VOL 3, ISSUE 4 - NOVEMBER-DECEMBER 2019

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IMPRINT

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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

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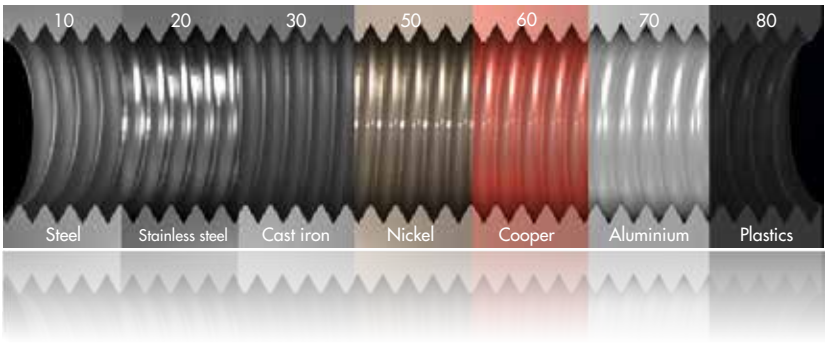

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NEW ERA DEMANDS NEW BUSINESS STRATEGY

I feel privileged to address the readers of Modern Manufacturing India (MMI) magazine, for the first time, after being elected as the President of Indian Machine Tool Manufacturers' Association (IMTMA).

Manufacturing on the whole is facing challenging times currently but I firmly believe that we will see light at the end of the tunnel, provided, we reboot, rethink, create an agile ecosystem and get ready for the marathon race. Meanwhile, IMTMA will continue to guide the machine tool industry to tide over this trying phase, explore various avenues for growth and leverage opportunities along the way as we move on.

It is an opportune time for us to look internally. Energizing the ecosystem, whether it is our teams, partners or suppliers and getting them to align with our new thinking is crucial. We need to gear ourselves to improve our processes, eliminate waste, and develop new products for new markets. These factors would help overcome the prevailing challenges and enable us to be ready when the market starts moving on the upward curve.

This edition of MMI focuses on the metal forming machine tool sector. Although, a big part of India's metal forming sector is unorganized, it is significantly large with an estimated market size of around $600 million and holds immense potential. Machine tool manufacturers will have a lot to explore at IMTMA's flagship exhibition IMTEX FORMING 2020 & Tooltech 2020 to be held in January 2020 at Bangalore International Exhibition Centre (BIEC), Bengaluru.

IMTMA is also organizing a mega event, 'Symposium on Smart Automation' on November 21, 2019 in Bengaluru to drive manufacturing excellence through automation. I am optimistic that these events will propel the manufacturing industry to scale greater heights.

While I believe that the auto sector will continue to garner significant business opportunities for the machine tool industry, the time is ripe for the industry to recognize opportunities in emerging sectors such as defence, aerospace, power, medical equipment, railways, heavy engineering, etc. which are likely to grow rapidly in the coming years. This calls for the industry to minimize technological gaps and brace themselves up to serve the requirements of its customers.

I wish you all a happy reading!

INDRADEV BABU
PRESIDENT
IMTMA

Machine tool manufacturers will have a lot to explore at IMTMA's flagship exhibition IMTEX FORMING 2020 & Tooltech 2020 to be held in January 2020 at BIEC, Bengaluru.

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V ANBU
DIRECTOR GENERAL & CEO
IMTMA

The opinion piece by IMTMA in this issue divulges the opportunities in store for metal forming manufacturers in the Association's IMTEX FORMING 2020 & Tooltech 2020 exhibition in January 23–28, 2020 in Bengaluru.

Dear MMI Readers,

Indian Machine Tool Manufacturers' Association (IMTMA) is delighted to publish the November edition of its Modern Manufacturing India (MMI) magazine. Many thanks for your continued interest. Our MMI editorial team, with its rigorous research and analysis, continues to bring you the latest information on the developments in the manufacturing industry.

This month's edition focuses on metal forming and it is pertinent to note that India's metal forming sector, with its significant small, medium and big players, makes paramount contribution to India's manufacturing growth. The opinion piece by IMTMA in this issue divulges the opportunities in store for metal forming manufacturers in the Association's IMTEX FORMING 2020 & Tooltech 2020 exhibition in January 2020 in Bengaluru.

As we carry on with sharing inspirational stories from the industry, we also reach out to you for your feedback, comments and thoughts to make this magazine more insightful and interesting. This will help us understand your requirements and enable us to meet your expectations. I thank you once again for your interest in the activities of IMTMA. You can download previous issues of MMI from the IMTMA website.

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MAKING A DIFFERENCE THAT MATTERS

As this year draws to a close, we look both backward and forward while compiling the present MMI issue. At the inception of MMI, we vowed to always do what is right and not just what is easy and popular. Since then, we, as a magazine, have been sharing the usual bits and pieces that publications have in common. But the similarity ends just there.

It is a matter of pride that, today, MMI is a well-acknowledged global publication and voice of the industry. Our immense thanks to the entire manufacturing fraternity and the academia for placing faith in us and sharing their experiences and expertise to facilitate us in creating unique and exclusive editorial pieces. We are grateful to the industry for lending us all the support for experimenting with our innovative ideas and making MMI a publication with a vision.

MMI is fortunate to garner co-operation from entities across the length and breadth of the country as well as many countries. We have always endeavored to be the platform of the industry and for the industry. Working towards the same, we have introduced different segments in almost each MMI such as 'Industry-Academia' to highlight the partnership between the two entities to whom belong our country's brightest minds; 'Best Practices' to feature companies that embrace and adopt changes in their way of working, and, in doing so, become role models for others; 'SME Success' to map the journeys of companies who start small with big goals, and surmount challenges to make impossible, possible; and 'Employment Opportunities' to create a buzz among the go-getters about new opportunities.

> *"It's only after you've stepped outside your comfort zone that you begin to change, grow, and transform."*
>
> *– Roy T Bennett*

Following this tradition, we are pleased to present the 'Startup' segment in this issue to chronicle the journeys of young companies that dare to think the unthinkable. While we celebrate our accomplishments of this year, we solicit your feedback to help us come up with stories that matter.

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PROPELLING THE METAL FORMING MANUFACTURING SECTOR

The young breed of entrepreneurs in the metal forming sector is aware of the value advanced manufacturing technologies can bring to manufacturing, and, hence, is keen to break free of the old ways and evolve. IMTEX FORMING & Tooltech is making a comeback in January 2020 for those ready to explore the unconformed and innovative in the industry.

Source: Magic Wand Media

The trend shifts in 3D printing and additive manufacturing, Internet of Things and smart manufacturing will also be showcased extensively along with laser cutting and welding solutions.

Manufacturers, in their pursuit to be more productive and efficient, have been consistently discovering technologies that can make their job easier and faster. Metal forming is one such technology to manufacture the finished product and it is evolving. In sheet metalworking, for example, various developments have taken place over the years, be it in cutting, bending, punching or forming. With customer requirements on product quality and quantity on the rise, companies are shifting to automated machines from the conventional ones.

Although a bit unorganized, the metal forming sector is significantly large with an estimated market size of around $600 million. Metal forming machinery manufacturers, although predominantly catering to the automotive sector, also serve other industry sectors such as railways, defence, industrial machinery.

Staying competitive

As per Global Metal Forming Machine Tools Market 2018-2022 report, the global machine tools market is likely to grow at a CAGR of 4.09 percent during 2018-2022. India is also in line with this projection and as the metal forming industry continues to take initiatives to enhance the quality and standard of metal forming machine tools, it may even surpass this estimate. Metal forming technologies are the core manufacturing technologies that influence not just the growth of the automobile and auto component industries, but also the aerospace and defence sectors.

Commenting on the functioning of metal forming industry, Indradev Babu, President, Indian Machine Tool Manufacturers' Association (IMTMA), said that earlier the metal forming sector relied on experience-driven knowledge; it was not very technology-savvy and was highly price sensitive. He added that factors are changing with the younger generation of entrepreneurs showing more enthusiasm towards adopting technology as they realize the value that advanced solutions or systems will bring to manufacturing and that the return on investments will also be higher. He noted that the winds of change can be sensed and the time has come for the metal forming fraternity to act quickly to stay relevant and achieve engineering excellence in this competitive world.

Platform for new trends

Adding on to Babu's views, V Anbu, Director General and CEO, IMTMA, said that metal forming machine tool buyers will have a lot to discover in two months' time when IMTMA organizes its flagship 'IMTEX FORMING & Tooltech 2020' exhibition at Bangalore International Exhibition Centre (BIEC) in Bengaluru from January 23 – 28, 2020. The exhibition will also have special pavilions on Additive Manufacturing and Factory of the Future: Industry 4.0, which will present user industries with an opportunity to procure the latest technologies for their production line.

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CREATING A SOFTWARE ECOSYSTEM IN METAL FORMING

In order to enhance its productivity, quality and competence, and become as lucrative as its peers, it is highly crucial that the metal forming industry must start adopting advanced technologies including building a software ecosystem.

Source: Magic Wand Media

AVINASH KHARE
Consultant Head
Pune Technology Centre
IMTMA
avinash@imtma.in

Although there is an increasing prevalence of software such as CAD/CAM (computer-aided design and manufacturing) in the Indian Industry to complement CNC machines, the Metal Forming front witnesses a dearth in awareness, competence and effective use of supporting software ecosystem, which is severely restricted to only few domains. As a result, most forming technologies in India today get deployed in 'equipment centric standalone mode' based on experience. With lower productivity, minimal automation, lesser predictability and consistency in effectiveness. This tends to undermine the real potential of forming technologies and makes them relatively unattractive for investment and for making a career in it.

New avenues

While sheet formability simulation, BIW assembly, sheet part CAD models, vehicle crash simulation, CAM for laser cutting, casting process development, simulation of molten metal flow and accessibility and collision

checking have been in use for decades, the same cannot be said about the following application areas, which have become possible today. There is much effectiveness to be gained by integrating them with corresponding forming processes.

Simulation and CAM for Press Brake and CNC Punch Press: For sheet products involving simple bending, punching, embossing, and deburring, there are software utilities available for product design, process design, simulation, spring back prediction/correction, tool selection, ATC management, back gauge movement, scrap flow, integrated robotic automation and management of raw material stack as well as finished parts, etc. However, it is common to see Press Brake and Punch Press usage in isolation without any automation or integration.

Laser Hardening and Cladding: While Laser Hardening and Cladding is used for repair/minor modification of die-mould and turbine blades, the process parameters are largely decided by hit and trial or empirical thumb rules. It is now possible to simulate and optimize the process and aim for uniform hardness/microstructure/texture even where there is an uneven quenching mass. Needless to say, if the stamping die has uneven hardness in the contact zone, it is visually seen on the produced sheet part.

Tube Bending, End Forming Laser Cutting and Hydroforming: In the Indian market, Tube Bending, End Forming, Tube Laser Cutting and Tube Hydroforming exist on separate islands of expertise. However, all the four processes are now integrated through common software and automation. Despite a nasty spring back, it is now possible to achieve correctly positioned holes, end forms and overall geometry of parts. It is also possible to extend the process integration to the structures built by the assembly of parts thus made.

Simulation and Design for the use of Rotary Swaging, Axial Forming for lighter transmission elements: Electric Vehicles will involve use of hollow light-weighted transmission elements and drive shafts sooner than later. Unless vehicle designers know how to design with such hollow transmission elements, which are made by the forming route rather than machining, they would not call for such parts in vehicle BOM (Bill of Materials). There is a need and potential of using this promising technology and it starts from Designing.

CAD/CAM for Laser Remote Welding: Laser Remote Welding can replace Spot Welding in BIW Lines but in the absence of availability and competence of Process Design and Simulation, the technology gets branded as 'not for us', 'costly', 'exotic' and 'futuristic' and gets summarily overlooked for serious implementation by Automotive OEMs. The cost will get diluted once OEMs plan for its large-scale adoption. Competence is what is needed first.

Mechanical Design of Structural Elements with Composites: Use of composites currently gets restricted to applications like panels, covers, shells and non-load bearing parts because mechanical designers do not have the software tools to do mechanical design using its 'tailorable' and weight optimizable anisotropic strength. Although there are some software offerings where composites can be built based on the thumb-rule based library of options, the structural analysis part is not widespread yet.

Design with Hot Formed parts: As in composites in Hot Forming, there is a lack of competence to predict and play with tailored strength and microstructure of parts made by Hot Forming. The technology is just sought to be used for making some cold formed parts by Hot Forming to push certain limits for compliance. However, that restricts the potential benefits of the technology in product engineering.

Welding Simulation: Difficulty in managing welding distortion and manipulating the welding process in order to get a consistent quality while deskilling the process remains a challenge. While, electronics has opened up many possibilities for predictive and adaptive control of welding and automation of coordinated weld positioning, the lack of use of Integrated Robotic Weld CAM and Simulation Software has made Indian industrial units prefer simpler manual skill-based welding equipment.

Simulation of Forging: Although it has become possible to predict the properties right up to microstructure, defects and alloying distribution with regard to strokes, timing and forces through software simulation, forging still remains a 'crude' technology based on experience and thumb rules. Getting forging equipment with better dynamic controllability is something that is becoming increasingly possible.

Simulation, Design and Process Design for Metal Additive Manufacturing: Although the software has been developed and is being showcased, metal additive manufacturing technology has not yet reached designers in the manufacturing industry. An awareness on its benefits needs to be spread.

The real potential of forming technologies is getting undermined, making them relatively unattractive for investment and for making a career in it.

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Position: Electronic Engineer
Location: Navi Mumbai
Key Requirements:

• The candidate must be a Diploma in Electronic Engineering with 2-5 years of real shop floor experience of component level, trouble shooting and simple design of digital circuit; • Should have clean PCB wiring knowledge and experience.

Position: Mechanical Engineer
Location: Navi Mumbai
Key Requirements:

• The candidate must be a Diploma in Mechanical Engineering with 2-5 years of experience; • Independent shop floor experience in fitting and fabrication is a must; • Must know measuring instruments and be able to read engineering drawings; • Must have knowledge of 3D software like solid works.

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Position: Pre-sales Co-ordinator **Location:** Mulund
Key Requirements:

• The candidate should be a graduate with 3-4 years of experience; • He should be responsible for estimating, tendering and billing of various government projects, and working on tenders and doing rate analysis for different tenders.

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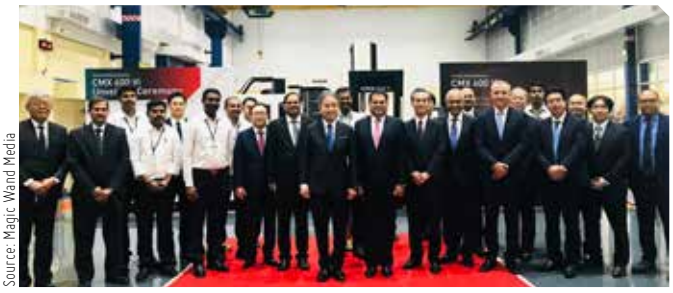
Local Production for CMX 600 Vi Begins in India

Coimbatore, India - DMG MORI CO., LTD recently held a production launch ceremony for the CMX 600 Vi at Lakshmi Machine Works Ltd (LMW) in Coimbatore, India.

DMG MORI will begin manufacturing the CMX 600 Vi vertical machining center in India where the demand for machine tools is expected to grow. The machine, for Indian customers, is manufactured at the LMW's factory with an initial production volume of 10 units a month. The production volume will be increased in stages. LMW began its partnership with DMG MORI about 30 years ago.

"At present DMG MORI in India caters to companies exporting components to companies in the US or Europe. With this collaboration we want to expand our customer base and foray into the Small and Medium Enterprises segment," said Masahiko Mori, President, DMG MORI.

"We have come together as old partners to provide the latest technology to our customers in India. They will now get an option to get reliable products and solutions for their ever-changing needs. It is a win-win situation for both our companies and countries," said Sanjay Jayavarthanavelu, Chairman and Managing Director, LMW.



Source: Magic Wand Media

Team DMG MORI and Team LMW along with Dr Masahiko Mori, President, DMG MORI and Sanjay Jayavarthanavelu, Chairman & Managing Director, LMW at the unveiling of CMX 600 Vi VMC at LMW Plant in Coimbatore.

Source: DMG MORI

(L-R): Dr Masahiko Mori, President, DMG MORI and Sanjay Jayavarthanavelu, CMD, LMW at the launch ceremony at LMW factory.

Dassault Systèmes Introduces SOLIDWORKS 2020

Chennai, India - Dassault Systèmes has introduced SOLIDWORKS 2020, the latest release of its portfolio of 3D design and engineering applications, in India. SOLIDWORKS 2020 features enhancements, new capabilities and workflows that enable more than six million SOLIDWORKS users to accelerate and improve product development, from conceptual design to manufactured products, and create value for their organizations.

By seamlessly connecting to the 3DEXPERIENCE platform, SOLIDWORKS 2020 also addresses the emerging trends and business needs in the global marketplace that require competitive organizations to seek new levels of collaboration and agility to more quickly and cost-effectively deliver new categories of experiences to their customers.

With SOLIDWORKS 2020, and the 3DEXPERIENCE.WORKS portfolio of solutions, the 3DEXPERIENCE platform provides a growing set of cloud-based solutions that work together to help manage every aspect of developing concepts, designing products, and manufacturing and delivering them. "We aren't just bringing powerful new capabilities to the SOLIDWORKS portfolio everybody knows and loves, but also extending it to the cloud through the 3DEXPERIENCE platform, the only holistic digital experience platform in the world. We've built a bridge to our platform-based portfolio, empowering our users to take advantage of 3DEXPERIENCE.WORKS offerings," said Gian Paolo Bassi, CEO, SOLIDWORKS, Dassault Systèmes. "This gives organizations the environment and the applications to truly embrace the Industry Renaissance and its spirit of discovery for new ways of inventing, innovating, collaborating and producing," he added.

Source: Dassault Systèmes

India Shining at METALEX Vietnam'19

Ho Chi Minh City, Vietnam - METALEX Vietnam 2019, Vietnam's International Exhibition on Machine Tools & Metalworking Solutions for Production Upgrade was held in October at Ho Chi Minh City, Vietnam, under the theme of 'Rising with Innovations'. India was the 'Partner Country' at the show.

Dr K Srikar Reddy, Consul General, Consulate General of India to Vietnam, emphasized the essential of Vietnam-India bilateral relation: "India is the ninth largest supplier of engineering products to Vietnam. Our bilateral trade turnover has witnessed a record 12.8 percent annual growth in 2018 to reach around US$ 14 billion as against a target of US$ 15 billion by 2020, which now seems easily achievable."

Adhip Mitra, Additional Executive Director, Engineering Export Promotion Council (EEPC) of India, shared his perspectives: "It is a great honor to see India selected as a partner country for METALEX Vietnam. I wish that more such exhibitions be arranged in both the countries for future interactions between our engineering industries."

Vu Trong Tai, General Manager, Reed Tradex Vietnam, said: "Vietnam's $300 billion economy is expected to rise between 6.6 to 6.8 percent this year. In particular, manufacturing remains the key driving factor to accelerate the economy development."

Source: Magic Wand Media

Third from left: Dr K Srikar Reddy, Consul General, Consulate General of India to Vietnam inaugurating the show along with EEPC India top brass.

CHIRON Opens Precision Factory

Neuhausen ob Eck, Germany - CHIRON recently celebrated the official opening of its new Precision Factory. The building was constructed specially for the assembly of new machine series which combine productivity and precision in an unprecedented way. Optimized assembly and logistics processes also ensure shorter delivery times.

