VOL 5, ISSUE 5 - JANUARY-FEBRUARY 2022

MODERN MANUFACTURING INDIA

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The Official Magazine of

Indian Machine Tool Manufacturers' Association

In Association with

Modern Machine Shop

LEVERAGING CUTTING-EDGE TRENDS

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Focused on the Goal 42

STARTUP
Stepping up the Auto Game 46

TARUN SAWHNEY
Vice Chairman & Managing Director Triveni Engineering & Industries Ltd 30

Global Trends in Metal Working Technologies!

INTERNATIONAL SEMINAR ON METAL WORKING TECHNOLOGIES 2022

25 February 2022 (Virtual Event)

Metal working industry is bracing for new challenges and new technologies in view of increasing competition vis-a-vis performance, quality, efficiency and environmental sustainability. There are difficult parts, intricate parts and difficult materials to be managed through metal working equipment and expertise from new technology horizons Viz. Additive Manufacturing, Industry 4.0, increasing use of robots, Micro machining and super finishing, and so on.

With a view to highlight the evolving trends in metal working technologies, Indian Machine Tool Manufacturers' Association (IMTMA) is organising the 'International Seminar on Metal Working Technologies', on 25th February 2022 (Virtual Event). This seminar will dwell extensively on new manufacturing strategies, review and address the emerging trends, as well as expose users and manufacturers to a range of innovative solutions.

Takeaways

This International seminar will provide both manufacturers and users of machine tools with latest metal-cutting and metal forming solutions that would enhance productivity, improve quality and finish of machined components, in addition to reducing costs.

Who should participate

CEOs, Top Management, Senior Executives, Practicing engineers, Industry consultants and R&D Specialists from Automotive, Auto components, Die & Mould, Consumer Durables, Machine Tool, Aerospace, Defence & Railway units, PSUs, General Engg. and other discrete manufacturing industries.

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- Emerging technologies
- Joining & Cutting processes
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- Surface Finishing
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CATEGORY	IMTMA Members, Micro and Small Enterprises, Research & Educational Institutions, Individuals	All other Companies
REGISTRATION FEE	**Rs. 2000/-*** Per Company	**Rs. 3000/-*** Per Company

Any number of delegates per company are welcome. Registration fee is per company, per business unit.

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For event details or any queries please contact Mr. Abhishek - M: 9844294387, E: abhishek@imtma.in

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PUBLISHER & DIRECTOR GENERAL & CEO, IMTMA
V Anbu

EDITORIAL
Editor-in-Chief
Soumi Mitra

Chief Copy Editor
Poonam Pednekar

Senior Correspondent
Arunima Nath

Sub-Editor
Sovan Tudu

Correspondent
Arpan Ghosh

Design
Magic Wand Media

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

Published and Printed by V Anbu on behalf of Indian Machine Tool Manufacturers' Association (IMTMA). Printed at Pentaplus Printer's Pvt Ltd 20/1, 4th main, 5th cross, Industrial Town, Rajaji Nagar, Bangalore-560044, Karnataka and Published from Indian Machine Tool Manufacturers' Association; Head Office: 10th Mile, Tumkur Road, Madavara Post, Bengaluru - 562123, Karnataka. Editor: Soumi Mitra

Publishing frequency: 6 times per year

Manuscripts: No liability is accepted for unsolicited manuscripts. They will be returned only if accompanied by sufficient return postage.


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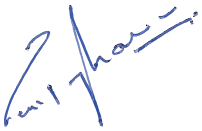
SETTING REALISTIC GOALS WITH A STRATEGIC VISION

Source: BFW



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

Dear Readers,

The year 2021 was all about recovery and getting back to business, and we now have that in our rear-view mirror as we drive on towards a promising 2022 and beyond. Perhaps this would be a defining moment for India to succeed in its aspirations of being technologically competitive. Meanwhile, despite all the challenges arising from the pandemic, Indian Machine Tool Manufacturers' Association (IMTMA) continues to usher in a new era of growth and bring innovative and specific solutions for industries.

The Indian Machine Tool industry, which globally ranks 13th in production and 7th in consumption as per Gardner Intelligence's 'World Machine Tool Survey 2020', has been deriving a large proportion of its business from the Auto sector. However, with the thrust given by the Government of India to various sectors through PLI schemes, the Machine Tool industry, while continuing to retain its business with the Auto sector, is geared up to serve the requirements of the emerging sectors.

The Indian Machine Tool industry is working towards indigenization of imported aggregates, enhancing the reliability of local supply chain products, building cost-competitive quality products for both local and export markets, and acting as the single point of contact for addressing all challenges relating to machine tools and bringing competitiveness that is on par with international standards. In this art of survival, 'Vision' will be a pivotal factor in steering the industry to realize its goals. In today's scenario, the world is changing rapidly, and the industry needs to embrace the changing order while keeping in mind the 'big picture'. We need to ardently venture into new areas, hitherto unexplored, make the best use of technology, and take up R&D for product and process innovations.

Although our flagship event IMTEX has been rescheduled, we are fully committed to safely and successfully holding the event as soon as the uncertainties dwindle.

In this art of survival, 'Vision' will be a pivotal factor in steering the industry to realize its goals. In today's scenario, the world is changing rapidly, and the industry needs to embrace the changing order while keeping in mind the 'big picture'.

Once again, I would very much like to underline that we appreciate working closely with all of you and hope that the Year 2022 will bring you, your family, and your business excellent health and happiness.

Wish you a bright new 2022.

Let's focus on our digital future.

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The pandemic has sped up the digital age, and several companies, including our Machine Tool industry, are using digital technologies in production processes to increase manufacturing efficiency.

Dear MMI Readers,

At the outset, I would like to welcome all the readers of Modern Manufacturing India (MMI) magazine to a very happy and prosperous New Year. While IMTEX 2022 has been rescheduled, we are committed to holding the exhibition safely and successfully as soon as the uncertainties diminish.

Our economy is set to accelerate further, with the Services sector resuming operations in full swing and manufacturing activities gaining momentum. The pandemic has sped up the digital age, and I am glad to note that several companies, including our Machine Tool industry, are using digital technologies in production processes to increase manufacturing efficiency. This bodes well for enterprises eager to explore new avenues for growth while tackling everyday challenges to achieve optimum performance.

As always, MMI continues to bring the latest information from the Manufacturing and Machine Tool industries to your doorstep. This month's edition focuses on advanced manufacturing. Read the IMTMA article to gain more insights into the Machine Tool industry.

While we continue to bring inspirational stories relating to manufacturing development from various quarters, we also reach out to you for feedback, which will be extremely valuable in helping us understand your needs. Once again, I extend my heartfelt thanks to every one of you, the readers of MMI, for your continued interest and support.

Readers can download previous issues of MMI from the IMTMA website.

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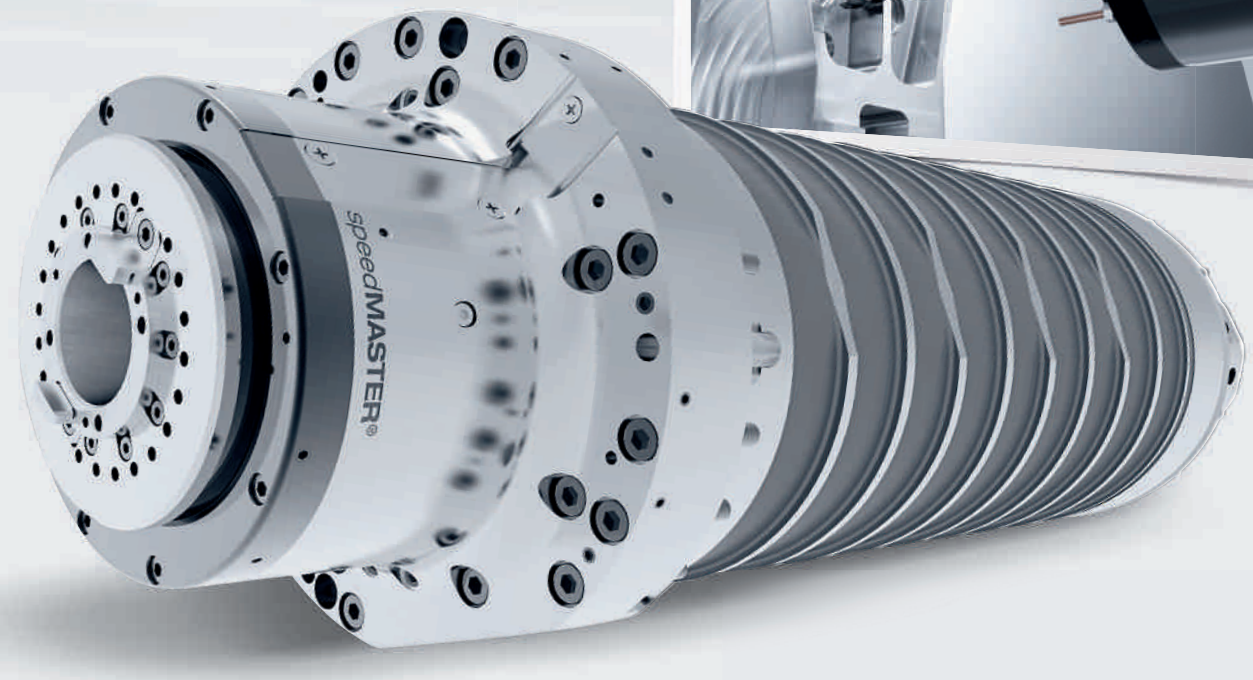

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CELEBRATING MILESTONES

Our Hon'ble Prime Minister Narendra Modi has called startups the 'backbone' of the new India and declared January 16 as 'National Startup Day'. As readers, you must know that MMI carries a segment on budding startups and their laudable growth. Curious, we did some research on startups and found out that India has the third-largest startup ecosystem in the world and is expected to witness year-on-year growth of consistent annual growth of 12-15 percent. These statistics are based on a study done by the Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce.

The study claims that in 2018, India had about 50,000 startups, including 8,900-9,300 technology-led ones. In 2019, around 1,300 new tech startups were born, implying there are two to three tech startups born every day. Hence, to showcase this spirit of entrepreneurship across India, DPIIT has organized the maiden 'Startup India Innovation Week' from January 10-16, 2022.

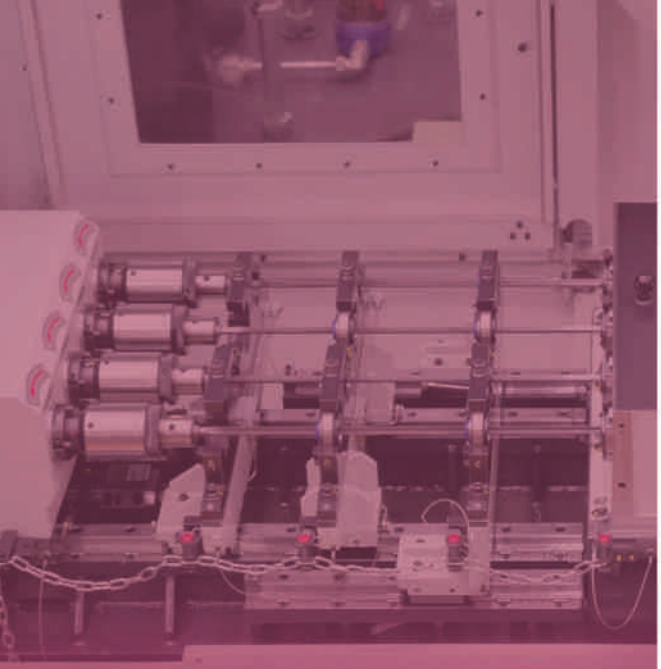
Similarly, a report by NASSCOM and Zinnov indicates that more than 2,250 startups were added in the year 2021, which was 600 more than what was added in the previous year. It is reported that in India, startups raised US$ 24.1 billion in 2021, a two-fold increase over pre-COVID levels. During the pandemic, India has seen a greater number of Unicorn startups (with a valuation of over US$ 1 billion) in just 2021 than it did in the period 2011-20.

Clearly, startups in India have extraordinarily evolved and are contributing significantly to the country's economic growth and development. We are witnessing an epoch of unparalleled innovation because of the steep rise of startups that brings transformative technologies and products to the marketplace.

> *"People want to start their own business or become financially independent. But you don't end up a successful entrepreneur unless you find a way to love the risk, the uncertainty, the repeated failures, and working insane hours on something you have no idea whether will be successful or not."*
>
> *- Mark Manson*

As a leading manufacturing publication, MMI has the responsibility of bringing forth such stories of entrepreneurship and technological prowess that are making India a 'Techade'. A big shout out to all our advertisers, contributors, and readers who motivate us to curate unmatchable content.

And since it's a new year and a new beginning, I, on behalf of the MMI team, wish you all a highly productive and successful 2022.



