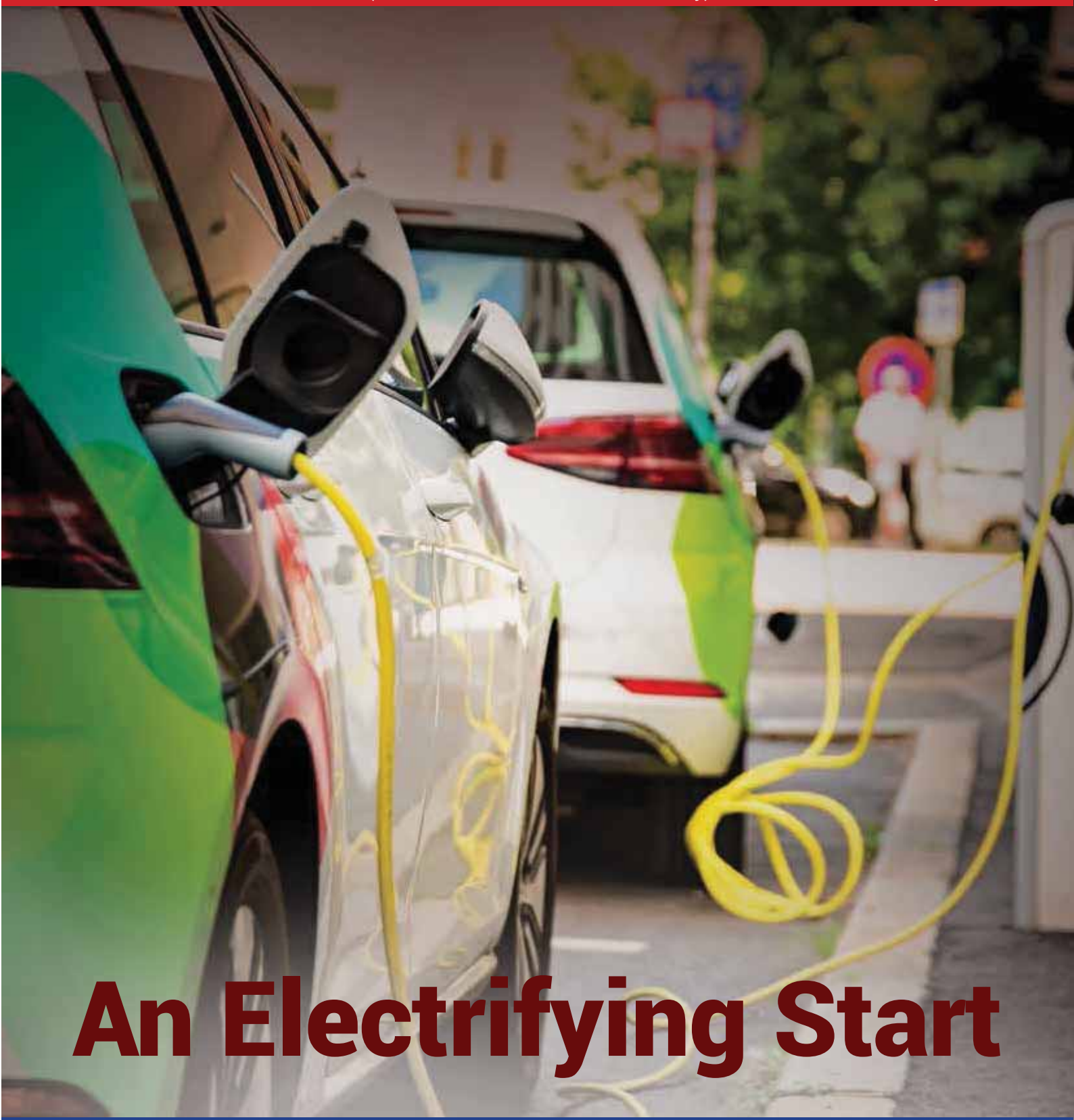
TAGMA TIMES

NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

Volume: XXVII / No. 08 (Private Circulation for Members Only) April 2021



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EDITORIAL

Be fast, not furious!

The recent past has witnessed many automotive giants in India and across the globe launching a series of Electric Vehicles (EVs). Over the years, the EV movement has gathered momentum. MoUs are being signed; global EV company, Tesla, has plans for India; ride-hailing service provider OLA recently announced that it plans on investing INR 2400 crore to build the 'world's largest' electric scooter facility in Tamil Nadu… The list of updates in the EV space is endless and is a sign of what the Indian tooling industry needs to gear up for.

The media is flooded with news about several large automotive OEMs either launching an electric vehicle or being in the process of launching one. EVs have percolated into every segment – two-wheelers, three-wheelers, four-wheelers, and even large fleet vehicles, like trucks, etc. This only goes to show that EVs are here to stay.