With a maximum annual capacity of 400 machines, the CHIRON Precision Factory in Neuhausen ob Eck, Germany, is currently the most modern machine factory in Europe. Costing more than €34.5 million, the new building on the take-off industrial estate is regarded as the biggest individual investment in almost 100 years of CHIRON's corporate history.

Source: CHIRON

The CHIRON Precision Factory is equipped for production of the new machine series on an area of 14,000 sq mt.

In equipping the new factory, IT experts and production planners pulled out all the stops in regard to digitalization in order to achieve high productivity. Digital assembly folders and contactless logistics bookings are important milestones on the road to a paperless factory. A pick-by-light system helps the order picker to access stored parts quickly and securely. Ultimately, the CHIRON Precision Factory also makes an important contribution towards climate protection. The waste heat produced by the machines during test runs is used in an environmentally-friendly way to heat the factory.

FFG India Opens New Facility

Bangalore, India - FFG India recently inaugurated its new state-of-the-art facility in Bangalore. A facility tour and open house were arranged to demonstrate the company's latest developments, technologies and FFG MAG India capabilities.

Jimmy Chu, Founder and Chairman of the Fair Friend Group (FFG), and Yoshiharu Inaba, Chairman, FANUC, addressed the audience on their plans with the facility. This was followed by a presentation by the FFG Management and interactive sessions.

The new facility will cater exclusively to the Indian market in the beginning and the plans are to later export machines to European countries including Germany, and Asian countries including Taiwan, Japan, Singapore and Malaysia.

According to Chu, the initial investment into the facility is around $10 million, which would increase once the Indian market grows for the company.

Source: FFG India

(L-R): Jimmy Chu, Founder and Chairman, Fair Friend Group (FFG) and Yoshiharu Inaba, Chairman, FANUC during the opening ceremony.

Taiwan-based FFG is a world leading industrial conglomerate operating in the fields of Machine Tool Technology, PCB (Printed Circuit Board), Industrial Equipment and Green Technology. With the acquisition of MAG Group, a leading machine tool manufacturer for the automotive industry, FFG's machine tool division has strengthened its position as one of the premier global machine tool suppliers.

FFG India started operations in 2006 with service, spare parts, sales and application support in all aspects of the FFG Group's leading turning, milling, grinding and gear-cutting technologies.

Schneider Electric's First Smart Distribution Center in India

Mumbai, India - Schneider Electric, the global leader in digital transformation of energy management and automation, recently opened its first Smart Distribution Center in India. The Smart Distribution Center, located in the commercial hub of Mumbai, has been digitally transformed with Schneider Electric's EcoStruxure architecture to be more energy efficient and provide real-time access to information right across the supply chain. Early results from this digitization initiative are showing expected energy savings of 10 to 12 percent and an increase in logistics efficiency of 5 percent at the site.

This is Schneider Electric's fifth Smart Distribution Center launch in 2019, following inaugurations in Australia, China, Brazil and France. Smart Distribution Centers are fundamental to Schneider Electric's Tailored Sustainable Connected (TSC) 4.0 supply chain digital transformation.

The Smart Distribution Center in Mumbai has been set up as a third-party logistics (3PL) site in association with global logistics giant, DHL.

Speaking on the occasion, Javed Ahmad, Senior Vice President, Global Supply Chain, India, Middle East & Africa and East Asia & Japan, Schneider Electric said, "Our Smart Distribution Center Programme serves as a model for other logistics and warehousing players in India to build intelligent distribution networks and paves the way for the region's logistics industry to become more sustainable and efficient."

Source: Schneider Electric

Schneider Electric's first Smart Distribution Center in India.

Eaton's First Aerospace Manufacturing Facility

Bangalore, India - Power management company Eaton recently celebrated the inauguration of its first aerospace manufacturing facility in India. The new facility, located in Bangalore, will manufacture hose assemblies and other fluid distribution products, including oil debris monitoring systems, to serve commercial, business and regional aircraft.

Source: EATON

Inauguration of Eaton's first aerospace manufacturing facility in Bangalore.

"The investment we've made in Bangalore is an integral part of our aerospace business's growth strategy," said Nanda Kumar, President, Aerospace Group, Eaton. "We believe this investment in India will help us grow our original equipment business, because customers are investing heavily here. The site will leverage smart manufacturing technologies and contribute to local growth through employment, business and sourcing opportunities," he added.

The facility, which will serve as the Hose Assembly Center of Excellence for Eaton's global operations, is built over 2.85 acre of land at the Karnataka Aerospace special economic zone (SEZ). With the opening of the Bangalore facility, Eaton now operates 27 aerospace manufacturing locations around the world, including a joint venture in China.

Autodesk University 2019 Inspires Creativity

Bangalore, India - Autodesk University (AU) was recently held for the second time in Bangalore to help connect with the best in the business, share technical knowledge, solve unique business challenges, and gain a deeper understanding of cross-industry opportunities.

With inspiring keynote presentations, showcase of leading-edge technologies and futuristic innovations by students, the event gave glimpses of how the world is changing. The event saw a participation of 2000 design and engineering professionals, students, creative hobbyists and design enthusiasts across India.

To share their insight, the event invited some of the best minds in the industry including Balaji Kesavaraj, Head - Business Strategy & Marketing, Autodesk India & SAARC; Haresh Ram Khoobchandani, Vice President Sales, Autodesk APAC; Vikram Dutt, Senior Director, Building - Business Strategy & Marketing, Autodesk Inc.; Theo Agelopoulos, Sr. Director, Infrastructure Business Strategy; MK Sunil Country Manager - AEC, Autodesk India & SAARC; and Shekhar Rohira Country Manager - D&M & M&E (India & SAARC), Autodesk.

Source: Autodesk

Students displaying their projects at Autodesk University event.

HANNOVER MESSE 2020 to Focus on Key Themes

Mumbai, India - To announce the highlights of Hannover Messe 2020, a press meet was recently held in Mumbai by Hannover Milano Fairs India (HMFI), the Indian arm of Duetsche Messe, the organizer of the world's leading tradeshow for industrial technology.

In line with the age of digitalization, HANNOVER MESSE 2020 will feature an updated exhibition program and a new lead theme – industrial transformation.

The revamped HANNOVER MESSE features the following six display categories: Automation, Motion & Drives, Digital Ecosystems, Energy Solutions, Engineered Parts, Future Hub, and Logistics.

More than 6,000 exhibiting companies from 70 countries and more than 2,00,000 visitors from 80 countries will participate in 2020. Two thirds of exhibitors and one third of visitors are to come from outside of Germany. Approximately 95 percent of visitors are trade professionals. In 2019, roughly eight percent of visitors (17,300) and 28 percent of exhibitors (1,715) came from Asia.

HANNOVER MESSE 2020 will, as usual, host more than 80 conferences and forums covering major trends and topics in the industry. Young Tech Enterprises, the startup hub at HANNOVER MESSE, will feature 150 young industrial companies.

Source: Magic Wand Media

(L-R): Priya Sachdeva, Senior Project Manager, HMFI; Mukesh Samtani, Assistant Director, EEPC India; Geeta Bisht, Director, HMFI and Divya Lad, Project Manager, HMFI.

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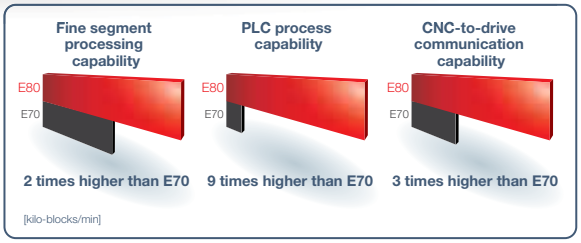

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MITIGATING MACHINE DOWNTIMES

Machines require timely intervention for preventive maintenance, saving a company from expensive unplanned downtimes. The TCO method has proved itself effective enough to help companies organize themselves and implement regular servicing of machines.

Source: Magic Wand Media

MAURIZIO PORTA
CEO, Porta Solutions
Master Trainer
of Method Flexible
Production
maurizio@
flexible-production.com

If you use machine tools, you are perfectly aware of the fact that sudden machine downtimes spread panic at the company. I am sure that you have already experienced this situation, and that it certainly was not a pleasant one. Why am I so certain that you have already found yourself in this situation? Simple. All machines or mechanisms require regular maintenance to ensure their optimal operation. No mechanism in the world can continue to work without a good 'servicing'. Whenever a machine stops due to some malfunction, you can immediately feel the fear spreading through the company. This fear comes from the fact that we know exactly when the machine stopped, but have no idea when it will start producing again. This feeling of not knowing results in a deluge of phone calls within the company to the maintenance department and even outside the company, calling the machine manufacturer directly and begging for help in order to solve the problem. Obviously, all this haste is caused by the fact that you have promised delivery dates to your final customers that you will not be able to meet if the machinery is not working. Needless to say, in today's competitive market, where companies are constantly trying to steal customers from one another, this situation makes it easier for competitors to seize the opportunity.

Can this panic situation be avoided?

The issue of the reliability of the machine starts way back. It is not just a question of carrying out preventive maintenance on the machine, which is indeed important, but it is only the last point of a very clear strategy developed

by the machine manufacturer. Recently, I had a chance to work with the University of Brescia. Together, we have analyzed a very effective method that fully embraces the topic of reliability and, even more importantly, by going backwards on this issue, it is possible to arrive at the cost of the machinery. Do you really know how much the machine tool installed in the production department is costing you? If you answer by telling me the purchase cost of the machine, as they say to the Apprentice: ...YOU'RE FIRED!!!

The Total Cost of Ownership, or TCO, is an approach developed in 1987, and it is used to calculate the total cost of the life cycle of a piece of equipment or plant by analyzing the following items:

- The Purchase (cost of the machinery)
- The Installation (cost of foundations, electrical systems, etc.)
- The Management (personnel training, surface area taken up, energy consumption, etc.)
- The Maintenance (the 'service slip', oil, filters, adjustments, etc.)

TCO is an excellent method for calculating total costs, by identifying all expenses in clear and easy-to-measure terms. Today, there are still many users who let themselves be guided only by the purchase (cost of the machinery), neglecting the other three.

Organizing using the TCO method

Having understood the importance of the TCO method, and bearing in mind the four items listed above, Porta Solutions organized itself in the following way for the TCO to be as cost-effective as possible for its customers. For each one of the four items, I will illustrate in detail how we have set up our strategy:

- **The Purchase (cost of the machinery):** This is down to you, the customer. There is nothing that can be taught as to how to obtain the best price. Obviously, you always try to purchase the machinery at the lowest possible cost, and this is a good strategy. From my point of view, as a manufacturer, in order to be able to offer you the machine at the lowest possible cost, I developed a machine, called MULTICENTER, so flexible that it is practically mass-produced, consequently with all the benefits provided by mass production, so as to meet your need for a low purchase price.
- **The Installation (cost of foundations, electrical systems, etc.):** In this case too, taking into account the TCO factor, the machine was designed in collaboration with the University of Brescia. A theoretical study of vibrations was carried out, followed by a testing phase. A prototype was built and the real vibrations were then measured using vibrational accelerometers.

Moreover, the electrical cab and the hydraulic control unit were installed on board the machine in order to minimize the installation costs as much as possible, according to a PLUG&PLAY concept. The power supply cable and the compressed air hose is all that is needed. These two benefits will also last over time, in case the machinery needs to be repositioned for company layout needs.

- **The Management (personnel training, surface area taken up, energy consumption, etc.):** In order for machine management to impact as best as possible on the TCO factor, it is split into various items: the personnel training for example. During the software development phase, the user interface was equipped with a touchscreen to make it easy to use, in addition to the possibility of having a built-in tablet for better portability.

Another issue is electricity consumption. With the latest-generation drives, the energy developed during the braking phase is regenerated and put back into the grid. In addition, the machine takes up little space, again to the benefit of the TCO factor.

- **The Maintenance (the 'service slip', oil, filters, adjustments, etc.):** We have now come to a

Whenever a machine stops due to some malfunction, you can immediately feel the fear spreading through the company. This fear comes from the fact that we know exactly when the machine stopped but have no idea when it will start producing again.

Knowing TCO

The Total Cost of Ownership, or TCO, is an approach developed in 1987, and it is used to calculate the total cost of the life cycle of a piece of equipment or plant by analyzing the following items:

- **Purchase (cost of the machinery)**
- **Installation (cost of foundations, electrical systems, etc.)**
- **Management (personnel training, surface area taken up, energy consumption, etc.)**
- **Maintenance (the 'service slip', oil, filters, adjustments, etc.)**

TCO is an excellent method for calculating total costs, by identifying all expenses in clear and easy-to-measure terms. Today, there are still many users who let themselves be guided only by the purchase (cost of the machinery), neglecting the other three.

TCO is an excellent method for calculating total costs, by identifying all expenses in clear and easy-to-measure terms. Today, there are still many users who let themselves be guided only by the purchase (cost of the machinery), neglecting the other three.

Source: Magic Wand Media

sore issue, one that customers find it really difficult to understand, despite the fact that it is incredibly banal. Let's start with the assumption that all users of machine tools have a car. They all take their vehicle to the dealership or to a mechanic they trust in order to change the oil, the filters, etc.

The same thing needs to be done with a machine tool!
At this point, I would actually be done with my explanation. However, let me sum it up in a more elegant way.

Preventive maintenance contract

The preventive maintenance contract is not a warranty extension contract, but rather an additional contract for scheduled routine maintenance that lasts for one year. No unscheduled repairs are carried out during scheduled maintenance calls. Please also bear in mind that in terms of workplace safety and health, the employer (your company) is required to guarantee that everything provided to the workers to allow them to carry out their activities (the employees) complies with legislative provisions in force.

Why a preventive maintenance contract?

• Increased productivity and zero unscheduled machine downtimes; • Greater operator safety; • Compliance with safety regulations; • Value retention of the machinery over time; • Monitoring of management costs; • Fewer maintenance jobs; • Lower maintenance costs; • Shorter waiting times for spare parts; • Preferential treatment; • Continuous telephone assistance; • Prevention of catastrophic and unexpected breakdowns, with consequent stoppage of production activities; • Constant monitoring of machinery efficiency.

Find out about our proposal for routine maintenance, and take a few minutes to think about how your productivity can improve without unexpected and dangerous machine downtimes, which often require even more expensive jobs to be carried out on the machine, only because you failed to intervene sooner.

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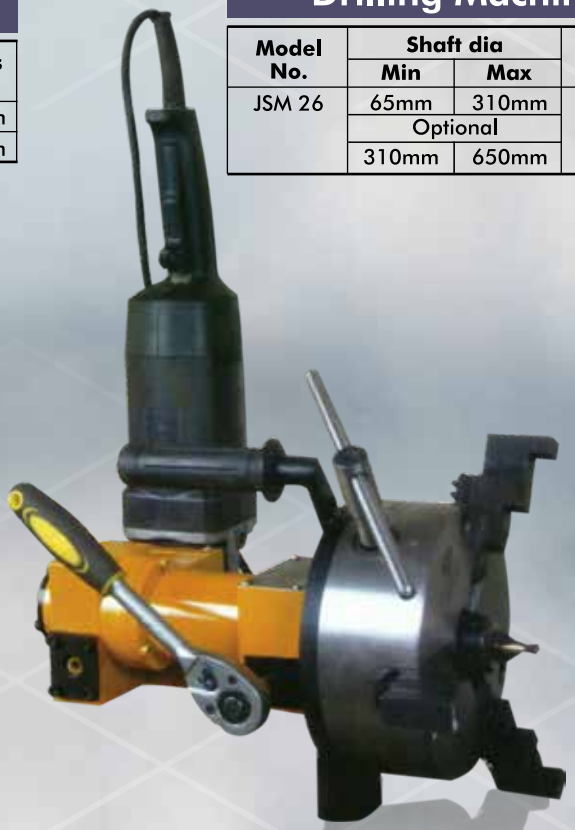

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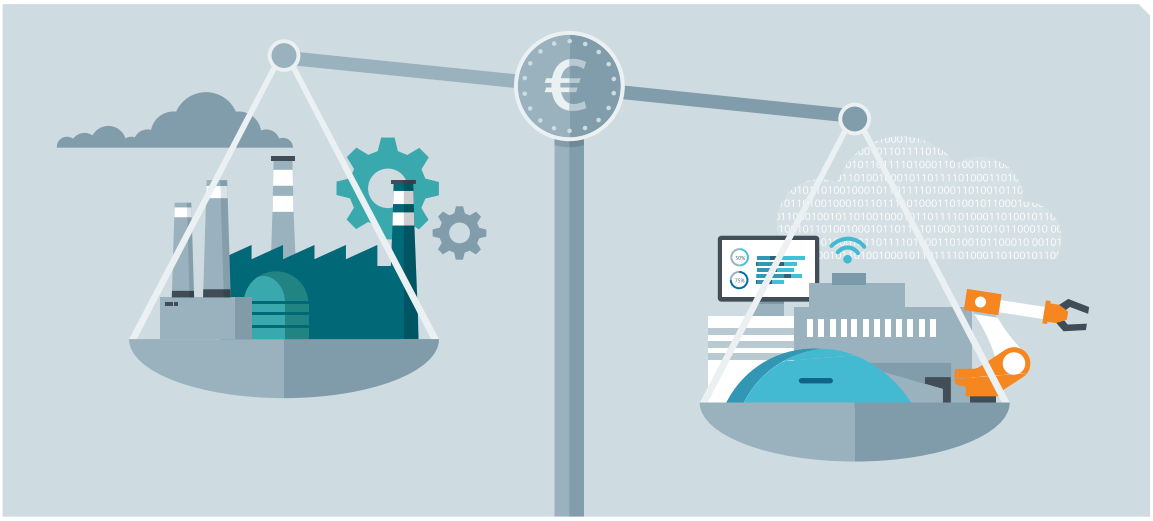
LEVERAGING INDUSTRY 4.0 THROUGH SMART FINANCE

While Industry 4.0 machines, technology and equipment are revolutionizing manufacturing by digitalizing production processes, quality assurance, maintenance, and many other aspects of the manufacturing ecosystem, there are challenges revolving around its adoption that can be overcome with finance.



Source: Siemens

SUNIL KAPOOR
CEO
Siemens Financial Services

Momentum for Industry 4.0 transformation is well under way across the globe. Industry 4.0 initiatives are expected to generate $21.7 billion annually in technology investment by 2023, having grown at a compound annual growth rate (CAGR) of 23.1 percent since 2017[1]. In terms of specific technology types, cyber-physical systems are expected to achieve the highest CAGR of 26.7 percent, reaching a total market value of $4.8 billion in 2023.[2]

At its core, Industry 4.0 is based on a set of design principles that link people, systems, places and equipment/technology – interoperability, information transparency, technical assistance and decentralized decisions. It is essentially a practical means of seamlessly integrating physical machinery, robotics, information technology and the internet in 'smart' factories. Leading investors in Industry 4.0 can be found in all global industry sectors, and several research commentators predict that the Asia-Pacific region, especially China, will retain the greatest market share through the early 2020.[3]

Not 'whether' but 'when'

The question hanging over digital transformation in manufacturing is no longer 'whether' to invest in it but rather 'when' to do so. In most marketplaces, the early mover will invest in new technologies or business models to gain a competitive advantage – at the expense of competitors that have not adopted. For the 'laggard' half of the market, investment in the new technologies or models is still required, but the possibility to gain competitive advantage has disappeared, upgrading as a 'follower' simply entails aligning with the new market norm.

Smart CEOs and CFOs in manufacturing are therefore recognizing the importance of being in the earlier swathe of adopters to get ahead of the competition. The market is fast approaching the tipping point, when the majority of the market will have adopted the new technology and business model. This deadline is made even more urgent by the realization that these 'laggard' adopters likely won't erode the gains made by earlier adopters for some period of time, if at all.