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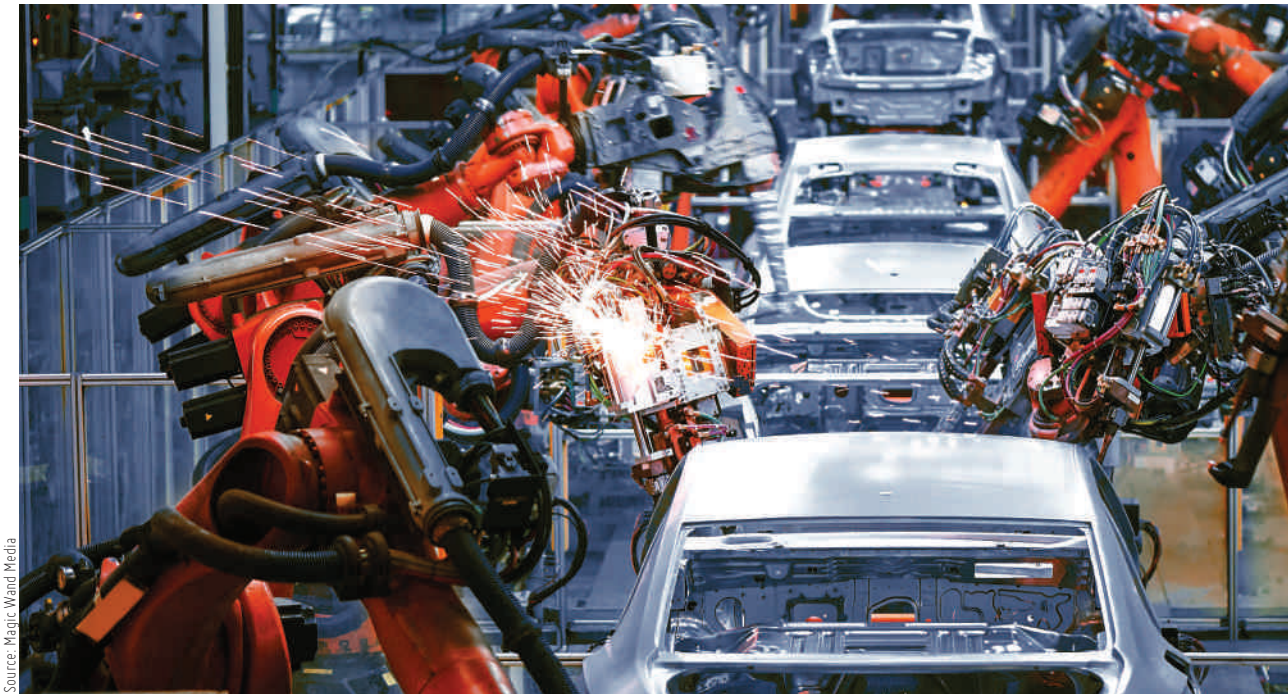


Source: Magic Wand Media

OPENING UP NEW VISTAS

Our machine tool industry is gaining momentum through the Government's PLI schemes meant to provide a thrust to the nation's manufacturing activities and turn it into a manufacturing hub. To aid in this endeavor, IMTMA has formed sectoral task forces to understand the needs of various industries and offer total solutions to them.

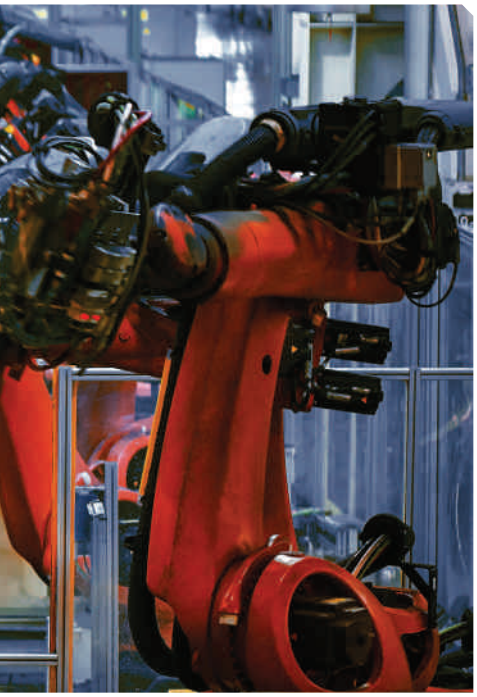
Machine tools form the bedrock of any manufacturing activity and the nation's overall economic development. Manufacturing is always strong when the Machine Tool industry is strong. Worldwide, countries like Germany, Japan, China, USA, Italy, Switzerland, South Korea, and Taiwan are strong in manufacturing as they have a robust Machine Tool industry that helps factories produce brands that can be sold across the world. The more sophisticated the performance of machine tools, the greater the industrial output.

To make India a manufacturing hub, the Government of India has launched several PLI schemes aimed at ushering in manufacturing-induced growth, making the industrial sector a key growth driver, and setting the country on a higher growth terrain. The identification of champion sectors is expected to propel investment and create demand for the Capital Goods sector. PLI beneficiary companies are expected to make investments in plants and machinery. This augurs well for the Machine Tool industry, which, for its part, is focusing on developing machines to meet the requirements.

Sectoral task forces

The Indian Machine Tool industry has a market size of around US$ 1.6 billion (FY 2020-21), of which domestic production accounts for around 50 percent of the total consumption. The industry globally ranks 13th in production and 7th in consumption as per Gardner Intelligence's 'World Machine Tool Survey 2020'. It derives a more significant proportion of its business from the Auto, Die & Mould, and General Engineering industries. However, with the thrust given by the Government to various sectors through PLI schemes, the Machine Tool industry, while continuing to do business

Source: IMTMA



with the Auto sector, is geared up to serve the requirements of emerging sectors. To hasten this endeavor, Indian Machine Tool Manufacturers' Association (IMTMA) has formed sectoral task forces to understand the needs of various industries and offer not just machines but also total solutions.

Interestingly, the Machine Tool industry recovered at a notable pace in the third quarter of 2021. The industry outlook for this year and the next two years remains optimistic, with business activities expected to gain more traction. Closer cooperation between industry and academia will help develop technological competencies, especially in application and process innovation. The launch of six technology innovation platforms by the Ministry of Heavy Industries, focusing on technologies, will facilitate the development of the key 'mother' manufacturing technologies indigenously and help achieve the vision of an Atmanirbhar Bharat and a globally competitive manufacturing sector in India.

Going with the flow

IMTEX & IMTEX FORMING 2022 had to be rescheduled due to the prevailing circumstances. However, IMTMA is fully committed to organizing IMTEX safely and successfully once the situation is conducive. While the Omicron and Delta viruses have forced multiple states to impose a varied level of restrictions, it is only a matter of time before the wheels begin spinning again. While 'Make in India' will continue to resonate through the minds of every company that manufactures goods, the support by the Union Government through its various schemes will continue to up the game for the industry.

Meanwhile, the Association will continue to work very closely with its member companies, solving the challenges they face and helping them grow in their sphere by showing them new avenues.

The industry outlook for this year and the next two years remains optimistic, with business activities expected to gain more traction. Closer cooperation between industry and academia will help develop technological competencies, especially in application and process innovation.

EQUIPPED FOR GROWTH

Automotive Component Manufacturers Association of India (ACMA), the apex body representing India's Auto Component manufacturing industry, has announced the findings of its Industry Performance Review for the first half of fiscal 2021-22. Highlights...

Source: Magic Wand Media

The turnover of the Automotive Component industry stood at ₹1.96 lakh crore (US$ 26.6 billion) for the period April 2021 to September 2021, registering a growth of 65 percent over the first half of the previous year.

Commenting on the performance of the Auto Component industry in India, Vinnie Mehta, Director General, ACMA, said, "Despite the slow offtake in vehicles sales due to supply-side issues, especially in the first quarter, the Auto Component industry demonstrated a remarkable turn-around in the first half of FY 2021-22. With significant growth in all segments – supply to OEMs, exports as also the Aftermarket, the Component industry grew to ₹1.96 lakh crore (US$ 26.6 billion), registering 65 percent growth. Exports grew by 76 percent to ₹68.7 lakh crore (US$ 9.3 billion), while imports grew by 71 percent to ₹64.3 lakh crore (US$ 8.7 billion), leading to trade surplus of US$ 600 million. The Aftermarket, estimated at ₹38,895 crore, also witnessed a steady growth of 25 percent. Component sales to OEMs in the domestic market grew by 76 percent to ₹1.53 lakh crore."

Sharing his insights on the performance of the Auto Component industry, Sunjay Kapur, President, ACMA, said, "Despite a resurgence of the demand for vehicles, supply-side issues of the availability of semiconductors, increasing input costs, rising logistics costs, and the availability of containers, among others, continue to hamper recovery in the Automotive sector. The Auto Component industry, in this backdrop, displayed remarkable resilience. Increased value-addition to meet regulatory compliance, fast recovery in external markets, and traction in the domestic aftermarket market have contributed to the growth of the sector in the first half of FY 2021-22.

Source: ACMA

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"On the subject of the Auto Component industry preparing to be future-ready, 60 percent of the respondents mentioned that they were already equipped to be part of the EV supply chain, while the rest would be ready in the next two-odd years."

Source: ACMA

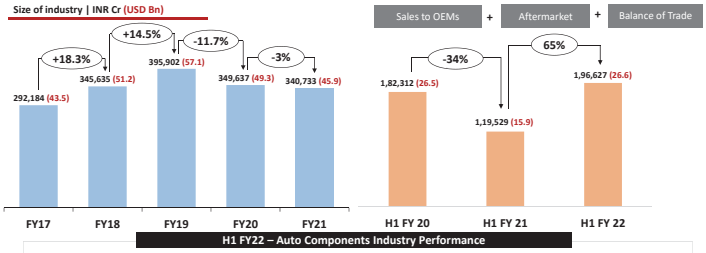
"The Auto Component industry has displayed remarkable resilience. Increased value-addition to meet regulatory compliance, fast recovery in external markets, and traction in the domestic aftermarket market have contributed to the growth of the sector in the first half of FY 2021-22."

Sunjay Kapur
President
ACMA

While the performance of the Vehicle industry during the festive season has not been on the expected lines, there are indications that the vehicle demand, in the coming months, will improve. This, together with the increased focus by the Auto industry on deep localization and the recent announcements of PLI schemes by the Government on Advanced Chemistry Cell (ACC) Batteries and Auto & Auto Components, will facilitate the creation of a state-of-the-art automotive value chain and developing India into an attractive alternative source of high-end auto components."

Elaborating on the mood of the industry and the outlook for the near to mid-term future, Kapur mentioned, "According to a recent survey of ACMA

H1 FY 2022 : Auto Components Industry Performance

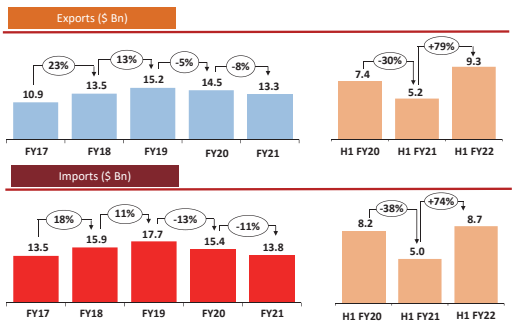


H1 FY22 – Auto Components Industry Performance

- The impact of the second wave wasn't as severe compared to the first wave.
- Supply side constraints – non availability of semiconductors, rising cost of raw materials and logistics challenges continue to hamper recovery
- Surge in international demand resulted in a positive trade balance.

H1 FY 2022: Exports & Imports - Balance of Trade

India recorded a trade surplus in H1- strong demand for exports

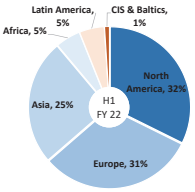


H1 FY22 EXIM Performance

- **$600 Mn trade surplus** in H1 FY22 **vs. $200 Mn surplus in H1 FY21**
- Exports rose by ~79% on account of a diminished impact of the second wave on foreign markets
- ~74% increase in imports Y-o-Y: higher demand in the domestic market compared to H1 FY21, supply chain deficiencies globally
- Increases demand for luxury vehicles and high-end cars in domestic market aided the demand for component imports

H1 FY 2022: Region wise Exports

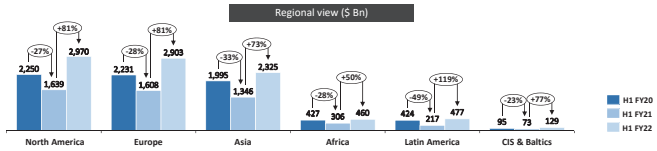
Total Exports in H1 FY 2022 USD 9.3 Billion



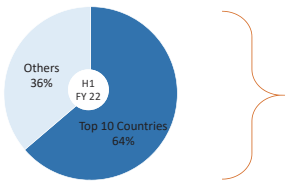
H1 FY2022 – Export performance

- Europe and North America remain the two primary export destinations, together accounting for ~63% of exports and both having outperformed the market average growth.
- Exports to Africa underperformed as Africa was amongst the hardest hit among regions by the second wave.

