany for the manufacture of advanced SYNERGIC MIG/MAG welding machines to keep in line with the latest developments and norms. "This project will be completed in 2024," reveals Oliver. "Under this project, we would manufacture world-class machines in India."

"We are also focused on Industry 4.0, wherein a new range of welding machines will be networked, monitored, and controlled on a cloud platform dedicated to specific customers using multiple units," he adds. "The welding engineer has all real-time data regarding machine utilization, power consumption, weight of filler wire deposited, and many more for a deeper analysis and error-free welds."

Colton is gearing up for Industry 4.0, where welding machines will be networked, monitored, and controlled via a dedicated cloud platform, providing real-time data for precise and error-free welding.

Flagships of excellence

Colton's product lineup boasts a range of exceptional welding machines. "Our ENDURA machines are recognized for their ruggedness, simplicity, and productivity. They are excellent workhorses for site jobs and are available in 250-600 A capacities," explains Oliver. "Our TIG DC/AC-DC machines are known for being precise, and all functions are pre-settable for professional applications. They are available in 300-1000 A capacities."

Source: Colton Weldtek Pvt Ltd

Source: Colton Weldtek Pvt Ltd

"The governing bodies need to act accordingly to support the manufacturing industry by bringing in the latest technologies, regulating the import of finished products, and upgrading skill development programs. Meanwhile, we aim to stay dedicated to the development of innovative welding machines in the upcoming years. We have always believed in the 'Make in India' concept and have invested heavily in local manufacturing."

Carlton Oliver
Managing Director
Colton Weldtek Pvt Ltd

The company also manufactures cold wire feeders and water cooling units for its TIG/GTAW applications. "Our MULTIPROCESS machines are CC/CV flexible workhorse in capacities of 800-1200A capable of performing SAW/GMAW/MMAW and GOUGING in the same source. They can be configured along with different submerged arc welding heads like tractor/beam mount/column boom mount," he elaborates.

"We have developed heavy-duty wire feeders for hard-facing applications that can feed wire sizes up to 3.2 mm. Our D-arc machines are dual-source machines with capacities of 800-3000 A capable of delivering full output from a single source or two dual-half outputs to two separate welders with independent controls," he adds.

Additionally, Colton is all set to launch its handheld laser welding machines, further diversifying its product portfolio.

Vision for the welding sector

The Welding sector, according to Oliver, has grown dynamically in the last decade and contributes a substantial portion of the country's exports, creating millions of jobs annually. "However, it still suffers from a burden of challenges. Most manufacturers of welding machines have shut down their manufacturing activities and started importing machines from China. There are numerous importers who have infiltrated the Indian market with similar cheap machines. This has killed the local manufacturers who have not adapted to the latest technologies," he adds, highlighting problems in the sector.

The Governing bodies, he stresses, need to act accordingly to support the Manufacturing industry by bringing in the latest technologies, regulating the import of finished products, and upgrading skill development programs. "Meanwhile, we aim to stay dedicated to the development of innovative welding machines in the upcoming years," he stresses. "We have always believed in the 'Make in India' concept and have invested heavily in local manufacturing."

Achieving global impact

Colton's commitment to skill development is evident through its welding skill training centers established across the globe. "We have centers in Belize, South Africa, Zimbabwe, Senegal, Tajikistan, Bhutan, Myanmar, Indonesia, and Mongolia," shares Oliver. These centers empower individuals with the knowledge and expertise needed for the Welding industry, contributing to job creation and skill enhancement worldwide.

SUPPORTING TOMORROW'S ENGINEERS TODAY

Acknowledging the fact that engineers coming out of academic institutions need additional training to serve the industry, EPLAN has come up with EPLAN Education developed for schools and colleges. It is a training concept that includes software solutions for electrical, fluid power, instrumentation, Control and Automation (ICA), and control cabinet engineering. Here's knowing more about its importance...