The size of the prize

Each manufacturing sector, even down to the individual manufacturer, needs to carefully analyze their particular situation

to identify a clearly articulated and evidence-based business case for return on investment. While estimated returns are based on models or forecasts, smart manufacturing CFOs manage risk by introducing sensitive monitoring processes and methods to closely track progress toward projected goals and gains.[4]

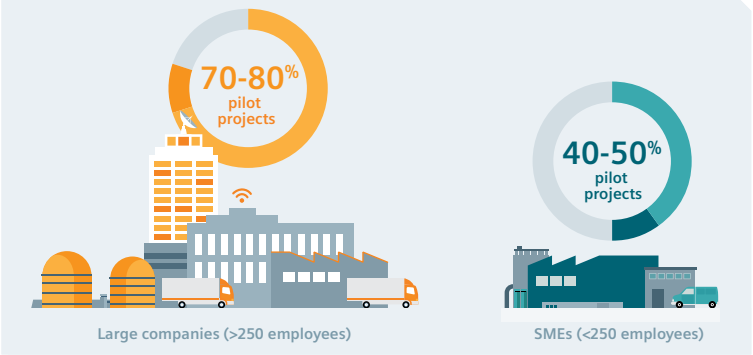
Nevertheless, return on investment is predicted to be very substantial. One major analyst, for instance, predicts that by 2020, manufacturers worldwide will be saving $421 billion annually as a result of Industry 4.0 investments and will gain $423 billion per year in revenues each year as a result of digital transformation.[5] In addition, previous research papers from Siemens Financial Services (SFS)[6] have presented evidence-based estimates of the financial benefit that manufacturers stand to gain from upgrading their production environment to Industry 4.0.

Overcoming Industry 4.0 challenges with finance

Ultimately, while there is momentum behind the transition to Industry 4.0, many commentators have remarked that the pace of transformation could stand to accelerate, especially as incumbent players look to compete with rival economies, stay ahead of new entrants, and manage disruptive change. Clearly there are challenges for Industry 4.0 adoption. The World Economic Forum summarizes these challenges as:

- difficulty in aligning the organization around the potential value and return on investment,
- uncertainty surrounding digital's value to their performance (especially in the short term),
- the cost of resources needed to implement new solutions, and
- the investments required to take them to scale.

These challenges tend to pivot around the issue of finance. The organization needs to understand the commercial benefits of Industry 4.0 and be confident that there will be a reliable return-on-investment. Then, it needs to be able to pay for the corresponding technology at a rate less than or equal to commercial gains in order to make the investment sustainable and cash-flow friendly. In response to these conditions, the term 'Finance 4.0' has been coined to describe financing techniques that enable sustainable digital transformation.[7]



Source: Siemens

What proportion of manufacturers in developed economies have implemented a significant pilot project for Industry 4.0 production solutions?

Finance 4.0 is the answer

This paper sets out the potential spectrum of smart financing options available to manufacturers.

Technology Upgrade and Update: For manufacturers already well on the path to becoming a fully digital enterprise, integrated equipment and technology finance options allow them to upgrade during the financing period and offer protection against technological obsolescence. Upgrades might involve replacing with a newer model or retro-fitting enhancements onto the main technology platform. Ultimately, manufacturers can use the additional flexibility to roll out Industry 4.0 and grow at the same fast pace as the accelerating demand for their (improved) products.

Pay to Access / Use Equipment & Technology Finance: Early engagement with the right financing partner will enable manufacturers to size and specify the pilot without unnecessary financial constraints and help build the business case with the freedom to access the technology that best fits their needs. Financial solutions will usually be based on a range of options: finance lease, operating lease, rental or hire purchase arrangement. Financiers with a deep knowledge of manufacturing in general and digitalization in particular will adapt the finance arrangement to align with the likely benefits the manufacturer will gain from the technology. This type of financing can also cover associated costs of ownership, such as maintenance, into a 'bundled' monthly payment. To enable a series of implementation and adoption decisions over time, financiers can also put in place an enterprise-enablement 'master' agreement with a manufacturer. This is an umbrella arrangement that speeds up new technology and gives the manufacturer the confidence that they will be able to acquire new technology from an OEM as soon as they need it.

Industry 4.0 initiatives are expected to generate $21.7 billion annually in technology investment by 2023, having grown at a compound annual growth rate (CAGR) of 23.1 percent since 2017.

Source: Siemens

How long will it be until over 50% of manufacturers have implemented an Industry 4.0 strategy that has a significant commercial and competitive impact on the company (whether price competitiveness, product quality, agility and time to market, service improvement)?

As the competitive advantage from Industry 4.0 generates growth, manufacturers are under increasing pressure to manage cash flow.

Software Finance: The journey to digital transformation requires deploying combined hardware and software solutions that can deliver digital data streams of performance data. These data are the key to production optimization, predictive and remote maintenance, and more intelligent manufacturing. This is recognized by specialist financiers that can offer manufacturers integrated arrangements for financing requirements.

Pay for Outcomes: Financing agreements in which payments are predicated on the expected business benefits, or 'outcomes', that the technology makes possible are being offered with increasing frequency. Savings or gains from access to the technology are used to fund monthly payments, making the technology cost-neutral for the manufacturer.

Finance to Assist Transition from Pilot to Mainstream

While the benefits of moving to a digitalized manufacturing environment are clear, the process of transition has to be carefully managed and commercial risk eliminated by rigorously testing new technology in the real-world production environment. This can often act as a barrier to digital transformation because the manufacturer is discouraged by the idea of having to pay for both the old or pilot arrangement and the new or scaled approach during the transition period. Recognizing the challenges of transition, financing arrangements are available that defer payment for a new system or scaled setup until it is reliably up and running. This removes the financial challenge of having to pay for the new system while the old one is still running.

Working Capital Solutions: As the competitive advantage from Industry 4.0 generates growth, manufacturers are under increasing pressure to manage cash flow. Cash flow and working capital challenges arise at moments other than just the initial point of acquiring digitalized technology. Digitalization may increase production capacity and productivity, while improving price competitiveness, to the extent that a manufacturer's order book experiences a sudden, significant upswing. This is good news. Yet the momentum that is built through digitalization brings its own challenges – such as suddenly having to buy raw materials or components in greater quantities. Added-value financing services offered in partnership with a specialist financier – usually based on some form of invoice finance – are available to help manage the cashflow challenges brought on by success through digitalization.

Finance Solutions to Enable OEM Sales Momentum: OEMs have access to the full range of Industry 4.0 finance techniques, with one important addition. Vendor financing programs can offer OEMs further competitive advantage, as they drive their own businesses or enable their own customers to become digital enterprises. OEMs and systems integrators can partner with digital finance specialists to offer integrated finance to their own prospective and existing customers – be the large, medium or small manufacturers – so that they can acquire new machines and digital solutions.

Vendor finance can help OEMs, systems integrators and other technology vendors to enhance their value proposition and overcome competitive pressures by providing an alternative to outright purchase during the initial scoping and needs analysis phase. Vendor finance can play an important, complementary role to support the sale of digital technology and machines and can encompass complete finance solutions, including maintenance, servicing, hardware and software. With affordable payment options, this can also help the OEM's customer to consider a more tailored technical specification and overall solution to fit the customers' needs over time.

Key References: [1]BCC Research, Industry 4.0 Technologies: Global Markets Through 2023, 9 Jan 2019. [2]Ibid. [3]Ibid. [4]See, for instance, Siemens Financial Services, Practical Pathways to industry 4.0, 2018. [5]PwC, Industry 4.0, Building the Digital Enterprise, 2016; Supply Chain Digital, Taking advantage of the Industry 4.0 difference, 10 Sep 2018. [6]SFS, The Digitalization Productivity Bonus, April 2017, et al. [7]See, for instance: EY, Protect Value, Create Value, 2017; Techwire Asia, Finance 4.0 in a Nutshell, 9 Jul 2018; Smart Machines and Factories, Finance 4.0, 23 March 2018

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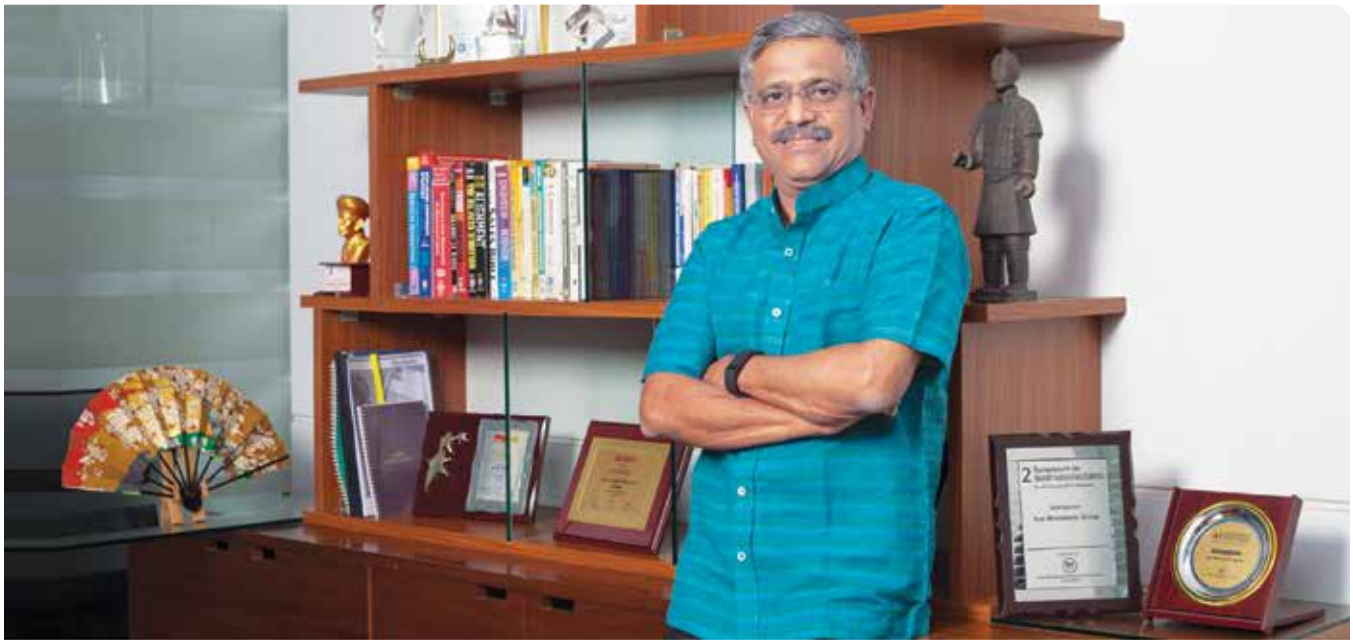

CAREER MANAGEMENT – A CRUCIAL NEED

Managing one's career is an unending pursuit that needs to encompass personal and professional goals in a balanced manner in alignment to business needs. This involves self-awareness, career exploration, development and planning. Essentially, it is a life-long journey of learning, and networking.

Knowing oneself thoroughly: As one embarks on their journey of self-awareness, it is essential that they discover their interests, skills, personality traits, special assets, and abilities. They must know who could benefit from their abilities and talents; what kind of work environment most appeals to them; what activities they enjoy and find motivating; is there any scope for upgrading their skills; and, then most importantly, ask their near and dear ones whether to gauge them to get true feedback, and score themselves realistically.

Career planning: It is a process that encourages one to have clarity over their career goals, and accordingly focus on strengthening skills and know-how for their current position and future opportunities. Once the goals are sorted, they must be written down and discussed with one's manager to plan strategies to achieve them. A concrete plan will provide direction and motivation to keep at it.

> "Career planning is a process that encourages one to have clarity over their career goals, and accordingly focus on strengthening skills and know-how for their current position and future opportunities."
>
> **T K RAMESH**
> **Managing Director and CEO**
> **Micromatic Machine Tools Pvt Ltd**

Learning is forever: Technology can be a boon if used wisely and effectively. Computers and smart phones have impacted the work and the way work is done, giving way to further innovations and advancements. This must be leveraged to keep learning more of one's field and, enhance skills and knowledge. Taking up credentialed coursework, certification programs (related to career/interest), joining cutting edge projects/committees/task forces, attending conferences, or simply staying current in professional reading, are some ways.

Building good relationships: As we have moved to an information, service and technological-oriented economy, our networking relationships have become essential assets. Understand that keeping connected and knowing how to build value-enhancing relationships is more important than ever before. These skills must be developed through applied communication courses, contact management software, effective listening and an authentic desire to know more about people.

Philosophy for career development: Career development happens when the employee, his manager, and the company are in perfect alignment with regard to their goals and the means to achieve them. Companies encourage people to develop in ways that link to the strategic objectives of the company.

People are responsible for proactively managing their careers, increasing their skills, experience, and maintaining a high level of performance. Leaders should take charge for actively encouraging and supporting teams in their career planning, using available resources, tools, and processes to help people use their abilities to meet the needs of the organization. The company must take responsibility for creating a conducive atmosphere and providing opportunities for all to grow.

The views expressed by the author are personal and he can be contacted at rameshtkr@gmail.com

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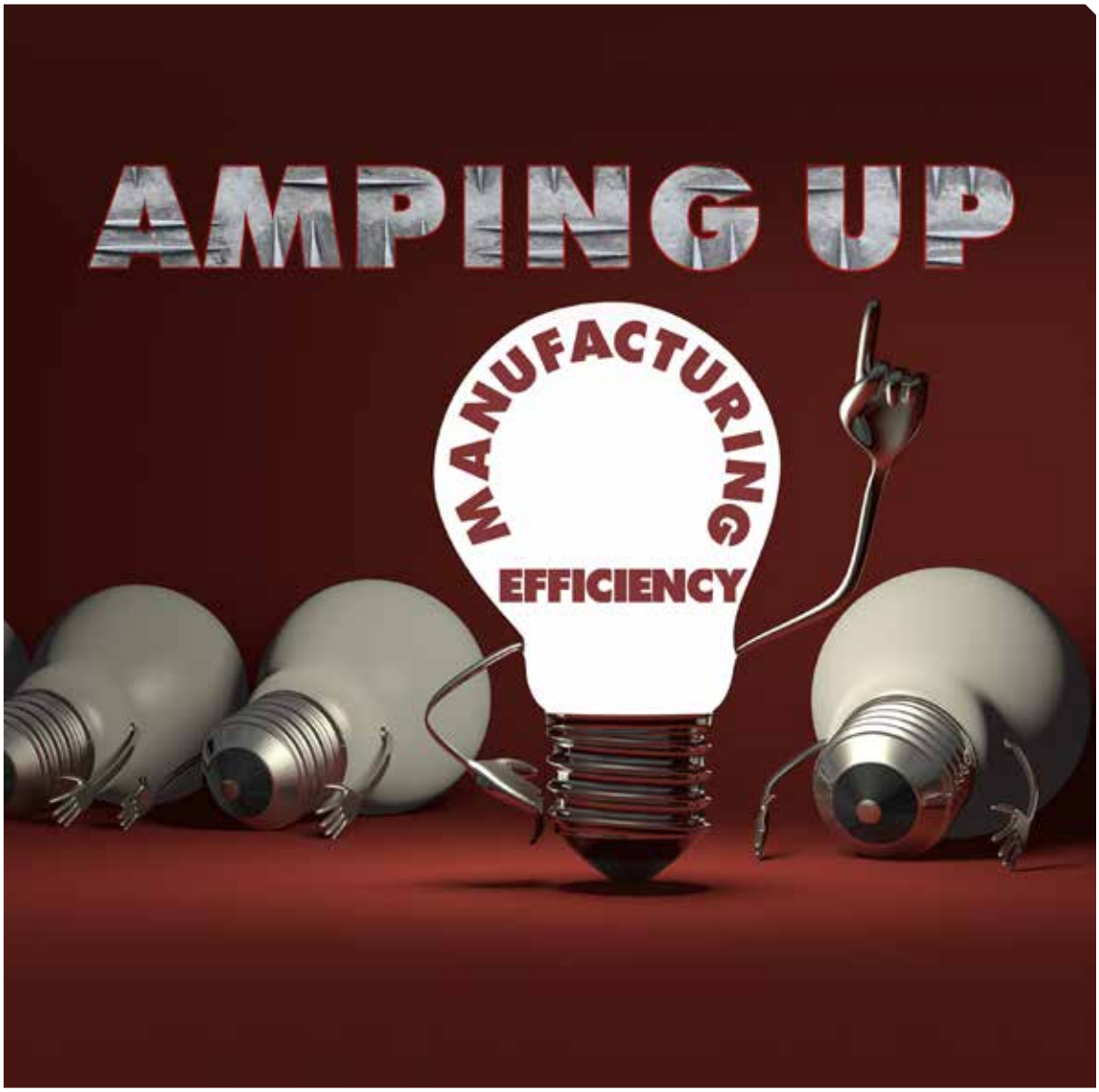

Source: Magic Wand Media

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The applications of tube-shaped workpieces have been growing steadily across many industries, thanks to its advantages like light weight and versatility in assembly. This increase in demand must be met with efficient near net shape manufacturing processes like rotary swaging, which is also gaining industrial prominence in the recent years.

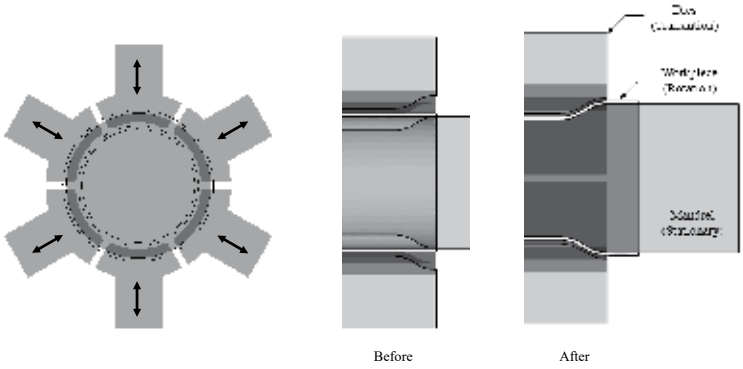
Near Net Shape (NNS) manufacturing processes are crucial for increased productivity and are always aimed at optimizing the number of processes as much as possible. Belonging to this category of processes is Rotary swaging. Formerly known as swaging, it's a process for precision forming of tubes, bars and other cylindrical workpieces. It is an incremental forming process which has a huge potential in automobile, aviation and aerospace industries.

The process has been predominantly used for reducing cross sections of metal tubes and rods and is categorized under

the open die forming processes according to DIN 8583 – Forging. Due to the versatility of its applications and the obvious advantages from a strength to weight ratio perspective, tube-shaped workpieces are finding their way in almost every major industry. And rotary swaging processes are preferred for forming tubes owing to their precision and automation ability.

Learning the process

In a rotary swaging process, multiple dies are arranged radially around the workpiece. The process mechanism can be understood by referring to Figure 1, where six dies are used to plastically deform the tube to resemble the shape of the mandrel. The dies move up and down with a constant velocity. The mandrel remains stationary and the workpiece is rotated with a velocity synchronous to the motion of dies. By virtue of the high-frequency radial movement of the dies, which in turn leads to the multidirectional forging, the tube undergoes uniform necking. Theoretically, rotary swaging processes can come under two categories namely: infeed method and recess method. The difference between these two methods is based on how the workpiece is fed. As the name suggests, in the infeed method, the workpiece is gradually fed along its axis. In the case of recess method, the workpiece does not have any axial motion. This article is based on the latter method which is often used for reducing the diameter only at a certain position of the workpiece.