Regional view ($ Bn)

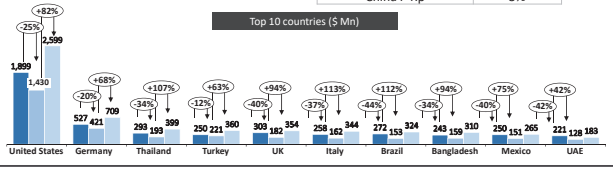


H1 FY 2022: Country wise Exports



Top 10 Countries	Share of Ex H1-FY22
U S A	28%
Germany	8%
Thailand	4%
Turkey	4%
U K	4%
Italy	4%
Brazil	3%
Bangladesh Pr	3%
Mexico	3%
China P Rp	3%

Top 10 countries ($ Mn)



Source: ACMA

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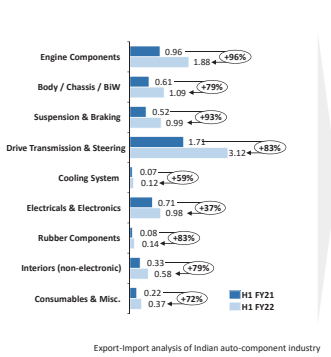
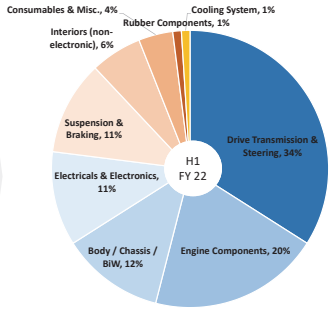
"Despite the slow offtake in vehicles sales due to supply-side issues, especially in the first quarter, the Auto Component industry demonstrated a remarkable turn-around in the first half of FY 2021-22."

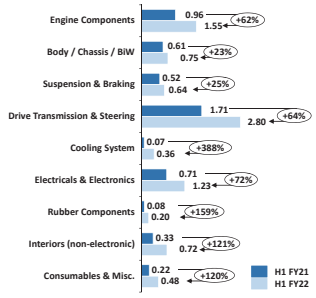
H1 FY 2022: Exports Segmentation by Product Type

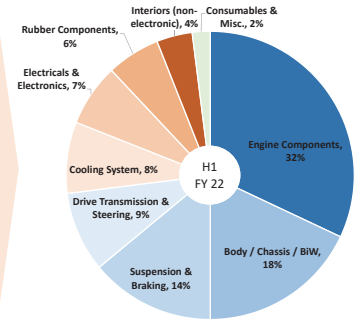




Export-Import analysis of Indian auto-component industry

H1 FY 2022: Imports Segmentation by Product Type





Summary: H1 FY 2022 vs H1 FY 2021

Figures in INR Crore	H1 FY 2020	H1 FY 2021	H1 FY 2022	Growth Rate
Auto Components Supply to OEMs	150,743	87,120	1,53,297	76%
Aftermarket	36,607	31,116	38,895	25%
Exports	51,028	39,003	68,746	76%
Imports	56,066	37,710	64,310	71%
Industry Turnover	**1,82,312**	**1,19,529**	**1,96,627**	**65%**

Figures in USD Billion	H1 FY 2020	H1 FY 2021	H1 FY 2022	Growth Rate
Auto Components Supply to OEMs	22	11.6	20.7	78%
Aftermarket	5.3	4.1	5.3	29%
Exports	7.4	5.2	9.3	79%
Imports	8.2	5.0	8.7	74%
Industry Turnover	**26.5**	**15.9**	**26.6**	**67%**

Conversion rate:
1 USD - INR 73.92 (FY H1 2022)
1 USD - INR 75.00 (FY H1 2021)
1 USD - INR 68.50 (FY H1 2020)

Headwinds and Tailwinds

Tailwinds

- Impressive estimated GDP growth for FY 2022
- Domestic demand continues to be strong
- Improving manufacturing activities/increased GST collection
- Emphasis on infrastructure development
- Surge in international demand/Exports
- Focus on clean and new technology
- Extension of FAME-II, announcement of ACC and Auto PLIs
- New entrants in mobility space

Headwinds

- Chip Shortage
- Increasing Raw material prices
- Increasing Logistics costs/availability of containers
- Stressed rural economy
- Increasing Fuel prices
- New variant of Covid-19
- Lower RoDTEP rates
- High GST rates on auto components

Source: ACMA

leadership, despite concerns of another wave of the pandemic, the industry is cautiously optimistic about the prospects of the Indian economy and the Automotive sector for FY 2021-22. Auto component manufacturers have now, by and large, recovered, and the investment cycle has also commenced. On the subject of the Auto Component industry preparing to be future-ready, 60 percent of the respondents mentioned that they were already equipped to be part of the EV supply chain, while the rest would be ready in the next two-odd years."

Key findings from the ACMA Industry Performance Review for H1 2021-22:

Exports: Exports of auto components grew by 76 percent to ₹68,746 crore (US$ 9.3 billion) in H1 2021-22 from ₹39,003 crore (US$ 5.2 billion) in H1 2020-21. Europe, accounting for 31 percent of exports, saw an increase of 81 percent, while North America and Asia, accounting for 32 percent and 25 percent, respectively, also registered an increase of 81 and 73 percent, respectively.

Imports: Imports of auto components grew by 71 percent from ₹37,710 crore (US$ 5.0 billion) in H1 2020-21 to ₹64,310 crore (US$ 8.7 billion) in H1 2021-22. Asia accounted for 63 percent of imports, followed by Europe and North America, with 29 percent and 7 percent, respectively. Imports from all geographies witnessed a steep increase, reflecting growth in domestic manufacturing activities.

Aftermarket: The Aftermarket in H1 2021-22 witnessed a growth of 25 percent to ₹38,895 crore (US$ 5.3 billion) from ₹31,116 crore (US$ 4.1 billion) in H1 2020-21.

Suitable for universal use: the C60xx ultra-compact Industrial PCs

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Powerful, flexible, and suitable for universal use: with the C60xx ultra-compact Industrial PC series, Beckhoff as a specialist in PC-based control technology offers a broad range of high-performance devices with low footprint and especially flexible installation. The range stretches from the compact C6015 IPC entry-level class with dimensions of just 82 x 82 x 40 mm through to the C6032 with Intel® Core™ i processors and a variety of modular interface and functional enhancements. Even for complex applications with the highest performance requirements, high-end computing power in an ultra-compact design can be combined with a very attractive pricing.

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WITH A WINNING EDGE

A look at how CNC machines can prove beneficial to the Indian manufacturing industry and the initiatives taken by Mitsubishi Electric India towards supporting the industry through its innovative offerings of the domain...

Source: Magic Wand Media

MASAYA TAKEDA
General Manager
CNC Systems
Factory Automation &
Industrial Division
Mitsubishi Electric
India Pvt Ltd

Every sector has seen transformations and advancements over the years. The days of numerical controls being solely about servomechanisms are long gone. We are now living in the era of CNC (Computerized Numerical Control) systems. These control systems have aided in a variety of ways, ranging from simple turning to complex machining. The controllers that operate these CNC systems are even more fascinating. Mitsubishi Electric looks ahead to partner with the brands that are focused on global and future-oriented development. CNC stands for Computer Numerical Control, and it refers to the concept of controlling machine tools with a computer. A CNC machine is an electromechanical device that uses computer programming inputs to operate machine shop tools. CNC machining is a widely used process in the manufacturing industry.

An overview of CNC systems

A CNC system is an automated method of controlling machine tools, 3D printers, and other devices through the use of software-programmed microcontrollers. CNC systems have helped achieve the required specifications and output much faster, with little or no manual intervention. The systems are controlled by sequential programs such as G-code or M-code, which are written by coders or generated by Computer-Aided Manufacturing (CAM) systems. The codes may be sliced or modified depending on their area of application. The machine unit is connected to the microcontroller unit or controller, which stores the coded programs. With the constant advancement in technology, CNC systems have found use in a variety of industries, including Electronics and Healthcare.

When it comes to the Manufacturing sector in India, CNC machines have had a signifi-

Benefits of the Extended Warranty Scheme

- ***Priority response:*** With the EWC, one can rest assured that as soon as they call the company's service team to report a breakdown, service engineers will swing into action to find a solution for the problem caused.
- ***Low operating costs:*** The company guarantees that there will be minimal downtime and that the machine's lifespan will be extended.
- ***Low EWC price:*** The EWC is available in the market at an attractive price compared to other leaders.
- ***Lower breakdown time:*** The company has a set of highly trained and well-equipped engineers and keeps track of all installed products and their service histories in their service management software to ensure that machines are repaired as quickly as possible.
- ***Free inspection visit:*** At the time of purchase of the EWC, Mitsubishi Electric India's CNC will conduct a free machine evaluation. This benefits the customer because they can learn about the machine's health and condition and plan production and maintenance ahead of time.
- ***No hidden costs:*** The contract covers engineers' travel, lodging, and freight charges for shipments and part returns. There are no additional fees.
- ***CNC service support (optional):*** The company provides round-the-clock telephone support through a dedicated toll-free line.

cant positive impact. They are known to provide a slew of advantages, including increased productivity, higher-quality products, shorter development times, and higher profits. Without CNC machines, one would have to hire more workers, face difficulties replicating a specific product, and deal with a host of other challenges. These machines are employed widely in the aerospace, electronics, defense, manufacturing, industrial, and medical domains.

Advantages of CNC machines

CNC machines offer a number of advantages, including:

Making mass production easier

CNC machining makes more sense than conventional machining when there is a high demand for a product, and one needs to manufacture the same piece over and over.

Workforce optimization and safety

When using traditional machinery, one needs to hire experts and other staff to deal with the machine. Then there are the ongoing costs of maintenance and repairs, which must be considered. Because of all of these factors, traditional machinery can be quite costly. However, this is not the case with CNC machines. As fewer people are required to operate these machines, the labor cost gets reduced.

Increasing the number of production options

The production processes get boosted by the easy-to-use CNC machines. The CNC software assists in creating products that are nearly impossible to make manually or with traditional machinery.

Being a digital era's machinery

Everyone nowadays wants to adapt to the trends of the digital era and become tech-savvy. CNC machines allow you to do just that. By virtue of their operation, CNC machines use computers to control machine tools, resulting in reduced development time, increased cost savings, and higher profits.

Assisting in the production of high-quality products

Several customers currently face issues with the quality of their products. This is a challenge that can easily be solved if CNC machines are introduced into the Indian Manufacturing industry. CNC machines allow making the same precise cut every time while maintaining consistent quality.

Mitsubishi Electric, a global leader in the sales and manufacturing of electrical and electronic products and systems, offers Computerized Numerical Controllers (CNCs) that are smoother, faster, and easier to use and offer higher accuracy. The M800/M80 Series, E80 Series, C80 Series, and other CNC control systems are offered by the company.

These CNC features help in the production of high-quality products with the utmost efficiency and standardized quality.

Increasing productivity

CNC tremendously increases productivity for machine tools as the machinery can be automatically run without requiring continuous attention from its operator. The wide range of CNCs offered by Mitsubishi Electric India enables businesses to achieve smoother and faster operations and a higher level of product finish. At the same time, it allows for increased productivity and profitability in operations.

Due to the outstanding features, the CNC products offered

Mitsubishi Electric, a global leader in the sales and manufacturing of electrical and electronic products and systems, offers CNCs that are smoother, faster, and easier to use and offer higher accuracy.

Source: Magic Wand Media

Everyone nowadays wants to adapt to the trends of the digital era and become tech-savvy. CNC machines allow you to do just that. By virtue of their operation, CNC machines use computers to control machine tools, resulting in reduced development time, increased cost savings, and higher profits.

by Mitsubishi Electric are proving to be extremely useful for the Indian Manufacturing industry. Aside from the advantages mentioned above, they are also energy-efficient, have a lower environmental impact, and ensure less wastage.

Initiatives by Mitsubishi Electric to support the industry

Extended warranty: Mitsubishi Electric India has always prioritized product and service improvement, focusing on delivering high-performance and cost-effective solutions. In a similar vein, the company has introduced a new Extended Warranty Contract (EWC) for specific Computerized Numerical Controllers to help the customers with better services. This ensures prompt responses, reliable technologies, and a user-friendly support system for clients all over India, resulting in better after-sales services.

The extended warranty contract covers the following CNCs from Mitsubishi Electric India:

- ***ECONOMICAL:*** E70/E80 series with turning/grinding/gantry machines for cost-effective controllers.
- ***STANDARD:*** M60/M70/E70/M80/E80 series for standard controllers.
- ***CUSTOM:*** Windows/customized controllers, including the C70/C80 series, for Japanese and Taiwanese machine tool builders.

Preventive Maintenance (PM): It's critical to have a proper preventive maintenance plan in place to keep shop machines running smoothly. Routine inspections help the customers improve output efficiencies, increase uptime, and improve profit margins.

CNC SS24 Round the Clock Support: Mitsubishi Electric has a dedicated toll-free line available 24 hours a day and seven days a week. At the toll-free number and via email, the company's CNC front engineers are available 24x7 to provide technical support to ensure hassle-free operations for the registered customers.

