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NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

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January 2021

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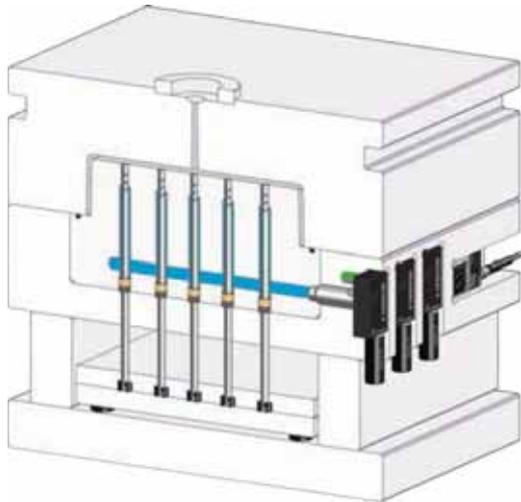
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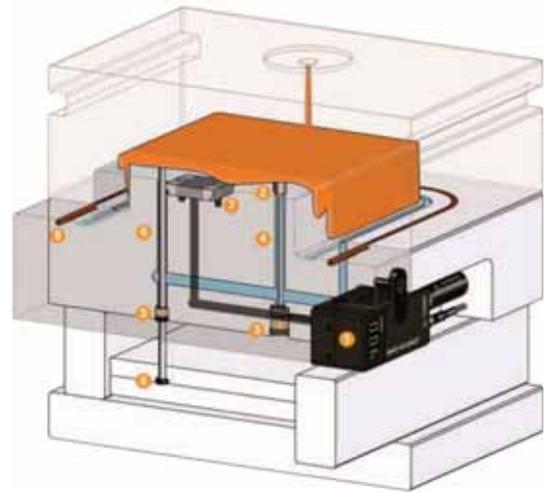
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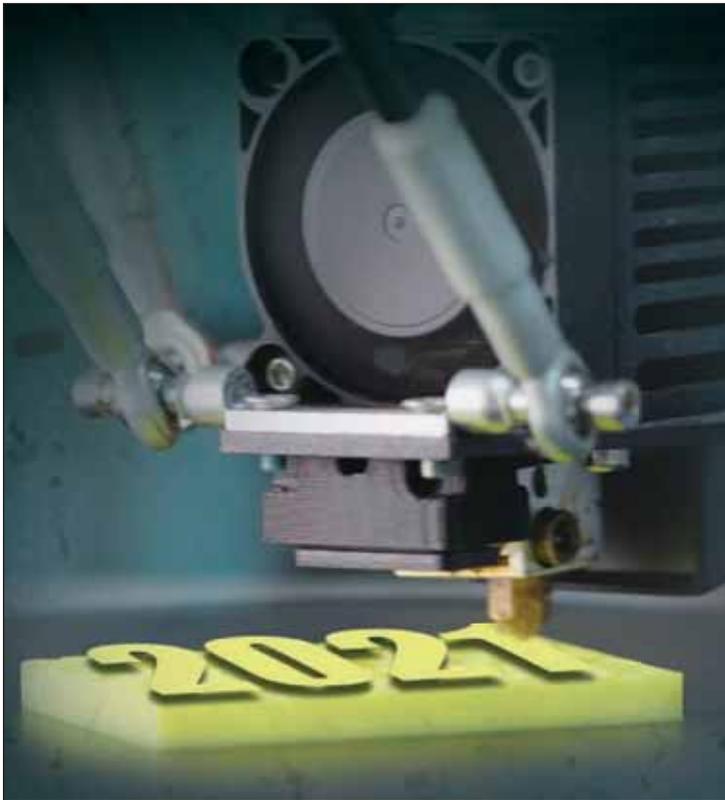
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◀ **THRUHARD SUPREME HH** ▶

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Injection molded Bumper part



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PRESIDENT'S MESSAGE



Wish you all a very Happy and Prosperous New Year!

Looking back at the last 12 months, who could have had any idea about what was in store for us in 2020! Yet, in spite of all the challenges and hardships we faced in 2020, much has been learnt about resilience, the value of operational agility, the importance of skill development, and where weakness exists in each of our value chains.

Now, is a good time to pause and reflect on the lessons we have learnt so far and contemplate on what the coming year might have in store for us. While we are aware that the exact future is impossible to predict, it is fair to say that there are some clear trends emerging in 2021 for the tooling industry. They are:

- We must de-risk our business by diversifying into various other sectors such as defence, aerospace, railways, and electronics, among others.
- We should encourage cluster development for tooling. TAGMA has already started work in this direction in collaboration with the government.
- We must make operations more efficient by adopting green practices and the latest technologies.
- Go digital from end-to-end. We must adopt digital processes in all our business operations — be it sales, operations, or production.
- Learn new skills. The new technologies, new processes, and new opportunities require new skills.

This whole situation might look like a big challenge for now, but I have a strong feeling that, in the long run, Indian tooling companies will find several opportunities before them. In the recent months, TAGMA has received a lot of encouragement from the government, as they assured us of all the possible support for the betterment of our industry. We are going to work very closely with the respective ministry to take this industry to next level with their help.

Once again, I, along with the TAGMA Secretariat, wish you all a great beginning of the decade. This decade belongs to India. Let's make the most of it.

D. K. Sharma

President,
TAGMA India



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A resilient resolve

Dear Readers,

would like to begin by wishing you all a very happy, safe, prosperous and resilient New Year!

“When we learn how to become resilient, we learn how to embrace the beautifully broad spectrum of the human experience,” reads a noteworthy quote by Jaeda DeWalt, an American artist. I find this quote very relevant considering our present-day scenario; when we learn how to become resilient, we learn how to embrace changes and act accordingly.

The year 2021 can be termed as the year of resilience and changes. The more we open our minds to newer experiences, the better are our chances of adapting to the changes around us. The year 2020 was full of challenges and learnings for Indian MSMEs. In spite of all that happened in 2020, the SME sector remains resilient and hopeful. Indian MSMEs, however, need to focus on technology adoption and start the process of going digital now, if they haven't.

In the long run, the pandemic could be looked at as a blessing in disguise for the Indian manufacturing industry. The disrupted global supply chain made manufacturers across the globe look to India and other countries to set up their manufacturing base. And, enormous opportunities have knocked on our doors thanks to campaigns like 'Atmanirbhar Bharat', 'Make in India' and 'Vocal for local'. India is expected to rank amongst the world's top three growth economies and amongst the top three manufacturing destinations before 2025, say news reports.

Business is definitely picking up! The automotive numbers look promising, many defence deals are being signed, the white goods and electronics industries are booming, FMCG is seeing an upward trend... so much positive news has begun to flood our lives. Indian MSMEs need to rise to the occasion and grab the huge opportunities before them.

The year ahead will vary for manufacturers depending on where they have felt the greatest impact from the pandemic. For some, it could be regaining lost ground, for others, it could be diversifying to newer sectors and businesses. Nevertheless, one thing will be common for all and that is to change the way we have been doing business.

On this positive note, I present you the first edition of TAGMA Times 2021.

Wish you all a resilient, innovative, and positive decade!

Happy reading!

Nishant Kashyap

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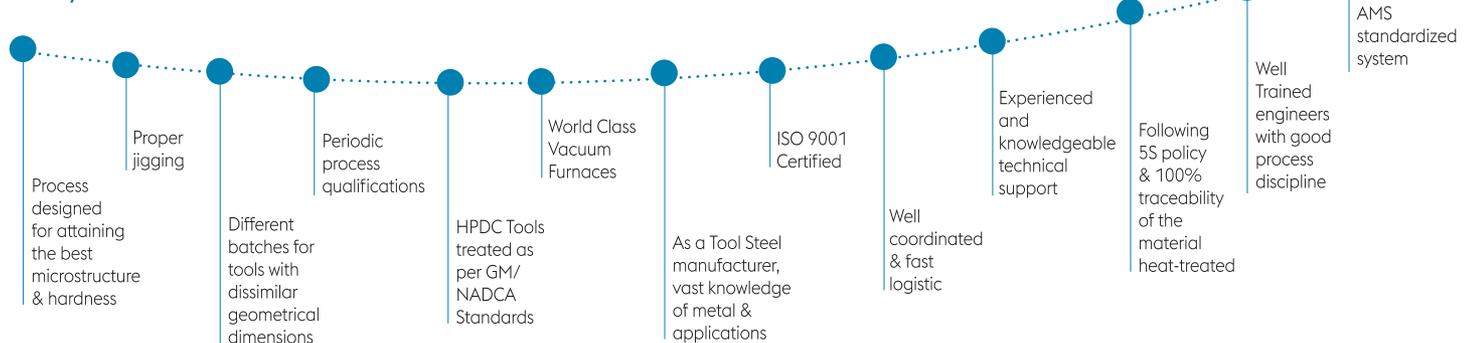
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ONE STEP AHEAD.

Godrej & Boyce becomes the only Indian company to be announced as a finalist at the World GBC 'Asia Pacific Leadership in Green Building' Awards 2020

GODREJ & Boyce, the flagship company of the Godrej Group, is the only company from India to be featured among the finalists for the prestigious World Green Building Council (GBC) Asia Pacific Leadership in Green Building Awards 2020, which celebrates Asia Pacific's brightest achievements towards a more sustainable built environment. They have been recognised as finalists under the 'Business Leadership in Sustainability' and 'Leadership in Sustainable Design and Performance' categories.

Godrej & Boyce was nominated as one of the four finalists for the Business Leadership in Sustainability Award that recognises companies, which are truly integrating sustainability into their business models and contributing in the transition towards a sustainably built environment. Furthermore, the Plant 13 Annexe building located at Vikhroli (Mumbai) was nominated as a finalist in the 'Leadership in Sustainable Design and Performance Award' category, which recognises pioneering green



building projects that deliver a range of benefits through a holistic approach to sustainability.

Elated by the recognition, George Menezes, COO - Godrej Electricals & Electronics, said, "At Godrej & Boyce, we are deeply committed to adopting sustainable practices in all spheres of our operations—internal and external. We have always aimed to continuously set newer and better standards for sustainability within the industry by considering factors that lead to positive outcomes for both the planet and its people. We are truly humbled and honoured to be recognised for our efforts towards this endeavour, and will continue pursuing high standards of sustainability, worthy of emulation."