Source: MFRC

Figure 1. Schematic illustration of the rotary swaging process

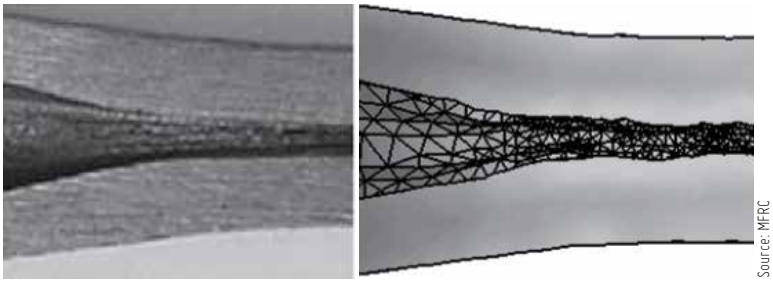
FE Simulation of rotary swaging

Finite Element (FE) simulations of manufacturing processes have become inevitable these days for reducing the development time as well as for using innovative methods to reduce energy and material consumption. FE simulation of a rotary swaging process with six dies is carried out in order to investigate the process mechanism and establish a generic framework to simulate different variants of the process efficiently.

The commercially available intelligent metal forming simulator AFDEX is used for simulating the rotary swaging process. Some engineering assumptions are made in order to simplify the FE analysis without losing out on the simulation accuracy.

- The thermal phenomenon between workpiece and dies is neglected
- The effects of acceleration and inertia are neglected
- Workpiece material is isotropic
- Elastic deformation component of workpiece is neglected
- Workpiece obeys von Mises yield criterion and its associated flow rule
- A pusher supports the workpiece which initially rests on the mandrel
- The mandrel and dies are assumed to be rigid.

The commercially available intelligent metal forming simulator, AFDEX is used for simulating the rotary swaging process.



Source: MFRC

(a) Experiments (b) Predictions

Figure 2. Comparison of experiment and FE prediction for radial in-feed swaging process of a steel tube without mandrel. Around 100000 tetrahedral elements were used for discretization. The wrinkles in the inner surfaces, observed in the experiment, were predicted well by the simulation.

Validation of FE methodology

The same simulation program was used to simulate the round-round in-feed swaging process with 4 dies, without a mandrel and with a back-pressing force exerted on the pusher by the axial motion of the workpiece (Figure 2). The predicted

tube thickness ranged from 3.66 mm to 3.84 mm where the experimental thickness was 3.75 mm. This shows that the FE methodology for infeed swaging process without mandrel matched well with experiments and the same can be applied for the recess swaging process (current research) with 6 dies.

Current FE Model, material properties and die velocity profile

The rotary swaging process is widely used for producing components like hollow drive shafts, gear shafts as well as the control rod of the steering gear.

The rotary swaging process is widely used for producing components like hollow drive shafts, gear shafts as well as the control rod of the steering gear. The process chain consists of cutting the raw material into required length, radially forging the cut blank into desired shape and then trimming off the elongated length by virtue of swaging process. Keeping this in mind, the analysis model is constructed. Figure 3 shows the FE analysis model of the process under investigation. The tube-shaped workpiece is 1.5 mm thick and 143 mm long with an outer diameter of 75 mm.

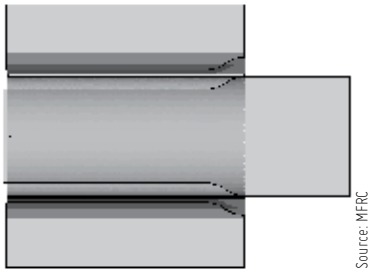


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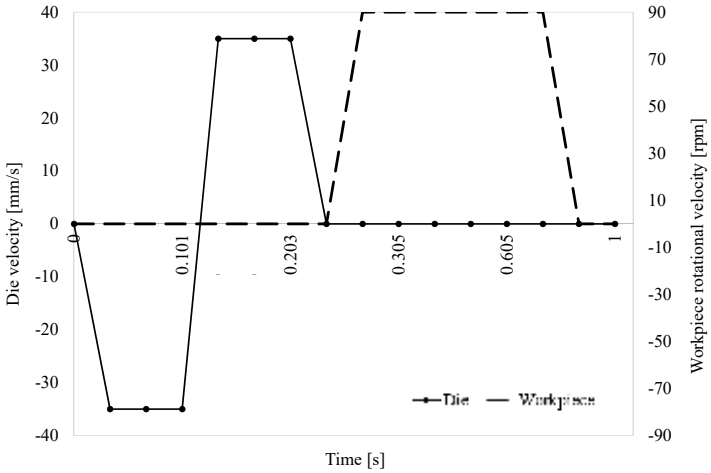
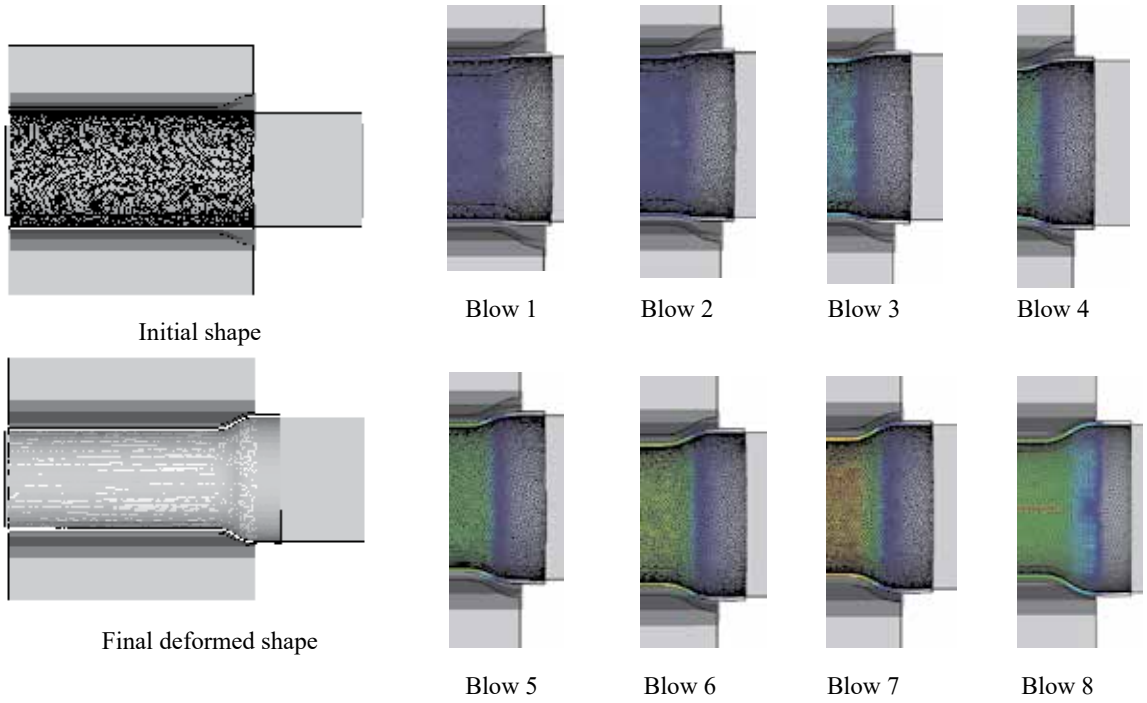
Figure 3. FE Analysis model under investigation



Source: MFRC

Figure 4. Velocity profiles of die and workpiece

The material of the tube is AISI_1020 and is characterised by $\bar{\sigma} = 300(1 + \bar{\epsilon}/0.01194)^{0.20618}$ MPa at room temperature. The friction between the dies, mandrel and the workpiece are defined using Coulomb friction model with a frictional coefficient of 0.05. The velocity profiles of the dies and the workpiece is shown in Figure 4. Around 77000 tetrahedral elements are used



Source: MFRC

Figure 5. Blow-wise deformation history of the swaging process

for discretizing the analysis domain. Remeshing is avoided while simulating this process in order to avoid the undesired but inevitable smoothening of state variables.

Results and analysis

The rotary swaging process consisted of 8 blows to carry out the incremental forming of the tube. The outer diameter of 75 mm was reduced to 60 mm in 8 blows incrementally as can be seen in Figure 5 which shows the blow-wise deformation history as well as the comparison of initial and final deformed shape. Thinning was observed near the end of the tube as a result of increase in length.

Figure 6 and 7 represent the effective strain and stress distribution respectively. To understand the effective stress distribution predicted, one must investigate the velocity distribution during the forging process (Figure 8) and the internal stress states of the tube (Figure 9). The nodal velocity significantly increases along the axial direction at the sizing zone. This is in line with the theoretical understanding of the process mechanism. Rotary swaging processes of this category experience triaxial stress state. The three stress components (σ_1, σ_2, σ_3) in Figure 9 are the axial, radial and circumferential stress components respectively. The axial stress is tensile and the radial, circumferential stresses are compressive in nature. In order to have a minimal variation of wall thickness, the radial stress must be kept minimal compared to the circumferential stress. This is controlled by adjusting the die advancement per blow. Obviously, the stresses increase significantly as the dies contact the workpiece. The axial elongation of the workpiece as well as the necking predicted in the simulation is because of the axial tensile stress by virtue of the deformation happening in the sizing zone. The axial elongation is inevitable in this process owing to the process mechanics and the excess length must be trimmed as per subsequent assembly requirements.

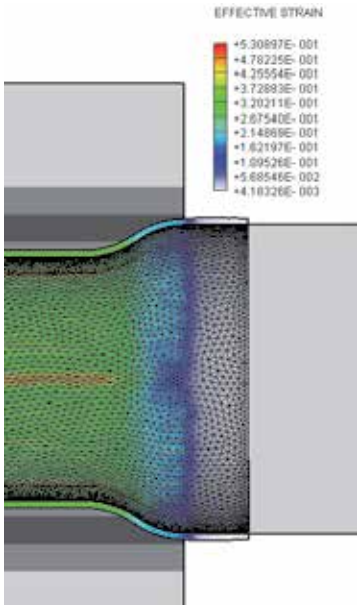
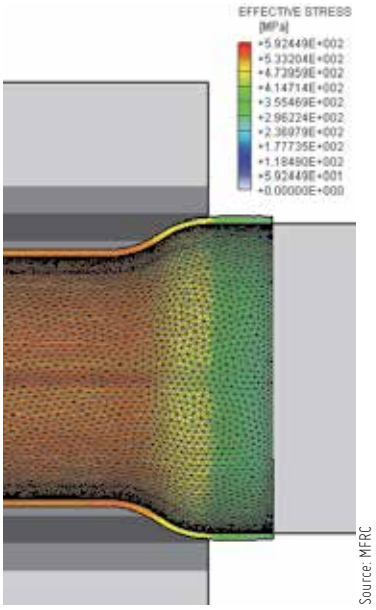


Figure 6. Effective strain



Source: MFRC

Figure 7. Effective stress

Summing up

The article focuses on the FE analysis of rotary swaging process for forming tube shaped workpieces using a commercially available metal forming simulation software. The phenomenon predicted in the simulation matches well with the theoretical understanding of the process. Recess swaging processes with mandrel experience triaxial stress states and the axial stress is responsible for elongation of the tubes. With complex material flow phenomenon, usage of FE analysis methodology is very crucial in arriving at creative and optimum process designs quickly.

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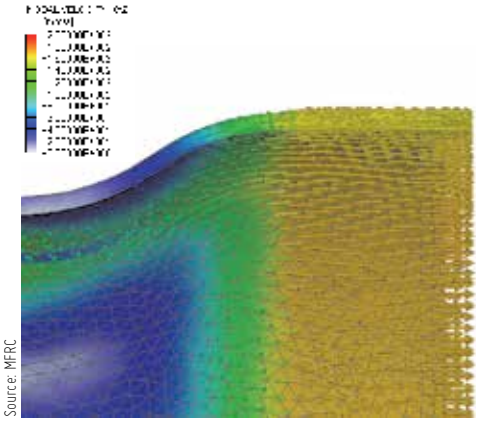
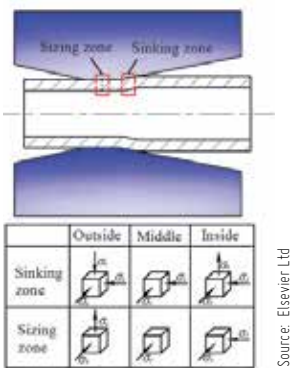


Source: MFRC

Figure 8. Nodal velocity vectors in the axial direction



Source: Elsevier Ltd

Figure 9. Stress states of the tube

CARRYING THE TORCH

Dr Roland Feichtl, President, CECIMO, the European Association of the Machine Tool Industry and related Manufacturing Technologies, interacts with MMI on a wide range of topics including the importance of free trade agreements for machine tool companies, India's significance as a promising country to start new businesses, and the opportunities that digitization offers. Highlights……

"For the European machine tool industry, India is our second Asian market and our sixth largest worldwide. CECIMO exports to India were worth more than € 429 million in 2018 and have consistently grown since 2014."

Dr Roland Feichtl
President
CECIMO

Source: CECIMO

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Despite the looming geopolitical troubles, which, according to you, are the opportunities for the global machine tool industry to thrive?

Dr Roland Feichtl: International political troubles create economic uncertainty so we must find institutions that give businesses the chance to invest and grow. That is why comprehensive free trade agreements are perhaps the best opportunity for machine tool companies, whether European or Indian. The new trade agreement between the European Union and Mercosur, for instance, not only guarantees a degree of stability for businesses on both sides of the Atlantic, but also opens new market for companies that may have never had the opportunity to export beyond their local or regional markets. We could say the same about a potential new trade deal with India, one of the largest markets in the world.

India has ranked 9th in Production and 7th in the Consumption of machine tools as per the latest Gardner's report on the World Machine Tool Survey. What are opportunities that India can leverage in the face of the current global economic slowdown?

Dr Feichtl: If we consider European and Indian bilateral trade, we can see that India has become a strategic partner for the European Union (EU). India is today the ninth largest market for the EU, while the EU is India's main supplier. In terms of volume, trade between the EU and India is worth more than € 90 billion.

With a less dynamic Chinese market and our traditional partners in Europe and North America slowing down after a period of strong production and exports, India, with a positive economic outlook ahead, seems like a promising country to start new businesses and invest.

CECIMO has joined umati, the universal machine tool interface, a project based on an initiative of VDW (German Machine Tool Builders' Association) as partner association. How much potential does the project hold for the industry? Is the project easier for SMEs to adopt and implement?

Dr Feichtl: Connectivity is the first step we need to take care of, if we want to make the most out of the opportunities that digitization offers to the manufacturing industry. This is the aim of umati: create a common open and secure interface to connect machine tools independently of their manufacturer. It will make data processing easier and get more value out of that data. SMEs, in particular, can benefit from the use of a common open protocol instead of multiple proprietary protocols from different manufacturers.

Kindly help us understand KRAKEN which is claimed to be the world's largest and most accurate multi-material 3D printing manufacturing system.

Dr Feichtl: One of the main challenges of additive manufacturing (AM) is the production of big parts, which assures high quality, accuracy and low costs. KRAKEN, a three-year EU-funded project, aims at solving this issue.

The machine combines both additive manufacturing technologies and subtractive operations. It can produce highly accurate multi-material quality parts of up to 20m long through the integration of real-time laser tracking technologies and two types of cameras and artificial vision systems.

The technology developed in the project is very interesting and it opens new possibilities to produce large parts in composite materials for sectors such as the automotive, maritime or large off-shore and wind infrastructure.

Before the end of the year, AM is slated to be at the centerstage of the European regulations. There are actions also being taken to fill in the skills gap in Europe with regard to AM. Given the size of the Indian machine tool industry and its challenges, what are the practices that India can emulate?

Dr Feichtl: The AM industry has experienced a period of growth and progress in Europe. This development has pushed companies to look for new solutions to increase efficiency, quality and precision of processes. But the advancements experienced by the sector require new engineering and management skills, which would allow to fully exploit its benefits. The existing courses on design, engineering and management related to production and manufacturing do not systematically deliver the necessary skills and knowledge for an effective deployment of AM technologies.

That's why CECIMO together with 15 partners participate in SAM. SAM, an EU-funded project, aims to develop an effective system for identifying and anticipating the right skills needed in the AM sector. The project will increase the attractiveness of the sector, strengthen education-research-industry partnerships, as well as encourage creativity not only in companies, but also in relevant educational and scientific institutions.

The Indian AM sector can already create collaborative platform which allows different stakeholders to work together and share the knowledge needed to anticipate future skills gaps.

Digital transformation is highly crucial for a sustainable future. How aggressive should be developing economies such as India to adopt Industry 4.0 which can lead to an increase in the GDP per capita following increased productivity and employment opportunities?

Dr Feichtl: Digitization and automation are driving tomorrow's production. Industry 4.0 and smart technologies such as additive manufacturing, IoT platforms, digital twins, artificial intelligence, robotics and cloud computing are also enablers of sustainability.

Thanks to advances in big machine data, analytics and connectivity, Industry 4.0 solutions could render machine tools more competitive and sustainable. It will increase energy efficiency, productivity and process reliability while optimize business operations.

Machine data also helps developing new business models such as pay per use, smart monitoring predictive maintenance etc. For example, predictive maintenance decreases total machine downtime considerably while increasing machine's lifetime.

All in all, we believe that developing economies such as India have a great interest in the fast adoption of Industry 4.0 and in addressing the barriers to digitization.

How do you perceive the importance of Augmented Reality (AR) and Virtual Reality (VR) in the manufacturing sector?

Dr Feichtl: AR and VR have gained great interest over the last years, especially in the manufacturing industry, as they offer great support to workers in their daily tasks.

These technologies open a whole new world of possibilities for the manufacturing industry and we still have lots to see.

India can provide legal and political stability, which are both crucial for businesses to mature and expand.

STANDING ON A FIRM FOUNDATION

For the past 15 years, Meiban Engineering has been unstoppable, achieving consistent growth and garnering accolades from its customers. Having built a solid ground, the company has a clear vision of its future and the juncture where it aims to head to.

Source: Meiban Engineering Pvt Ltd

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Leading solution provider in the field of automation and turnkey projects for manufacturing automobile and sheet metal components, Meiban Engineering Pvt Ltd's journey to success has been a quintessential one, packed with a multitude of lessons for the company and for others too to draw inspiration from. "It has been a wonderful journey for Meiban to come up to the present level," shares AV Srinivasan, CEO, Meiban Engineering Technologies Pvt Ltd. "Our customers and, of course, our associate, Murata Machinery Ltd have been supporting us extremely well," he adds.

The company started out as a very small operation, getting all its technical support only from Japan in the first five years. It eventually became independent in supporting its customers in the areas of installation, commissioning and machine maintenance. In the last five years, Meiban has developed its skill sets to do the local turnkey. "While we have a long way to go, I think our foundation has been laid strong and we are ready for the future," he notes.

The company currently operates out of a 11,000 sq ft facility in Bangalore and its major Indian customers include many multinational and local companies in various applications like elevator, escalator, electrical panel, lighting, switchgear, air conditioner etc., across many applications.

Offering full customer experience

Srinivasan's association with Murata Machinery Ltd, Japan's leading manufacturer of CNC machines with high-end technology dates back to 1990 when he joined the company in Japan, and was there until 2004. "While Muratec has been in India since 1980, we wanted to increase the footprint for Muratec machines in the Indian subcontinent," he shares. This led to Meiban Engineering in India.

After its inception, the company slowly progressed into having

Meiban-Muratec Tech Centre where it has both Sheet Metal as well as Metal Cutting machines. "We have kept the machines for full customer experience. Starting from demonstration of the machines, we walk the customers through various functions and features available in the machine, and also the offline software available," he explains.

The Tech Centre is also used for test cutting of customers' components, and feasibility study of customers' application. "The Centre has both Punching and Bending for the Sheet Metal machines. At any point of time, we can punch the sheet and bend it, and show it to the customer. We also have real-time demonstration facility for PNM (Process Net Monitor), which directly helps the customers in the Industry 4.0 / IoT areas, where the customers monitor the performance of the machine and improve wherever possible," he adds.