Working to make India self-sufficient: Mitsubishi Electric India's CNCs aspire to be a trusted partner for businesses seeking global and long-term growth. The company is also assisting India's Manufacturing industry with solutions that target specific growth segments. This step is being taken to support the Government's 'Make in India' initiative among manufacturers across the country and ensure that Atmanirbhar Bharat comes into practice with high-quality and reliable solutions.

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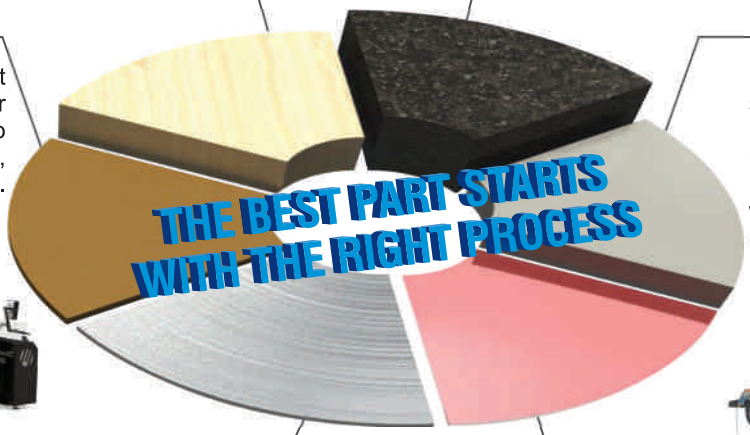

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Source: Magic Wand Media

LEVERAGING CUTTING-EDGE TRENDS

Once considered science fiction, Artificial Intelligence is now a vital technology for business sectors, especially manufacturing, where massive amount of data is generated. The following is a round-up of experts from the manufacturing world who have leveraged it for its array of benefits and better decision-making.

REJI VARGHESE
Managing Director
RV Forms & Gears LLP
fngreji@gmail.com

There is a popular funny saying on how Industry 4.0 will change manufacturing to require just two beings at the factory. One being the guard to ensure security and the other being a dog to ensure the guard doesn't touch any machine. While this may be an exaggerated thought, the power of Artificial Intelligence (AI) may pull us closer to the model of the guard and the dog.

Artificial Intelligence may sound high-tech, but it has now become part of our daily lives. Whether it's Siri, Alexa, self-driving cars, conversation-

al bots on e-commerce sites, e-mail spam filters, or Netflix and Amazon recommendations, AI has infiltrated almost everything we do.

Manufacturing and AI

In manufacturing, AI has made its presence felt with Smart machines and Smart factories. Industry 4.0, or the Fourth Industrial Revolution, allows manufacturers to have cyber-physical systems that enable us to have digital twins of anything that has an electric pulse on the shop floor, be it a machine, drill, or fixture; one can get a

Source: Yamazaki Mazak India Pvt Ltd

"Mazak controllers use 3D models, CAD data, and AI-enhanced machining process selection to automatically program parts in MAZATROL. For our machine spindles, we utilize AI technology to optimize cutting conditions by monitoring spindle vibration and adaptively altering cutting technology (Feeds & Speeds) to remove the vibration. With optimum processes achieved, the cutting technology characteristics for the tool are stored in the MAZATROL or EIA (NC) program."

Anil Bhardwaj
Managing Director
Yamazaki Mazak India Pvt Ltd

real-time play-by-play report of what is happening at one's plant while being miles away from all the action.

While having the ability to observe operations remotely is exciting, there is a high value in creating the ability to have a feedback mechanism for remotely controlling various entities.

Whether shutting down a machine in the extended downtime to save electricity or increasing the depth of a cut for a brand-new tool to gain precious minutes in production, Industry 4.0 has truly been thriving. But we then begin to ask ourselves, how much of this could just have been calculated and predicted in seconds instead of us running numbers and formulae every single time we had to make a new decision? Well, this is where harnessing the power of AI makes a difference.

Nikhil Rabindra, Head, SmartFix 4.0, says, "The most common form of AI in Industry 4.0 is Machine Learning which functions primarily in two ways—classification and regression. While both forms need prior data to train the model, the outputs vary. Classification gives a qualitative output. Some examples could be raw vibration sensor data that can detect the type of tool used based on the nature of the graph plotted or the use of computer vision where a camera can look at a component and identify all the parts assembled to ensure the quality of the final product. Regression is when the output is quantitative. A couple of good regression examples are: OEE calculation for your shop floor based on the historical data collected or even the ability to predict how much more life is left in a tool by checking the gradual increase in the power consumed as well as higher vibration signals caused as the tool begins to get blunter."

Machine Learning is just one strand of AI leveraged by Industry 4.0. However, the scope for AI in manufacturing is a lot more. The ability to predict various individual aspects still needs a lot of human intervention to triage all predictions to optimize both process and quality. The true power of AI can be felt when data-driven decisions are made all through the supply chain. Imagine the tool wear example from before can also lead to automating the depth of cut setting on the machine when there is a time crunch. That, in turn, predicts the cost of required inventory, which can be integrated directly into the ERP. All one has to do then is log in

While having the ability to observe operations remotely is exciting, there is a high value in creating the ability to have a feedback mechanism for remotely controlling various entities.

and approve the decision made by AI, or have the option to optimize the process further.

Anil Bhardwaj, Managing Director, Yamazaki Mazak India Pvt Ltd, says, "Mazak controllers use 3D models, CAD data, and AI-enhanced machining process selection to automatically program parts in MAZATROL. For our machine spindles, we utilize AI technology to optimize cutting conditions by monitoring spindle vibration and adaptively altering cutting technology (Feeds & Speeds) to remove the vibration. With optimum processes achieved, the cutting technology characteristics for the tool are stored in the MAZATROL or EIA (NC) program."

He adds, "We also have an AI Thermal shield that automatically compensates the machine for temperature changes. Machine Learning combined with Spatiotemporal modeling is used to increase the stability of processes with temperature change, further enhancing the machine's accuracy."

For many companies, the implementation of AI can seem daunting. Manufacturers can now generate billions of data points through smart machines, advanced sensor technologies, and intuitive computing power. Still, many are uncertain how to effectively use and manage this massive volume of data to increase productivity, reduce costs, improve quality, etc. They often attribute their hesitancy in the adoption of AI to cost, lack of IT requirements, or not being Industry 4.0 ready.

However, for companies to stay competitive, manufacturers must realize that AI is no longer a concept of the future but is now a reality that can be immediately implemented in one's plant.

Sunil Joshi, President, Sandvik Coromant India, says, "AI is opening up many opportunities for both producers and suppliers. It can be leveraged to optimize maintenance, refine processes, increase productivity and sustainability, and improve safety. In addition, it is driving increased automation through the use of collaborative robots, thereby increasing productivity and lowering costs. Sandvik is developing new concepts and solutions that can help manufacturers reduce waste and improve efficiency. Our digital machining solutions, which include software solutions, can strengthen the customers' value chain and facilitate data-driven decision-making."

For companies to stay competitive, manufacturers must realize that AI is no longer a concept of the future but is now a reality that can be implemented.

Source: Sandvik Coromant India

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President
Sandvik Coromant India

Areas in manufacturing where AI helps

Production Optimization

Optimizing processes can be a data-heavy task that involves a considerable amount of historical data sets. Deciding which process parameters produce the best quality and output is not an easy task. Questions like which parameters to use for the highest yield, etc., are best answered by AI that can crunch the data fast, constantly learning from the previous data points.

Jose Varghese, Director, Technology, DMG Mori Seiki India, says, "DMG Mori helps the customer transform their shop floor into a digital factory by taking advantage of the advanced technologies and contributes to significant improvements in productivity and profitability. DMG Mori Digital Factory transcends the five steps of planning, preparation, production, monitoring, and service. With the cutting-edge operating system, with CELOS at its core, it connects humans, machines, and factories to achieve visualization and analysis of information, which has been difficult in the past. Through factory digitization, DMG Mori identifies the challenges that the customers face and provides solutions best suited to their needs.

DMG Mori Digital Twin is one such specific AI tool developed to offer the following benefits to the customer:

- Continuous process improvement due to virtual programming and teaching machines.
- Development-related product optimization, leading to savings in time and money.
- Increase in productivity due to better system utilization.
- Quality improvement of the machine and automation solution by means of virtual tests."

Predictive & Preventive Maintenance

Some of the biggest potential

problems for a production operation can be the breakdown of a core piece of machinery or equipment. Often, preventive maintenance schedules are not optimized for real-time operating conditions. Now, with a whole range of IoT sensors, MES data, and Machine Learning algorithms, manufacturers can utilize many machine data points to predict breakdowns and wear and tear.

Bhardwaj informs, "Mazak has developed an AI-based system, in conjunction with the Industrial AI (IAI) Center at the University of Cincinnati, a leader in predictive analytics, the Mazak Spindle Health Monitoring System that uses EDGE Computing and Data Analytics algorithms to model each machine's spindle during a 60-second test run, establishing a baseline value for comparison in subsequent tests. Operators can conduct fixed cycle tests at any time and view Health Assessment and Fault Diagnosis screens on the machine's Smooth CNC. Predictive analytics diagnoses pre-failure conditions before any downtime occurs."

In its current configuration, the Mazak Spindle Health Monitoring System uses two high-definition data sensors, a data acquisition unit, and an industrial computer to acquire, process, and store machine data. A Neural Network Self-Organizing Map (SOM), also known as AI, compiles a growing profile of each machine, learning to assess its health through features extracted from a growing data set.

"Machine tools continue to get smarter thanks to AI that provides shops with advance warning of problems before they can derail productivity and profitability. The Mazak Spindle Health Monitoring System represents an ongoing development in OEM integration of smart features into high-tech machines," he adds.

Source: DMG Mori Seiki India

"DMG Mori helps the customer transform their shop floor into a digital factory by taking advantage of the advanced technologies and contributes to significant improvements in productivity and profitability. DMG Mori Digital Factory transcends the five steps of planning, preparation, production, monitoring, and service. With the cutting-edge operating system, with CELOS at its core, it connects humans, machines, and factories to achieve visualization and analysis of information."

Jose Varghese
Director, Technology
DMG Mori Seiki India

As Varghese shares, "DMG Mori, as a pioneer in the Machine Tool industry, is at the forefront of AI applications. The cognitive systems are now a part of the machine tool assembly, augmenting human capabilities in handling machine tools with CNC systems at a superlative speed and Big Data scale. One such application is predictive maintenance. DMG Mori has collected comprehensive data from more than 3 lakh installed machines worldwide and has been exploring the causes of machine troubles and their solutions through the Product Problem Report system for more than 20 years. With the accumulated data as well as factor analysis of each error using AI, a robust predictive and accurate preventive maintenance mechanism is in place today."

He adds, "'Condition Analyzer' is a platform developed by DMG Mori for the visualization of machine sensor data. It records the data, detects machine and machining condition changes at an early stage, analyzes changes to minimize machine downtime, and provides access from any networked PC, mobile device, or CELOS interface. This AI-powered revolution is gathering momentum with every passing year in the DMG Mori world for the customers to reap the benefits."

Supply Chain Optimization

Supply chain networks can be very complex, with thousands of parts and hundreds of locations. Using Machine Learning algorithms, users can determine the best shipping routes, optimize inventory, etc.

Forecasting Yield

Yield prediction is another critical area where AI can be used in manufacturing. Using AI, forecasts can be made on RoI with a high degree of accuracy. Accurate yield forecasts can help a great deal in inventory and supply chain management. If outputs are lower than expected, this can alert the management to increase production time to meet demand needs. Yield prediction is a data-heavy, complex problem that AI can help solve.

Virtual and Augmented Reality

VR and AR use technology to create simulated environments that we can submerse ourselves

Yield prediction is another critical area where AI can be used in manufacturing. Using AI, forecasts can be made on RoI with a high degree of accuracy.

into, while AI aims to outfit technological devices with the keen insight and perception of a responsive being. With Augmented and Virtual Reality technologies improving every day, more and more major companies are developing AR and VR for training, preventative maintenance devices, inspection, quickly identifying defective products and operational problems, etc.

Tool Optimization and Tool Wear Analytics

With a range of ultra-sensitive but tough sensors available and with the option of mounting these sensors on the fixture or the cutting tool as close to the cutting edge as possible, accurate data can be achieved regarding how a tool is performing, its life, and the cost per component per tool.

Joshi adds, "We are also developing sensorized tooling to provide data for smart decision-making during the machining process. We have also implemented smart manufacturing concepts at our plant in India. Development and implementation of AI solutions provide Sandvik with the ability to offer customers increasingly detailed and appropriate advice on how certain operations could be performed more efficiently and how their machines can be used optimally in specific situations to be more sustainable."

Rabindra shares, "SmartFix 4.0 has leveraged AI for multiple use cases. The most sought-after feature is the tool wear prediction that is served from vibration data captured from the fixture. The in-built AI model maps the sensor signals to the expected age of the tool, thereby allowing the customer to track tool wear."

In manufacturing, AI is also being used in energy management. It can monitor and collect information about energy consumption in the form of numbers, text, images, and videos.