Undoubtedly, any change always brings with itself a sense of uncertainty. The present uncertainty has certainly impacted every toolmaker, who has been unfailingly serving the needs of the automotive industry for decades. And why not? Afterall, EVs do not require as many components as internal combustion engine vehicles. While this is a matter of concern for toolmakers, it is also a wake-up call. In today's volatile world, where things are changing at a rapid pace, it is advisable to be prepared.

EVs are going to play a bigger role in the global automotive industry in the coming years. And so, we need to align our strategies accordingly. According to studies, the emergence of EVs will have a positive impact on electric motors, batteries, wiring harnesses, microprocessors, and controllers. Also, the massive charging network that we need to accommodate the large number of EVs coming into the picture will also demand a huge number of components.

As the opportunity presents itself, it would be wise for toolmakers to acquire the required skill set, infrastructure and technologies needed to manufacture EVs. The 'In Focus' section of this issue highlights the opportunities that EVs will create for toolmakers and a lot more.

If you have any advice or suggestions on how you, as a toolmaker, are gearing up for the 'EV Evolution' or would like to share your thoughts on the same, do write to us. We will be happy to share your thoughts!

Happy Reading!

Nishant Kashyap
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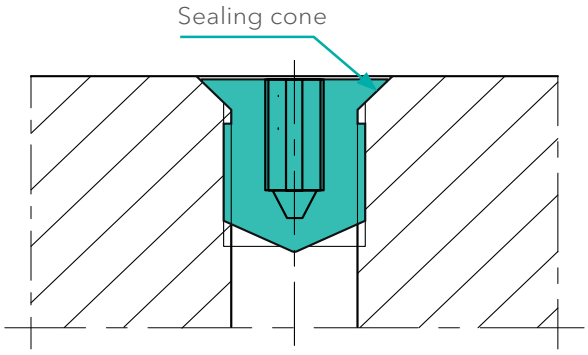

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India attracts FDI inflow of US$ 72.12 billion during April, 2020 to January, 2021

THE measures taken by the government on the fronts of FDI policy reforms, investment facilitation and ease of doing business have resulted in increased FDI inflows into the country, as India has attracted a total FDI inflow of US$ 72.12 billion during April 2020 to January, 2021. It is the highest ever for the first ten months of a financial year and 15% higher as compared to the first ten months of 2019-20 (US$ 62.72 billion).

Image used for representation only. Courtesy: Envato Elements

The trends show that the FDI equity inflow grew by 28% in the first ten months of F.Y. 2020-21 (US$ 54.18 billion) compared to the year ago period (US$ 42.34 billion).In terms of top investor countries, 'Singapore' is at the apex with 30.28% of the total FDI Equity inflow followed by U.S.A (24.28%) and UAE (7.31%) for the first ten months of the current financial year 2020-21.

Japan has been leading the list of investor countries to invest in India with 29.09% of the total FDI Equity inflows during January, 2021, followed by Singapore (25.46%) and the U.S.A. (12.06%).

The Computer Software & Hardware has emerged as the top sector during the first ten months of F.Y. 2020-21 with 45.81% of the total FDI Equity inflow followed by Construction (Infrastructure) Activities (13.37%) and Services Sector (7.80%) respectively.

As per the trends shown during the month of January, 2021, the consultancy services emerged as the top sector with 21.80% of the total FDI Equity inflow followed by Computer Software & Hardware (15.96%) and Service Sector (13.64%).

These trends in India's Foreign Direct Investment are an endorsement of its status as a preferred investment destination amongst global investors.

HAL records revenue more than INR 22,700 crores in FY 2020-21

IN spite of the COVID-19 pandemic that affected the company's operations and disrupted the supply chain (both within and outside the country), Hindustan Aeronautics Limited (HAL) has recorded a revenue in excess of INR 22,700 crores (provisional and unaudited) for the financial year that ended on March 31, 2021. The corresponding figure for the previous year stood at INR 21,438 crores. The company has posted a revenue growth of around 6% in FY 2020-21, thanks to the improved productivity after suspending the operations for one month in the beginning of the year.

The year, 2020-21, was significant in terms of securing the largest-ever defence contract of 83 LCA MK-IA by an Indian company. This helped the company surpass the order book position in excess of INR 80,000 crores, says Mr. R. Madhavan, Chairman and Managing Director, HAL. The record revenue was achieved with the help of the production of 41 new helicopters/ aircraft, 102 new engines, overhaul of 198 aircraft/helicopters and 506 engines.

The cash flow position has improved significantly with improved budget allocation from defence customers; it stands in excess of INR 34,000 crores, including advance payment of around INR 5,400 crores for the 83 LCA MK1A contract. This helped HAL to liquidate all its borrowings availed from the banks. The company has ended the year with a positive cash balance of around INR 6,700 crores, as against borrowings of INR 5,775 crores, as on March 31, 2020.