Continual R&D and innovation

While Meiban has an engineering team to support its customers locally in India, the complete R&D activities happen only in Japan. "We take the feedback from the market, discuss with our customers on their requirements and pass it on to Murata Machinery for further action," informs Srinivasan.

As far as Indian local operation is concerned, Meiban has been building up a highly skilled and competent engineering team over a period of 10 years, and most of these engineers have been trained in Japan. The company also conducts training programs in India by inviting experienced engineers from Murata. The engineers are also sent on a long-term training to Murata where they undergo extensive training in application areas along with their Japanese counterparts. "We expect these measures to help us provide best possible solutions to our customers in India," he notes.

Source: Meiban Engineering Pvt Ltd

M3048TG with Cell Loader FS 2512

Source: Meiban Engineering Pvt Ltd

> "To become more cost-effective in the days to come, we have started localizing some of the peripherals in India. We have also started offering machines with local turnkey solutions."
>
> **AV Srinivasan**
> **CEO**
> **Meiban Engineering Technologies Pvt Ltd**

Meiban has also started developing some vendors in India who can help the company in the localization of certain items.

Staying on top

When asked about the competition with the other domestic players in terms of product efficiency and cost-effectiveness, Srinivasan replies, "We mostly sell machines with complete solution on turnkey basis. Muratec is not just a Turning Machine maker, but we are a Total Automation Solution Provider. When we say complete solution, the proposal or solution includes machine plus peripherals and options to achieve full automation for unmanned operations on 24 x 7 basis, standardized and customized units to JUST-FIT the customer's productivity needs."

He adds that although many local companies now supply automation solutions, Meiban has an edge over others, with the company been in this field for a long time. "However, to become more cost-effective in the days to come, we have started localizing some of the peripherals in India. We have also started offering machines with local turnkey solutions," he shares.

Latest offerings

At IMTEX and Tooltech 2020, Meiban will be launching its 30 tonne Servo Punching machine with FS loader. "This loader is a highly advanced loader which can accept up to 100 schedules for the customers to plan. It also comes with the shortest cycle time, and permits the customer to keep punching while changing the pallets. This automation solution is supported with All Electric Servo Press Brake BB-4013," shares Srinivasan.

With all its latest innovation that is to garner raves from the industry once again, the company takes pride in its earlier accomplishments too that helped Meiban fetch the Best Supplier Award from Rittal India in the year 2007 when it was able to provide the company with the most optimal solution for its punching issue in a very short span. "We supplied four machines and worked with the customer to implement its own automation solution. Our machines are still running to the satisfaction of our customers," he adds.

On the plans to broaden Meiban's horizon in India and beyond, Srinivasan reveals, "Murata Machinery always works with the 3-year and 5-year plans, and we follow its plans in India. We already support Murata in the areas of installation and commissioning in the Middle East and Northern Africa. We are very much open to support it in the Asia Pacific region also."

Meiban-Muratec Tech Centre offers full customer experience. Starting from demonstration of the machines, customers are walked through their various functions and features, and offline software.

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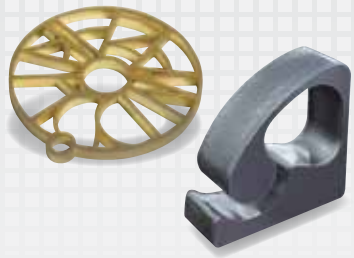

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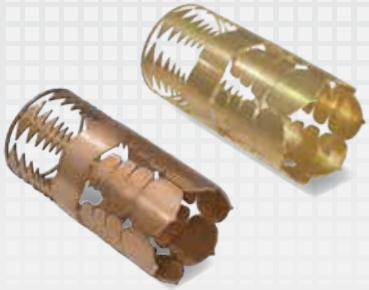

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THE PERFECT THREAD

Thread cutting demands reliability and high precision as it is usually the last operation during the machining process of any component. DC Swiss has developed an internal thread whirl (milling) cutter which generates threads without any burr, even in demanding, hard-to-machine materials.

Source: DC Swiss SA

Fig 1: The GWi5000 is available in sizes from Ø 0.8 mm to Ø 6 mm for various thread norms.

Micromachining, already present across the manufacturing industry, and will spread even widely in the near future. DC Swiss sensed this change and demand of the industry and proactively started the development of the program focused for the production of small parts. After concentrated efforts and various developments for five years, the company has created more than 2,000 different articles including cutting and forming taps, thread mill / whirl cutters and various SCS certified control devices.

DC Swiss' latest development is the thread whirling tool GWi5000, which was developed for customers in the medical, watch-making and aerospace industries facing larger series coupled with shorter delivery times. We imagined a tool to produce the 'perfect internal thread' for micro-machining applications in demanding materials such as titanium, but also alloyed steels and aluminum. A perfect thread is a burr-free thread that does not require any post-treatment and can be produced in one setup without operator intervention.

The tool

The GWi5000 is a patented multi-tooth full-profile carbide thread whirler available in sizes from Ø 0.8 mm to Ø 6 mm for various thread norms, which combines three different operations in one. Featuring either three or four teeth (depending on the diameter), two teeth rough and finish the flanks while one tooth (or two when machining larger diameter threads) machines the core diameter, ensuring burr-free profile and edges of the thread. The tool is unique in its ability to machine the flanks and the core diameter in one cut. There is no other tool in the market that can guarantee a burr-free thread without extra deburring operations.

The ultrafine grade carbide tool is coated with a special VS coating for low wear and good heat resistance for high-performance machining. The internal coolant is realized through three half-moon shaped channels to ensure the coolant is delivered to the cutting edges where it is needed. This design ensures optimal chip evacuation and high surface qualities.

The process

To generate 'the perfect thread,' a 'perfect hole' is required. Perfect here means drilling a core hole with the right diameter for this particular thread whirling process. Since we are not only machining the flanks, but also the core diameter, the general formula for calculating core diameters using the thread pitch does not work. There needs to be enough material for the thread whirler to machine the core diameter during threading.

After the centring and drilling operations, the GWi5000 enters the hole with a counter-clockwise rotation, left-hand cut, cutting the thread from top to bottom (conventional thread whirling works from bottom to top with a right-hand cut). After

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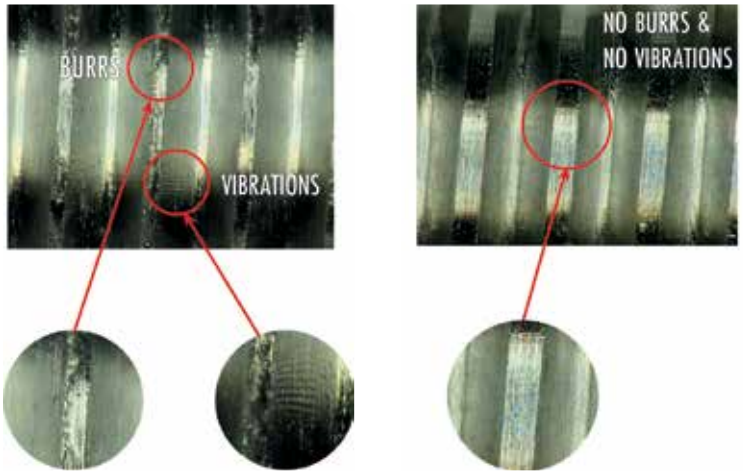
reaching the bottom, the tool is centred and moved back to its starting position. In 60 to 70 percent of all cases, one cut finishes the thread; very hard and demanding materials might sometimes require two cutting passes. Moreover, DC Swiss ensures a reliable, stable process, requiring few, if any, NC corrections during machining. The following example illustrates this point.



Source: DC Swiss SA

Fig 2: The GWi5000 guarantees a burr-free thread without extra deburring operations.

The application

While smaller series threads can be more efficiently machined using a combination tool such as the ZBGF circular thread milling cutter, which combines drilling and threading in one tool, separate drilling and threading operations with the GWi5000 will pay off when machining larger series, as the following example illustrates:

A customer specialized in medical and dental products was looking for a highly-precise thread that could be produced in high batches without post treatment and 100 percent according to the required standard. Made from Titan Grade 4, the part needed a blind hole with a thread of M1.8 x 0.35 6H, with a depth of 2xD. Using cutting oil as lubricant, the GWi5000 produced 2,500 threads at a cutting speed of 30 m/min and a feed rate of 0.03 mm/tooth. There was only 1 NC correction required (the operator adjusted the NC program during the process because of tool wear), which makes the GWi5000 highly suitable for series production. Other products required up to 5 NC corrections for the same job. The special tool geometry and coating ensures minimum wear and, hence, a more reliable, accurate process. We can also calculate the point where the NC correction needs to happen to organize automated production.

While the process requires machines with a certain spindle power and rpm, most new generation turning and milling machines are suitable to ensure a reliable process. Most companies in the aerospace, medical, automotive or watch-making industries have already upgraded most of their equipment, but older machines with suitable spindle speeds can also be used for thread whirling.

With the standard range starting from Ø0.3mm up to Ø160 mm, DC Swiss offers quality high-performance and reliable solutions in threading technology.

For quality control, DC Swiss offers ring and plug gauges to control the profile shape, thread flanks and different norms. The customer now has the option to maintain entire quality system in-house. The company provides high-quality carbide gauges for production, wear gauges to control the ring gauges and gauges to calibrate the optical measurement systems. This helps the customer in saving the time and money to frequently send their gauges for calibration.

A perfect thread is a burr-free thread that does not require any post-treatment and can be produced in one setup without operator intervention.

Source: DC Swiss SA

Fig 3: With the standard range starting from Ø 0.3mm up to Ø160 mm, DC Swiss offers quality high-performance and reliable solutions in threading technology.

TRANSFORMING THE MACHINING WORLD

Robotic Machining is a highly user-friendly revolutionary technology which is taking the machining world by storm. ROBOFINISH by Grind Master Group is vitally contributing to it by delivering flexible automation solutions and resolving major bottlenecks in the foundry industry.

Source: Grind Master Group

Robotic Machining Cell

Robotics, today, is one of the most sought-after technologies across the globe. The demand for Industrial Robotic Automation systems is rising exponentially. It was in the early 1970s that CNC machining processes like Milling, Grinding, Turning, etc. started to evolve. This was also the time of the evolution of Industrial Robots for applications including Handling and Welding. However, there were some limitations to CNC technology such as flexibility, scalability, complexity of motion and cost. These factors were overcome by Robotics. Moving on, these two technologies combined, giving rise to Robotic Machining in the early 2000s.

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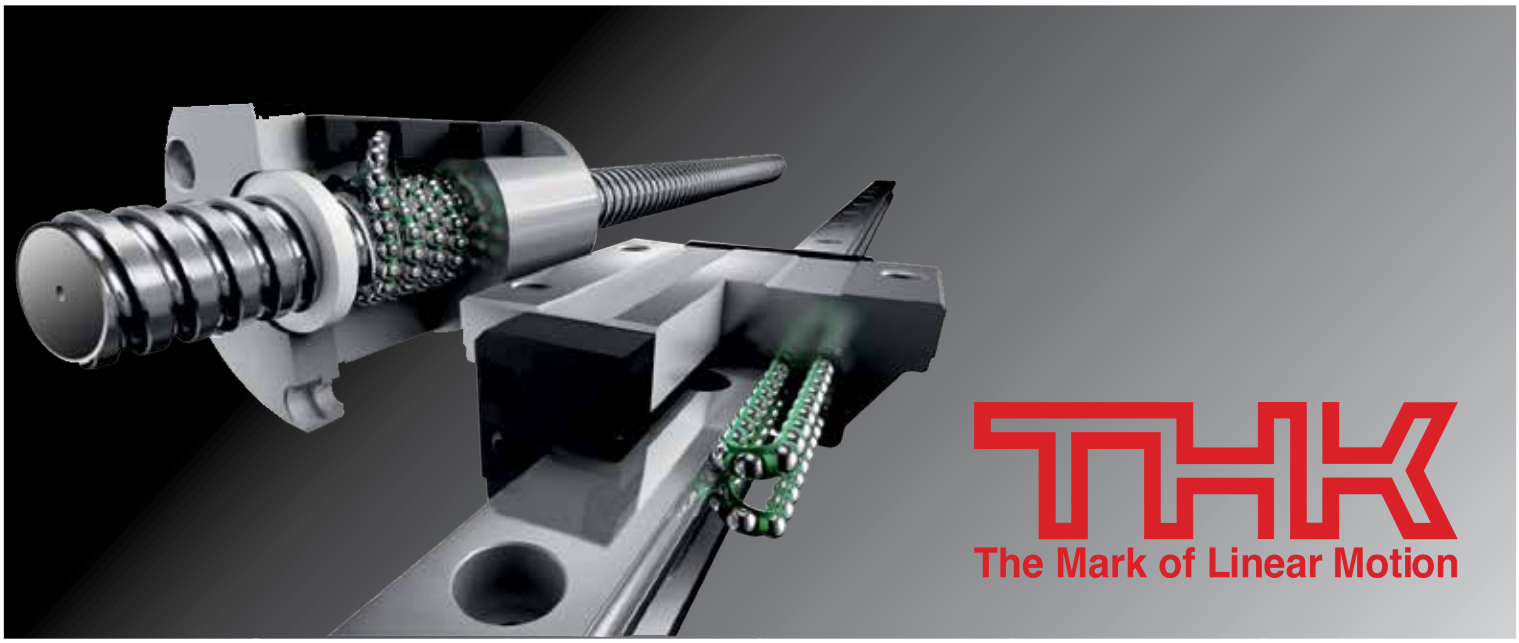
Understanding Robotic Machining

Robotic Machining is a very wide spectrum. It includes Robotic Milling and Sculpting, Robotic Trimming and Cutting, Robotic Grinding and Deflashing of Castings and Forgings, Robotic Finishing and Polishing, and Robotic Deburring. These systems consist of an industrial robot and controller, spindles and tool changers, tool rack, fixtures and programming software.

Robotic Machining is a major leap from Industry 2.0 to Industry 4.0, heading towards Next Generation Manufacturing. This transformation towards smart manufacturing practices has a deep impact on productivity, enhanced and consistent quality, health and safety, flexibility/ multitasking, reduction in cycle time, and cleanliness on the shop floor.

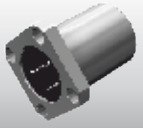
Robotics has some key technologies that include Application/Process Development, Tooling and Fixtures, Controls and Programming Software. There are two approaches in Robotic Machining. The first one is Robot Moving Tools where one or multiple tools are mounted on the Robot Wrist and the workpiece is clamped in the fixture. This approach is suitable for a wide variety of large parts. The second approach is Robot Moving Parts where one or multiple tools are fixed in the cell and the workpiece




LM Guide


Ballscrew


Cross Roller Ring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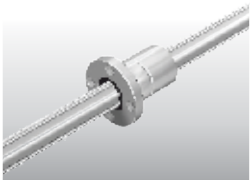
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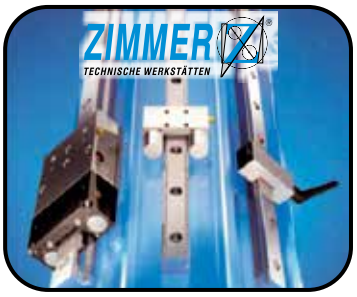

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is moved by Robot and gripper. This approach is suitable for small parts made in dedicated production lines.

Robotic Fettling

Robotic Machining is the use of industrial robots to automate and standardize repeatable manufacturing processes or tasks. Automation of a process brings several key benefits to manufacturers of castings like increase in productivity, upgradation in quality, and creation of a healthy and safe working atmosphere. The technology behind Robotic Fettling and how it may be successfully deployed across the iron casting industry serves as a guide of dos and don'ts for successful executions. Iron castings of manufactured parts have the most complex shapes. And here is where automated robots come to rescue by delivering quality with accuracy.

Robotic Grinding/Fettling gives tremendous improvements in the consistency and completeness of fettling. Manual operations are subject to numerous variations through the days, weeks and months of the year since different operators work in different styles. Multiple operators work on one component leading to handling damages. Manually operated cutting tools invariably cause scratch marks and dents, which are a major cause for the rejection of castings. Tool selection in Robotic Grinding is highly critical because process reliability, cycle time and running cost of the system are majorly based on the type of tools used. In certain cases, it is observed that selecting the most advantageous tool can reduce the cycle time and the running cost by as much as 90 percent. The most commonly used tools in Robotic Fettling include diamond-plated wheels for cutting and grinding.

Robotic Fettling have various costs associated with it which have to be considered while calculating cost per piece over the long run such as the maintenance cost (annual maintenance, spares etc.), energy cost, consumables cost (use of customized tools for robotic application can save significantly), retooling and reprogramming cost, and labour cost (including future rise in the same). Significant improvement in quality is considered while calculating the investment returns of a robotic fettling system. A drastic reduction in the rejection rate and removal of rework/checking stations also brings space savings. Correct selection of application and wise implementation can ensure a return on investment on Robotic Fettling Systems within one or two years.

Robotic Sculpting

Robotic Sculpting is creating sculptures using heavy-duty industrial robots instead of human hands. It automates the sculpting process and maintains the aspect ratio and proportions (scalability) of the sculpture. It eliminates the chances of errors and drastically reduces the pattern-making process in large sculptures. Small sculptures can be created directly in one go from a raw block of material. The prototype/sample is scanned and designed, after that the robot is programmed using specialized software and the block is then sculpted using the robot. Robotic sculpting includes operations like Rough Milling, Finish Milling and Engraving. It is the most advanced technology that can sculpt wood, thermocol, foam, graphite stone, granite and marble, brass as well as copper.

Robotic Machining is a very wide spectrum. It includes robotic milling and sculpting, robotic trimming and cutting, robotic grinding and deflashing of castings and forgings, robotic finishing and polishing, and robotic deburring.

Robotic Sculpting

Source: Grind Master Group

Robotic Fettling

Source: Grind Master Group

Grind Master's contribution

Grind Master Group (GM) is a global technology leader in specialized turnkey machines for Metal Finishing, Deburring, Microfinishing, Robotic Machines and Abrasives, providing total solutions for surface finishing requirements. With over 5,500 machines across six continents, serving a wide range of industries, the Group brings a world of experience of over 35 years in machine technology and process knowledge. It has strong IP bank of over 30 patents, over 30 registered designs and three trademarks.

Grind Master Group has seven manufacturing facilities and three state-of-the-art innovation R&D centers across the globe. The group companies in India, China, France and the USA constantly strive to exceed customer expectations with innovative and trustworthy solutions created with passion and expertise. It established its Robotic Machining Technology Unit in 2011 to diversify the product range, and over the last seven years it has delivered over 100 robotic milling/grinding/finishing/deburring solutions.

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A STITCH IN TIME

Complex capital goods deteriorate during their operation. In order to achieve the goal of restoring as many as parts of goods as possible, the Collaborative Research Centre (CRC) 871 is doing a research in condition-based regeneration of complex capital goods.

Source: IFW

Figure 1: Exemplary picture of the process chain

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In the course of Industry 4.0, permanent condition monitoring is a major goal, especially for valuable and complex capital goods. Examples of such complex capital goods are jet engines, railway vehicles and wind turbines. In contrast to the condition-based monitoring is the current manual repair of these components. It is dependent on the subjective assessment of the processing employee and thus on his training and experience. To change that, basic research in the involved field of engineering and economics is necessary. The Collaborative Research Centre (CRC) 871 is doing a research to achieve exactly this. Experts from production engineering, fluid dynamics, structure simulation and economic sciences are combining their knowledge. For an exemplary application of the developed regeneration process, a high-pressure turbine blade of a civil jet engine is used.