Source: SmartFix 4.0

"SmartFix 4.0 has leveraged AI for multiple use cases. The most sought-after feature is the tool wear prediction that is served from vibration data captured from the fixture. The in-built AI model maps the sensor signals to the expected age of the tool, thereby allowing the customer to track tool wear."

Nikhil Rabindra
Head
SmartFix 4.0

"DMG Mori's 'Tool Control Centre' provides a visual representation of a time sequence graph for monitoring and analysis of the axial and bending loads of every rotating tool. 'Easy tool monitoring' on the DMG Mori turning machines is a technology cycle with automated learning of load limits. It has a powerful algorithm for efficient monitoring right after the first part is machined," Varghese explains.

Energy Management

In manufacturing, AI is also being used in energy management. AI can monitor and collect information about energy consumption in the form of numbers, text, images, and videos. By evaluating what is observed, AI can manage energy usage. It can compress and analyze data to predict future problems and ultimately optimize energy consumption in the long term. Having an AI system look into the energy consumption of a production operation can significantly reduce operating costs. The reduced cost can allocate more funding for process improvement resources, leading to higher yield and quality.

Challenges with advantages

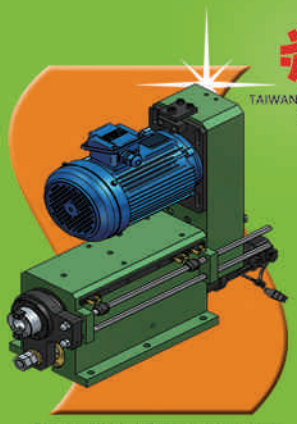
With all the benefits AI has to offer, there are some challenges to overcome with regard to manufacturing, starting with the challenge of investing in the new infrastructure that enables these advantages. The infrastructure includes buying new IoT-enabled machines and having robust network connectivity that allows the shop floor to be truly connected.

Next, there is the dilemma of where the data resides—local or cloud? And how secure is data if it is stored on the cloud? While local can be optimal for a single location, a cloud solution can be more beneficial for a multi-location setup. Solutions like SmartFix 4.0 address these problems by providing flexibility in the setup without burning a hole in the pocket of a legacy setup and also integrating with existing IoT solutions for a fraction of the cost. Finally, the philosophical question of how much human intervention and decision-making can be handed off to AI is always an ongoing process.

So yes, the forum is open to debate on how far AI can be implemented in manufacturing, but the above points are a top-level survey of all the potential paths that can be explored going forward and maybe seeing a factory smart enough to be managed by just a guard and a dog.

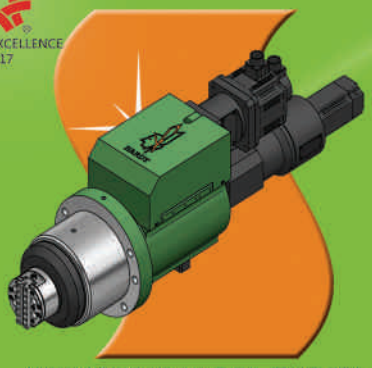
HANN KUEN MACHINERY

HARDY

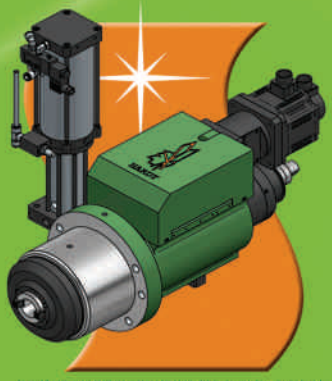


TAIWAN EXCELLENCE 2017

Servo Type Drilling / Tapping Spindle Head Unit



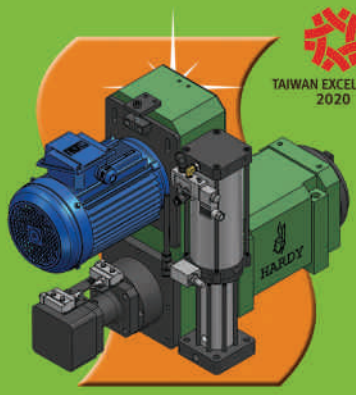
Built-in Motor Facing Head Unit - Flange Type



Built-in Motor Drilling/Tapping Spindle with ATC and Center Coolant

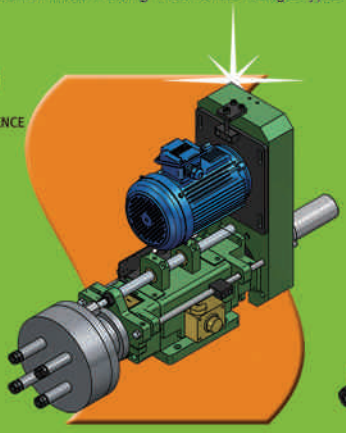
TAIWAN EXCELLENCE 2020

Built-in Motor Spindle Unit

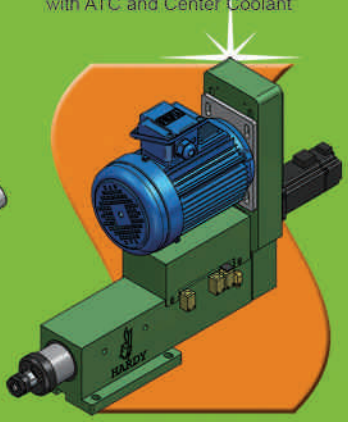


TAIWAN EXCELLENCE 2020

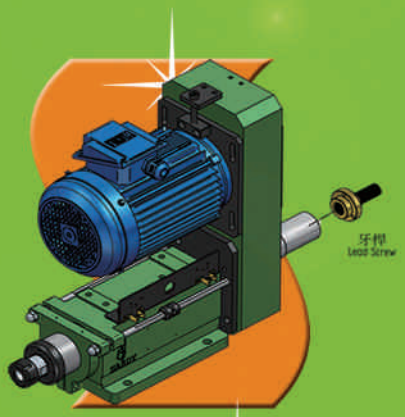
Boring/Milling Head Unit with ATC



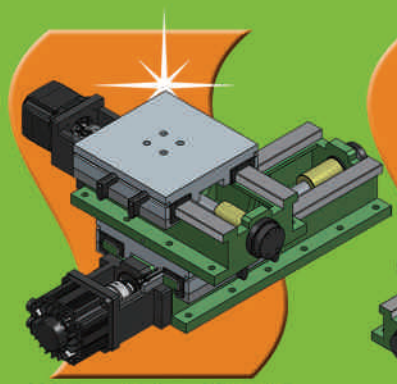
Multi-Spindle Head



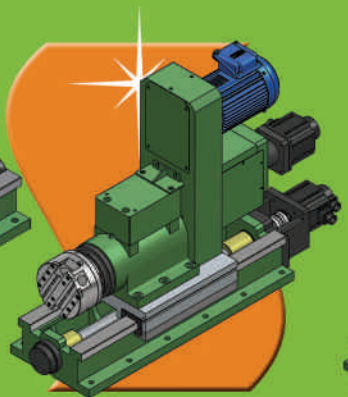
Servo Type Drilling / Tapping Spindle Head



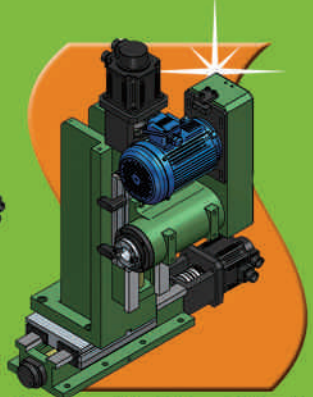
Tapping Spindle Head



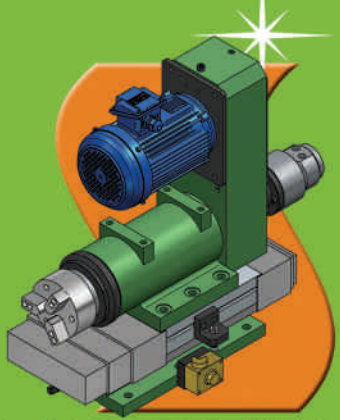
XY Servo Hardness Slide Unit



Servo Facing Head + Servo Ball Screw Slide Unit



XYZ Servo Slide Table + Milling Head



3-Jaw Chuck Spindle + Slide Unit

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ON A HIGH GROWTH PATH

Tarun Sawhney, Vice Chairman & Managing Director, Triveni Engineering & Industries Ltd (TEIL), in this free-wheeling interview with MMI's Editor- in-Chief, Soumi Mitra, offers us a peek into the company's current happenings and shares the challenges faced and tided over during the pandemic lockdowns, the impact of the Government's Atmanirbhar initiatives on its portfolio, and the benefits derived out of automation.

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

Triveni Engineering & Industries Ltd (TEIL) is around a 90-year-old diversified business conglomerate and one of the leaders in Engineering businesses. Kindly help our readers learn more about it.

Tarun Sawhney: TEIL is a diversified, integrated, and sustainable organization rooted in innovation, quality, and customer-centricity. We are a market leader in our engineering businesses. We are an industry-leading organization, with extensive expertise in delivering quality products and solutions to a growing clientele across geographies. The foundation of our profitable growth and sustained value delivery is built on our network of strong relationships, research & development capabilities, excellence in manufacturing, engineering efficiency, and stringent quality controls. We run our operations with strict adherence to all Environment, Health & Safety (EHS) norms to provide clean, safe, and healthy working conditions for our employees as well as total protection to the communities around which we operate. We have six co-generation plants, and the company currently operates 104.5 MW grid-connected capacity. Subsequently, in the engineering business, we have the Power Transmission Business (PTB) focused on delivering innovative, value-engineered, and reliable products and solutions in the areas of Gears, Defense, and Built-to-Print.

Source: Triveni Engineering & Industries Ltd

"With our extensive experience in critical rotary machinery technology and supplying and meeting the requirements of Defense and Defense support organizations in the past and expertise in turbo machinery, the Defense business has successfully procured approvals for both new projects and refurbishing requirements in the Naval Defense space."

Tarun Sawhney
Vice Chairman & Managing Director
Triveni Engineering & Industries Ltd

We have seven world-class FSSC 22000 certified sugar manufacturing facilities with over 61,000 tonne per day crushing capacity. In the last few years, the company has also stepped up its production of ethanol in line with the Government of India's National Policy on Biofuels, and today, we have 320 KLPD manufacturing capacity which is already under expansion to 660 KLPD.

In our Water business, we are the leading solutions provider for efficient water management for industrial, municipal/urban applications. Our focus is on delivering customized and sustainable futuristic solutions aimed at addressing the growing shortage of water resources. Our water technology protects resources and encourages recycling and reuse of water in large cities and industries.

With your legacy, how do you ensure being state-of-the-art and remaining profitable?

It was a remarkable achievement for our business group to stay profitable by bringing transformation as per the ever-changing business environment. Firstly, we increased productivity through economies of scale and increased sugar recoveries, and then by diversifying and increasing our focus in the other business segments. We made investments in the right areas to enable sustained growth and become more competitive at the domestic and international levels. Our total debt has been significantly reduced, and it is now approximately 50 percent lower than it was five years ago. As a result of the overall macro environment and the company's initiatives in its various business segments, we believe we are well poised to grow from here on.

Like all business establishments, TEIL must have been impacted by the challenges posed by the COVID-19 pandemic. How did you address them to register strong growth? What were your learnings from the pandemic?

For the company as a whole, we at TEIL responded with unparalleled agility and successfully steered our business through unprecedented challenges to deliver outstanding performance for FY 21. Our response to COVID-19 was both cautious and aggressive. We took several targeted initiatives to protect the health and safety of our employees, supply chain partners, communities, and other stakeholders while ensuring business continuity in a complex environment.

Source: Triveni Engineering & Industries Ltd

"We are India's largest producer of engineered-to-order Turbo gearboxes with over 80 percent market share in the High-Speed segment and hold a robust presence in the Replacement market. So far, we have retrofitted/replaced/overhauled over 900 gearboxes for more than 80 global brands."

Tarun Sawhney
Vice Chairman & Managing Director
Triveni Engineering & Industries Ltd

Automation and digitalization became synonymous with the new way of functioning, with our IT teams working relentlessly to steer an organization-wide business transformation amid the new normal. We adopted new technologies with extraordinary speed and moved fast to embrace the Internet of Things (IoT) and Industry 4.0 practices, particularly in our Power Transmission and Water businesses, to enhance productivity while complying with the various restrictions imposed across the country amid the pandemic crisis.

Our Engineering businesses, which faced a total shutdown of operations during the lockdown period, returned to normalcy by mid-May 2020. Amid the unprecedented COVID pandemic, the Power Transmission Business completed over 1,000 international deliveries in FY21. In the Water business, we secured an international EPC order of Water and Sewerage projects worth US$22.80 million (₹156 crore, net of GST) from the Ministry of National Planning, Housing and Infrastructure, Republic of Maldives, funded by Exim Bank of India.

The business portfolio of TEIL includes Integrated Sugar, Alcohol, Co-Generation Power, Water Solutions, Power Transmission, and Defense. How have the Government's Atmanirbhar initiatives been helping businesses of your stature?