Going green

Godrej & Boyce, being one of India's oldest businesses, has always positioned itself to lead and influence the larger business community in India.

The company set up India's first Net Zero Carbon building under the Indian Green Building Council (IGBC) rating system and partnered with the World Green Building Council to promote Net Zero buildings across the Asia-Pacific region.

Further recognising that business and sustainability go together, the company recently pledged to double its Energy Productivity by 2030; signing into the Global EP100 initiative, which is led by the Climate Group.

Daicel Corporation to establish a new production site for automobile airbag inflators in India

DAICEL Corporation (Head Office: Kita-ku, Osaka, President & CEO: Yoshimi Ogawa) has decided to establish a new production site in India to meet the growing demand for automobile airbag inflators in the country. The plant will be constructed at the OneHub Chennai Industrial Park in Tamil Nadu, southern India, and is scheduled to start operations in December 2023.

In response to growth in the Indian automobile market and the tightening of safety regulations, Daicel established a sales base (Daicel Safety Systems India



Pvt. Ltd., DSSI, Gurugram, Haryana) in October 2018, to conduct marketing and local research.

Until now, the company has been supplying products to the Indian market from its production site in Thailand and other countries. However, due to the growth potential of the

Indian automobile market, and the need to strengthen automobile manufacturer and airbag module manufacturer supply chains in India, Daicel Corporation has decided to establish a local production site.

It will further strengthen its presence in the Indian market through stable production and supply of products, contributing to the development of the Indian economy through both inflator production and parts procurement in the country.



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Hyundai strengthens commitment to 'Atmanirbhar Bharat'

HYUNDAI Motor India Ltd. (HMIL), the country's first smart mobility solutions provider and the largest exporter since inception, recently announced the commencement of exports of its recently launched Made in India-Made for the World all-new i20. This milestone marks the beginning of the next decade and HMIL's resilient commitment to 'Atmanirbhar Bharat'.

Commenting on the commencement of export of the all-new i20, Mr. S S Kim, MD & CEO, Hyundai Motor India Ltd., said, "The all-new i20 has surpassed customer expectations in India, becoming one of the highest selling models in its segment. We are delighted to mark our renewed commitment to 'Make in India' with the commencement of exports of the all-new i20 in the global markets. With 5.16 lakh exports since its first launch, the i20 is already a brand to reckon with even in the global markets. We are confident that the advanced and hi-tech feature

Made in India for the world

Hyundai Motor India is presently exporting 10 models namely – ATOS (SANTRO), GRAND i10, XCENT, GRAND i10 (NIOS) & GRAND i10 (AURA), i20, i20 ACTIVE, ACCENT (VERNA), VENUE and All New CRETA. Globally, Hyundai exports 'Made-In-India' cars to 88 countries across 5 continents. They are:

- ▶▶ South America (32 countries)
- ▶▶ North America (Mexico)
- ▶▶ Africa (28 countries)
- ▶▶ Asia Pacific (26 countries)
- ▶▶ Europe (1 country).

packed all-new i20 will continue to drive customer delight."

As the country's largest exporter of automobiles, Hyundai also surpassed the 3 million vehicle export milestone earlier in 2020, exporting Hyundai cars to 88 countries. Hyundai Motor India has recorded multiple export milestones over the years. Its cumulative exports crossed:

- ▶▶ - 5 00 000 in March 2008
- ▶▶ - 10 00 000 in February 2010
- ▶▶ - 20 00 000 in March 2014.

During the successful export journey, Hyundai Motor India has won prestigious awards including - 7 EEP National and 5 South Region Awards as Top Exporter of Year for Large Enterprise category.

Tata Motors receives 98 patents in 2020

TATA Motors, India's leading automobile company, recently announced that it had accelerated its drive for engineering excellence and innovation in 2020 by filing 80 and receiving 98 patents in 2020. These patents predominantly relate to the megatrend of CESS (connected, electrified, sustainable and safe) automobiles and encompass an eclectic mix of improvements in automotive electronics, noise vibration and harshness, conventional and advanced powertrain systems, and crash safety under various categories of Industrial Designs, Copyrights and Notarizations.

Over the years, Tata Motors' dedicated focus on R&D has led to a consistent introduction of new technologies, practices and processes that have since become frontrunners in the

Awards and recognitions

Tata Motors' focus and thrust on building intellectual property is regularly acknowledged with prestigious awards and recognitions.

Amongst the recent recognitions won are the 6th CII's Industrial IP Award for 'Best Patents Portfolio for a Large (Manufacturing/Engineering) Organization' for 2020; the IP Excellence Recognition Award at 2019 Questel Executive IP Summit and being acknowledged amongst India's Top 15 Innovative Companies by Clarivate Analytics in 2019.

automotive world.

Speaking about Tata Motors' commitment and focus on R&D, Rajendra Petkar, Chief Technology Officer, Tata Motors, said, "At Tata Motors, we have a rich history of introducing innovations that develop to become industry benchmarks. We encourage our talented team to think afresh and challenge the status quo in our consistent pursuit of excellence. A carefully curated solution-oriented

approach enables us to collectively ideate, innovate and collaborate to evolve new technologies, products and processes to delight customers. Consistently developing intellectual capabilities and properties at an institutional level is key for the advancing India's auto industry's role in building 'Atmanirbhar Bharat'. At Tata Motors, our objective is to create best in class 'Make in India' products that offer global standards design, safety, comfort and driveability."

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IMF projects impressive 11.5% growth rate for India in 2021

THE IMF, in January, projected an impressive 11.5 per cent growth rate for India in 2021, making the country the only major economy of the world to register a double-digit growth this year amidst the coronavirus pandemic. The International Monetary Fund's growth projections for India, in its latest World Economic Outlook Update, released recently, reflected a strong rebound in the economy, which is estimated to have contracted by 8 per cent in 2020 due to the pandemic.

In its latest update, the IMF projected an 11.5 per cent growth rate for India in 2021. This makes India the only major economy of the world to register a double-digit growth in 2021, it said. China is next with 8.1 per cent growth in 2021 followed by Spain (5.9 per cent) and France (5.5 per cent). Revising its figures, the IMF said that in 2020, the Indian economy is estimated to have contracted by eight per cent. China is the only major country, which registered a positive growth rate of 2.3 per cent in 2020. India's economy, the IMF said, is projected to grow by 6.8 per cent in 2022 and that of China by 5.6 per cent.

With the latest projections, India regains the tag of the fastest developing economies of the world. IMF Chief Economist Gita Gopinath, during a virtual press conference to release the WEO update, said that India has somewhat a faster pace of recovery, but "cumulatively, by the end of 2022, it is nine per cent below its pre-pandemic projected level".

"We are seeing India come back to its 2019 levels and 2021, but it's still below. Why do we have these upgrades (in IMF's growth projections for India)...because the activity and mobility particularly came back much faster than expected in India. We have not seen another wave," Gopinath said.

"In fact, we are seeing a very strong decline in cases, which is again a bit different from other parts of the world. So, these factors, including what we're seeing in terms of high frequency indicators, point to have somewhat faster pace of recovery. But again, there is still some distance to go," said Gopinath.

Earlier this month, IMF Managing Director Kristalina Georgieva had said

that India "actually has taken very decisive action, very decisive steps to deal with the pandemic and to deal with the economic consequences of it". India, she said, went for a very dramatic lockdown for a country of this size of population with people clustered so closely together. And then, India moved to more targeted restrictions and lockdowns. "What we see is that transition, combined with policy support, seems to have worked well. Why? Because if you look at mobility indicators, we are almost where we were before COVID in India, meaning that economic activities have been revitalised quite significantly," the IMF chief said.

Commending the steps being taken by the Indian government on the monetary policy and the fiscal policy side, she said it is actually slightly above the average for emerging markets. "Emerging markets, on an average, have provided 6 per cent of GDP. In India, this is slightly above that... Good for India is that there is still space to do more," she said, adding that she is impressed by the appetite for structural reforms that India is retaining.

Courtesy: PTI

Karnataka CM breaks ground for 400-acre toy manufacturing cluster in Koppal

CHIEF minister BS Yediyurappa performed the ground-breaking ceremony of a toy manufacturing hub in Bengaluru recently, describing the 400-acre project as a landmark for the Karnataka government's product specific industrial cluster development programme.

This cluster, he said, intends to attract an investment of ₹ 5,000 crore and generate direct and indirect employment for an estimated 1 lakh people

in the region. "The toy manufacturing industry is labour-oriented, and most workers are women. Hence, this cluster is a bold step towards empowering women," he said.

The cluster is promoted by Aequus SEZ Pvt. Ltd. in partnership with the Karnataka government. Aravind Melligeri's Aequus operates a large aerospace SEZ in Belagavi as well. Jagadish Shettar, minister for large and medium scale



industries, said Koppal has a tradition of making Kinnal toys. "We aim to make Koppal the country's toy-making hub by promoting this art."

If all goes as per plan, this could become India's biggest toy manufacturing destination. Melligeri said his vision is to have several units — component makers, assembling units, toolmaking units, warehouses — making puzzles, soft toys and electronic toys, among others. He said global toy makers like Hasbro, Mattel, Spin Master and MGA Entertainment have expressed interest in buying from the Koppal facility.

Alstom wins major signalling & telecommunication systems contract from Indian Railways

INDIA adopts ground-breaking European Train Control System for mainline railways for the first time Alstom has won a contract worth €106 million from the National Capital Region Transport Corporation Ltd. (NCRTC) to design, supply and install the signalling, train control and telecommunication system (Package 24) of the 82.15 km Delhi – Ghaziabad – Meerut Regional Rapid Transit System (RRTS) Corridor. NCRTC is a joint venture between the Government of India and States of Delhi, Haryana, Rajasthan and Uttar Pradesh. It is implementing RRTS, a first-of-its-kind semi-high-speed rail line which will reduce the journey time between Delhi and Meerut to just 60 minutes,

compared to the current 90-100 minutes, and with a maximum speed of 160 km/h.

Alstom's scope of work includes design, supply, installation, testing and commissioning of Signalling

& Train Control, Supervision, Platform Screen Doors and Telecommunication Systems for the corridor. This line will be the first in India to adopt the European Train Control System (ETCS) hybrid Level 3 signalling system, which is the core signalling and train control component of the European Rail Traffic

Management System (ERTMS).