Reaping repair benefits

In the industry, these blades are inspected by skilled employees and the damage is categorized according to a manual wherein all damages are listed with the limit values for each type. If a damage exceeds the limit, the blade is considered to be not repairable and is declared 'scrap'. If otherwise, position of the damages is marked with a pen and the blade is handed to the machining area. Dents and other smaller damages are polished out. If the material, for example, on the tip is missing, it is welded on. After that, the blade is re-contoured using rotary tools and belt grinders. Due to all the manual processes, the quality of repair highly depends on the worker. The automation in such an industrial maintenance, repair and overhaul (MRO) process is low. Since the processes have different processing times, they are not arranged in a line, but

rather in cells with varying number of machines or work places for different processes. During the whole repair process, there is no information on how the repair benefits the performance or lifetime of the goods. To change this and to better focus the repair measures on the performance or lifetime limiting damages, a condition-based regeneration is necessary.

Making it industry-ready

As a 'proof-of-concept', research from different institutes is combined in a process chain for the condition-based regeneration, as it can be seen in Figure 1. Besides the research of the interfaces between the different technologies, the process chain is used as a demonstrator. The aim is to transfer the research into the industry. To fully automate the regeneration, the individual process cells are connected with a mobile handling system (MHS). It consists of the MIR200 from Mobile Industrial Robots and the UR10e from Universal Robots and an electric gripper from Zimmer Group. Due to integrated sensors, the MHS can avoid obstacles and can collaborate with humans. The UR10e is also equipped with sensors so the whole system can operate without fences. Thus, the process chain can be flexibly extended by further process cells and the workpiece can run through the repair process in any order. The whole process chain is divided in two layers, a real and a virtual layer, as it can be seen in Figure 2.

The process chain starts in the real layer with a gentle disassembly of the turbine blade. With a piezo-driven tool, the necessary force can be reduced to minimize the wear of the blade. After the disassembly, the blade is transferred for the inspection. It is checked non-destructively for cracks. If no unrepairable crack is detected, the blade is digitized using an optical measurement system. This process cell is the interface between the real and virtual layer. First, the whole blade is measured and digitized into a point cloud (STL). After that, areas of interest are scanned with a higher resolution. These areas are then combined with the point cloud. The digitized blade is the base for a digital workpiece twin. It is used to connect the real with the virtual layer and store all data. In addition to the geometry data, the type and position of the damage, simulation results and customer requirements, for example, are also stored here.

Further analysis of the digitized blade is done within the virtual layer. There, the condition of the blade is acquired. The performance of the blade is determined by aerodynamic simulations. Due to high computing time, this is done in advance. A tool called 'ASTOR' combines the results of the simulations and calculates the performance of a blade in seconds. A similar tool is used for the structural simulation. This can calculate an estimation of the remaining lifetime of the blade. Previously, the simulations were only used for product development. With the results, the damages can be repaired in the real layer. The first goal is to automatically repair the tip. Therefore, a new geometry of the blade is generated and the tip is prepared in the real layer.

For adding material, a laser deposition welding cell with 5-axis is used. Different materials can be used depending on the type of the blade. In case of the high-pressure turbine blade, a nickel base alloy is used. This process is not accurate enough for the aerodynamic requirements. Therefore, a re-contouring process follows the additive process. With a 5-axis mill, the geometry of the blade is restored. Through a redundant axis in the machine tool, the deformation of the blade is compensated. After a final quality control, the geometry is measured and the blade is inspected for cracks to ensure the quality. This geometry can be simulated again to get the performance and lifetime increase. With this information, the overhaul process can be improved. The whole process chain can also be continuously updated with new repair methods and process cells. The first display of this system demonstrator will be in November 2020, after which it will be available for presentations by the interested parties from the industry and the research for another year.

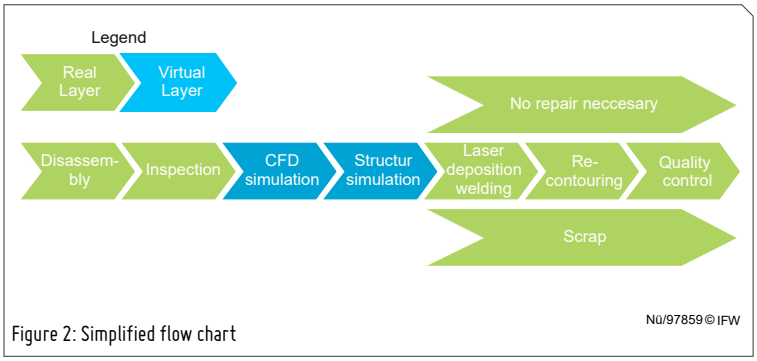


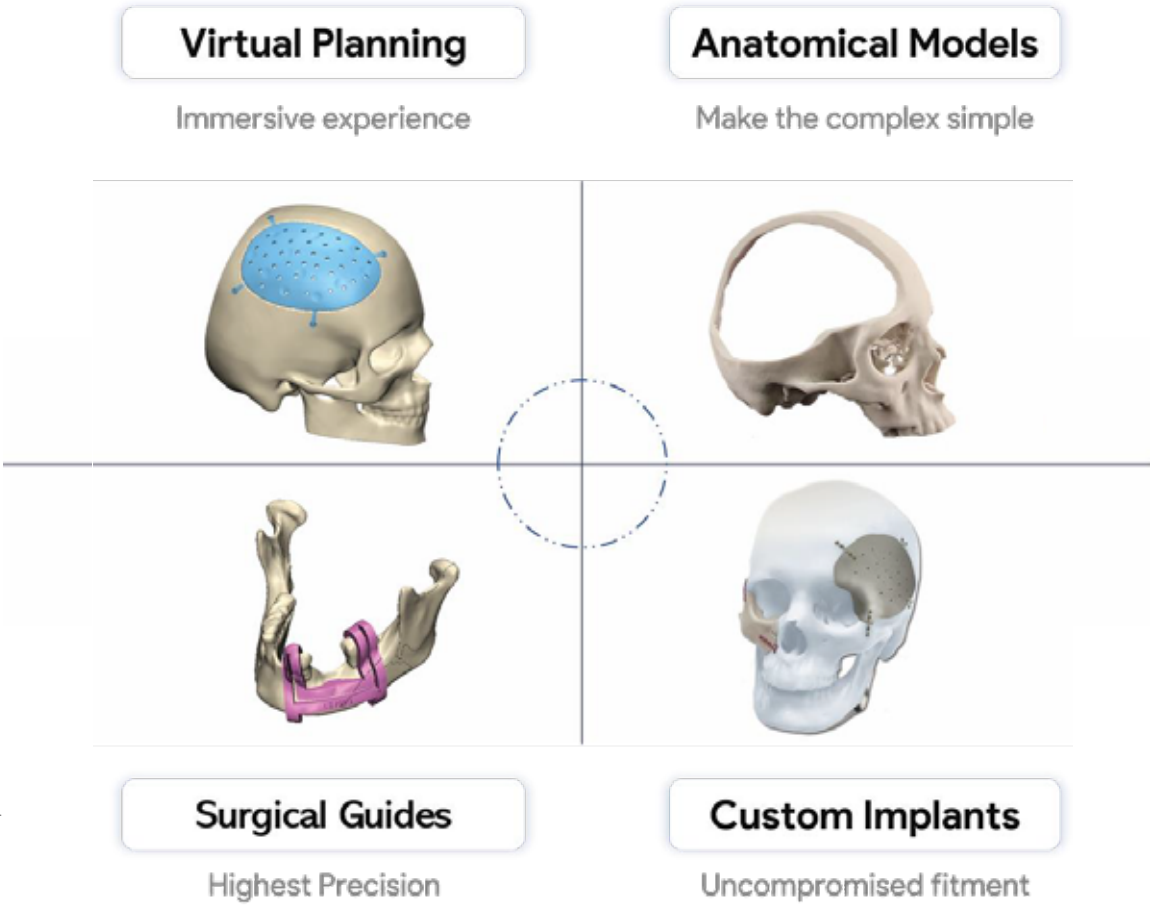
Figure 2: Simplified flow chart

Source: IFW

The first display of this system demonstrator will be in November 2020, after which it will be available for presentations by the interested parties from the industry and the research for another year.

TAILORED MEDICAL OFFERINGS

Intriguingly named Lucid Implants, this Nagpur-based deep science MedTech start-up is striving to deliver efficiency, reduce medical errors, control costs, and offer personalized healthcare. Here's learning the inspiration behind the commendable job and the stupendous opportunity of being mentored by Dassault Systèmes experts...



Source: Lucid Implants

Successful ideas usually originate from feeling strongly about a certain cause or need that drives one to work towards to meet it and make a difference. For Dr Nitin Bhola, the inspiration for Lucid Implants (brand name LUCID) was the gaping gap that he recognized between medicine and engineering. Having spotted an unmet clinical need for personalized surgical care in India, he went for it, passionate to bring in a meaningful change. "Being a craniomaxillofacial surgeon for the past 20 years, I was intrigued by technologies like Additive Manufacturing that had the potential to save and improve people's quality of lives," he shares. This urge to explore more in the field led him to collaboratively work with Visvesvaraya National Institute of Technology (VNIT), Nagpur on the transdisciplinary bone tissue engineering project carried out by Dr Pranav Sapkal and Prashanth Ray in 2015. The trio coincidentally shared the same intention and vision for providing personalized surgical care.

Giving shape to idea

In 2018, Dr Bhola, Dr Sapkal and Ray founded Lucid Implants that specializes in custom-made medical devices, offering perfectly tailored and scientifically aligned implants. "We help surgeons to predict and validate a medical device for a specific patient by providing

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Source: Lucid Implants

"Being a craniomaxillofacial surgeon for the past 20 years, I was intrigued by technologies like Additive Manufacturing that had the potential to save and improve people's quality of lives."

Dr Nitin Bhola
Chief of Surgery
Lucid Implants

Source: Lucid Implants

"We initially faced problems in product commercialization and business development. But eventually, achieved an early traction of 52 percent CMGR and were able to impact 24 lives."

Dr Pranav Sapkal
Chief of Engineering
Lucid Implants

Source: Lucid Implants

"Using 3DEXPERIENCE Platform, all our production, simulation and operational tasks can be integrated into a singular workflow for seamless 'concept to patient fit' alignment."

Prashanth Ray
Chief of Intelligence
Lucid Impants

custom ceramic, polymer, and metal hard tissue implants as a bone replacement," informs Dr Bhola.

The start-up's total solution seamlessly integrates virtual planning for 3D pre-surgical simulation, intraoperative patient-specific tools for surgical precision and personalized implants for perfect fitment. The solutions mainly cater to the needs of Neuro, Oral and Maxillofacial, Dental and Plastic surgeons.

"The clinician sends us the CT/MRI scan files through www.lucidimplants.com, and a 3D data set is created for 360-degree visualization. Once the design is approved, the physical model or the implant is fabricated and sent to the clinician," he says explaining the process.

Source: Lucid Implants

Lucid Implants winning the 3DEXPERIENCE Pitch at Dassault Systèmes' 3DEXPERIENCE Forum India 2019 at Bangalore.

Being a part of Dassault Systèmes' global accelerator program allows the start-up to leverage its 3D experience platform solutions, collective intelligence and deep mentorship support for a period of two years.

Seeking solutions

The team recognized a huge problem the way medical industry is currently set up. "Around 4 lakh new oral cancer cases are added every year worldwide out of which one-third are Indians. In terms of absolute numbers, more people get injured in road crashes in India than anywhere else in the world. Another major problem is the facial deformation by birth," explains Dr Sapkal.

"Current clinical solutions for these problems is the use of bone grafts taken from patient's own body or standard titanium meshes which are mass produced, trying to fit patient to the product instead of product to the patient. This leads to major issues like extra morbidity, increased risk, long hospitalization times, poor aesthetics and most importantly poor patient's quality of life," he adds.

To address these, the team is providing custom-made medical devices. "Our total solution seamlessly integrates virtual surgical planning, anatomical models, surgical guides and custom implants. Our custom solution not only helps maintain patients' quality of life and aesthetics, but also gives complete control over surgical procedure resulting in minimal tissue damage, reduced surgery time and cost," informs Dr Bhola.

Source: Lucid Implants

Teething troubles

LUCID was formed after 7 years of R&D and has an expert advisory board across the nation. The team has the background expertise and a proven track record with one patent and 37 publications.

However, the transition from hardcore medical and engineering academic background to establishing a medical device start-up was indeed a roller-coaster ride for the team. "The problem we faced initially was the clear plan of product commercialization and business development. But as time went on, we were able to achieve an early traction of 52 percent CMGR and were able to impact 24 lives," Dr Sapkal informs.

This exactly was the motivation behind the endeavour. "The products we make give people their lives back, enabling them to live without pain and get back to experiencing the best life has to offer," he stresses.

Gaining accolades

Lucid Implants recently won the 3DEXPERIENCE Pitch at Dassault Systèmes' 3DEXPERIENCE Forum India 2019 at Bangalore. This was the first 3DEXPERIENCE pitch conducted by the company under the 3DEXPERIENCE Lab initiative in India. The pitch was part of the plenary session at the 2019 3DEXPERIENCE Forum India in the city where the the panel of judges voted Lucid Implants as the winner, fetching the start-up a chance to present its innovative idea to the members of the executive committee at Dassault Systèmes at the corporate headquarters in Vélizy, France. Further, it will be accelerated in the 3DEXPERIENCE Lab and mentored by Dassault Systèmes experts based in one of its offices around the world.

"Being a part of Dassault Systèmes' global accelerator program allows us to leverage its 3D experience platform solutions, collective intelligence and deep mentorship support for a period of two years," shares Ray on the importance of the program to the start-up.

"Using 3DEXPERIENCE Platform, all our production, simulation and operational tasks can be integrated into a singular workflow for seamless 'concept to patient fit' alignment. In a nutshell, we will be using this platform for designing, simulation and integrating in the complete Product Lifecycle Management (PLM) of the medical devices we manufacture," he adds.

There's lot in a name

When asked about the thought behind LUCID as the brand name, Dr Bhola explains, "In emergency medicine, a 'Lucid Interval' is an improvement in a patient's condition after a traumatic brain injury. Lucid also means something which has been expressed clearly. Our intention through this name was to convey that our way was a novel approach to solve present day craniomaxillofacial (CMF) surgical treatment challenges and build an emotional connection between patients and doctors."

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SPRINGING TO SUCCESS

Imbued with entrepreneurial passion, Gala Precision Engineering's young team has reached heights, serving global markets with its high-end technology solutions in the fields of surface engineering and high-performance springs. Here's knowing its present stature, the various odds the SME faced in the way towards adopting the requisite automation and how they were overcome...

Gala's Auto Bending Machine

Source: Gala Precision Engineering Pvt Ltd

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Thanks to its well-structured and validated business model, Gala Precision Engineering Pvt Ltd today is well-positioned to provide its customers with technology-driven, value-added solutions, leveraging a broad product portfolio on the one hand, and enhancing the entire value-chain quality, delivery, and services on the other.

With the business diverged into two streams - Surface Engineering Solutions and Springs Technology - the company currently exports to over 25 countries including Germany, Switzerland, Finland, Italy, the US, Singapore, Taiwan, and China. With over 300 global customers, the company generates 60 percent of its revenue solely from exports.

Surface engineering solutions

Gala is a one-stop solution provider for surface finishing needs of deburring, finishing, washing and cleaning. "We have more than 25 years' experience of building standard and customized machines. We offer complete solutions of machines and processing media and compounds for surface finishing and parts cleaning needs. We have the capability to build large finishing and cleaning equipment for challenging needs of defence, atomic and aerospace sectors," shares Avadhut Panshikar, Vice President – Operations, Gala Precision Engineering.

The company's finishing machines are capable of achieving Ra value of 0.05 micron and precision parts cleaning machines of achieving millipore value of less than 1 mg.

Source: Gala Precision Engineering Pvt Ltd

"By implementing LCA with horizontal deployment, our production capacity has increased by 200 percent, manufacturing cost per piece has reduced by 60 percent, and with capex as low as ₹8 lakh, we have substantially optimized manpower."

(L-R): Avadhut Panshikar, Vice President – Operations and Nirav Makadia, HOD-Automation for improvement of Process, Productivity & Safety, Gala Precision Engineering Pvt Ltd

Springs technology

Three decades of experience, and a consistent effort of remaining updated with the latest technologies in the field and incorporating them in the design and manufacture of high-performance Disc springs and Strip springs have helped Gala scale up its business to become Asia's largest manufacturer of Disc springs.

"High quality, reliability and design collaboration are the key factors for us to become preferred partner of our global customers. We, today, serve global OEMs in Power Equipment, Oil & Gas Equipment, Wind Turbines, and Automotive industries," informs Panshikar.

Towards automation

In 2016, the management of Gala set a business target of ₹150 crore by 2021. "This was the major drive for us towards adopting automation in our processes to achieve increased output and remain competitive in the current market," he explains.

For the manufacturing of Disc Springs, processes such as Blanking, OD / ID turning, Deburring, Bending, Heat treatment, Descaling, Scragging, Height checking, Phosphating / Shot pinning, Visual inspection etc. are to be followed. "Before we start these processes, we first need to evaluate them in terms of manpower usage, critical operational parameters, line balancing etc."

In the project of 'Disc Spring Bending', the reasons to replace the existing manual processes with Low Cost Automation (LCA) was to achieve increased output, increase safety and reduce accidents, optimize manpower, reduce outsourcing and dependency on the vendors, and optimize line balancing.

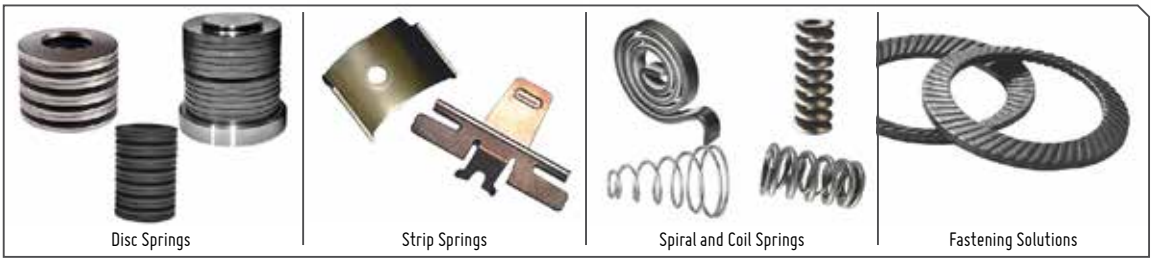
"To achieve a conical shape, we would manually feed single pieces in the bending die mounted on a conventional press. The operator would give stroke command to the press

In the project of 'Disc Spring Bending', the reasons to replace the existing manual processes with Low Cost Automation (LCA) was to achieve increased output, increase safety and reduce accidents, optimize manpower, reduce outsourcing and dependency on the vendors, and optimize line balancing.

Deburring and Finishing | Industrial Parts Cleaning | Phosphating Plants | Media and Compounds

Source: Gala Precision Engineering Pvt Ltd

Gala Precision Engineering's products in Surface Engineering Solutions



Source: Gala Precision Engineering Pvt Ltd

Gala's products in Springs technology

The internal design team was used for designing of mechanical drawings and outside vendors were hired for the manufacturing. The complete machine was, later, assembled at the company's plant.

by pressing the hand switch," shares Panshikar.

The feeding process was laborious and productivity varied from person to person. Also, there were instances, where the operator met with accidents. To overcome these issues, the organization started looking for a sustainable solution to improve productivity, safety and consistency of the operation.

Necessity, mother of innovation

As the bending process is highly critical and outsourcing rids one of any control on the process at the vendor's end, the team started working towards finding a solution to reduce the problems faced by the organization.