The Government has been encouraging businesses to become independent and self-reliant in all senses. Through its National Biofuel Policy, the Government has expanded the scope of raw materials for ethanol production by allowing sugarcane juice, sugar-containing materials like sugar beet, sweet sorghum, etc., that are unfit for human consumption for ethanol production. Today, ethanol blending in India has reached close to 8 percent. The goal of 20 percent ethanol blending by 2025 will accelerate the growth of the Ethanol industry in the country, which will aid in reducing the country's dependence on imported crude.

We, at Triveni, have been leveraging the capacities, capabilities, and efficiencies of our distilleries effectively to make the most of the Ethanol opportunity unleashed by the Government of India's National Policy on Biofuels. Today, we are at 400 crore liter of demand, which should go up to 1,000 crore liter when we touch 20 percent blending. We are doubling our existing distillery plant capacities with a low Capex, and with this, our total plant capacity

TEIL adopted new technologies with extraordinary speed and moved fast to embrace the Internet of Things (IoT) and Industry 4.0 practices, particularly in its Power Transmission business.

will reach 660 KLPD by 2022-23.
Our Power Transmission Business (PTB) segment caters to customers across 70 countries via a state-of-the-art manufacturing facility in India. The Gears business has bagged multiple gearboxes orders for various domestic customers for their expansion requirement through various OEMs for all high-speed applications.
We are also actively engaged with the naval headquarters, shipyards, and other naval establishments to participate in major upcoming projects with indigenous designs or with Transfer of Technology (ToT) collaborations for varying products.

The goal of 20 percent ethanol blending by 2025 will accelerate the growth of the Ethanol industry in the country, which will aid in reducing the country's dependence on imported crude.

The Government, in Atmanirbhar 3.0, announced investing of ₹10,200 crore for Capex in Defense-related industries. How has this move affected your Defense line of business?
Our Defense business is a strategic foray guided by the company's ability to identify and harness emerging opportunities. The segment is poised to cater to engineered equipment requirements for Defense under the 'Make in India' Initiative. With our extensive experience in critical rotary machinery technology and in supplying and meeting the requirements of Defense and Defense support organizations in the past and expertise in turbo machinery, the Defense business has successfully procured approvals for both new projects and refurbishing requirements in the Naval Defense space.
Through its strong portfolio of current and upcoming products, the business is well poised to contribute to the indigenization of high-end technology in the Indian Defense Industry in line with the Government's 'Make in India' policy. The 'Make in India' initiative has led to new opportunities for diverse engineered products, and Triveni's Mysuru facility is actively participating in many of these indigenous development projects. The Defense Procurement Policy 2020 focuses on self-reliance for various equipment in Design, Development, and Manufacture by the Indian Industry. Most of the new projects envisaged by the Defense sector are customized requirements for critical equipment, offering substantial value to PTB's rotating machinery portfolio. PTB initially focused on Naval Defense markets and has gained some foothold in the critical turbo pumps space.

What are your views on the 'Make in India' initiative in niche segments like Power Transmission?
Triveni is the key contributor to the Government's 'Make in India' initiative and caters to customers across 70 countries via its manufacturing facilities in India. It is India's largest producer of engineered-to-order Turbo gearboxes with over 80 percent market share in the High-Speed segment and holds a robust presence in the Replacement market. So far, we have retrofitted/replaced/overhauled over 900 gearboxes for more than 80 global brands. Very few companies provide customized gears manufacturing as it requires advanced technology and stringent adherence to international standards. Therefore, Triveni has a differentiated edge.
The Government's 'Aatmanirbhar Bharat Abhiyan' scheme will cater to the sustenance of laborers, the middle class, the Cottage industry, Medium and Small Enterprises (MSMEs), and other industries. It is a step towards Self-Reliant India, which will support the 'Make in India' program while helping MSMEs boost their business. We are hopeful that the Gears business can significantly contribute to the indigenization of gearboxes to further align with the Aatmanirbhar program announced by the Government of India.

The adoption of new technologies and robotic systems is helping firms overcome the effects of the pandemic while keeping their workforce safe. How do you view automation, and what would you be suggesting to smaller players who still have apprehensions regarding implementing it?
Rapid technological progress poses challenges for labor markets. Automation both displaces and creates job markets. At present, an unprecedented digitalization of the economy is ongoing. Artificial intelligence has become a reality, and machines can learn how to outperform humans in some cognitive tasks.
Automation adoption is very likely to result in the growth of small players as these businesses often face challenges such as massive competition with large corporations, reduced budgets, less workforce, etc. As automation tools are incredibly diverse, they can help with multiple tasks in no time.
At Triveni, we have been among the pioneers in using automation and digitalization in our sugar operations. The usage of the Vehicle Tracking System for sugarcane transportation and satellite-based sugarcane area mapping has been implemented for a long time.

How far have Indian players reached the deployment of Industry 4.0 and other advanced manufacturing technologies such as Artificial Intelligence and Machine Learning?
Industry 4.0 is gaining popularity due to the rapid improvements made in cyber-computing capabilities in the last few decades. It has started making inroads in the Indian Manufacturing, Real Estate, IT-ITes, and other sectors. While the development of automation in India has been comparatively lower than in the rest of the world, it is growing significantly.

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ENABLING PROGRESS

Bharat Fritz Werner Ltd (BFW), a flagship company of the Kothari Group, is India's leading solution provider of machine tools. With its focus on innovation and disruption, the company has rightly set the stage to enable and support its growth.

Source: BFW Ltd

Bharat Fritz Werner Ltd (BFW) began its journey in 1961 as a joint venture between Fritz Werner Germany and Indian Promoters, the Kothari Group of Industries, at a time when our country was developing its industrial identity following independence. Around 2002, the Indian promoters bought out all the stake of Fritz Werner, and BFW became a fully Indian-owned company.

"Over our journey of 60 years, we have found our purpose of 'Enabling Progress,' and we have sustained that purpose throughout. It has become our guiding light and is infused deep in the DNA of the company," shares Ravi Raghavan, Managing Director, BFW.

The company started building SPMs (Special Purpose Machines) way back in 1970 and began exporting products in 1979. It was the first Indian company to supply local machining solutions to well-known Japanese multinationals like Maruti Suzuki, Toyota, and Honda as they set up their shops to shape India's Automotive industry. Over the years, its product range expanded, and so did its leadership as a solution provider.

"Over the last decade, we have focused on getting our product platforms to the global level of technology and have also expanded our offerings to include comprehensive milling/turning and multi-process technologies, automation, IoT, process engineering, and recently, additive technology," he says.

"As we celebrate our 60th year of service to manufacturing, we are thankful to all our customers for their strong trust in us, all our supply chain partners, and our dedicated employees," he adds.

Catering to a wide variety of segments

BFW is well spread over many industry segments, including Automotive, Farm Equipment, Defense, Aerospace, Railways, Job Shops, Die & Mould, Oil & Gas, Energy, Infrastructure, to name a few. "Automotive remains the largest segment, but over the last five years, we have consciously reduced our over-dependence on Automotive by capturing more opportunities in other segments. Our product and market development strategies reflect this direction. For example, keeping in mind the needs of Aerospace, Defense,

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

and Medical segments today, we have a full range of high-end 5-Axes machine platforms – Vertical, Horizontal, and Double Column configurations. We are also the first Indian machine maker to have an in-house developed array of combination 2-Axes spindle heads to suit these platforms," shares Raghavan.

Globally, BFW is operational in Europe (Germany, France, Italy, Turkey), Russia, South East Asian countries, and the Middle East along with its distributor partners and promotes select high-end technologies in these segments.

Focus on R&D

BFW launched Dr Kalam Center for Innovation in 2016 to create applied R&D for next-gen manufacturing technologies. Raghavan elaborates, "Our purpose is to 'Enable Progress', and being an industry leader in the Indian industry, we believe it is our responsibility to continue to develop new technologies through the applied R&D route. At Dr Kalam Centre of Innovation, our teams are doing significant work in the field of common technologies, which we subsequently deploy on various product platforms."

The company has developed a unique composite structure technology (I C Tec – Patent Pending) to enhance the rigidity and vibration-damping performance of machine structures, resulting in the superior surface finish of parts produced on machines and enhanced tool life.

"In India, we have a typical problem of significant temperature variations within a day and across the year. Hence, our customers need to produce parts with increasingly stringent accuracy needs. To overcome this issue, we have developed a radically intelligent Thermal Compensation Technology (I RTC – Patent Pending). This allows compensating thermal deflections in real time while machining the components and ensures the highest standards of consistent accuracies on our products," he explains.

Source: BFW Ltd

"Over the last decade, we have focused on getting our product platforms to the global level of technology and have also expanded our offerings to include comprehensive milling/turning and multi-process technologies, automation, IoT, process engineering, and recently, additive technology."

Ravi Raghavan
Managing Director
Bharat Fritz Werner Ltd (BFW)

IRIS, the company's scalable, modular IoT platform based on Edge processing technology, is helping create smart shop floors for its customers. This technology has also been developed at Dr Kalam Centre of Innovation.

"Besides these, our teams are engaged in ultra-high-speed spindle technologies, a combination of spindle heads and a variety of sensor-based systems. Dr Kalam Centre of Innovation is providing a strong technology foundation for our future products," he remarks.

Questioning the status quo

BFW has been recognized as one of the Top 25 Most Innovative Companies in India at the prestigious CII Industrial Innovation Awards from more than 600 companies across the nation. Raghavan comments on this acknowledgment from the industry, "We are happy to have been included by CII in the list. At BFW, we have been encouraging innovation and creativity continually. Our effort is to develop a strong culture of innovation. Innovation does not stop with a product; it includes questioning the status quo of everything that comes in the way of serving customers effectively. Therefore, it includes processes, products, technologies, and services."

BFW has evolved a strong platform-based concept of products deployed across the product families. "As we conceive a new platform, we brainstorm and set very high goals for the platform, which necessarily demand unconventional solutions. For example, our Mach platform constitutes the slimmest high-speed machines. This meant questioning every conventional norm to minimize the footprint," he informs.

In daily routine work, the company has a robust kaizen process to kindle the creativity of its people in evolving minor improvements in day-to-day operations.

"Recently, we deployed the SAP Hanna platform, and we are in the process of revamping and digitizing all our internal processes to serve the customer more efficiently. In a nutshell, questioning the status quo is a way of life at BFW," he points out.

In sync with current times

BFW has delved into Additive Manufacturing (AM) and Digital Manufacturing and has signed a strategic partnership with Meltio, a disruptive laser metal deposition technology manufacturer, for the AM technology.

Briefing us with this alliance and the company's goals to tap business opportunities in AM and Digital Manufacturing, Raghavan says, "The world of manufacturing is undergoing major technology disruptions, and the growth of additive technology is one of them. Globally, additive technol-

BFW has delved into Additive Manufacturing (AM) and Digital Manufacturing and has signed a strategic partnership with Meltio, a disruptive laser metal deposition technology manufacturer, for the AM technology.

ogy is slated to grow from US$18 billion industry to US$148 billion industry at a CAGR of 25 percent over the next decade. Indian manufacturing will not be an exception to this. The current share of the Indian industry in the world of metal additive is 2 percent. The 'Atmanibhar Bharat' initiative of the Indian Government will create big growth opportunities for the deployment of additive technology in Aerospace, Defense, Energy, and MRO segments, apart from its penetration in traditional Automotive, Die & Mould, and prototyping applications. Therefore, we see significant growth opportunities in the AM and Hybrid areas."

BFW would like to enable the large-scale transition of AM technology from 'niche' to 'industrial applications', he shares, adding, "We see DED (Direct Energy Deposition) as a great technology for the future for this transition. Our alliance with Meltio, Spain, will help us evolve several CNC and Robotic product platforms to meet the diverse needs of the Indian industry."

Within its first year of operation, BAMPL, a wholly-owned subsidiary of BFW, is already certified with 'AS9000 D', which is essential for the supply of high-quality components to the Aerospace domain.

Scaling up

m2nxt Solutions and BAMPL (BFW Advanced Manufacturing Solutions Pvt Ltd) are wholly-owned subsidiaries of BFW. When asked how they contribute to the parent company, Raghavan replies, "The manufacturing world is undergoing a disruptive transformation – from discreet, isolated manufacturing to fully connected, autonomous factories. We have decided to be a significant player, enabling our customers to transition seamlessly into the new ecosystem. With this objective, our subsidiary m2nxt is focusing on Physical and IoT-based virtual automation solutions, Process engineering, and now Additive manufacturing solutions."

Source: BFW Ltd

"Our effort is to develop a strong culture of innovation. Innovation does not stop with a product; it includes questioning the status quo of everything that comes in the way of serving the customers effectively. Therefore, it includes processes, products, technologies, and services."

Ravi Raghavan
Managing Director
Bharat Fritz Werner Ltd (BFW)

While BFW will continue to focus on making various machine solutions, m2nxt will focus on everything around the machine—material movement, automation, quality assurance, assembly processes, etc.—to evolve a connected system in a cohesive manner for its customers.