HAL has taken various cost cutting and austerity measures during the year that include indigenisation of various components, increasing outsourcing efforts and rationalisation of manpower, which is expected to facilitate the company to register a double-digit growth in the Profit After Tax (PAT).

Considering the anticipated growth in profits, HAL paid an interim dividend of INR 30 per share during the current financial year, representing 300% on the face value of INR 10 per share.

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Indian passenger vehicle industry to post 22% to 25% growth in FY2022: ICRA

THE Indian passenger vehicle (PV) industry is expected to post an impressive growth of 22% to 25% for FY2022, after a 2%-4% de-growth in FY2021. As per ICRA research, the growth will be on a lower base of Q1 FY2021, primarily due to industry slowdown and the pandemic impact. In addition to the lower base, expected pick-up in economic activity, improved consumer sentiments besides resilient rural income sentiments (less impacted by pandemic), healthy crop cycles and several government initiatives will propel growth. The shift towards personal mobility from public transport in the present pandemic-laden scenario will also help the sector.

Amongst the various PV industry sub-segments, the utility vehicle (UV) segment is likely to post an impressive growth and will outperform the rest of the industry. Throwing more light, Mr. Ashish Modani, Vice President, ICRA, says, "The V-shaped economic recovery has boosted consumer sentiments from lows of the June'21 quarter, even though it still remains lower than the previous (2019) levels. Consumer sentiments are one of the key indicators for non-discretionary purchases, like cars and luxury goods. Demand has remained strong post the festive seasons, as both retail and wholesale dispatches witnessed recovery. The industry clocked the best-ever volume during H2 FY2021, primarily driven by inventory restocking and pent-up demand. Also, as demand sentiments improved, discounts offered during the lean phase eased substantially. The industry's outlook continues to remain stable."

On the macro economic scenario, India is expected to be amongst the fastest growing large economies during FY2022e with most economists expecting a double-digit growth in GDP. Historically, PV demand has witnessed stellar growth whenever GDP growth exceeded 7%%. The low base of Q1 FY2021 will optically result in exceptionally high growth rate in FY2022, though FY2019-24 CAGR growth will remain modest at 3%-4%. As per ICRA, whether the industry will cross the earlier peak of FY2019 in FY2022 or not remains to be seen.

The long-term industry growth drivers remain intact viz. relatively low penetration, weak public transport infrastructure, high financing penetration, favourable demographics and improving per capita income, urbanisation and improving road infrastructure, etc. What might affect the growth are concerns like high fuel prices and inflationary environment, which impact first-time buyers, supply chain disruption, which could impact production volume, steady increase in vehicle prices, especially in the backdrop of rising commodity prices, stricter emission/safety norms; and second round of COVID-19 wave being witnessed currently. The semi-conductor shortage is a key challenge in Q1 FY2022, as the automotive industry accounts for 12% of global semi-conductor demand. The stronger than expected recovery along with supply disruption at few manufacturing locations has aggravated chip shortage issues and some OEMs have experienced the impact on production volumes. Though some normalcy is expected from Jun-2021 onwards industry volume will be impacted during Q1 FY2022. India's dependency on overseas suppliers for semi-conductor is likely to continue over the next 3-5 years.

How the sub-segments are likely to perform?

Luxury cars: Within the industry sub-segments, luxury car volumes are expected to clock over 25%-30% growth in CY2021, after two years of decline. Luxury car penetration in India remains the lowest amongst large economies (US, China, Germany), thus there is long-term growth visibility. However, higher taxes on CBUs/CKDs are a key deterrent, as local manufacturing is not viable due to low volumes.

UVs: Despite all odds, the compact SUV (C-SUV) segment, which currently accounts for 31% of industry share YTD FY20201 has registered fifth consecutive year of growth in FY2021. The sedans, especially mid-size and executive segments (INR 10-12 lakhs price bracket) will likely underperform due to cannibalisation from the UV segment. The entry segment too will continue to shrink over the medium term. In line with ICRA's expectations, the small car sales again fizzled out after short term momentum during Q2 FY2021.

The analysis

- The preference for personal mobility and focus on cash conservation had resulted in outperformance of the small car segment. But with better availability of finance and improvement in consumer sentiments, the shift towards the compact car and UV segment is expected to continue over the medium term, resulting in under-performance of the small car segment.
- Industry capacity utilisation has been fluctuating, from 50-55% in FY'20 to sub 50% in FY'21e and 55-60% in FY'22e. Most OEMs have surplus spare capacity with the exception of Kia, Hyundai and MSIL which are expanding capacity.
- As for capex, industry's total investment outlay is estimated at INR 28,000 to INR 33,000 crore during FY2022- FY2023; the incremental investments will primarily be for new product/platforms and emission/safety compliance. Investment could be accelerated depending on the incentive structure under the PLI Scheme.