"As leaders in digital mobility, we are thrilled to receive this contract and provide India's first-ever line with the future proof signalling system. Alstom

sees huge potential for the technology in the Indian market. We are looking forward to deploying our advanced technologies in a bid to revamp the mainline railway landscape," said Ling Fang, Senior Vice President of Alstom Asia Pacific.

A key feature of the RRTS

is interoperability of all its priority corridors which facilitates seamless commuter movement across the corridors, without the hassle of changing the trains for passengers. ETCS signalling system will not only facilitate interoperability but will also ensure train movement at quick frequencies, thus reducing the waiting time for passengers. The contract marks a world premiere for the combination of the latest ETCS standard supported by the latest digital Interlocking and Automatic Train Operation (ATO) over Long Term Evolution (LTE) radio. The integrated platform screen door solution will also provide utmost safety to passengers.



BDL and Thales sign Teaming Agreement to manufacture STARStreak Air Defence System in India

LEADING defence company Thales on Thursday said it and state-run Bharat Dynamics NSE 3.77 % Limited (BDL) have signed an agreement to work in partnership on an air defence system with the support of the Indian and British governments.

Through the agreement, BDL will become a part of the STARStreak missile system's global supply chain, providing the opportunity for export of Indian manufactured components to this system's existing and future customers, including the UK Armed Forces, Thales said in a statement. The "teaming agreement" was signed by Thales and BDL in the presence of UK and Indian

government representatives in a virtual ceremony on January 13.

The statement quoted British Defence Minister Jeremy Quin saying that co-operation between the UK and India continues to develop at pace with much closer ties within our defence equipment programmes and systems.

"Today's signing marks the start of the next-generation of missile systems for the Indian Army and reinforces our commitment to work with international partners," he added.

The fastest missile in its category,

STARStreak is unique due to its three laser-guided darts, which cannot be jammed by any known countermeasure.

The agreement will also provide the opportunity for BDL to offer a 'Make in India' STARStreak solution to the Indian government, "with a capability that will match the immediate air defence needs of the Indian Army and Air force, and with 60 percent of the system manufactured in India", the statement noted. The STARStreak missile system is already in service in the British Army and has the capability to defeat any air target - even armoured helicopters - as the last line of defence, it said.

Toyota Kirloskar Motor signs MoU with Government of India for skilling of youth

TOYOTA Kirloskar Motor (TKM) recently announced the signing of a Memorandum of Understanding (MoU) with the Directorate General of Training (DGT), Ministry of Skill Development and Entrepreneurship, to develop skills among youth under the Flexi-MoU Scheme of the Government of India.

‘Toyota Koushalya’

The programme, titled ‘Toyota Koushalya’, will take forward the MoU by focusing on developing students at the Toyota Technical Training Institute (TTTI). The institute imparts world-class skills’ training to youth belonging to the economically weaker sections of society in the rural areas of Karnataka. Under the Flexi-MoU Scheme, TKM is identified as an Industrial Training Provider (ITP) to develop skilled human resources for manufacturing companies and first-time entrepreneurs.

Ms. Neelam Shami Rao, Director, Directorate General of Training, Government of India, says, “The Flexi-MoU Scheme is designed to cater to the needs of both the industry and the trainees. The scheme allows industries to train candidates as per their skill set requirements and provides trainees with an industry environment aligned with the market demand and latest technology. We are glad to partner with Toyota to develop youth as skilled and industry-ready employable technicians.”

Learn and earn

‘Toyota Koushalya’ provides an opportunity for youth to acquire skills relevant to the manufacturing industry and improve their employment potential through a ‘learn and earn’ approach consisting of a mix of theoretical and On-the-Job Training (OJT). These youth will be trained by supervisors, who are Master Trainers in

How Toyota Kirloskar Motor develops people?

Toyota Kirloskar Motor (TKM) has invested heavily in Toyota Technical Training Institute (TTTI) and Gurukul Skill Development Centre. Training centres at Toyota have developed globally certified master trainers, who hone the skills of employees as they move up their career ladder.

“We believe that the success of Toyota comes from our people. We are a people-oriented company. In this perspective, we take care of the holistic well-being of every member by developing their skills, knowledge and attitude from a mid-to-long-term perspective,” says Shankara.

He adds, “We impart experiential learning workshops wherein all employees can set their career and life goals even beyond their retirement. We take the ambition of every employee seriously. We develop the employees in such a way that they can achieve their career aspirations and achieve self-realisation. For example, we also send them for training in Japan or Thailand, if they aspire to become world-class technicians. We develop them in a way that they add value to their peers, family, company and society. It is this people-centric approach that has helped us build quality cars.”

the world-renowned Toyota Production System (TPS). Upon the completion of training, the trainees will need to answer an exam jointly conducted by



DGT and TKM as per the DGT guidelines and Craftsman Training Scheme (CTS) to get certified. The programme aims at skilling youth, who have passed their 10th standard and are facing difficulty in affording higher education.

Admissions to the programme have already commenced. The two-year training programme will be imparted in four trades, namely, automobile welding, automobile assembly, automobile painting and mechatronics.

‘Toyota Way’ philosophy: Beacon for people development

Apart from the ‘Toyota Koushalya’ programme, Toyota has been imparting ‘Lifelong Learning’ to its employees to help them achieve their fullest potential. At Toyota, people are the most important asset. Hence, developing people forms the fulcrum of the company’s philosophy. ‘Toyota Way’ focuses on becoming better by sharpening the skills of every person and continues the quest for improvement by encouraging both incremental and breakthrough innovative thinking.

“To manufacture quality products, any company can establish good processes, best-in-class equipment and infrastructure. But what makes Toyota unique is its philosophy of developing quality people. Toyota focuses on developing its people, who, in turn, establish good processes, offer ever-better products and services, thereby achieving customer delight,” says G Shankara, Vice President, HR and Services, TKM.

Industry Update

voestalpine High Performance Metals India installs India's largest Schmetz Vacuum Furnace

VOESTALPINE HPM India has successfully installed India's largest Schmetz vacuum furnace (360deg Nozzle Type Quench / German Technology) at their Chennai facility.

"Such an investment in ultra-modern technology in spite of a slowdown in business due to the pandemic situation clearly announces our vision of being the number one solution provider in the tooling segment; vacuum heat treatment being



an important part of it. With this advanced German technology vacuum

furnace, we would be able to meet our esteemed customers' quality and lead time requirements in South India," says Mr. Alok Jhamb, the company's Managing Director.

The furnace specifications are:
Make: Schmetz Germany
Size: 900 x 900 x 1200 mm
Batch Qty: 2 tons
Quenching: 3600 Nozzle Type
Maximum Quenching pressure capacity: 13 bar

New developments in hot runner technology for high-quality film injection molding

NEW and advanced developments around HRSflow's hot runner systems are specially designed to increase product quality in cascade injection molding. This includes the only recently launched HyFlow technology developed for applications with hydraulically actuated cylinders, in which the opening and closing speeds and the positioning of each individual pin can be precisely adjusted via the oil flow rate. Now also available in the market is the Hyper-GF series for processing abrasive thermoplastics. On the application side, HRSflow uses a current pilot project with a customer, to show how FLEXflow Evo, the recently presented advancement of the FLEXflow technology for servo-electrically driven valve gate systems, can be used to achieve outstanding results when back-molding sensitive films.

HyFlow uses a controller with a user-friendly interface

to set the lock position of each individual pin. The opening and closing speed for each nozzle can be set by a manual adjustment mechanism. This allows for controlling the melt flow rate in a way that cascade injection molding results in a uniform mold filling process

without sudden pressure drops and the associated surface defects. The positioning of the pin also allows for optimal balancing of the pressure distribution in the cavity during the entire injection process.

The new Hyper-GF series, available for HRSflow's Ga and Aa nozzles, is designed to improve the long term

performance of the hot runner system when processing highly abrasive materials such as glass fiber reinforced materials. It supports extended service lives even in injection molding processes with very high productivity. Contributing factors include

the use of special steels and an optimized flow channel design.

The possibilities offered by the FLEXflow Evo hot runner system for film insert molding (FIM) are demonstrated in a joint project with the film manufacturer Kurz, Fürth/Germany. This pioneering technology enables, for example, the integration of

capacitive films for sensors or touch control panels in combination with backlit decorative films. This provides a previously unknown design and functional flexibility, especially for automotive interior applications. In cooperation with Kurz, a film featuring functional capacitive elements for touch operation and decorative elements was back-injected with a crystal clear polycarbonate (PC) in a single step, enabling backlighting in the area of the operating elements. The servo driven valve gate technology produced results of a quality level that would not be achievable with conventional concepts. In particular, after back-injection with the FLEXflow Evo technology, the thin functional and decorative elements do not show internal stress as in conventional cascade injection molding, thanks to the evenly and low-pressure spreading melt flow front, whilst any damage to the film was reliably avoided.



Dedicated PolyWorks interface for Hexagon structured light scanners

HEXAGON'S Manufacturing Intelligence division recently announced the launch of a new software plugin that will allow full operation of Hexagon structured light scanning systems from within the powerful third-party inspection software platform PolyWorks, developed by InnovMetric Software Inc. This represents the first implementation of a new SDK released by Hexagon that allows a third-party software environment to take full hardware control of any of the company's range of structured light scanners.

The SLS-PW Plugin and any subsequently developed plugins will let users streamline their scanning and inspection workflow into a single software



environment, with clear productivity benefits. The increased efficiency of a single platform workflow will reduce inspection times by eliminating the need to export and import measurement data between separate programs, as well as by minimising training needs.

"The need to use proprietary standalone software solutions to operate structured light

scanning systems is an issue faced by users across the industry, whether they are using scanners from Hexagon or other manufacturers," says Dirk Rieke-Zapp, Commercial Product Manager Structured Light Scanners at Hexagon. "With the development of this new SDK for our range of structured light scanners, we're making it possible for users to deeply integrate this type of high-detail

scanning within their existing metrology workflows by completely removing the need to insert proprietary software at the measurement step of the inspection process."

When added to the existing versatility of the PolyWorks platform, the SLS-PW Plugin delivers a flexible solution for companies that run a range of metrology hardware and wish to simplify their workflows. As well as avoiding the need to transfer structured light scanning data between programs, the plugin means that a single program can now be used to perform measurement and inspection tasks with devices as varied as structured light scanners, trackers, portable measuring arms and CMMs.