Source: BFW Ltd

Over the last three years, m2nxt has already evolved exciting solutions for machine automation, die casting automation, IRIS solutions, and many others.

BAMPL addresses a different need. The Indian Government's 'Atmanirbhar Bharat' has ambitious plans in the Aerospace and Defense segments. "The customers will need a reliable capability for sourcing high-precision, complex parts of exotic materials. BAMPL will specialize in the manufacturing and supply of such complex mid-size components and subsystems within India and globally. To us, it is a natural extension of the manufacturing expertise that has been gained over decades by BFW," he adds.

A platform to celebrate manufacturing

Traditionally, manufacturing is considered the 'Backend' industry. However, considering its role as the backbone of every product the people at BFW touch and feel in their daily lives, they have come up with a platform – Manufacturing Day – to 'celebrate manufacturing'. As Raghavan explains, "The objective of the Manufacturing Day is to get senior manufacturing professionals on a common platform to network, share best practices, discuss common challenges, and evolve roadmaps to address them."

Over the last six editions at Pune, Gurgaon, Chennai, Bangalore, and two virtual events in 2020 and 2021, the event has been very well received by the manufacturing fraternity. Several thought leaders have contributed invaluable insights to these events, including global thought leaders Jason Jennings, Steve Faber, and Sonam Wangchuk, to name a few. The event has addressed several issues like Innovation Culture, Road Map for Smart Manufacturing, Upcoming Technologies in Manufacturing, etc.

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REAPING SUSTAINABLE BENEFITS

With an increase in technological advancements in the manufacturing sector and rising demand for customized products and services, manufacturers must rethink the way traditional manufacturing is approached, especially when supply chains must be readjusted using smarter technologies – especially additive manufacturing.

Source: Stratasys

As the global manufacturing ecosystem transitions into Industry 4.0, there is a massive requirement to advance production methods and find an alternative to energy-intensive manufacturing and transportation processes. As per a 2019 report by the U.S. Department of Energy, compared to traditional manufacturing, additive manufacturing could decrease waste and materials costs by nearly 90 percent and reduce manufacturing energy use by 25 to 50 percent. From rapid prototyping to mass production and injection moulding to end-user production, additive manufacturing has been resolving several manufacturing challenges and gaining prominence in multiple sectors.

Digital Manufacturing and Industry 4.0

It is common knowledge that the pandemic has taught manufacturers in India and globally that it's time to move away from traditional manufacturing approaches. An inherent constraint that organizations have had to work around is the prediction of demand for months in advance. This challenge remains agnostic of industry and scale – be it Automotive, Real Estate, or Consumer Stores. Being able to predict this demand accurately and avoiding wastage of resources will be a key priority as the nation adapts to the requirements of Industry 4.0. The capability to use generative design plays an important role in part optimization and is one of the main advantages that additive manufacturing offers over traditional manufacturing methods. This not only saves time but also eliminates the need for long transport routes and storage areas, consequently reducing the carbon footprint. In addition, a shift toward digital manufacturing opens up the possibility of a digital supply chain that is quicker, cheaper, and safer for the environment. This will enable the sustainable production of customized and high-quality products for multiple industries such as Aerospace, Healthcare, Automotive, and Consumer Electronics.

Role of additive manufacturing in driving sustainability

Manufacturing is an energy- and resource-intensive activity, which leads to waste gener-

RAJIV BAJAJ
Managing Director – India and SEA
Stratasys

ation throughout the product lifecycle. Additive manufacturing could improve the sustainability of industries globally. The very process of manufacturing by using only the material needed, instead of removing excess material, without the need of producing tools, could be revolutionary for the global environment. Production of parts only when and where it is needed can go a long way in reducing overall emissions from industrial production.

Another essential aspect is transportation. Manufacturing is just the first step, followed by assembling and finally delivering it to the customer – all of which involves logistics, which, apart from adding to the overall costs, results in emissions. With additive manufacturing, one can send a digital file to the place where it is needed, and then it can be printed locally. This not only saves a lot of time and resources but also has a positive impact on energy consumption.

Source: Stratasys

Scope of additive manufacturing

We are currently at an inflection point for global manufacturing, where massive pressures to upgrade unresponsive supply chains and 20th century energy-intensive manufacturing and transportation processes intersect with a mature adoption curve for additive manufacturing. This technology will ensure that manufacturers can deliver an array of high-volume products while maintaining low costs, high quality, and sustainable methods of production.

Over the past two years, the world has witnessed the impact of additive manufacturing in critical areas such as healthcare, manufacturing, product development, and education. This will also pave the way for advanced additive manufacturing technologies optimized for a wide variety of applications and a broad range of cost-effective, high-performance materials.

The future will focus on adopting unique materials, smart solutions, and intelligent connectivity to the manufacturing systems – all of which will be made possible by additive manufacturing. Some industry experts also predict that this technology can support the expansion of space programs. Innovations in this space have also made it possible to envision a distributed network of manufacturing with 3D printers strategically placed worldwide, interfacing with cloud-based, digital inventory that is produced locally, as needed. The potent combination of smart additive manufacturing systems, connected to a digital supply chain and supported by modern cutting-edge innovation, can transform the face of the entire Manufacturing sector. The best part is that it will happen while using less waste and energy and with better performance and a much shorter time to market.

Source: Stratasys

The future will focus on adopting unique materials, smart solutions, and intelligent connectivity to the manufacturing systems – all of which will be made possible by additive manufacturing. Some industry experts also predict that this technology can support the expansion of space programs.

Source: Magic Wand Media

TOWARDS A SMART FUTURE

Indian companies must equip themselves with the requisites, including knowledge, skills, and attitude, to advance technologically and adapt to the changing scenario.

RRAJESH KHOSLA
President & CEO
AGI Glaspac
sagi@agi-glaspac.com

Manufacturing and other industries have seen remarkable progress in technology in the last few years. Technological advancements are fuelling the next industrial revolution. Connected products and systems in factories throughout the world are making businesses smarter and more responsive to the needs of their customers. The primary goal of businesses is to leverage technology to improve efficiency and profitability, increase innovation, and manage safety, performance, and environmental impact. Indian companies need to be prepared for technological advancements with the knowledge, skills, and attitudes to adapt to the changing environment.

Sensor-enabled machines can communicate successfully with other machines, devices, and people, allowing for data collection that may be used to make informed decisions in the changing landscape. Industry 4.0 is a collection of technologies such as Cloud Computing for Big Data and Analytics; Cobots of the Industrial Internet of Things (IoT); Sensors and Simulation; Integration of both horizontal and vertical systems; Cyber Security; Augmented Reality; and Virtual Reality.

Machine-as-a-Service (MaaS) has emerged as a strong manufacturing force thanks to Industry 4.0. By 2022, the market for Machine Learning as a service is estimated to approach US$ 3.754 million. By 2021, it was estimated to be 3.3 billion M2M (Machine-to-Machine) global connections.

All operational aspects of the manufacturing business, from conventional industries like Automotive and Coal to high-end manufacturing, will be brought together in the future by digital manufacturing (miniaturization, printed electronics, etc.). The Boston Consulting Group predicts that by 2025, the per-

centage of work performed by robots in all manufacturing industries will rise from roughly 10 percent to about 25 percent. An increase in automation, which can increase productivity by 30 percent, can reduce industrial labor expenses by as much as 5 percent annually.

Challenges faced by the manufacturing industry in India

According to CII, a mere 28 percent of India's industrial Manufacturing sector is equipped with a smart factory. Since the introduction of Industry 4.0, the smart factory has become a crucial part of the industry. As a part of the Government's 'Make in India' plan, linked factories will become a reality. However, there are formidable challenges listed as follows:

Integration

The Indian Manufacturing industry faces obstacles that could hinder the adoption of linked factories. Companies find it challenging to operate with less human oversight.

Interoperability

An infrastructure change may be required when wireless connectivity is implemented. An integrated tool can be used to keep track of inbound and outbound shipments for location-related information, timely order fulfillment, and critical in-transit factors such as temperature, humidity, storage conditions, etc., to bridge the connectivity gap.

Financing

In India, the Government's 'Make in India' project, which aspires to turn the country into the world's factory and create high-skilled jobs in the industry, is an essential facilitator of linked factories. The decision-making processes of the governing committees and leaders should be clearly outlined.

Sense of safety and security

The most critical consideration is security. Data, communication, and intellectual property rights must be protected. Concerns about data security have arisen as more systems are integrated, and more people are granted greater access to those systems.

Upskilling

The sector is expected to create 100 million new jobs by next year and reach a value of US$ 1 trillion by 2025. It is seeing an increase in demand for social, behavioral, and cognitive skills and attitudes such as crisis management, resilience, interpersonal communication, quick decision-making, and critical thinking. Experts believe that these skills are necessary to generate maximum efficiency from machines being deployed with emerging technologies.

Overcoming obstacles

Even though the Indian Manufacturing industry is rapidly adopting technology, it must address the obstacles that could hinder the adoption of linked factories.

Inflexibility is a problem for many manufacturers when incorporating new technologies. The majority of factories still use paper-based processes, which needs to change. One of the most prominent challenges organizations face is the lack of competent staff to develop and deploy smart solutions. During the transition, factory workers would need time to adapt to the new environment. As a result, it's critical to provide them with the training and time they need to become proficient.

Companies cannot afford to neglect the equally important issue of security. They must have mechanisms to protect their intellectual property, data, and communications. Their knowledge of the software necessary to maintain data privacy while allowing them to exchange data and logistics details must be thorough.

The way forward

The Government's 'Make in India' project will be a significant facilitator of linked factories in India. These factories' ability to integrate global supply chains by enabling real-time information exchange to develop analytical frameworks for improving efficiency will be critical.

Some of the most critical differentiators for manufacturers embarking on connected factories will be a forward-looking mentality, investment in R&D, a talented workforce, and a powerful human-machine interface.

Those that get on board with Industry 4.0 early will gain an advantage over their competitors, while those who hesitate will find themselves irrelevant and left behind.

One of the most prominent challenges organizations face is the lack of competent staff to develop and deploy smart solutions. During the transition, factory workers would need time to adapt to the new environment. It's critical to provide them with the training and time to become proficient.

FOCUSED ON THE GOAL

GH India has come a long way from its humble roots. From working out of a rented shed to owning a state-of-the-art facility sprawled over two acre, the company's journey has been a tour-de-force in every possible sense of that phrase.

Source: GH Induction Pvt Ltd

Aerial View of GH Induction India Plant

GH Group, one of the largest induction companies in the world with headquarters in Spain, has been in India as a joint venture partner of GH India for the past 23 years.

GH India, commencing its operations in 1998 from a rented shed in Ambattur Industrial Estate, Chennai, moved on to its own 20,000 sq ft built-up area in Thirumudivakkam Industrial Estate in 2000. In 2013, the company moved to its state-of-the-art facility spread over two acre.

The company started with a net worth of ₹5 million, 15 employees, and a turnover of ₹25 million in its first financial year of nine months and is now comfortably placed with a net worth of ₹301.50 million, 140 employees, and a turnover in the range of ₹400-500 million per annum.

"We take pride in offering superior European technology, fast and efficient services, and excellent process technology support with Indian flexibility and pricing. We have to our credit more than 4,000 installations worldwide. GH India has a complete know-how and access to the latest technology of the Group," shares RV Chari, Managing Director, GH Induction India Pvt Ltd, with evident pride.

Catering to an array of industries

GH India is one of India's leading players in the Induction Heating machine-building industry. The company offers complete Induction hardening solutions and manufactures Standard Vertical and Horizontal machines, including Special Purpose Machines suitable to the customer's layout and productivity.

Induction heating finds extensive application in various industries. Providing an appropriate solution for an induction heating application requires sound knowledge of and experience in several disciplines of engineering. GH India

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

designs and manufactures a broad range of highly engineered world-class Induction Heating capital equipment for the hardening of components used in a variety of industries such as Automobile, Steel, Railways, and Defense, among others.

GH India has developed a highly efficient generator that reduces energy consumption by 5 percent to cater to the Pipe & Tubing industry.

Some of the popular applications are: Heat-treating (surface hardening, tempering, annealing); Mass heating for forging, extrusion, upsetting; High-frequency induction welding for tube mills; Seam annealing for tube mills; Brazing for tools, cladding diffuser bottoms for cookware, motor end rings, transformer conductors; Shrink fitting; Vacuum sintering, annealing, levitation melting; and 'plug-quenching' of critical parts to limit the distortion.

Ninety percent of GH India's turnover is attributed to the Automobile sector, followed by the Nuclear Power Sector, Renewable Energy Sector, etc.

Ensuring customer satisfaction

To ensure meeting the customer's ever-changing demands, Chari explains that it's essential to keep tabs on the market, which the company does by participating in trade events. "Our Sales and Technical Team participates in the exhibitions conducted by prestigious organizations like IMTMA, ACMA, etc. These events are eye-openers; they keep us abreast of developments, competitors, and new ideas, and they help us with customer interaction and goodwill creation. These platforms also aid in showcasing to the world the developments made in GH India," explains Chari.