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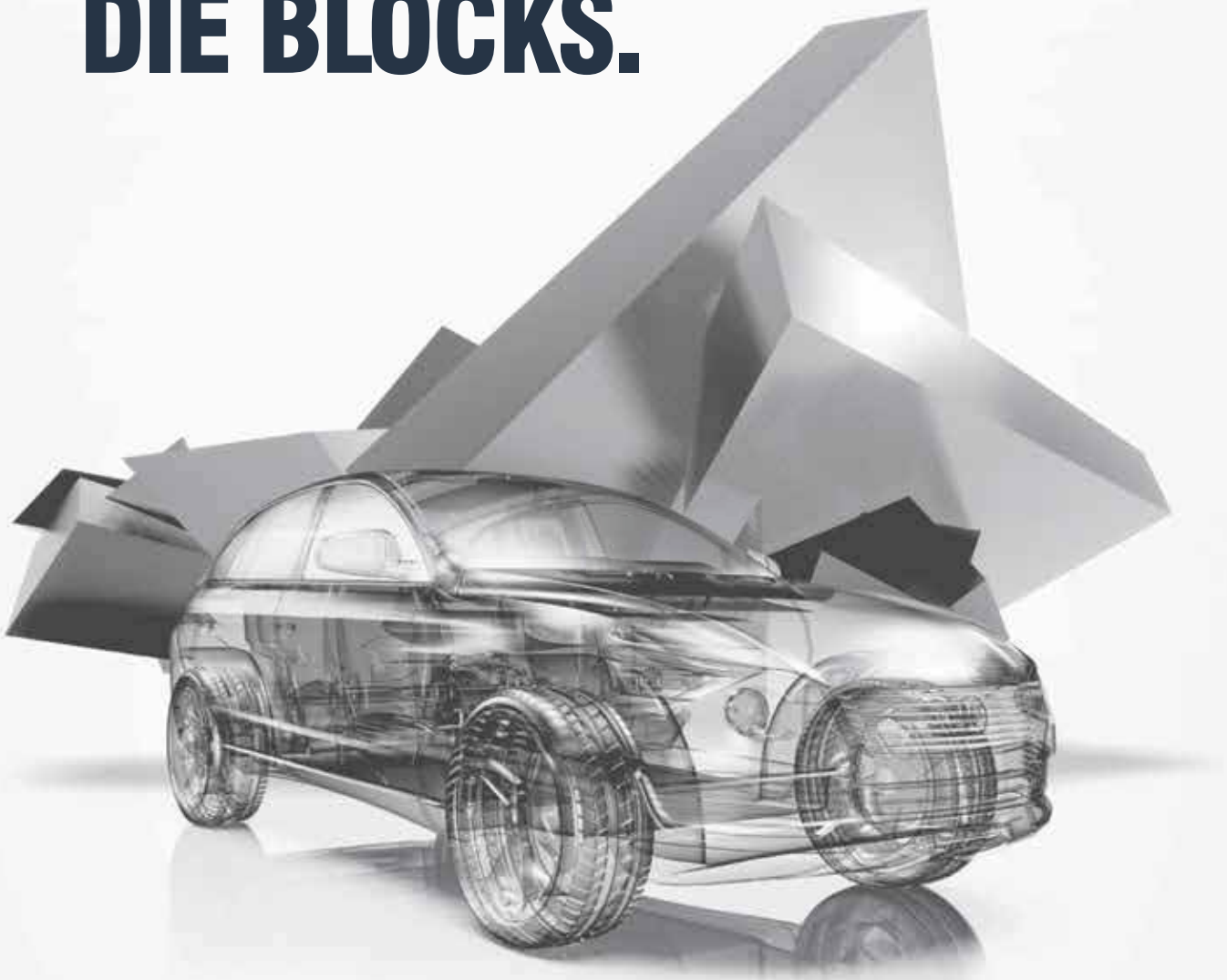

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E-platform for toolmakers to showcase their offerings to stakeholders, potential customers launched

THE tooling industry is a high captive and high skill dependent industry. Hence, this industry is always in a critical stage due to higher fix cost. Their costs are directly proportionate to time and hence, a lower lead time for any development is high on the agenda for the tooling industry. As mentioned, due to the high captive cost involvement, sharing of resources is a crucial factor for them.

Keeping idle assets is a big concern for the entrepreneur and hence, it has been noticed that this type of industry works in clusters. The trust among the various stakeholders is very high and effective utilisation of their resources gives high leverage to these companies, which improves sustainability and improves the productivity and cost with a better cash flow situation.

When we look at India, the talent available in the tooling industry is fairly comparable to other low-cost countries, but it lacks a "cluster culture", leading to non-sharing of resources. Hence, in spite of good talent and willingness among the stakeholders, this industry couldn't achieve the desired growth since it majorly lacks sharing of resources. It has been noticed that even many stakeholders are even not aware of resources available with other potential partners, which leads to either high lead time or loss of business or extra costs.