Mazak unveils new Ez Machine Series and SmoothEz Control

WITH both affordability and high performance for job shops in mind, Mazak has officially launched the new Ez machine series, the new MAZATROL SmoothEz control and the accompanying MazakUSA.com/Ez website. The new machine family and control were developed specifically to help remove the cost barriers to acquiring the latest manufacturing technology without sacrificing machine capability or production performance, while the new Ez website further streamlines the customer experience and offers visitors focused access to Mazak's newest product line.



Machine configurations within the new series include both horizontal turning and vertical machining center models, all of which feature the MAZATROL SmoothEz control and are designed

and built in Kentucky. Among the turning center configurations are the QTEz 8, QT-Ez 10 and QT-Ez 12 models each offered in a 2-axis, M, MY and MSY versions.

M versions include milling capability, MY machines feature milling and Y-axis offcenterline capability and MSY machines are a combination of both milling and Y axis capability paired with second turning spindles for complete DONE IN ONE® part processing. For further increased productivity and unmanned operations, the machines seamlessly integrate with bar feeders and robots.

Each QT-Ez model number indicates the standard chuck size, but Mazak also offers a smaller size optional chuck for each machine to provide greater maximum rpm capability. These include a 6" chuck option for the QT-Ez 8, an 8" for the QT-Ez 10 and 10" for the QT-Ez 12. Each model is available in a 20" bed length and an optional 40" bed length for the QT-Ez 12 model. Available machine turrets include 2-axis drum style, with a bolt-on or BMT55 turret for rotary tool applications, and tailstocks are offered with either manual positioning with hydraulic quill or servo positioning capability.



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3D printing trends for 2021:

A year of radical renewal

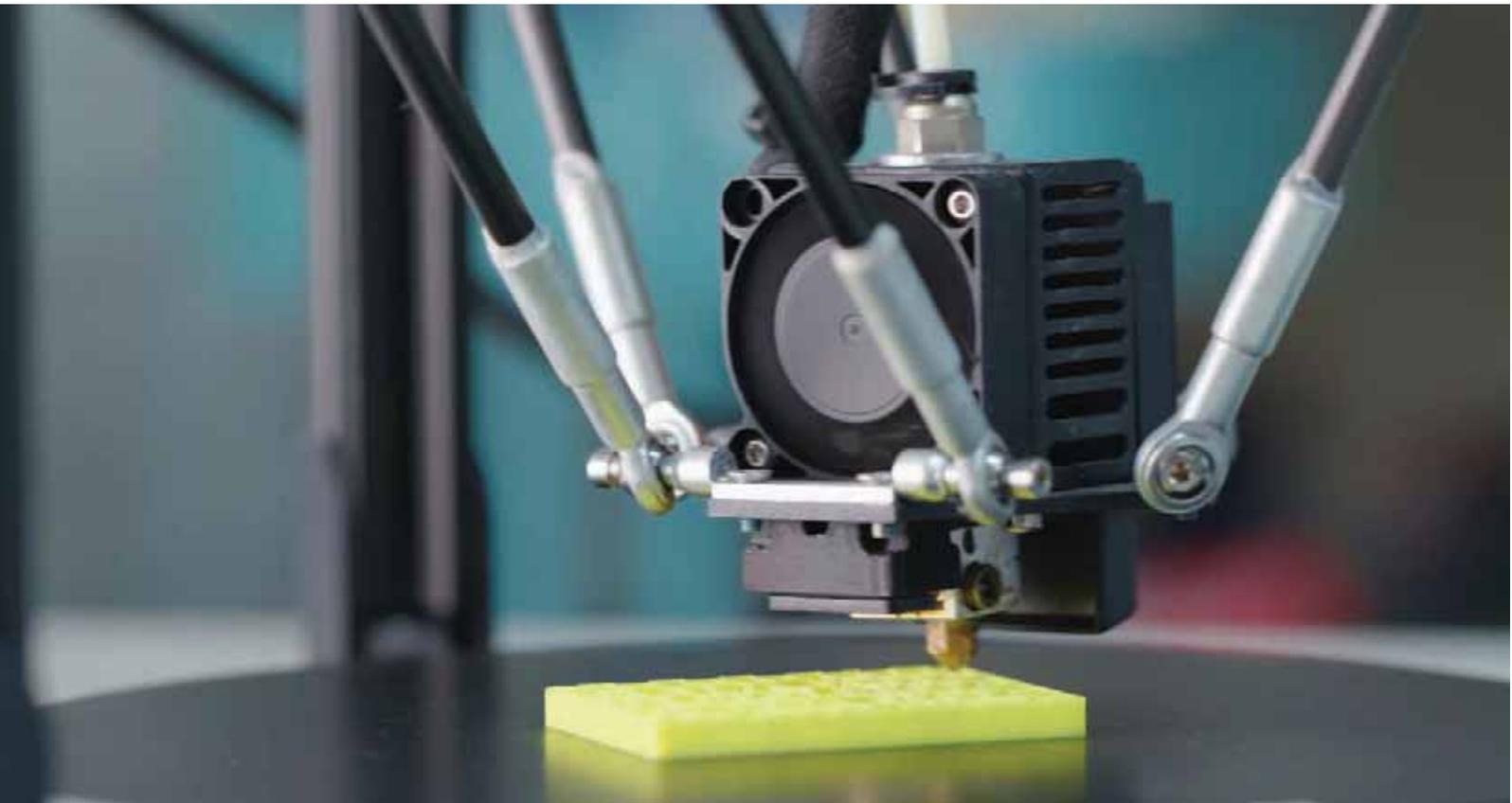


Image Courtesy: elements.envato.com

As we mark our entry into the fourth decade of 3D printing in 2021, we also enter a decade with the potential for radical renewal. The COVID-19 crisis has had an enormous effect on every industry and continues to propel us into a space where we need to think differently. We need to think about where we need to push the boundaries of innovation and creativity. With this being said, the legacy of 3D printing starts in 2021 with three key trends: going back to the drawing board to rethink manufacturing; enabling the personalization of not only products, but also 3D printers themselves; and creating new solutions, fast, explain **Kristof Sehmke**, Communication Manager, Materialise and **Bram Smits**, Public Affairs, PR & Investor Relations, Materialise.

In Focus

This is not the first time the world has seen this opportunity for change. Apple introduced the iPod right when the dotcom bubble burst. Airbnb came to life during the financial crisis of 2008, and Alibaba launched its online marketplace at the height of the SARS epidemic in 2003.

“In this time of great flux, we must dare to take bold steps and discard what is not future-proof. We need to harness the core values of technologies, like additive manufacturing (AM), to move towards new ways of thinking and doing that have a meaningful impact,” says Fried Van Craen, CEO and Founder, Materialise.

We believe that additive manufacturing is meaningful when it empowers people to make better choices. The COVID-19 crisis has shown that AM can step up and provide meaningful solutions to emerging challenges. But, so far, these solutions have not truly played to the strengths of the technology. The value of AM lies in being able to create things that no other manufacturing method can.

AM's ability to customize, to print with fewer components and with less waste, means that it can ensure solutions that are socially inclusive and that operate with sustainability at their core. The key to a strong legacy for our industry is to continue finding meaningful applications that take advantage of these qualities and to bring a greater awareness to all that AM has to offer.

In the short-term, we are still locked into the COVID crisis, but the trends we foresee in the coming year look to successfully take us to the other side of this, stronger and more flexible, and ready for possibilities where 3D-printed products or components bring more value.

Let's not forget that this value is often created at the beginning of the chain, in the digital capturing of the essential customer data and requirements. At the end of the chain, the 3D printing packages this value into a product. Let's rethink value chains as Apple, Airbnb or Alibaba did.

As Fried put it, “As companies realize that they need to do things differently, AM empowers them to make a difference. And, in this way, the legacy of AM will not be what it allows us to make, but what it makes possible.”

“As companies realize that they need to do things differently, AM empowers them to make a difference. And, in this way, the legacy of AM will not be what it allows us to make, but what it makes possible.”

Fried Van Craen,
CEO and Founder, Materialise

1. Back to the drawing board

Everywhere around us, the COVID-19 crisis is turbo-boosting digitization. At the same time, the climate crisis continues to press upon us a sense of urgency to reconsider the status quo of our economic and industrial systems. The continued emergence of such extreme crises means that we can no longer continue the way things have been going. We need to dramatically rethink the way industries operate and how we develop solutions to new challenges.

The pressures of these types of existential threats demand more than just incremental steps forward. Incremental processes of innovation also leave little room for revolutionary technologies, like AM, to make an impact. But by allowing ourselves to completely rethink how we approach solutions, we open the door to radical new designs and innovative processes, something AM is naturally designed to do.

Take Airbus, for example. They recently revealed plans to accelerate the development of hydrogen-



Our medical engineers worked together with doctors to create the Materialise Passive NIP by designing a 3D-printed connector that holds together standard medical equipment.

powered commercial jets and skip over the development of hybrid engines entirely. This bold jump means that by 2035, the world could see the first zero-emission, climate-neutral aircraft. Technologies, like AM, can play a big part in realizing these types of innovative concepts.

More than anything that came before, global crises are incentivizing industries to fast-track their technological innovation, and this climate of radical reinvention represents an opportunity for AM to really become instrumental in the areas of design and manufacturing.

According to Bart Van der Schueren, CTO, Materialise, "AM frees designers from the constraints and limitations of traditional manufacturing technologies, helping them to focus on the solution instead of the product. As a result, AM allows us to create performance, weight-saving, time and cost advantages. Until now, AM has really only been able to demonstrate its potential. Now, it gets the chance to actually do it."

Starting fresh doesn't mean starting from nothing. By going back to the drawing board, we create freedom to give new technologies a chance. To unleash new perspectives and possibilities. Then, the only limit to the change we can create, is our imagination.



"The importance of empowering engineers and operators to also personalize and optimize the printing process is often overlooked," says Materialise's Executive Chairman, Peter Leys.

2. Personalizing the process

"It is generally known and accepted that a unique and distinguishing characteristic of 3D printing is that it significantly reduces the cost of customization of products. What is less known and often overlooked is the importance of empowering engineers and operators to also personalize and optimize the printing process as such," says Peter Leys, Executive Chairman, Materialise.