"To begin with, we applied the Pareto principle to analyze the current data and based on that, we finalized a few sizes of the components whose volumes were high and orders consistent," he informs.

The team then consulted some external experts but the speed, accuracy and capex were not feasible as per the company's requirements so the same process was decided to be executed in-house with the Automation team.

Implementation

After concept finalization and technology selection, the team presented the concept to the top management. "Our management had already set the guideline that we could invest 2 lakh on automation if we saved on one human resource. As per our calculation, the overall capex was far less than 2 lakh, so we got the go ahead on the same," reveals Panshikar.

"The internal design team was used for designing of mechanical drawings and outside vendors were hired for the manufacturing. The complete machine was, later, assembled at our plant. Electrical panels and PLC programs were also designed in-house," he adds.

The company's first machine was developed within three months, after which the trial showed the following challenges:

- Feeding single component from the stack required a highly precise fork with greater life and no warpage, with the thickness lesser than the component's thickness to take one component out at a time.
- The feeding of a component in the die had to be precise to ensure proper positioning, else warpage occurred on the component.
- Accurate sensing of the component to give the feedback to the press for the stroke.
- Manufacturing of the different sets of bending dies for the SPM.

The team overcame all the challenges and finally handed over the first machine to the company's production team after one month's trial on the shop floor with proper training and supervision.

Horizontal deployment

The company then went for horizontal deployment and within one year's span, implemented a total of 4 SPMs for lower thickness Disc Springs and 2 Servo feeders on the press for higher thickness Disc Springs which require larger bending load.

"Hence, by implementing LCA with horizontal deployment, today we do 39 varieties of bending, amounting to production of 216 lakh disc springs per year. Our production capacity has increased by 200 percent, manufacturing cost per piece has reduced by 60 percent, and with capex as low as ₹8 lakh, we have substantially optimized our manpower," concludes Panshikar.

Source: Gala Precision Engineering Pvt Ltd

The manual process of feeding single piece in a die mounted on the press

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PERFECTING THE PROCESS

L&T Electrical & Automation (E&A) winning the coveted Deming Prize for the year 2019 for excellence in Total Quality Management (TQM) is a reflection of the company's commitment towards continual improvement in its processes and the quality of its products and services. The leaders at E&A take us through the journey as they recount the changes implemented that made this recognition possible...

Source: L&T Electrical & Automation

(Front Row, L-R): Dr Hasit Joshipura, Member — Executive Committee, Larsen & Toubro and Senior Vice President & Head, E&A; Girish Tiwari, Vice President & Head — Electrical Standard Products, E&A; HT Mistry, Vice President — Switchgear Design & Development, E&A; Dr Masamori Ihara, Chairman, The Deming Prize Examination Committee; and SD Mahajan, General Manager — Quality, E&A

(Back Row, L-R): Naresh Kumar, General Manager — Sales & Marketing, E&A; Tapan Tripathy, General manager - Switchgear Design & Development, E&A; AP Pargaonkar, General Manager — Manufacturing, E&A

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L&T Electrical & Automation (E&A), a major business portfolio of Larsen & Toubro, is into low and medium voltage switchgear products, electrical systems, energy meters and automation solutions, catering to industry, utility, building & home, infrastructure and agriculture segments.

This year, the company's organization-wide Total Quality Management (TQM) efforts have borne fruit, making it the first switchgear company outside Japan to have been awarded the prestigious Deming Prize for quality standards in India. The Prize is an annual award given by JUSE (Union of Japanese Scientists and Engineers) to organizations that successfully implement TQM practices and is one of the highly regarded awards in the world in the field of management practices.

"TQM is a journey and with the Deming Prize we have just reached a milestone. We are happy that our team effort has received a global recognition and that L&T's name has appeared for the first time on the JUSE quality website. That is a right feeling for us," shares Girish Tiwari, Vice President, Head – Electrical Standard Products, E&A.

Beginning is half done

Although the company took to the path of TQM in 1991, the attempt took a structured form only in 2011. "We went for TQM in the early nineties in the areas including Employee Involvement, Waste Elimination, and Structured Problem Solving.

The initiative in between became dormant. In 1995, we started sending our people to Japan for training programs. This was the time when we started getting influenced by the Japanese way of TQM. Meanwhile, we had Japanese gurus visiting us on different occasions and guiding us on new product development, and philosophies including Kaizen, and Six Sigma," recounts Tiwari.

It was in the year 2011 that the team deemed itself ready to take a crack at TQM practices yet again and eventually qualify for the Deming Prize. "So, it's been a journey of eight years," he adds.

When the company started implementing TQM, some doubted if the methodology, which is more successful in the auto industry, would be equally effective in the switchgear segment. "We have shown and seen ourselves that basically it is an engineering industry, and TQM is an approach and a quality mindset which can be applied anywhere. It worked in the auto because all the new concepts of manufacturing generally emerge from the auto set up," he adds.

"At a macro level, it is called macro excellence. It is not just about manufacturing; it is about process excellence across businesses," comments Dr Hasit Joshipura, Member – Executive Committee, Larsen & Toubro and Senior Vice President & Head, E&A.

Towards winning

The Prize has a precedent process which requires getting trained by Japanese Senseis who visit a company's plants once a quarter. They normally spend two or three days per plant, review its various processes, reveal the current level the company is at and guide on its future course. "It's like how a guru gauges one's preparedness and passion, and hand holds through each step to reach a global benchmark," explains Tiwari.

The Deming Prize Medal

Source: L&T Electrical & Automation

The guidance has helped the company now operate at a customer dpm level of 150-160 from 600-700 in 2014, which is four times reduction in customer complaints.

Learnings along the way

Although, TQM is perceived as managing quality in general, what the company learnt in its journey was that it is also quality of management. "The key is that whatever is there to manage – inventories, cost, IT operations, customers, suppliers, employees – must be managed well. A KPI in place demonstrates if improvization is on," shares Tiwari.

There have been all-round improvements in many areas including efficiency and preventive maintenance. "We earlier would work on minimizing the number of breakdowns. But we were taught to understand our machines so well to be able to correct them before they break down, leading to production stoppage," he adds.

The company's Operating Equipment Efficiency (OEE) which was at 78 percent is now at 90, and the goal is to reach 95 percent.

The Deming Prize auditors assess companies to see whether they are result-oriented. "They use the phrase 'respect for result'. We would show them our graphs where we could not get close to our targets. They taught us to scientifically decide our targets to gain the clarity needed to achieve them," states Tiwari.

That SOPs (Standard Operating Procedures) are crucial was another lesson learnt since it releases pressure off employees. "In our case, we made elaborate user-friendly SOPs, which our employees felt made their jobs lot easier," he adds.

Simplifying processes

At first, E&A applied TQM to manufacturing operations for

Source: L&T Electrical & Automation

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Member – Executive Committee
Larsen & Toubro
Senior Vice President & Head
E&A

Source: L&T Electrical & Automation

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Girish Tiwari
Vice President &
Head – Electrical Standard Products
E&A

TQM has helped the company now operate at a customer dpm level of 150–160 from 600–700 in 2014, which is four times reduction in customer complaints.

Source: L&T Electrical & Automation

The E&A team under the guidance of Japanese Senseis

a few years before spreading to other functional departments. "In factory there are a number of issues to be tackled - quality issue, supply chain issue, supplier relations, cost reduction etc. Once we achieved results there with TQM, we were asked to apply it to the design department to continue the improvement as the saying goes that quality is built in design," notes Tiwari.

The normal practice is that after having accorded a company with the Deming Prize, it is told why was it found worthy of it. The reasons are spelt out loud and clear.

Acknowledging best practices

E&A is primarily a product business whose competition is with global leaders in the field. With its own designing, production, sales and marketing, the company is self-reliant and complete as an organization. "In India, since we own the leadership position, it is both our responsibility and a business requirement to know what will be needed by the customer tomorrow. While working towards Deming, we endeavored to excel at the processes we already had in place and come up with successful products which are called Hit Products by the Deming auditors. This is known as New Product Intensity," explains Tiwari.

The normal practice is that after having accorded a company with the Deming Prize, it is told why was it found worthy of it. The reasons are spelt out loud and clear. "One of the things that was pointed out to us was that we were doing very well with regard to New Product Intensity, which means we have been able to identify, develop and roll out products which are needed by the customer. Second, our ability to involve everyone in the process was commended. Third was our machine efficiency. Now, we have machines that are running between 90 and 95 percent OEE; customer dpms have gone down by four times; our line fill rate, which used to be 84-85 percent is running on 98 percent; and supplier satisfaction is at the benchmark level. These were the areas that indicated to them that there was an overall impact on whatever we had tried to improvize upon," reveals Tiwari.

Offering Hit products

The Deming audit team acknowledged four things responsible for the company consistently coming up with successful products. The first thing pointed was its sales department which is kept in total sync with systems. E&A has a system of order loss analysis. "It is easier to evaluate when you win an order than when you lose it. But we have a system of understanding the competition whenever we fight or negotiate with the customer for an order. It is such that whenever we find ourselves pressed for price or for meeting customers' requirements, the system conveys that particular input to the marketing team. The product management takes it up to the design team. This is the way we come to know what is likely to happen in the near future," he adds.

The second thing is its products that do CSR, which normally is done as an activity. Every new product that the company produces is compact, made faster and with less weight, which means it uses less materials such as copper and silver.

The company keeps tabs on new technologies and ensures to incorporate them in the product development. Lastly, it was acknowledged that the products get developed with total involvement of end users. "We have customer groups where we go and share with them our product samples. We take their input to ensure that the final product is very close to what our customers are looking at. These are the four ways by which we come with successful products," he says.

Advantage Deming

The Deming Prize, considered as the Nobel Prize for the manufacturing industry, is certain to add immense value to the brand L&T. "It will definitely work in our favour. We are being asked whether it will fetch us more business or orders. I think the question has to be revised; we are doing things that can convince the industry that this company will be successful in future because it has found the premise that processes produce results. We have proven that if one has processes in place, results come," notes Tiwari.

"It does not matter if you get the award or not. One, it rallies the entire business around a single goal, which itself is a huge gain and second, you are sure to get benefit from the improvements in your processes. The award is an icing on the cake," says Dr Joshipura.

He further adds, "There are no parallels like this where an Indian originator competes essentially with global competition for as long as we have competed, and yet is able to retain leadership. So, you need to do things to make sure that you remain and continue to have a seat on the table."

CELEBRATING ENGINEERING INNOVATIONS

The 8th VDMA Mechanical Engineering Summit offered optimism in the face of challenges the Indian industry currently encounters and reflected on the concrete steps being taken to revive it. An overview...

The 'Energy Efficient and Conservation Award' was conferred to KSB Pumps in the large category, and Vulkan Technologies Pvt Ltd in the small & medium category. The 'Work Condition and Work Safety Award' was offered to Sartorius Stedim India Pvt Ltd in the large category and the winner in the small & medium category was SMS India Pvt Ltd.

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Source: VDMA India

The VDMA Newsletter Summit Special Edition was unveiled during the event by eminent industry legends.

The Summit, that convened 250 VDMA members, commenced with a welcome address from Rajesh Nath, Managing Director, VDMA India who spoke on the various domestic and global issues that have made the year 2019 eventful so far. The ones closer home included the slump in the automotive sector in India. According to Nath, this is the ideal time to consolidate and have an optimistic view. He pointed out to the positive steps being by the Government of India to boost investment and growth that will eventually help the country to come out of the current situation.

The Guest of Honour Vinay Kumar Katyal, Director, Bangalore Complex, Bharat Electronics Ltd, cleared the air around Public Sector undertakings in India, which are misconceived as loss making ventures, by disclosing Bharat Electronics' turnover of ₹11,000 crore in 2018. The fundamental reason for success, he said, is its transition from a manufacturing organization to a technological solution provider.

India in comfortable place

Margit Hellwig-Böette, Consul General, Consulate General, the Federal Republic of Germany, Bangalore, gave a special address on Innovation, Digital Workplace and Start-ups. She mentioned that the speed of innovation is slowing down globally because of the trade war between the US and China and there is a lookout for a motivated young workforce. In this regard, India is in a comfortable position, she noted.

Ulrich Ackermann, Managing Director, Foreign Trade Division, VDMA Frankfurt, spoke on the challenges of global trade that are to affect the international flow of money, information, products and services.

Positives galore

A knowledge paper on 'Automotive Industry - Impact due to Electro Mobility' was released by BDB India Pvt Ltd. The study included certain interesting inputs with regard to Electric Mobility: the prices of battery have almost come down by 70 percent, rent sharing has started getting preferences, and also the subsidy announced by the Government on EV buying would have a positive impact. According to this report the public transport, two-wheeler and three-wheeler segment are expected to be quicker in adapting to EVs in India.

Debabrata Sinha, Chief Financial Officer & VP, Rittal India, shared his experience on anti-profiteering in the engineering industry and informed that the anti-profiteering framework under the goods and services tax (GST) has been extended by another two years.

MR Subramanya, Vice President, Siemens Technology and Services Pvt Ltd, elaborated on the importance of Industrial Automation. Shankar G Rao, General Manager & Head, and Anuradha Preet, Strategic Consultant, Robert Bosch Engineering Pvt Ltd, provided an insight into the role played by employees and their effective re-skilling in the successful realization of industry 4.0 throughout the organization.

Dr Eric Maiser, Head, VDMA Competence Centre Future Business, in his presentation focused on the technologies trending in the year 2030 and the key activities being carried out by the VDMA Start-up Machine in coaching start-ups that build their businesses with futuristic technologies at the core.

A panel discussion on 'India Marching towards a $5 Trillion Economy – Role of Manufacturing', moderated by Nath, rounded off the Summit.

EVENT CALENDAR

EVENT NAME	CONTACT	DATE & VENUE
CAMTECH 2019	T: +91 79 40279900 – 10 E: varun.gopalakrishnan@cii.in www.cii.in	December 06, 2019 Hotel Crowne Plaza Ahmedabad, India
IMTEX FORMING 2020 & TOOLTECH 2020	T: +91 80 6624 6600 E: info@imtma.in www.imtex.in	January 23–28, 2020 BIEC Bangalore, India
METAV DUSSELDORF INTERNATIONAL TRADE FAIR	T: +49 (0) 69 756081 53/54 E: metav@vdw.de www.metav.com	March 10–12, 2020 Düsseldorf Exhibition Centre Düsseldorf, Germany
HANNOVER MESSE	T: +49 511 89 34466 E: geeta.bisht@hmf-india.com www.hannovermesse.de	April 20–24, 2020 Hannover Fairground Hannover, Germany
TAGMA DIEMOULD 2020	T: +91 22 28526876 E: tagma.mumbai@tagmaindia.org www.diemouldindia.org	April 22–25, 2020 Bombay Exhibition Centre Goregaon Mumbai, India
MACHINE TOOLS AFRICA	T: +27 (0) 11 835 1565 E: info@machinetools.co.za www.machinetoolsafrica.co.za	May 12–15, 2020 Johannesburg Expo Centre Johannesburg, South Africa
BIEMH 2020	T: +34 94 404 00 00 E: bec@bec.eu www.biemh.bilbaoexhibitioncentre.com	May 25–29, 2020 BEC Bilbao Exhibition Centre Bilbao, Spain
ACMEE 2020	T: +91 44 2625 0489 E: info@acmee.in www.acmee.in	June 18–22, 2020 Chennai Trade Centre Chennai, India
MTA VIETNAM 2020	T: +65 6233 6688 E: machine-isoa@ubm.com www.mtavietnam.com	July 10–12, 2020 Saigon Exhibition & Convention Center (SECC) Ho Chi Minh, Vietnam

To suggest an event, please send details to soumi.mitra@magicwandmedia.in

SPELLBINDING PRODUCTION SHOW

Woven around the theme of 'Smart technologies driving tomorrow's production!', EMO Hannover 2019 once again proved to be the premier trade fair for the metalworking sector, featuring the entire bandwidth of present-day manufacturing technologies.

Source: VDW

(L-R): Adel Al-Saleh, Member of the Board of Management Deutsche Telekom AG; Andreas Scheuer, Federal Minister for Transport and Digital Infrastructure; Carl Martin Welcker, General Commissioner of EMO Hannover; Stephan Weil, Prime Minister of Lower Saxony and Dr Roland Feichtl, President, CECIMO at the opening ceremony of EMO Hannover.

Focusing on smart engineering, EMO Hannover 2019 housed a comprehensive range of advanced trends in metal-cutting, metal forming, production systems, high-precision tools, automated material flows, computer technology, industrial electronics & accessories, latest machines, efficient technical solutions, product-supportive services, sustainability in the production process, and much more at Hannover Fair Grounds from September 16-21, 2019.

The much-awaited trade fair was opened in the presence of Andreas Scheuer, Federal Minister of Transport and Digital Infrastructure; Stephan Weil, Lower Saxony's First Minister; Adel Al-Saleh, Member of the Board of Management of Deutsche Telekom; Dr Roland Feichtl, President, CECIMO; and Carl Martin Welcker, General Commissioner, EMO. With around 117,000 production specialists from 150 countries and more than 2,200 exhibitors from 48 countries, who showcased their innovations for industrial production, the world's leading metalworking fair was a haven for manufacturing enthusiasts seeking to know more.

Source: VDW

(L-R): Sylke Becker, Head of Public Relation VDW; Carl Martin Welcker, General Commissioner of EMO Hannover; Dr Wilfried Schäfer, Managing Director VDW and Gerhard Hein, Managing Director of the working group Laser and Laser Systems for material processing addressing the international press at EMO Hannover.

Source: VDW

First from left: Heinz-Jürgen Prokop, Chief Executive Officer Machine Tools (CEO MT) and Managing Director, TRUMPF GmbH + Co. KG along with Industry legends at UMATI Hall during EMO Hannover.

Source: VDW

Special Display Young Talents 2019: Partners from the industry, vocational colleges and educational institutions and the Youth Education and Development Foundation for Mechanical Engineering presented its training projects and initiatives for the metalworking professions and for technical study programmes at EMO Hannover.

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Source: Magic Wand Media

Christian Thones, Chairman of the Executive Board, DMG MORI AKTIENGESELLSCHAFT demonstrating the enhanced digital capabilities of the company and announcing the partnership between DMG MORI and US-based Software Supplier TULIP for providing agile manufacturing solutions.


Source: Magic Wand Media

Stephan Nell, CEO, UNITED GRINDING Group orienting the media on the goals of the company to strengthen its customers' competitiveness in the coming days.


Source: Blaser Swisslube

(L-R): Blaser Swisslube Ambassador, Titan Gilroy of TITANS of CNC Academy and Marc Blaser, CEO, Blaser Swisslube (centre) during the Press Meet at EMO Hannover.

Visitors from Asia, particularly India, China, Japan and Taiwan, made up almost one third of foreign visitors this year.

Thriving in uncertain times

According to VDW (German Machine Tool Builders' Association), the percentage of company executives among tradeshow attendees was about as high as two years ago, at 58 percent. Around half of them came armed with capital investment plans and for foreign visitors. This figure was even higher, at more than 62 percent. Around 25 percent of attendees placed orders during the fair or planned to do so soon. Further around 20 percent intended to spend money downstream from the fair.

In this backdrop, Welcker shared, "EMO Hannover has once again proved solid as a rock, providing clarity for further development of production technology, even in uncertain times. Its trademarks included a strong international character, a high caliber of visitors and exhibitors, and an amazing wealth of innovations and new products."

Dr Markus Flik, Chairman of the Board of Management, Chiron Group SE, noted, "The focus of our displays has been on lightweight construction, our digital SmartLine systems and our new 'LifetimeSolutions' service concept. Our discussions with customers have revealed that these topics are right on target."