The pandemic has created unique opportunities for Indian toolmakers since it raised major travel restrictions, which forced major OEMs and their suppliers to relook at the local resources. At the same time, the Government of India also started a major drive of 'Atmanirbhar Bharat Abhiyan', where the government proactively started hand-holding the manufacturing industry to support their pain areas. Global customers are starting to look for a 'Plan B' for their dependency on China. But as mentioned, the root cause of 'trust building' and 'clusters' are missing factors to reach the goal.

'Book My Tool' launched in association with TAGMA

On March 23, we launched 'Book My Tool' in association with TAGMA. The launch was graced by TAGMA President Mr. Devaraya Sheregar and TAGMA Vice President Mr. Shanmugasundaram D. It was indeed a grateful opportunity to be associated with TAGMA.

More than 1000 attendees witnessed the launch of app via Zoom and Facebook.

'Book My Tool' is a unique forum for the tooling industry in India where buyers and sellers can interact for their requirements, post tooling job requirements, post job vacancies, buy and sell machinery and do a lot more. It is an e-cluster for Indian toolmakers. Our motto is to skill up and scale up the Indian tooling industry by the step called as 'Book My Tool'.

Through 'Book My Tool', we are trying to nail the problem by creating an e-platform, where all toolmakers can register their companies free of cost. They can showcase their resources, abilities with capacity and capabilities with all other stakeholders and potential customers. There is no solution available for a toolmaker to reach to customers and hence, we created this unique platform for them to take a further leap.

A single enquiry for our subscribers can turn their business at a different level and the same way the unique supplier information from this portal can provide a big relief to all customers in the easiest way. We, the 'Book My Tool' team, appeal to all toolmakers to utilise this platform by posting your company profiles on our portal. Please note that it is free service.

Aaran 1 Engineering ventures into AM

AFTER the recent collaboration of Phillips Machine Tools & Markforged, Aaran 1 Engineering (one of the prominent suppliers in the precision engineering sector) ventured into additive manufacturing with the purchase of Markforged Metal & Composite 3D printers. It became an early adopter of the smart AM platform with Markforged Metal & Polymer 3D Printers. Aaran 1 Engineering is one of the market leaders in manufacturing of high-precision engineering components, mechanical sub-assemblies and tooling systems for aerospace, defence, oil & gas and medical sectors.

Speaking of venturing into additive manufacturing, Gavin Price, Managing Director, Aaran 1 Engineering Pvt. Ltd, said, "We, at Aaran 1, have the desire to create a unique manufacturing experience for our customers, and when looking for a new supplier, it's key to offer something more. Hence, we have decided to venture into additive manufacturing with Markforged Metal X and composite printers to our portfolio along with the support from Phillips Additive."

Sharing insights on the adoption of additive manufacturing technologies in the Indian market, Anuj Budhiraja, Country Manager, Markforged India, said, "Indian manufacturing industry is looking forward to implementing best-in-class technologies to embrace Industry 4.0. India is ready to adopt additive manufacturing technologies on the shop floor for 3D printed tools, jigs, fixtures, grippers and, end of arm tooling."

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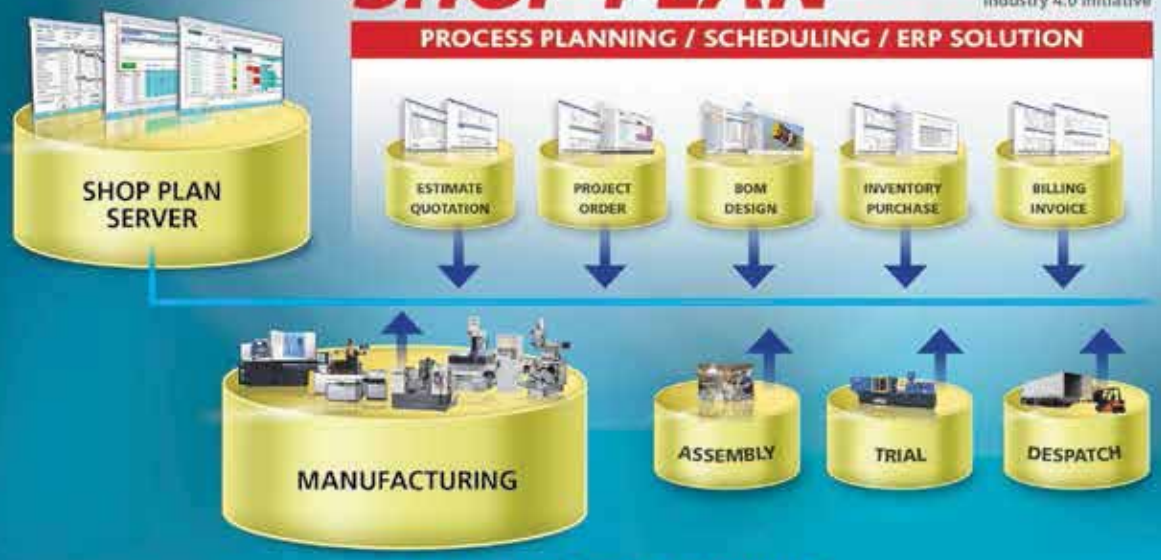

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Streamrunner®, the new, additively manufactured hot runner system from HASCO hot runner

HASCO has enjoyed a reputation for innovation and pioneering technologies for many decades. The company made its first move into additive manufacturing for hot runner manifolds back in 2016. Since then, the experts at HASCO hot runner have been building further on their initial experience in this unique field for the hot runner industry.