Why is customization of the process so important? Is the ideal AM world not a world where the operator simply pushes the start button and then prints whatever product that needs to be printed based on a pre-installed set of parameters that comes with the machine?

Well, the illusion of a world where one standard printing process fits all applications is wrong, short-sighted and, last but not least, dangerously boring.

First, it is wrong because 3D printing is such a flexible technology that its potential would, by definition, be under-used if only a few standard processes would be deployed regardless of the product that is being manufactured. If you want to use additive manufacturing to its fullest extent, then you have to tweak each and every parameter of the machine and the process to the specific product that you intend to print. In a prototyping context, this possibility and need was less crucial as the efforts to adapt the process to a particular product could only be depreciated over, at best, a very small batch of products. As AM is more and more used for mass production, the need to come up with the most optimal process for a particular product obviously becomes more and more relevant.

Second, the one-process-fits-all-products philosophy is short-sighted, because it completely overlooks the fact that personalization and localization go hand-in-hand. Or to put it differently: 3D printers can only be deployed in a distributed manufacturing setting, if the local operators have the freedom and ability to adjust the process to their local reality. Typically, the primary parameters would be set centrally and then, more specific secondary parameters would be adjusted by the engineers in their respective locations to meet their local needs.

Finally, a world where an operator cannot contribute the added value of their knowledge and expertise to the printing process would be a dull push-the-start-button world. The world of standard

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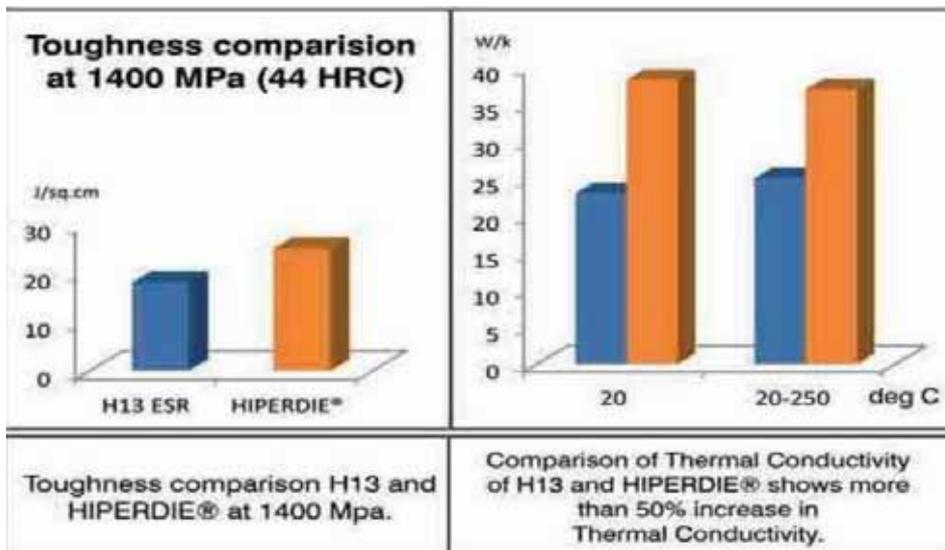
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In Focus

processes would not only be boring; it would also be dangerous, because it would be a world with less competition as 3D printing facilities would not be able to distinguish themselves from other operators by adding their personal expertise and experience to the process. And lack of competition means, at the end of the day, lack of innovation.

So, the more operators are empowered to fine-tune, optimize and personalize the 3D printing process, the more the value of 3D printing will be unleashed. Yes, 3D printing should become faster, cheaper and more reliable. But to get there, 3D printing should also, and foremost, become more and more personal.

3. No time to waste

Brigitte de Vet, Vice President for Medical, Materialise, says, "COVID-19 has launched the world into a state of constant urgency. Healthcare professionals as well as regular consumers have been confronted with shortages and quality issues for both essential medical products and everyday consumer goods, a consequence of a global market model that hinges on centralized, mass-manufacturing. Things we used to take for granted are no longer necessarily available or even appropriate, and new solutions need to be developed fast."

Digitization is accelerating in every area as companies are investing in technologies that can help them adapt to this new normal of filling supply gaps, remote work and local solutions. But as part of this adoption, they need to make choices, and they will choose based on risk, cost and quick return on investment (ROI).

AM is one of those digital technologies that can deliver short-term ROI, low-cost manufacturing, and low risk, but the entry point has typically come with



Consultancy services can help guide businesses on their paths to AM success.

a lengthy learning curve. Some companies started the AM adoption process ten years ago and are well-positioned to make greater shifts to the technology, but companies new to AM no longer have the luxury of time.

Brigitte continues, "As a result, we see a growing trend for services that guide companies along this path. We see this, for example, in the medical world, where the value of personalized medicine is well known, but there is a low tolerance for uncertainty. New solutions need to offer strong evidence that they are safe and effective and can deliver a high-quality standard of care. Consultancy services can help minimize the risk of such big investments and accelerate the timelines by sharing their expert knowledge of what the technology can and can't do, and the right manufacturing method needed for each unique case." 🇮🇳

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‘I’m quite optimistic about the coming years’

“I see many new developments happening in India. But, at the same time, on a broader base, a lot of groundwork needs to be done. For instance, there’s a need for improvement in a lot of areas such as trust among customers and suppliers, and financial planning, which is a major pain area for all toolmakers, among others,” says **Marc Weinmann, Chairman, VEM Tooling.**

Q Please give us an overview of the challenges currently faced by toolmakers during the COVID-19 pandemic. Also, could you please explain their significance in hampering growth and business prospects?

The COVID-19 pandemic has adversely impacted the global supply chain and affected the functioning of businesses across various sectors. Toolmakers are finding it challenging to deal with this crisis. For instance, owing to low order volumes and holding off on new development projects from OEMs and Tier-1 companies, toolmakers are currently grappling with excess capacity and financial management.

Undoubtedly, customers are willing to develop tools in India instead of approaching overseas suppliers that are offering better pricing. However, the local buyers are quoting irrational prices and payment terms, which does not bode well for Indian toolmakers.

In simpler words, everyone in India is talking of developing the local mould making market, but no one seems to be willing to really support this cause. The Indian buyers’ approach seems short-sighted and disinterested in forging long-term partnerships.

Q As per estimates, ~70% of Indian tooling demand is being met domestically and ~30% via imports. What could Indian toolmakers do to reduce imports?

Indian toolmakers lose out to their global competitors because, in most cases, they are not equipped to meet the tooling demands. They need to join hands and focus on improving their processes to match the standards of other

dominating tooling industries across the world. The industry also needs to explore alternative ways to enhance their productivity. For instance, they should consider investing in design automation, high-end machining processes, better manufacturing process and measurement capabilities.

Q With the automotive industry going through an uncertain time, what other emerging sectors could toolmakers explore?

Rather than focusing only on automotive, toolmakers need to believe that they have a world of opportunities waiting to be tapped. For instance, when the pandemic struck, some toolmakers decided it was best to diversify. They started with the manufacturing and distribution of disposable face masks, and other healthcare products, to meet the growing demand for these. So, the medical industry is definitely a good option here. Pharma and packing industries could also be explored. The Indian government has been promoting indigenous production and has allocated an impressively high amount for the defence sector. I think toolmakers could consider exploring the defence sector as well. However, TAGMA needs to assist toolmakers here. The association needs to create a forum for toolmakers to help them understand the needs of various industries and access the opportunities that these industries have to offer.

Q Industry 4.0 and hybrid manufacturing have been around for a long time now. Do you think companies will opt for automation post COVID-19?

The pandemic has made the world realise that if we want to survive, we need to adapt to the

Opinions & More

changes that come our way. So, if toolmakers are looking to survive and thrive in the long run, they will have to adopt automation. Most tool rooms are sceptical about adopting automation because of the costs involved. However, they need to find ways around that. For instance, smaller tool rooms in India could actually consider merging. They could build on each other's strengths and become far more competitive.

Q What short and long-term opportunities do you see amid the COVID-19 crisis for Indian toolmakers?

With global trade being affected, I see local customers exploring local suppliers to get the job done. This could be looked at as a short-term opportunity. In the long-term, I think the disruption in the global supply chain has made industries across the world realise why they need to consider other manufacturing destinations. I think India is emerging as a preferred manufacturing hub. But here, I believe it's all up

to Indian manufacturers and their suppliers. They must find feasible ways to work together and make the best of this opportunity.

Q After a challenging 2020, what are your expectations of 2021? According to you, how will the industry shape up in the coming days?

I am quite optimistic about the coming year. I see many new developments happening in India. But, at the same time, on a broader base, a lot of groundwork needs to be done. For instance, there's a need for improvement in a lot of areas such as trust among customers and suppliers, and financial planning, which is a major pain area for all toolmakers, among others.

Besides this, I'm hoping to see a change in the way banks and other financial institutions amend their approach towards the industry. I hope, like their international counterparts, they choose to support the industry instead of only thinking about business risks. 🌈

Indian Tool Room Industry Analysis - January 2020

TAGMA and Nomura Research Institute Consulting & Solutions conducted a Market Study on Indian Tool Room Industry covering all user segments and understand current market and its evolution over the next 5 years

- Global Tooling Industry Snapshot
- Indian Tool Room Survey Approach and Methodology
- Survey Results Major Highlights
 - ❑ Total Tooling Demand in India and Share of Different Sources
 - ❑ Demand and Supply Split by Tool Type and End Users
 - ❑ Sectoral Insights
- Tooling Market Trends Demand Side
- Tooling Market Trends Supply Side
- End User Expectations and Comparison with Global Counterparts
- Major Challenges facing Indian Tool Rooms
- Case Studies of Asian Tooling Hubs
 - ❑ Korean Tooling Industry
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- Government Initiatives for Tooling Industry
- Future Expectations on Tooling Demand
- Key Imperatives for Ecosystem Stakeholders

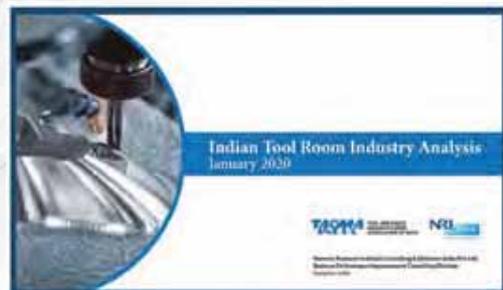
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Continental, HERE and Leia Inc jointly create Natural 3D Automotive Navigation

- ➔ 3D navigation shown on the automotive Lightfield display creates intuitive user experience and can contribute to driving safety
- ➔ Lightfield technology enables a natural 3D effect that is visible without glasses or eye tracking sensor for driver and passengers alike
- ➔ Premium 3D content for 75 global city centers in HERE's Premier 3D Cities



Natural 3D navigation allows for a more intuitive user experience.