Source: GH Induction Pvt Ltd

"We take pride in offering superior European technology, fast and efficient services, and excellent process technology support with Indian flexibility and pricing. We have to our credit more than 4,000 installations worldwide. GH India has complete know-how and access to the latest technology of the Group."

RV Chari
Managing Director
GH Induction India Pvt Ltd

Periodically, training sessions are conducted by the suppliers on their highly specialized products, wherein the engineers from GH India are apprised of the latest developments in them.

Visits are arranged to customer places to interact with them. This exercise provides a wealth of information to GH India as the Sales & Service Team gets to know the needs and requirements of the customer first-hand. At the same time, difficulties experienced by the customer with their existing machines provide the basic data required for the Engineering & Application Team to work upon.

Dearth of skilled personnel

Large corporations and SMEs are both equally inflicted with the issue of a dearth of skilled personnel. Chari shares how GH India tackles this issue in its capacity, "GH India, operating in the niche field of manufacturing customized induction heating machines, requires not only a skilled but also a well-trained workforce. For us to train our personnel, we first need to identify their qualifications, attitude, and aptitude."

The company recruits freshers from Polytechnic Colleges, Industrial Training Institutes (ITI), and Engineering Colleges. It then gives them on-the-job training in assembly, wiring, and trials to make them understand the whole process. "It's the most cost-effective and simple method of training your employees under expert supervision, and the newest employees are put to work straight away," he adds. GH India tries to maintain a small buffer strength to supplement in the case of emergencies or exigencies.

GH India outsources its requirements to MSMEs and concentrates only on wiring, assembly, operating software, and technical know-how required for the hi-tech niche machine building.

Source: GH Induction Pvt Ltd

Shopfloor of GH Induction India Plant

The passionate team behind the success

The inspiring force behind GH India is its Promoter Director & Vice Chairman – VR Chari, a doyen in the induction field since 1964, who has had wide exposure to various industrial applications and the ability to find appropriate solutions to satisfy customer needs by adopting an out-of-the-box approach.

"Eighty percent of the managers (star members) who form the Core Team are involved in the various aspects of machine building. They have been with GH India for more than 15 years, and some of them who started as trainees at the time of its inception have grown to head various departments. This winning team is well-equipped to meet any untoward challenges that may arise at any time," Chari shares.

GH India implements the 'Gurukul' system of learning for its employees. Fresh recruits work with the team leader from the problem definition stage to the development of the solution. The managers are involved right from machine and software trials to the discussions with the Control Team and review meetings with customers.

"Over the years, the sustained efforts put in by the Directors, Star Members, and all the other employees have contributed to GH India's creating a name for itself as a dependable and versatile solution provider in the induction field," he adds.

The company implements the 'Gurukul' system of learning for its employees. Fresh recruits work with the team leader from the problem definition stage to the development of the solution.

GH India and automation

SMEs are often reluctant to embrace automation. Chari tells us how the company has leveraged automation for its growth.

"Automation comes into effect whenever machines and computers are used for repetitive manual activities. GH India, being in the machine-building industry where each machine is unique due to customization, the scope of repetitive activities that can be automated is relatively less," he explains.

"Extensive usage of software solutions and simulation packages such as Solidworks, Eplan, Finite Element Analysis, and extensive CNC/PLC software is part and parcel of the entire machine building process," he adds.

GH India outsources its requirements to MSMEs and concentrates only on wiring, assembly, operating software, and technical know-how required for hi-tech niche machine building. On the other hand, it sells automation (low-cost automation appropriate to the application) as part of the solution to its customers.

Challenges during lockdowns

The entire Manufacturing industry had to face many obstacles during the pandemic lockdowns and is still grappling with its effects. Chari gives insight into what GH India faced and how it emerged from the unprecedented situation. He shares, "In the initial phase of COVID-19, we had to face the hitherto unforeseen situation of Confirmed Orders on hand being put on hold by the customers. They later postponed their decision to place new negotiated orders, leading us to an uncertain future, and we were left in a 'wait & watch' phase."

Once the lockdown was lifted partially and then fully, employees who had left for their native places could not return to the workplace. With uncertainty plaguing the production and supply-chain cycle, he adds that the overall mood was not upbeat.

"Visits by the Sales & Service Team to Customer places were curtailed, alternate channels of communication like 'Microsoft Teams' meetings had to be established, and the employees had to develop new skills in 'on-line' communications," he adds.

Though the deliveries were put on hold, GH India continued its manufacturing activity with the available workforce and stock of materials on hand. It made extensive use of the in-house facilities (like hardening machines for trials supplemented by appropriate fixturing) to make up for the challenges posed by the pandemic.

"For GH India, working capital was not a problem since the management had the foresight to save enough for a rainy day," Chari informs.

Source: GH Induction Pvt Ltd

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STEPPING UP THE AUTO GAME

Enabled by in-house developed technology and products, Bangalore-based mobility technology company CellProp Pvt Ltd aims to design and produce the most advanced, class-leading electric commercial vehicles and work on solving the hurdles that logistics companies face in their large-scale adoption.

Source: CellProp Pvt Ltd

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

A mobility technology company based out of Bengaluru, Karnataka, CellProp Pvt Ltd finds its origins in the idea of electrifying large commercial vehicle fleets for India to accelerate its transition towards net-zero emissions. "In India, more than 80 percent of freight is moved by CVs (Commercial Vehicles). Hence, their large-scale electrification will not just reduce emissions but also India's diesel imports," points out Nakul Kukar, Founder & CEO, CellProp Pvt Ltd.

The company is focused on the design & development of Electric Commercial Vehicles (eCVs) – Electric Light Commercial Vehicles (eLCVs) and Electric Heavy Commercial Vehicles (eHCVs). These eCVs are deployed as part of its end-to-end solution, which solves all the pain points associated with the adoption of electric mobility.

Things in process

Currently, the company is deploying eLCVs with a 1-tonne payload to an initial set of customers. These eLCVs are re-manufactured vehicles that are built from the ground up in its facility using battery packs and BMS developed and manufactured in-house. The battery pack has a modular design with each module of 24V, 6kWh capacity and is AIS-48 certified. "As our production capacity grows, we will indigenize the production of electric motors and drives as well. The eLCV has a range of 150km (24kWh battery, 30kW peak power) and is presently being deployed with logistics companies in Bangalore," shares Kukar.

He adds, "Our eHCV platform is currently under development and is suitable for eTrucks up to 20T GVW. It delivers 200kW peak power and 250km range with a 600V, 300kWh in-house developed and produced bat-

tery packs and BMS. The pack will soon be certified for AIS-48, and subsequently, the eHCV will be sent for certification."

All of the company's CVs have 4G/LTE connectivity, and the data acquired from the operation of these vehicles is uploaded to its Mobility Platform. The mobility platform is an integrated software platform to process the acquired data to offer analytics and a host of value-added services like OTA updates, health monitoring, energy management, charge scheduling, etc. to Cell Propulsion customers.

The start of the journey

Cell Propulsion was founded by Kukar, Paras Kaushal, and Supratim Naskar. Before CellProp, Kukar and Kaushal worked at the Indian Space Research Organization (ISRO) on its launch vehicle rocket engine systems. At the time, Naskar, Chief Technical Officer (CTO) of the company, was working on launch vehicle payload fairings and mechanisms.

Kukar and Paras Kaushal, COO & Co-Founder of the company, had also worked with an aerospace startup on the design & development of lunar lander systems and the design & development of solar-powered electric aircraft. While working on the electric aircraft project, they realized that the electrification of ground vehicles represented a massive opportunity in India. Given the experience gained with EV technology and prior experience in managing complex engineering projects, they decided to initiate this venture.

The company started full-time operations in 2017 with the goal of designing and producing electric commercial vehicles (eLCVs and eHCVs). During the initial years, the Founders were involved in the design & development of core technology and powertrain components like battery packs, BMS, motors, drives, etc. Subsequently, they worked on integrating all these discrete components into powertrain systems for eLCVs and eHCVs. "Our initial goal was to sell eCVs to logistics companies. But upon realizing various systemic challenges involved in their adoption, we began to focus on building the complete ecosystem to accelerate the adoption and make the transition for logistics companies to electric highly seamless," shares Kukar.

While Kukar sees fundraising, investor interactions, business development, and formulating the overall strategy and vision for the company, Kaushal is responsible for managing company operations and overseeing the general administration, infrastructure development, HR, Finance & Accounts, Compliance, and Supply Chain. Naskar, on the other hand, looks at leading technology and product development for electric powertrains and eCVs.

Source: CellProp Pvt Ltd

> "In India, more than 80 percent of freight is moved by CVs (Commercial Vehicles). Hence, their large-scale electrification will not just reduce emissions but also India's diesel import."
>
> **Nakul Kukar**
> **Founder & CEO**
> **CellProp Pvt Ltd**

The company is backed by some of the largest early-stage VCs in the Indian ecosystem. "Some of our major investors are Endiya Partners, growX Ventures, and Micelio Mobility Fund. We have raised around US$3 million cumulatively across all our equity financing rounds and more than US$1 million in debt financing," he adds.

Hurdles on the way

Revealing the key challenges the startup currently faces, Kukar explains, "Due to lack of local production, global supply chain disruptions caused by the pandemic, and a global semiconductor shortage, supply chain and inventory management has become an issue."

The availability of skilled talent to build high-voltage, high-power equipment for eHCVs is another problem, he acknowledges.

When asked how the company copes with the competition in the field, Kukar responds, "The key to competing in the CV segment is to offer the most advanced features in our eCVs and make them category-leading products for the customers. Some such features are payload capacity, range, starting torque, etc. Offering the best specifications for these features at a reasonable price is being achieved by us through in-house technology development and massive vertical integration."

Cell Propulsion also offers a host of digital solutions and services to operate and manage eCVs efficiently. This enables the consistent performance of its products and increases savings for its customers during

Currently, the company is deploying eLCVs with a 1-tonne playload to an initial set of customers. These eLCVs are re-manufactured vehicles that are built from the ground up in its facility using battery packs and BMS developed and manufactured in-house.

the entire product life-cycle. "We believe that such end-to-end fully-managed approach to support the operation of eCVs will also offer a strong competitive advantage to us," he notes.

Why electrify CVs?

Shedding light on the need for electrification of CVs in India to promote the larger adoption of EVs in the country, Kukar says, "In India, the large-scale electrification of CVs will help reduce diesel consumption to such an extent that fuel price fluctuations will stop impacting the price of goods for the common man. It will also reduce India's diesel imports. Also, CVs are the largest source of vehicular pollution due to their low mileage diesel engines and the way they are driven. Their electrification will naturally have a massive impact on air pollution and air particulate levels."

Another driver for the electrification of CVs, he adds, is a surge in demand for the delivery of goods within large cities due to the boom in e-commerce, which means increased demand for LCVs. Meeting this demand with eLCVs will also enable logistics companies to deliver on their sustainability goals while reducing their operating costs.

> "The key to competing in the CV segment is to offer the most advanced features in our eCVs and make them category-leading products for the customers. Some such features are payload capacity, range, starting torque, etc."
>
> **Nakul Kukar**
> **Founder & CEO**
> **CellProp Pvt Ltd**

"It is encouraging to see that the Government is taking necessary steps to create awareness and encourage the adoption of EVs. The policies from various state governments are also promising and are getting developed on an incentive-led model that will enable both manufacturers and consumers. The modification of the FAME II policy is a significant step forward for the e2W to encourage localization and increase affordability. We anticipate similar incentives for eCVs, as this segment is the largest producer of emissions and the largest consumer of diesel. The announcement of such incentives will further accelerate the adoption of eCVs in India," informs Kukar.

In India, the Goods Carrier segment sees the highest vehicle usage, which makes the CV segment ideal for leading the transition to electric due to a robust economic case.

Source: CellProp Pvt Ltd

EV ecosystem in India

Kukar gets candid about the EV ecosystem in India for the commercial and logistics segments and reveals what he thinks is needed to improve it. He says, "In India, the Goods Carrier segment sees the highest vehicle usage, which makes the CV segment ideal for leading the transition to electric due to a robust economic case. This has led to many new players entering the CV industry with their eCV products. However, almost all of these new entrants are developing commercial e2W and e3W with just one or two players focusing on eLCVs (e4W) and eHCVs."

According to him, the eCV ecosystem in India is at an early stage with massive growth potential. "This positions Cell Propulsion perfectly in this segment with a strong first-mover advantage. We believe that this growth will truly be realized in coming years with the announcement of Government incentives for eCVs, resulting in their wider adoption," he adds.

Plans ahead

He concludes with the team's vision for Cell Propulsion, which is to become the pioneer in the electrification of CVs and lead the deployment of eCVs on Indian roads. "Enabled by in-house developed technology and products, we aim to design and produce the most advanced, class-leading eCVs while also working on solving all the hurdles that logistics companies face in the large-scale adoption of eCV fleets. Finally, we intend to expand our operations outside of Bangalore to other Tier-1 and metropolitan cities."

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