The results of numerous studies and tests have gone into the development of HASCO's innovative hot runner system, which now offers mouldmakers and injection moulders unprecedented freedom in design.

The official market launch of the additively manufactured hot runner system at the K 2019 fair attracted a great deal of interest. Since then, a number of successfully implemented customer projects have served to confirm the advantages of the system. HASCO hot runner has now adopted the name of Streamrunner® for this innovative technology to enable its clear identification and differentiation.

High-quality injection mouldings with low shear stress

The Streamrunner® is an additively manufactured hot runner manifold offering maximum freedom of design. Using this technology, flow channels can be configured with the optimum rheological layout, avoiding sharp edges and areas with poor flow. The gentle passage of the melt through the manifold makes for considerably lower shear stress in the material, resulting in better quality mouldings. And, the flow-optimised design speeds up colour changes too, since the melt can be divided and deflected over generous radii.

The complete absence of diverting elements means the Streamrunner® can be produced in a particularly compact design. Very tight spacing down to 18 mm is also possible for high cavity systems, depending on the application in question. The height of the manifold can also be restricted to 26 mm, making it considerably smaller than other manifolds on the market. Used in conjunction with separately controlled nozzles, the advantages of this unique system become even more apparent.

Compactness and maximum degrees of freedom

The Streamrunner® is opening up completely new options in hot runner technology. Employing simulation-based analyses, the specialists at HASCO hot runner can configure specific solutions tailored to individual assignments.

Seco Tools partners with Fusion Coolant Systems to drive forward corporate environmental sustainability efforts

IN an effort to become more sustainable in its machining practices, Seco Tools has partnered with Fusion Coolant Systems (Fusion), which offers an environment-friendly coolant technology that can lower carbon footprint while enhancing overall performance. Both the companies have a goal -- to make machining easier and more effective for manufacturing leaders and engineers, while maintaining environmental awareness, making this partnership a perfect match.

"We've had a working relationship with Fusion Coolant Systems for many years; from the inception of the technology when they developed it years ago. We've worked on multiple customer projects

and had heavy interaction on the R&D side to come up with solutions that help solve customer issues. So, it really was just a natural transition to formalise this partnership," said Rob Keenan, President of Seco Tools, North America. "It's about providing complete solutions. We feel strongly that Fusion has a state-of-the-art solution that's going to help medical customers, especially, in their medical device manufacturing processes."

"There is so much innovation in the medical sector, including a strong migration towards additive manufacturing. Fusion's Pure-Cut™ solution allows for dry, or near-dry machining, while improving operating efficiencies," said Brian Ahlborn CEO of Fusion Coolant Systems. "The Seco team has worked to exploit this technology in their tooling on applications that have now been running for several years in several industries. Our relationship has grown naturally, helping customers solve complex problems."

ASHNA
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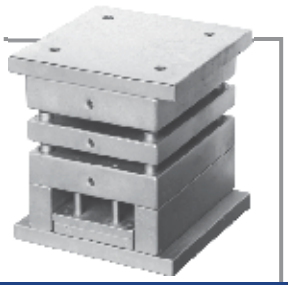

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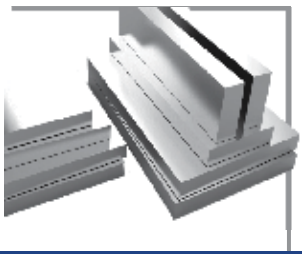

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An Electrifying Start

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The need to reduce carbon footprint has prompted the automotive industry to manufacture Electric Vehicles (EVs). Industry experts forecast that EVs will most likely dominate the automotive landscape in the coming years. As the industry gears up for the next phase of automotive evolution, toolmakers, who have, until now, focused on the manufacturing of components of commercial vehicles, are likely to face the impact. While manufacturing EVs presents new challenges, it also offers a plethora of new opportunities. Toolmakers need to focus on mobilizing themselves if they want to ride high on the e-mobility wave.