Continental, HERE and Leia Inc are partnering to bring three-dimensional navigation into display solutions for vehicle cockpits. Continental, HERE and Leia Inc are partnering to bring three-dimensional navigation into display solutions for vehicle cockpits. By this, the companies are jointly providing an important component for a safe and intuitive in-vehicle user experience with a wow factor. HERE's 3D depiction

of buildings and topography is displayed with Leia's Lightfield technology. The joint solution allows for the visualization of 3D maps without the need for adaptive eyewear or an eye-tracking sensor. The Lightfield technology even makes the 3D effect visible from various angles. Thus, driver and passengers alike can see the 3D graphics.

"3D display technology not only brings a new wow

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factor into the vehicle cockpit but with the right content, it also creates a more intuitive interaction between driver and vehicle and thus enhances driving safety," says Ulrich Lüders, head of strategy and portfolio at Continental's business unit Human Machine Interface. "As we see this especially for 3D navigation, I am very happy that we can contribute to a better UX and safer driving environment by bringing together HERE's premium map content and Leia's Lightfield software with our expertise in automotive human-machine interface solutions."

3D Navigation designed to help support safer driving

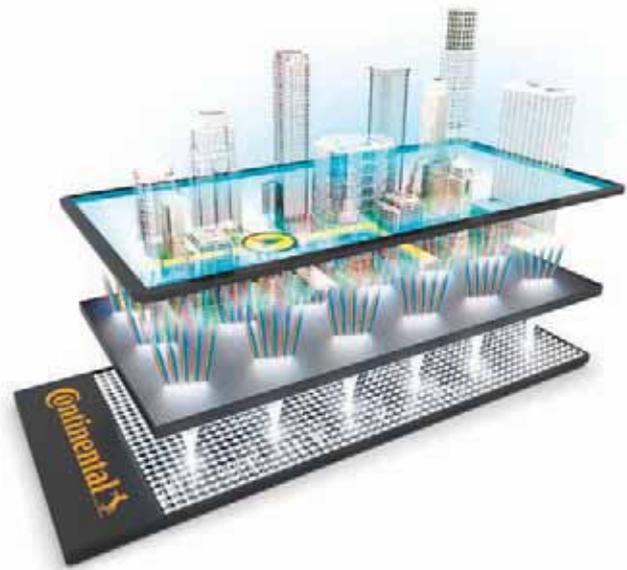
Various studies on traffic safety show that driver distraction is among the main reasons for traffic crashes worldwide. In the U.S., distracted driving caused more than 2,800 fatalities in 2018, according to the National Highway Traffic Safety Association. For Continental, therefore, it is critical to work toward intuitive UX solutions that provide drivers with the content and functions they are looking for and therefore support greater driving safety while minimizing distraction in the vehicle cockpit.

"Especially in complex driving scenarios such as city traffic, it can be a real challenge for many drivers to follow navigation instructions and at the same time maneuver safely," says Ulrich Lüders. Thanks to the correct spatial reproduction of the real world offered by the 3D solution from Continental, HERE and Leia Inc, drivers are able to grasp the necessary information quicker, better orient themselves and stay more attentive to the driving task.

Highly accurate 3D content

The content enabling this solution comes from HERE Premier 3D Cities, consisting of HERE's premium map content and highly detailed 3D representations of 75 global city centers that are fully interactive and customizable. Each building is indexed and accurate in terms of physical location, volume, elevation and façade colour. 3D terrain models also provide elevations for representative depictions of a city's layout. Detailed 3D landmarks are included within the coverage of each city and are integrated into the 3D terrain, as well as the various styles of the surrounding buildings.

Based on Continental's Natural 3D Display, Leia's Lightfield technology and HERE's 3D map content, the companies have created a joint demonstrator and plan to work with vehicle manufacturers to bring this solution into the next generation of vehicles.



■ The 3D effect becomes visible without special glasses or an eye-tracking sensor thanks to the Lightfield technology.

About Continental

Continental develops pioneering technologies and services for sustainable and connected mobility of people and their goods. Founded in 1871, the technology company offers safe, efficient, intelligent, and affordable solutions for vehicles, machines, traffic and transportation. In 2019, Continental generated sales of €44.5 billion and currently employs more than 233,000 people in 59 countries and markets. In 2021, the company celebrates its 150th anniversary.

About HERE

A location data and technology platform, moves people, businesses and cities forward by harnessing the power of location. By leveraging our open platform, we empower our customers to achieve better outcomes - from helping a city manage its infrastructure or a business optimize its assets to guiding drivers to their destination safely.

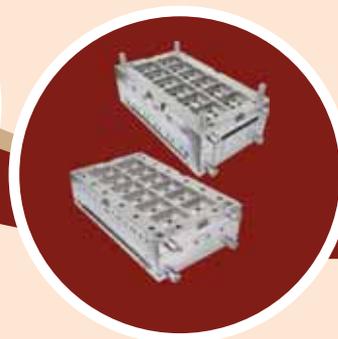
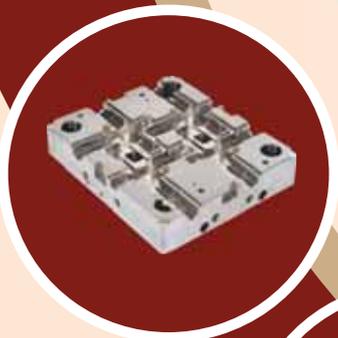
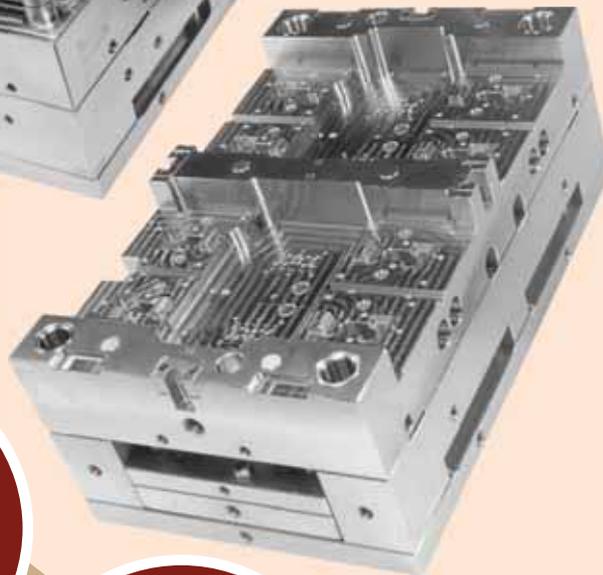
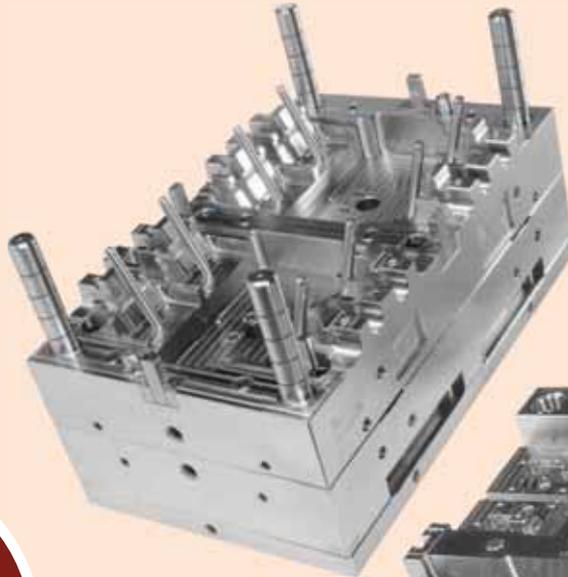
About Leia Inc

Leia Inc, an experience platform based in Silicon Valley, creates 3D Lightfield products and software that challenge the limits of what can be created and shown on a display. Leading brands in the automotive, educational, hospitality, gaming, and medical fields are embracing 3D Lightfield as the de facto medium to break through and connect with their consumers and define their marketplaces. Leia combines nanotechnology and AI to build the future of experience. 🌈

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Legacy components for the Indian space industry in metal additive manufacturing



Additive manufacturing or 3D printing is perceived as an innovative processing method to replace traditionally produced parts, including castings and multi-component parts. 3D printing helps to create parts in a brief timeframe, with least material wastage, and permits a more elevated level of customisation.

In this case, two brackets were made using AISI-316L grade for aviation applications, using laser powder bed fusion technology. A thorough analysis was performed on the powder to check for structural integrity to qualify the component for functional testing. A large amount of material was removed, extreme machining time and related issues, for example, residual stress and warpage conceived, which would happen in conventional methods, have been eradicated by taking up additive manufacturing.

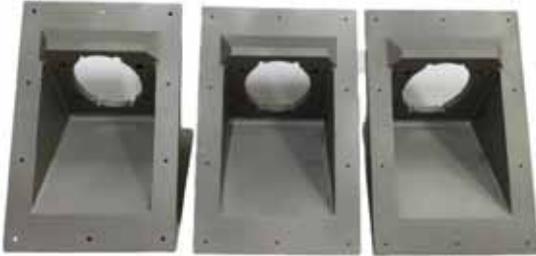
The mechanical properties meet the prerequisites of the ASTM F 3184-16 norm, resulting in similar or better part build. Despite the successful build, a minor contortion was noticed in the thin wall region, which was resolved by adding extra stock in the thin section and later, post processed by machining. The brackets were found to be free from any defects $> 100 \mu\text{m}$, as non-destructive testing was performed by the large macro CT. Furthermore, it has been identified that there is ample scope for topology optimisation, which can lead to weight saving, thereby increasing efficiency.