Impressive visitor presence

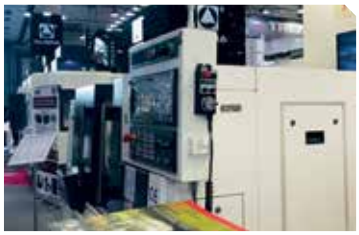
The trade visitors at EMO Hannover 2019 were from major industry sectors such as machinery and plant manufacturers, automotive industry and its component suppliers, aerospace sector, precision mechanics and optics, shipbuilding, medical technology, tool and die manufacture, steel and lightweight construction. A high percentage of Asian visitors accounted for almost one third of visitors from abroad, with China, Japan, Taiwan and India heading the rankings. Other countries with strong representation at the event included Italy, Poland, Sweden, Russia and Turkey.

Maiden EMO visitor, Joanna Wu, International Trade Manager, Hangzhou Zhijiang Magnetics Co., Ltd, shared, "My first impression is the sheer scale of this fair. I have come here from China to look for joint venture possibilities for our company and find potential partners."

Solutions to meet changing demands

Addressing the EMO opening press conference, Welcker said, "Digitalization and networking have been the subject of much discussion over the last few years, but they are now finally being implemented in the production processes. With factories becoming smart and machine tools becoming intelligent they communicate with each other, raising production to new quality levels."

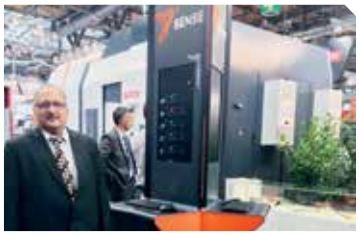
He stressed that there are challenges and opportunities arising from the transition of the automotive industry – the metalworking sector's largest customer. The introduction of new drive technologies will undoubtedly lead to changes in individual manufacturing processes. Hence, complex new production systems are needed for the manufacturing of key electrical components such as


Source: Magic Wand Media

Ace Micromatic Group from India has been participating at EMO for decades and has a strong presence in Europe with a wide dealer and distributor network to cater to the European market.

Source: Magic Wand Media

(Second from right): Vijay Zaritaklikar, National Sales Manager, UCAM Pvt Ltd along with a customer at EMO Hannover.


Source: Magic Wand Media

Mihir Baxi, President, Global Sales, Jyoti CNC Automation Ltd-Huron Graffenstaden SAS at the company booth at EMO Hannover.

Source: Magic Wand Media

While addressing the audience at the CELIMO – European Trade Association Meet at EMO Hannover, V Anbu, Director General & CEO, IMTMA spoke on the present Indian machine tool sector and the opportunities India offers for doing business.

Source: Magic Wand Media

James C F Huang, Chairman, TAITRA (fifth from left) and Alex Ko, Chairman, TAMI (fourth from right) along with industry veterans introducing the iMTduo 2020 and TIMTOS 2021 during the gala Taiwan Night at EMO Hannover.

Source: Magic Wand Media

(Second from left): Masayoshi Amano, President, JMTBA announcing the JIMTOF 2020 highlights during a press meet at EMO Hannover.

batteries, traction motors and power electronics.

Japanese attendee Kiyokazu Sugiyama, Machining Engineering Group, Nissan Motor Co., Ltd, emphasized, "EMO 2019 is providing an ideal way for us to get a comprehensive overview of what is happening in the automotive sector. Two years ago, we made our capital investment decisions and signed deals for a new technology at EMO. There is a wide range of production systems and machine tools available in the Japanese market, but we want to get a direct comparison with the range in the world market."

Innovation platform for production technology

The EMO motto 'Smart technologies driving tomorrow's production' focused on the key issues faced by the industry today. Christian Thönes, Chairman of the Executive Board, DMG Mori AG, shared, "Our discussions with customers at EMO 2019 in Hannover revealed that a focus on the holistic process chain including digital services, creates the relevant added value for customers."

This edition of EMO featured the first Artificial Intelligence (AI) applications in the Start-up area as well as at the booths of some trailblazing companies. Along with the strong interest in AI and machine learning, visitors' appetite for future visions was reflected in the concurrent events and forums where the topics included not only AI, but also additive processes, the industrial internet of things (IIoT), 5G and OPC UA or umati, the new standard interface between machine tools and overarching IT systems.

umati - Cynosure of EMO Hannover 2019

umati – the universal machine tool interface is an industry initiative of the VDW that was set up with an objective to achieve an open standard for data exchange based on the global interoperability standard OPC UA. It defines all necessary framework conditions to ensure seamless and secure integration of customers' machines and software. Dr Heinz-Jürgen Prokop, Chairman, VDW, highlighted, "Seventy companies from 10 countries have connected 110 machines and 28 value-added services at EMO Hannover 2019 via the umati standard interface, demonstrating for the first time that the universal interface between machines and IT systems can function across all product types. umati is opening up a new chapter in production."

Creating a connection and providing a uniform language for machines, systems and software are essential prerequisites for reaping the benefits of digitalization in production.

Paving the path for future

According to Welcker, this edition of the show proved that the industry is actively addressing the challenges of the future and has served as a prelude to the next EMO to be held in Milan, Italy from October 04 – 09, 2021.

Source: Magic Wand Media

Carl Huang, Secretary General, Taiwan Machine Tool & Accessory Builders' Association sharing the latest trends of Taiwan Machine Tool industry and announcing the Taiwan International Machine Tool Show (TMTS) 2020.

Source: Magic Wand Media

Third time EMO Hannover participant, Khushbu Honing from India was overwhelmed with the visitor response during the show. The company's European distributors were also delighted with the meaningful interactions they had with potential customers.

Source: Magic Wand Media

(Seated at the centre) Massimo Carboniero, President, UCIMU-SISTEMI PER PRODURRE elaborated on how the Italian machine tool builders offer wide digital dimension in their products and solutions with a competitive advantage. EMO Hannover press meet served as an apt platform to promote EMO MILANO 2021.

CMTX 2019: OPENING UP NEW OPPORTUNITIES

Hosted by Indian Machine Tool Manufacturers' Association (IMTMA), the Chennai Machine Tool Expo (CMTX), held from September 26 – 29 in Chennai, was well received as a new and ideal point of convergence in South India by the manufacturing fraternity. Highlights from the show...

(L-R): Srivats Ram, Managing Director, Wheels India Ltd; Indradev Babu, President, IMTMA and V Anbu, Director General & CEO, IMTMA during the CMTX opening ceremony.

Source: Magic Wand Media

Building off the success of its regional shows in the North and West of India, IMTMA this time offered its platform in Chennai to bring together manufacturing players from the nearby Tier 2 and 3 cities with the aim to provide them the much-required exposure to the ever-evolving manufacturing technologies.

Notwithstanding its maiden edition, the Chennai Machine Tool Expo (CMTX) 2019 proved to be a successful show with regard to the wide variety of product displays and high visitor turnover. The expo gained what it had aimed for which was to attract end-users from Tamil Nadu and South India and add value to the region's SMEs.

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The bright side

The event kickstarted with the traditional inauguration ceremony graced by the Chief Guest, Srivats Ram, Managing Director, Wheels India Ltd. Also present were Indradev Babu, President, IMTMA; V Anbu, Director General & CEO, IMTMA; and other eminent dignitaries from the industry.

The leaders focused on the current headwinds the industry is facing and deliberated on the ways to remain unfazed. Ram proffered hope for the coming days and offered suggestions to the machine tools manufacturers, "The industry must follow the benchmark capabilities of global manufacturers. Emulating their capabilities and standards will increase your scope. It's a cyclical industry, and hence the current situation will change."

"Automation is the area where people will invest in the coming days. This is the period when you must focus on building that capability so that if not in terms of volume, but in terms of capability you can reach the global customers," he further added.

Babu pointed out to the consistent efforts by the industry, "The Indian Machine Tools industry has been addressing the technological requirements of the Automotive sector. It is focusing on new product development, design, innovation and research. I am glad to inform you that the Advanced Manufacturing Technology Development Centre (AMTDC), jointly set up by IMTMA and the Department of Heavy Industries, GoI, at IIT Madras, is developing new technologies for the manufacturing industry. It is a matter of pride that the Auto Industry from Tamil Nadu has been using the Centre to improve their manufacturing processes."

Regional reach

On choosing Chennai as the chosen location for a regional show, Ram noted, "Chennai is

Source: Magic Wand Media

"Many of the end users of machine tools are in Chennai and Tamil Nadu. It is good for the machine tool manufacturers to exhibit here as more people from companies can visit."

Srivats Ram
Managing Director
Wheels India Ltd

Source: IMTMA

"Regional expos have a specific purpose. They reach out to SMEs who may not be able to go to big shows. I am confident the shows will keep developing and growing strongly."

Indradev Babu
President
IMTMA

Source: IMTMA

"The expo is held to attract visitors from and around Tamil Nadu. CMTX also aims to add value to SMEs, the backbone of manufacturing in terms of productivity, reliability, and cost competitiveness."

V Anbu
Director General & CEO
IMTMA

a big market for machine tools. While machine tool companies are concentrated in Bangalore, the end-users mostly are in Tamil Nadu so it is beneficial for the machine tool manufacturers to exhibit here."

Commending IMTMA's role in organizing regional shows, he noted, "It is important for IMTMA to organize such shows because they help reach a wider audience. Most suppliers from tier 2,3 and 4 do not make it to shows happening in places such as Bangalore due to several constraints. Hence, regional shows are a must."

Regional technology shows, said Babu, are significant for the manufacturing industry as they bring local customers directly to vendors and build good brand awareness. "I think the exhibitors will be able to reach many local customers and sign contracts to enrich their manufacturing processes," he added.

Ram also expressed his delight on the future capabilities the manufacturers exhibited at CMTX 2019, "This is important since the evolution and growth of the industry depends on the capability building," he stressed.

Live Demos at CMTX 2019

EPSON gave live demo of its cost-effective, space and energy saving industrial robots, SCARA Robots T-3 and T-6. The most interesting feature of these robots is they do not have any internal battery, which ordinarily adds to the operational expense of robots since roughly after a year and a half, robot batteries need to be changed.

Zentron Labs Pvt Ltd displayed its Terminal Inspection Systems, G Tron and IMM 9030. The machines come with three-camera systems. G Tron can inspect 2,400 parts per minute. The IMM 9030 can show every detail of what is happening inside the system, thus enhancing quality control drive for any manufacturing company.

Meiban Engineering Technologies being the Indian counterpart of Muratec, Japan, presented turning machines from Muratec. The company demonstrated how two machines for different operations have been combined in a cabinet to reduce installation space.

Ace Manufacturing Systems Ltd displayed its metal working machines TCV 540 for chipping, AMS 850 V for die-mould operation and newly launched SJE 08. It showed its 3D Printed critical automotive parts. The company is keen to spread awareness on its new end-to-end 3D manufacturing service. A new division has been opened to design, validate and manufacture parts from aluminum, steel, titanium and inconel.

Batliboi Ltd demonstrated the Chetak 55 MC, 80 MC machining centers, along with 20 TC LX turning center with improved performance.

UCAM Pvt Ltd presented its updated clamping systems that offer more compactness and rigidity.

Efforts going right

For a country like India whose manufacturing sector mostly comprises SMEs, it is highly crucial that they remain updated with the latest developments in the global industry. The role of regional shows is of high significance since they are a catalyst in making our industry players come at par with their global peers. Through its regional shows, IMTMA endeavors to bring India's SMEs in the forefront and aid them in leading the country in its growth journey.

Through its regional shows, IMTMA endeavors to bring India's SMEs in the forefront and aid them in leading the country in its growth journey.

Image Processing Software

TwinCAT Vision for PLC programmers

TwinCAT software unites a comprehensive range of machine functionality – PLC, motion control, robotics, high-end measurement technology, IoT, HMI and now machine vision – all in an end-to-end engineering and control platform.

Beckhoff Automation Pvt Ltd
Hall & Stall:
3A / A121

Machine vision is rapidly becoming a key quality enabler for manufacturing machinery. This applies particularly to Industry 4.0 concepts, quality optimization and track-and-trace applications. Now, TwinCAT Vision provides the required image processing capabilities in the form of PLC functionality on a universal, end-to-end software platform, complete with a specially developed library of image processing functions and function blocks that can be called up directly from the TwinCAT PLC. The flexible runtime system in TwinCAT is capable of executing these functions and function blocks in real-time.

Integration at this level simplifies engineering significantly, so that PLC programmers can now create machine vision applications themselves without support from outside experts.

GigE Vision compliant cameras of almost any kind can be added easily – even in parallel – via standard camera interfaces and configured in TwinCAT Engineering. With TwinCAT Vision, there is no need for specialized tools or programming languages when coding the image processing logic, because the machine vision applications are created in the PLC, using familiar PLC programming languages.

With stand-alone machine vision solutions, communication between image processing and control applications can be complex and difficult to manage. TwinCAT Vision not only avoids communication problems of this kind, it also allows the image processing and control components to communicate with one another directly. Because the image processing operates at the same real-time level as the PLC, response times are shorter and machines can run faster and more efficiently as a result.

Source: Beckhoff Automation Pvt Ltd

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TwinCAT Vision adds valuable new machine automation capabilities directly into the PC-based control system.

Hydraulic Presses

For Large Aerospace Parts

Hind Presses and Automation Pvt Ltd
Hall & Stall:
2A / A102

This 4,000 tonne oil hydraulic press supplied to the largest aerospace parts manufacturers in India is capable of ring forging, flange forging, fast forging, isothermal forging and titanium alloy forging.

Such press has an option of speed control of 0.01mm/sec which gives it a unique capability of isothermal forging wherein the deformation of the titanium alloy and other exotic materials is highly controlled. It is monitored via an on-site command center with mimic control display for easy operability. The equipment is highly sophisticated and sensor controlled and requires lesser man power for its operation.

The press is equipped with two swing arms for precision ring forging and flange forging. The moving table ensures multi-tool arrangement giving much shorter cycle time for producing precise hot forged parts. The hydraulic system is designed with world-renowned bought-out parts with an oil tank capacity of over 50,000 lt.

Source: Hind Presses and Automation Pvt Ltd

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Vacuum Technology

Vacuum Generation Made Compact

Schmalz India Pvt Ltd
Hall & Stall:
3A / A127

J. Schmalz GmbH has developed the new SCPM family in response to the growing demand for space-saving, decentralized vacuum generators that combine powerful suction with straightforward integration. Their optimized power density and compact dimensions allow the ejectors to be used very close to the suction cup. Up to 16 ejectors can be easily blocked to form a compact pneumatic unit with just one connection. A further interesting feature is the modular system, which greatly simplifies the selection of the right vacuum generator: Using different modules, three different versions can be created with just one main body. In addition to the basic version SCPMb, there is also a 'c' version – where 'c' stands for 'controlled'. With additional features such as the automatic air-saving function and active blow off, this version reduces compressed air consumption during handling by more than 80 percent. The intelligent 'i' version of the SCPM also offers numerous functions for monitoring and controlling the entire production process.

Schmalz India Pvt Ltd
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Source: Schmalz India Pvt Ltd

Compact Ejector SCPMc (controlled) while removing plastic injection-moulded parts.

Laser Cutting Systems

The Flexible Arm X5

Sahajanand Laser Technology Ltd
Hall & Stall: 4 / B110

The Laser Cutting System has 2 more axes of freedom than the conventional X, Y and Z axes that allow higher flexibility to operate on various sizes and shapes of automobile sheet metal components.

The machine has the capability to cut complex curves precisely, effectively and quickly. SLTL has eliminated the complex task of operators to rearrange the parts, over and again, thus saving precious time. The system is accurate in providing the following solutions:

Simple operations: The machine being sophisticated has a simple control unit, making it easy to run even with low expertise.

Automation at work: It comes with advanced features including 360-degree infinity rotational head, dynamic edge control and many more. This calls for less human intervention, thus offering error-free operations and saving time.

Robust hardware and software: The machine can be operated for long working hours without compromising the quality of the products.

Flexible system structure: Since the machine is designed to operate on numerous shapes and sizes, the operational bed of the machine is modular in nature.

Sahajanand Laser Technology Ltd
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www.SLTL.com

Source: Sahajanand Laser Technology Ltd

Optical Metrology

Rapid Profile Projector V 300

The V 300 from Dynascan measures or traces parts in a few seconds as opposed to 10 or 20 minutes on a conventional Profile Projector.

An accurate, large diameter lens captures the image of the part, processes it on a high-end computer system and throws out the dimensions, together with Pass / Fail Reports and SPC Analysis, in 2 to 3 seconds. A high magnification Zoom Lens enables measurement of very small dimensions like 10 microns. Results can be stored in a variety of output formats, saved to the cloud or shared with customers. For large components bigger than the field of view of the lens, the part can be mounted on a work stage to scan and measure the complete part. The machine is available in two models, a vertical light path for large flat components, plastic parts, etc., or a horizontal light path with a steel table for mounting of parts like blocks, shafts, gears, splines, etc. Both configurations are available in lower cost manual or motorized versions with a fixed magnification or full CNC versions with zoom lenses.

Dynascan Inspection Systems Co.
Hall & Stall: 3A / A125

Source: Dynascan Inspection Systems Co.

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Engineered Alloys

Aluminum Bronze Alloys for stainless steel forming & bending tube

The alloys from AMPCO METAL are known to have remarkable wear and corrosion resistance and render perfect surface on Stainless Steel and Titanium.

Headquartered in Switzerland, AMPCO METAL manufactures a wide range of alloys in a variety of grades and conditions for today's most demanding applications. The company's high-performance aluminum bronze alloys for pressing, tube bending, deep drawing, rolling and profiling applications are readily available in a comprehensive range. The company, as a well-established integrated producer and distributor of specialty metals, brings vast experience and expertise to solve wear and corrosion metal problems. AMPCO® BRONZE is a universal material used in applications where all kinds of marks, galling or friction problems can decrease the quality for good. It is also an ideal material for high load and wear applications. These alloys can be an ideal solution in bending, forming or deep drawing processes, especially for stainless steel and titanium.

AMPCO METAL India Pvt Ltd
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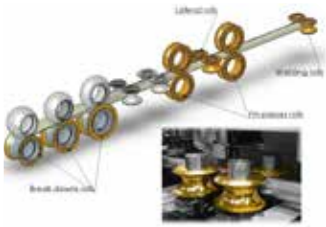
AMPCO METAL India Pvt Ltd
Hall & Stall: 3A / L103

AMPCO® 25 Aluminum Bronze Alloy

The patented alloy is used in applications including Deep Drawing and Tube Forming. It displays outstanding mechanical properties such as: • High magnetic properties • Sliding characteristics • Extreme hardness • No cold welds on the forming rolls and dies • Absolutely perfect surface on carbon, stainless steel or titanium tubes • Extended lifetime • No hardening or expensive coatings • Easy to regrind • High thermal conductivity.



Source: AMPCO METAL India Pvt Ltd

AMPCO® 18, 21 & M4 Aluminum Bronze Alloy

The alloy is used in applications such as Tube Bending. It helps in: • Speeding up tool manufacturing • Improving sliding properties • Reducing production costs • Increasing product quality • Offering minimum friction

Source: AMPCO METAL India Pvt Ltd

Company Index

Advertiser Index

Asia's Leading

Fixture Builder

Presents

IoT enabled Industry 4.0 Fixtures

For over 45 years Forms & Gears has been supplying Precision Machining Centre Fixtures to the world's leading Auto OEMs and Machine Makers in Japan, Germany, UAE, Qatar, Thailand, Turkey, Indonesia and all over India. Forms & Gears now brings you IoT enabled Industry 4.0 fixtures for High Performance Machining.

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- ☑ Fixture level analytics to help isolate and troubleshoot faster.
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