Kimberley D'Mello

Travel bans and economic slowdown during the COVID-19 pandemic may have reduced greenhouse emissions to some extent. However, this only temporarily redresses the climate change issue. "Once the global economy begins to recover from the pandemic, emissions are expected to return to higher levels… As countries move toward rebuilding their economies after COVID-19, recovery plans can shape the 21st century economy in ways that are clean, green, healthy, safe and more resilient. The current crisis is an opportunity for a profound, systemic shift to a more sustainable economy that works for both people and the planet," highlighted the United Nations on its website.

The adverse impact of climate change has prodded several countries across the globe to stop and think about sustainable ways of living. At a time when several countries are looking for ways to reduce their carbon footprint, Electric Vehicles (EVs) are garnering appeal as the silver lining in the clouds. Compared to vehicles that run on diesel or petrol, EVs emit less greenhouse gases, which make them an environment-friendly option. In

fact, a recent World Economic Forum report states that "Norway, Iceland and Sweden are leading the charge, with plug-in electric vehicles accounting for 74.8%, 45% and 32.2% respectively in 2020".

Now, let's understand India's stand on EVs…

According to a NITI Aayog report titled 'Zero Emission Vehicles (ZEVs): Towards A Policy Framework', "While many countries have included EVs as an element of transportation policy, their responses have varied according to their stage of economic development, energy resource endowments, technological capabilities, and political prioritization of responses to climate change. In India, a particular set of circumstances which are conducive to a sustainable mobility paradigm have created an opportunity for accelerated adoption of EVs over ICE [internal combustion engines] vehicles." As per the NITI Aayog report, the circumstances include:

- A relative abundance of exploitable renewable energy resources.
- High availability of skilled manpower and technology in manufacturing and IT software.
- An infrastructure and consumer transition that affords opportunities to apply technologies to leapfrog stages of development.
- A universal culture that accepts and promotes sharing of assets and resources for the overall common good.

In 2017, several news reports quoted Union Minister Mr. Nitin Gadkari saying that he would strive for India to switch to 100% electric mobility by 2030. Additionally, while addressing the virtual 'Electric Mobility Conference 2020', organised by FICCI Karnataka State Council, Mr. Gadkari said, "The future is very bright and India has the potential to become the largest EV market in the world as the government continues to push for EV adoption."

EVs in the market

As the government promotes the use of EVs, Indian automakers are skeptical about making the big switch as they are concerned about the economic viability of the move. However, some Indian automakers, decided to take the plunge. Let's take a look at some of their eco-friendly contributions:

Mahindra Electric Mobility Ltd.

Driven by purpose for a tomorrow that is clean, green and technologically connected, Mahindra Electric Mobility Ltd. has rolled out quite a few EVs. Some of them are:

Treo Zor Electric 3-Wheeler Cargo: Last year, Mahindra Electric Mobility Ltd. announced the launch of its new electric 3-wheeler cargo model, Treo Zor, in India. The Treo Zor is based on the proven Treo platform and comes in 3 variants – Pickup, Delivery Van and Flat Bed, said the company's press release.

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e-Alfa Mini electric rickshaw: Earlier, in 2017, Mahindra & Mahindra Ltd. announced the launch of the e-Alfa Mini, its zero-emission, all-new electric rickshaw for passenger movement. The e-Alfa Mini with a 4+1 seating capacity is a complete 3-wheeler designed specifically for Indian conditions, said a press release issued by the company.

eVerito: A year prior to that, Mahindra Electric had in 2016 announced the launch of its innovative new eVerito - the all-electric, zero-emissions sedan. Powered by electric drivetrain technology from Mahindra Electric, the direct drive single speed transmission eVerito can be charged at home as well as quick charged in 1 hour and 45 minutes through fast-charging technology.

Tata Motors

Tata Motors has been proactively driving electric mobility in the country. To build a sustainable future for India, the company has been working collaboratively on various electric vehicle solutions. Some of them are:

Nexon EV: Redefining the evolution of EVs in India, Tata Motors announced the launch of the Nexon EV, an aspirational SUV for car buyers looking for a connected drive experience with zero emissions, last year. Powered by the cutting-edge Ziptron technology, the vehicle promises zippy performance, an ARAI certified anxiety-free range of 312 km on a single charge, an efficient high-voltage

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system, fast-charging capability, extended battery life and class leading safety features, said the company's press release.

Tata Ultra Urban AC electric buses:
Expanding its horizon further, Tata Motors then strengthened its relations with the Brihanmumbai Electric Supply and Transport (BEST) and delivered 26 state-of-the-art electric buses last year. The 25-seater Tata Ultra Urban AC electric buses are equipped with advanced features for the comfort of the driver and the passengers like: 'Lift Mechanism' that extends an automated ramp for easy ingress and egress of specially-abled passengers, along with ergonomic seats, roomy interiors, utility provisions like charging ports, Wi-Fi hotspot for on-the-go connectivity and wide entry and exit passages. The full-electric buses come with Intelligent Transport System (ITS), telematics system, regenerative braking system, amongst other features for efficient and smooth operations, said the company's press release.