Case Study

The challenge

Conventional production of the AISI-316L brackets relies on casting and shaping of bulk feed stock materials, followed by subsequent machining to final shapes and dimensions. These ancient manufacturing processes forever inevitably end in an outsized quantity of fabric waste, high machine hours, high producing value and long lead times. The material needs for producing Type-I bracket of weight 3.5 kg was calculable to be a forged/rolled block of 100 kg and thickness 125 mm, wherein 96.5% of fabric is wasted throughout machining. The buy-to-fly ratio is ~ 28, just in case of a conventionally factory-made one. Additive manufacturing will bring down the get-to-fly ratio to ~ 1, leading to significant value and time savings.

The solution



A reduction of lead time and cost will be achieved for parts, thanks to a number of characteristics of additive manufacturing; shorter lead time from design to production, adaptability to design changes, complicated geometries at no additional price and significantly less post-processing, as compared with the conventional production routes. For this case, we found powder bed fusion to be the most suitable and optimum option to ensure part-built quality and integrity.

Process and specification

Stress-relieving of 3D-printed brackets was performed by soaking at 600 °C for 2 hrs as per AMS 2759-4C. The temperature of 600 °C is adequate, as 3D printing doesn't generate any major residual stresses, like thick section moulded product. Also, a high-temperature stress-relieving would cause distortion of thin sections. Brackets were subjected to sandblasting for improving the surface finish.

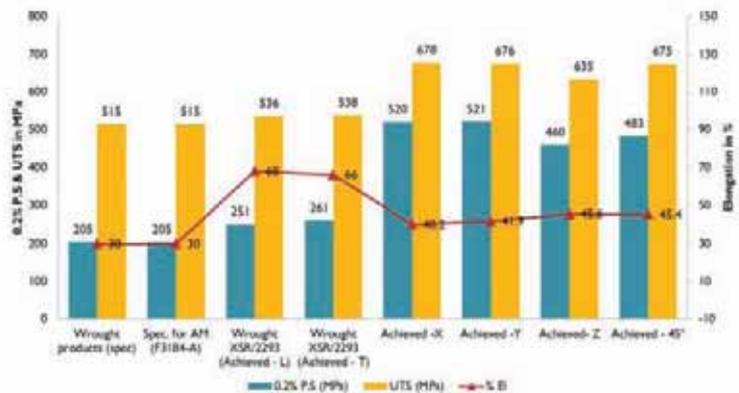
The following activities were performed in the entire additive manufacturing process:

- ▶▶ Mechanical property improved
- ▶▶ Microstructural evaluation at par
- ▶▶ Computed Metro Tomography (CT) inspection was successful



- ▶▶ Dimensions and geometrical inspection ensured accuracy of the final part
- ▶▶ Structural testing resulted in real-time results.

Testing and approvals



Computed metro tomography analysis confirms the soundness of brackets realised by 3D printing. The porosity level in this process is higher than that of wrought products and size approximated to be 100 µm. However, this will not affect the functionality of the products. It may also be noted that the porosity noticed in 3D-printed components is less than the sizes resolvable by conventional NDT techniques, such as ultrasonic testing and X-radiography.

Comparison

The tensile properties achieved by the LPBF 3D printing process for AISI-316L have been compared with wrought products of 100 mm section thickness,

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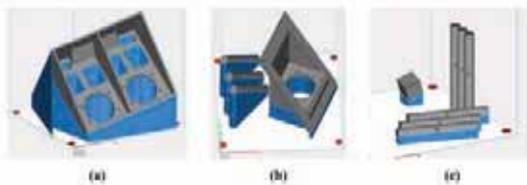
as shown above. It is observed that the yield strength achieved in the LPBF process is much higher than that achieved by wrought products, whereas percentage elongation is on the lower side. A similar trend of mechanical properties has been reported. In this case, it may be noted that AISI-316L stainless steel wrought products are processed by hot working, followed by solution annealing at temperature ~ 1040 °C. LPBF being a layer-by-layer processing, stress relieving at 600 °C is adequate for relieving the residual stresses generated by the processing.

Microstructure

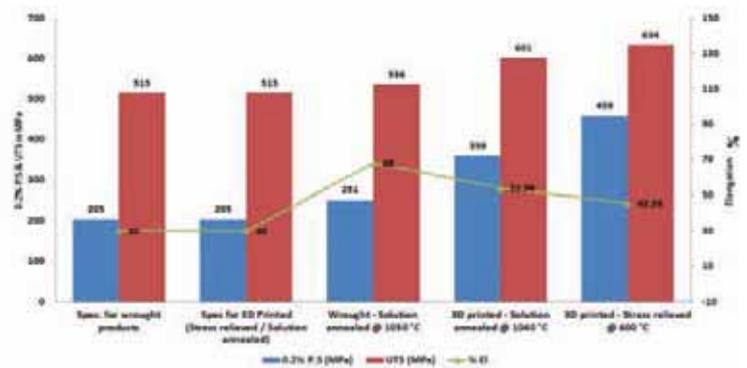


Subsequent to tensile testing, the cross section of tensile specimen ends was prepared as per conventional metallographic polishing and then, etched using 10% oxalic acid electrolytic reagent to reveal the microstructure as shown in Fig. 5a–d. The microstructures shown below revealed that the thickness of each melt pool layer was ~ 100 μm , indicating two to three layers of powder are fused during each laser beam scan.

Orientation



The 'standard specification for additive manufacturing stainless steel alloy with powder bed fusion as per ASTM F3184-16 in Class A condition (stress relieved condition)' was followed for 3D printing of these brackets. Test coupons in four directions (X, Y, Z and 45° to XY, YZ and ZX planes, i.e., body diagonal of an imaginary cube) were 3D printed along with the brackets for evaluating the tensile properties and impact strength. Build orientation followed



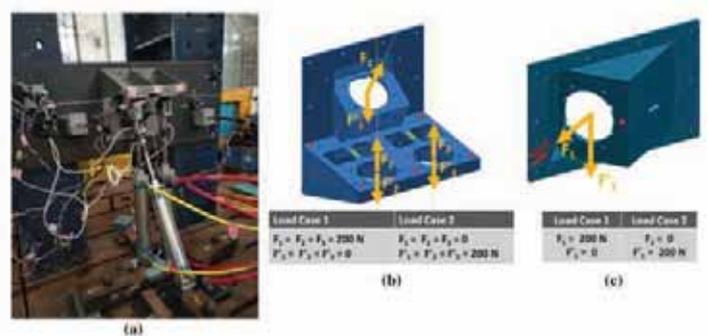
for 3D printing of brackets and test coupons for characterisation are as shown above.

Tensile

To compare the mechanical properties of LPBF 3D printed AISI-316L test in solution-annealed condition, the specimens were subjected to solution annealing and tensile properties were evaluated. The comparison is shown above. These results confirm that the LPBF process can give better mechanical properties (including the minimum guaranteed % elongation) as compared to the conventional wrought products even in solution-annealed condition.

Testing

Functional acceptance tests of LPBF 3D printed brackets were performed by structural testing (test setup shown below) by applying four times the actual thrust and inertial loads. The brackets successfully withstood the test, and strains observed were very benign/negligible of ± 9 $\mu\epsilon$ in tension and compression loading conditions. Thus, these brackets were qualified for the intended end use. Trial suiting of the brackets with the thrusters was carried out and found to meet the geometric requirements for the intended application.



Conclusion

Two kinds of brackets for aerospace applications

Case Study

were realised through the LPBF/ DMLS 3D printing, followed by stress-relieving heat treatment and subjected to careful characterisation. The subsequent are the conclusions from this study:

- ▶▶ The distortion noticed on the thin wall regions was avoided by adding additional stock at thin sections and removing by post-processing
- ▶▶ The mechanical properties in a stress-relieved condition meet the necessity as per ASTM F 3184-16 and also the achieved properties are akin to the moulded product. The LPBF method provides higher mechanical properties than the standard moulded product, even in the solution toughened condition.
- ▶▶ In the early stages, failure ascertained in 45° specimens was attributed to incomplete sintering at these layers. The basis cause was established as improper spreading of powder at one amongst the layers.
- ▶▶ Non-destructive testing was performed by macro CT and brackets were found to be free from defects. The porousness was approximated to be 100 µm, which cannot affect the functionality of the product. The porousness noticed in additively manufactured components is a smaller amount than the sizes resolvable by standard NDT techniques such as ultrasonic testing and X-radiography.

- ▶▶ If needed in the future, structural testing confirmed that enough margins are accessible within the designed brackets with the laser powder bed fusion additive manufacturing route and additional weight reduction are often achieved by topology optimisation through design for additive manufacturing. 🌈

About Objectify Technologies

Objectify Technologies is India's only in-house metal and polymer Additive Manufacturing Engineering Service Provider (AM-ESP) with expertise in aerospace, automotive, tooling, white goods and medical component building and consulting. Its objective is to ensure the widespread acceptance of additive manufacturing / 3D printing across all industries' supply chain and become a flag bearer to additive manufacturing information.

Collaboration with

The Vikram Sarabhai Space Centre (VSSC) is one of the main research and development establishments within ISRO. VSSC is an entirely indigenous facility working on the development of sounding rockets, the Rohini and Menaka launchers, and SLV, ASLV, PSLV, GSLV and GSLV Mk III families of launch vehicles.

The Indian Space Research Organization (ISRO) is the space agency of the Government of India and has its headquarters in Bangalore. Its vision is to "harness space technology for national development while pursuing space science research & planetary exploration".

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South Indian institution uses 3D printing to accelerate new product development for healthcare providers



The Coimbatore Institute of Technology (CIT) was founded in 1956 with the noble aim of disseminating knowledge in the fields of science, engineering, and technology, to the student community. CIT is now one of the most reputed and prestigious educational institutions in South India and is backed by world-class research and development initiatives. The philanthropic founders of CIT envisioned a unique professional learning order with special emphasis on industrial training. The institute was affiliated to Madras University till 1980 and got affiliated to Anna University in 2001. The institute is government aided and is also recognised by the All India Council for Technical Education (AICTE). CIT was granted autonomous

status in 1987 and is accredited by the National Board of Accreditation (NBA).