Source: Magic Wand Media

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EPLAN provides software and service solutions in the fields of electrical, automation, and mechatronic engineering. The company develops one of the world's leading design software solutions for machine and panel builders. EPLAN is also acknowledged as the ideal partner to streamline challenging engineering processes.

Keeping pace with complexity

Not only are design trends and software platforms changing all the time, but electrical design projects are also in a state of constant transformation and brief themselves, an ongoing trend towards increased complexity. Traditional CAD software simply cannot keep up with these changes. That's because efficient electrical design now requires far-reaching knowledge and expertise across numerous areas, as well as a deep understanding of the different standards and components that go into making up designs. In addition to knowledge of electrical systems and principles, many project briefs require skills in control systems engineering, computer programming, and wiring diagrams to be able to effectively address the requirements of each project with precision.

Avoiding being left behind in electrical design trends

Amidst such rapid changes in the sector, how can one ensure they don't lag behind in their electrical design practices and standards if they are professionals or students?

"EPLAN is the perfect choice for electrical design engineers who

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"EPLAN has become an industry practice. It has become critical for students to learn and institutions to incorporate that in the curriculum. EPLAN is used where Electrical Engineering expertise is in demand, spanning across Energy, Automotive, Machine Building and Process industries. It plays a vital role in embracing current trends such as digitization, cloud, and Industry 4.0 technologies."

Umesh Pai
Managing Director
EPLAN India

EPLAN Education gives prospective engineers, schools, and universities access to EPLAN software solutions. Lesson plans, exercises, and written exams supplement the training concept, which is now being used at more than a thousand institutions worldwide as a training tool.

want to remain on top of the latest developments in their field. The aim of all computer-aided Engineering (CAE) systems is to improve design efficiency, and the way that these software platforms enable better practices, greater accuracy, and increased productivity is changing all the time to that of traditional CAD tools in the past," shares Umesh Pai, Managing Director, EPLAN India.

The latest generation of Electrical CAE platforms, such as EPLAN, incorporate a wide variety of digital automation features to boost efficiency, encourage greater standardization and save an engineer's valuable time.

Training, certification, and e-learning

Going through regular training, gaining certifications, and staying familiar with the latest software developments will help ensure that one and their engineers are up to date with current trends and updates in software and technology. Formal technical qualifications can quickly fall behind the times when technology changes, so the best way is to stay up-to-date with training.

One can become EPLAN certified through a modular training course that combines hands-on and self-paced e-learning for maximum knowledge retention and applicability. This certification course is continuously refreshed and updated to provide the latest knowledge and skills to engineers as per the latest industry needs and trends.

Working together with academia

EPLAN is committed to developing specialist engineering knowledge right from the start. Its belief that the industry must closely work in tandem with academic institutions is based on the great rewards that have been reaped through such fruitful collaboration.

EPLAN is closely associated with academic institutions with the goal to bridge the gap between industry and academia. Engineers coming out of academic institutions need additional training for them to be ready to serve the industry which has been one of the major concerns of the industry. Academic institutions work under the constraint of imparting fundamental skills needed by the industry as well as keeping abreast with the latest industry trends and technology.

"EPLAN has become an industry practice. It has become critical for students to learn and institutions to incorporate that in the curriculum. EPLAN is used where Electrical Engineering expertise is in demand, spanning across Energy, Automotive, Machine Building and Process industries. It plays a vital role in embracing current trends such as digitization, cloud, and Industry 4.0 technologies," informs Pai.

Getting students industry-ready

EPLAN Education gives prospective engineers, schools, and universities access to EPLAN software solutions. Lesson plans, exercises, and written exams supplement the training concept, which is now being used at more than a thousand institutions worldwide as a training tool. One can close the gap between theory and practice and secure their progress through knowledge.

"Developed for schools and colleges, EPLAN Education is a training concept that includes software solutions for electrical, fluid power, instrumentation, Control and Automation (ICA), and control cabinet engineering. It's a worthwhile reason for the upcoming engineers to become familiar with EPLAN before starting a career in electrical engineering," adds Pai.