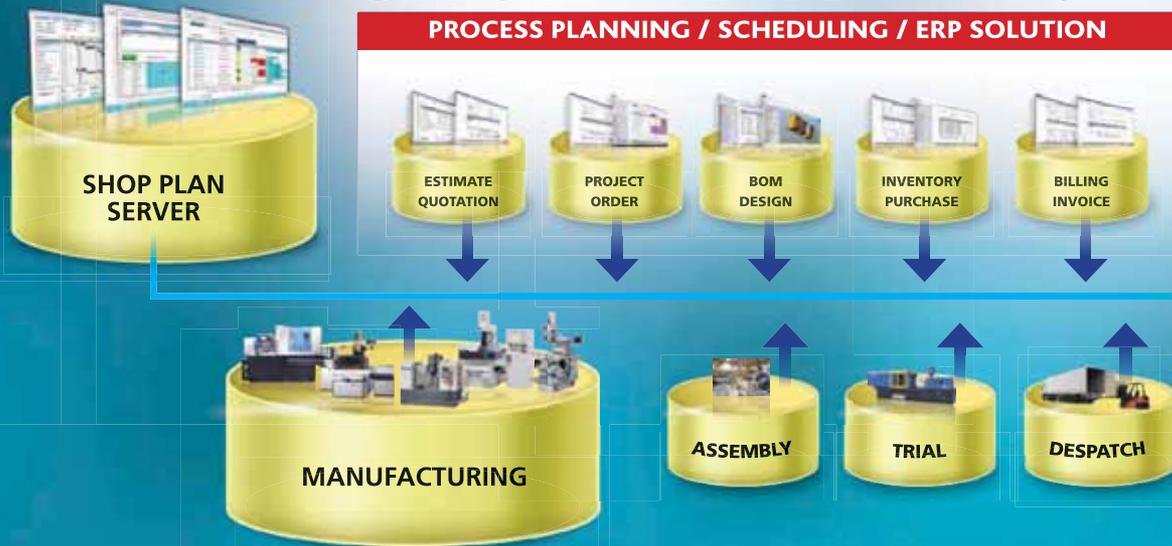
CIT boasts of a strong academia-industry interaction and a high quality of research and consultancy practice. The institute, managed by a pedigreed lineage for the past 50 years, enjoys national repute. The institute has the services of competent qualified faculty and visionary management to enhance the quality of education at all levels and maintain its position in the emerging global scenario.

Currently, CIT offers nine UG academic programmes and 12 PG academic programmes in addition to its M.S. and Ph.D. research programmes. The institute

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**Dr. Rajesh Ranganathan,
Professor, Coimbatore Institute of Technology**

also offers eight engineering diploma programmes in various disciplines through its Sandwich Polytechnic College since 1961.

Among various research groups at CIT, the Advanced Integrated Manufacturing and Management Research Group (AIMMRG) headed by Dr. Rajesh Ranganathan (Ph.D – Loughborough University, UK) functions specifically in the area of additive manufacturing. This research group obtained its funding from government organisations like DST, MHRD and SERB.

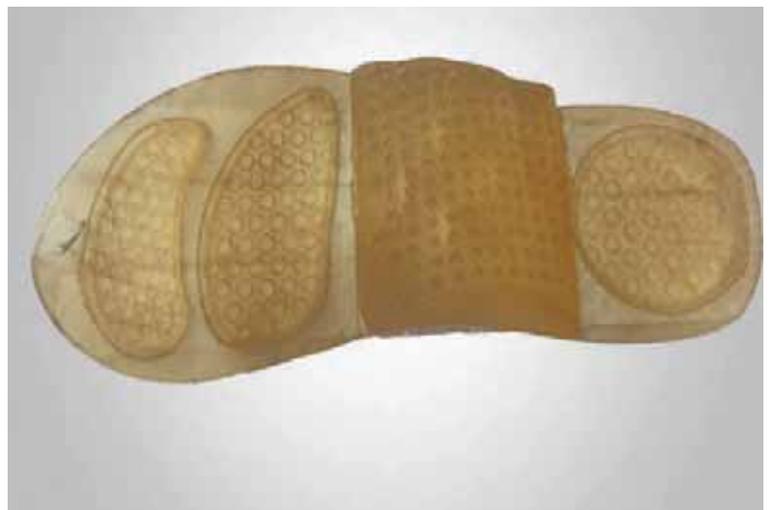
Employing technology to lend a helping hand

To keep pace with the changing needs of society, CIT always strives to evolve rapidly and stay relevant. The institute appreciates the swift speed of the changes and advancements in technology and their application to society at large. To stay true to its tenet of serving society through technical education and research, the institute introduced PG courses in Advanced Manufacturing Technology, concentrating on additive manufacturing. This was in addition to their many research initiatives for new product development in healthcare engineering.

AIMMRG holds many research projects, which work for the human cause. One such research initiative was focused on making a direct difference in the lives of people by developing new products for healthcare providers. The AIMMRG team found out that a majority of available products in the market were developed and produced keeping in mind requirements of the western world. This posed a

great challenge for Indian healthcare providers in terms of finding the right product with the right fit for domestic patients. To add to the problem, a majority of product requirements were those where the patients required highly customised products to suit their particular needs. To bridge this glaring gap and soothe the lives of domestic patients, the AIMMRG team decided to produce customised products. The team started using the Clear Acrylic manufacturing process to produce customised products, but soon found out that it was extremely time consuming and tedious. Also, it was difficult to get the complex geometry of products right with this process. The team realised that the products produced by using this method were ill-fitting and didn't serve the purpose for which the entire research initiative was started in the first place. This made the team search for other viable and better options vis-à-vis product manufacturing.

The AIMMRG team was very clear in their requirements and criteria for this initiative. The team wanted a technology that could help them produce excellent customised products that would fit impeccably as required by domestic healthcare providers and their patients. The team didn't want to compromise on this aspect and also wanted the products to be comfortable, durable, and very easy to use. Hence, in 2012, with the production of customised body-fitting products as their top



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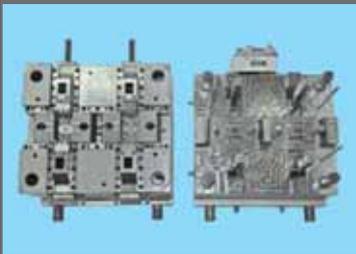


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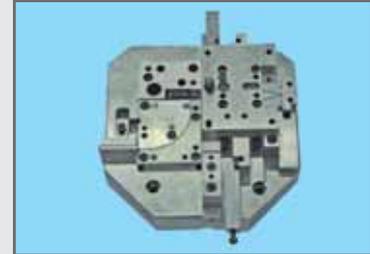
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requirement, the team ventured out in the world of 3D printing. After some research, the team finalised the FDM uPrint and Polyjet Connex 260 printers from the Stratasys portfolio because they promised to satisfy all their criteria.

Discovering the marvels of 3D printing

CIT's - AIMMRG decision of going for Stratasys 3D printers for their healthcare product development turned out to be a masterstroke. Students and faculty from the Mechanical Engineering Department, Centre for Excellence in Manufacturing Sciences, and other departments at CIT started using the printers for all their academic and product development needs. The UG and PG students of CIT's Advanced Manufacturing Technology course found the printers to be of immense value to supplement their learning of additive manufacturing. The healthcare product development team took specific

requirements from healthcare providers and seamlessly printed various products exactly as per specifications and customisation needs of patients. Healthcare providers found the printed products to be of great help because their patients experienced unmatched comfort of the printed products that were exact fits. Testing of products also played a crucial role in this success as the team performed nonpartisan functional tests for all products with respect to user comfort, durability, and ease of use.

The team printed various products as required by healthcare providers, such as custom diabetic foot wear, surgical tools for laparoscopic surgery, custom wound healing mechanism, and custom device for club foot. The team, healthcare providers, and patients are happy with the quality, finish, colour and product material, as it is opaque, ABS, and rubber-like as required.

Accelerating time-to-market through 3D printing

The AIMMRG team at CIT is particularly happy about the time savings that Stratasys printers realised for them. The team is ecstatic that with these 3D printers, they do not have to do much of pre and post processing of products and can easily print very complex customised products within 45 minutes and 12 hours. A product that used to consume 53 hours to produce by using the earlier method is now ready in just about 5.59 hours, saving nearly 89% of valuable time for the CIT team and helping them accelerate their time-to-market. Apart from this, 3D printing reduced the cost of errors for the team and enabled them to get better at complex designing and perfecting them.

METHOD	TIME
Past (Without 3D printer)	53 hours
Present (With 3D printer)	5.59 hours
Savings	89% (overall)

Another advantage that the team experienced about Stratasys 3D printers is that the team processed two Indian patents and two US patents and have published about eleven journal papers related to printed products, with further novel research publications in the pipeline. As for DesignTech, the CIT's research team has only words of praise, so much so, that that have recommended them to other research institutes. The CIT team is thankful to the DesignTech team for their help in selecting the right printer, providing appropriate training, and continuing their support throughout their journey. 🌈

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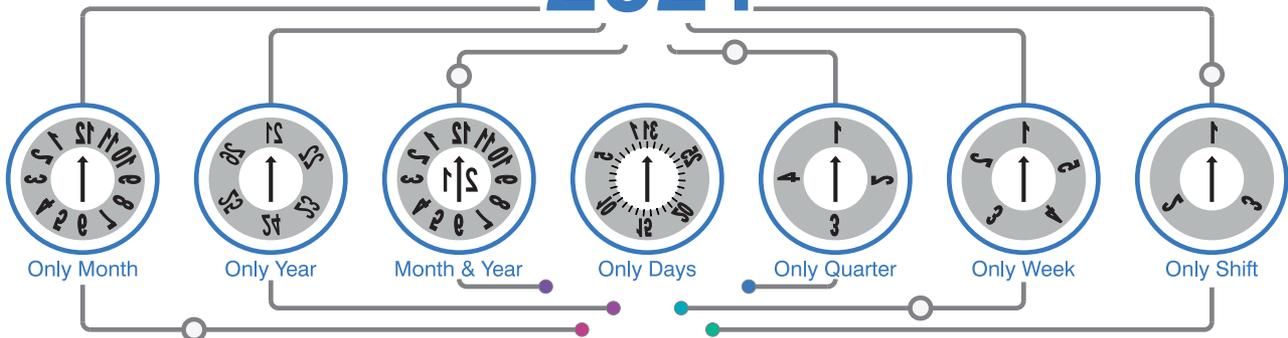
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