EPLAN Education includes a range of functions in a wide variety of disciplines and integrated data. Instructors can refer to structured lesson plans, relevant practical assignments, handouts for students, and sample exam questions, including answers. Students and trainees get assignments, tutorials, and term papers. Students can opt for the industry-recognized EPLAN certification for the recognition of competency with job preference in the industry to kickstart their career.

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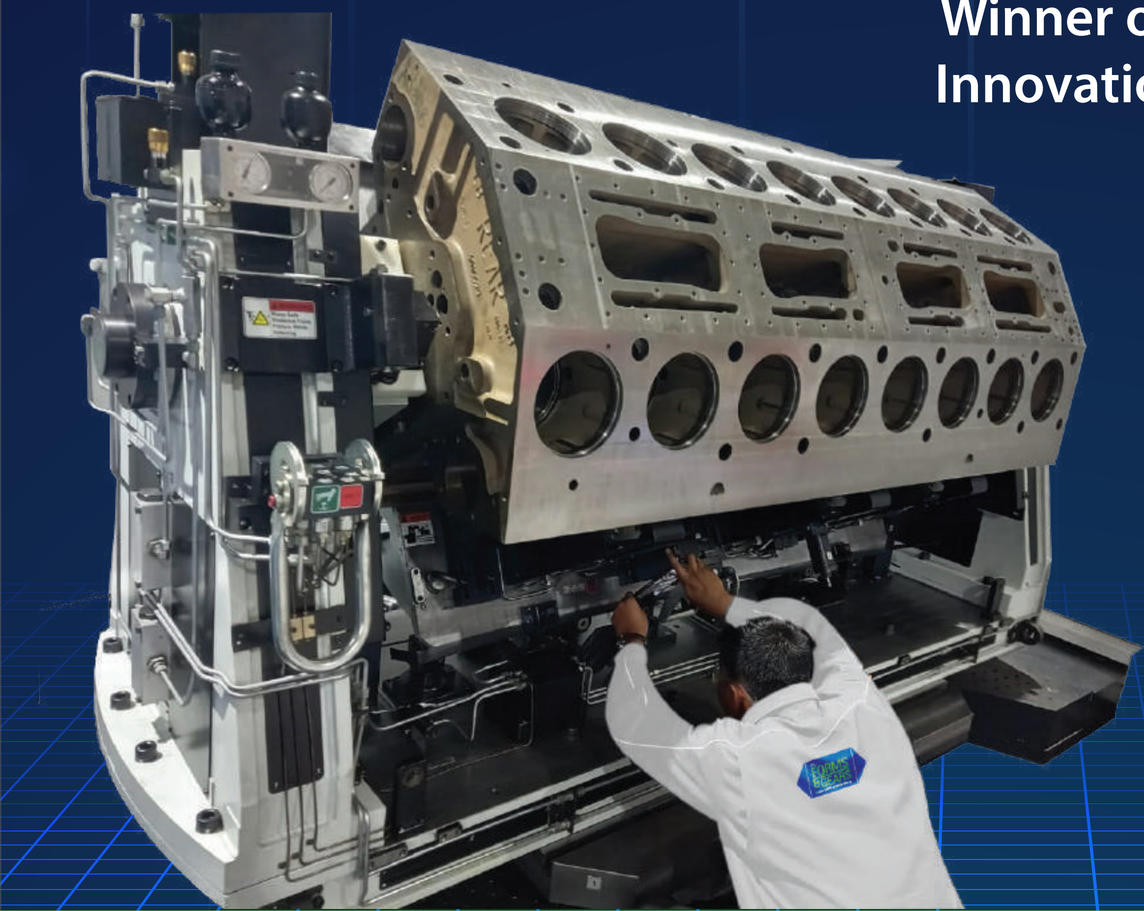

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