Tigor EV: Following the introduction of Tigor EV for government and fleet consumers, Tata Motors in 2019 announced the launch of its extended range Tigor EV Electric Sedan, with a range of 213 km, certified by ARAI. It is available in 3 variants – XE+, XM+ and XT+ – for both fleet and personal segment customers. The new extended version offers an enhanced driving range, low cost of ownership, connectivity, comfort of a sedan and zero emissions, informed the company's press release.

Toyota Kirloskar Motor

Toyota Kirloskar Motor believes that it is imperative to challenge themselves and provide customers with new breakthroughs that not only promises magnificence and comfort, but also contributes to the well-being of the ecosystem. One such breakthrough is:

Toyota Vellfire: Toyota Kirloskar Motor (TKM) unveiled the illustrious Toyota Vellfire, the new luxurious self-charging hybrid electric vehicle in India, last year. The New Vellfire delivers a powerful driving experience while ensuring low fuel consumption and carbon footprint. The new Vellfire engine which is also coupled with two electric motors and a hybrid battery ensures low emissions whilst delivering a delightful driving experience, stated the company's press release.

Hyundai Motor India Ltd.

As a technology and innovation driven brand, Hyundai is committed to helping build India's future mobility. The company focusses on delivering 'Shared', 'Connected' and 'Zero Emission Mobility'. Some of its contributions are:

KONA Electric: Showcasing the strengths of its SUV model combined with the innovative technology of an electric powertrain, Hyundai Motor Company launched the KONA Electric in 2018. Hyundai KONA is an expression of Hyundai's advanced technology in eco-friendly mobility. It is a long-range green SUV that offers 452 Kms/charge, said a press release issued by the company.

Hyundai NEXO: In the same year, Hyundai Motor announced the Next Generation Fuel Cell Electric Vehicle (FCEV) – Hyundai NEXO. The HYUNDAI NEXO SUV model spearheads Hyundai Motor's plans to accelerate development of low-emission vehicles globally. It combines the practicality of an SUV with clean advanced fuel cell technology. This next generation vehicle offers the most advanced technology on the market with various advanced driver assistance systems and the strongest powertrains in the segment, said a press release.

IONIQ: The company also announced the Global Electric Vehicle – IONIQ in 2018. The vehicle reflects Hyundai's commitment towards clean mobility solutions and future readiness with unrivalled global technology in electric vehicles for aspiring customers without compromising on driving dynamics and performance, said a press release.

Mission manufacturing

At the virtual 'Electric Mobility Conference 2020', Mr. Gadkari had called upon the automobile industry to reduce cost of EVs. This, he said, will ensure that the sales go up and, as a result, the industry would stand to gain. He stressed that the quality of the vehicles should also be maintained and felt that with higher output, the automobile industry would be able to

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cater to the growing market. He also said that Indian manufacturers have the capability to make efficient EVs that can not only create more jobs but also provide opportunities for exports. "e-Mobility is going to be the future mode of transport with greater efficiency and less impact on the environment. Import of crude oil and air pollution are two major concerns for the country. We need to have an integrated approach for EVs," he stated.

Referring to the NITI Aayog report, Mr. Gadkari said that India needs a minimum of 10 GWs per hour of cells by 2022, which will be expanded to 50 GWs by 2025. "We need to encourage the manufacturing of these cells in India. I urge the industry to think about manufacturing e-batteries in the country," he emphasized.

As the journey for emission-free vehicles commences, automakers have already taken charge. For instance, to jointly support the EV revolution in India, Mahindra and LG Chem collaborated in 2018 for the Li-ion battery technology. "Under the aegis of this collaboration, LG Chem will develop a unique cell exclusively for India application and will also supply Li-ion cells based on NMC (nickel-manganese-cobalt) chemistry with high energy density. These cells will be deployed in the Mahindra and SsangYong range of Electric Vehicles. LG Chem will also design the Li-ion battery modules for Mahindra Electric, which in turn will create battery packs for the Mahindra Group and other customers," informed a press release.

Also, in 2020, Epsilon Carbon, an Indian coal-tar derivatives company, announced its plans to diversify into the battery material business to develop and manufacture high-performance and quality carbon products for anode components of Lithium-ion Batteries (LiB). The manufacturing facility has been set up in Ballari region of Karnataka in August. Vikram Handa, Managing Director of Epsilon Carbon, had said: "To make India self-reliant in e-mobility, India is aiming towards establishing manufacturing leadership in the EV space and Epsilon Advanced Material's manufacturing leadership in graphite anodes will make India self-sufficient for a key raw material for LiB cells."

Besides these, in April this year, Lohum announced its plans to invest up to INR 250 crore in the next three years to enhance its capacity with plans to foray into electric four-wheeler battery segment, according to a PTI News report. The company, which currently has a battery manufacturing capacity of

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300 megawatt-hours per annum, plans to set up a new unit at Greater Noida to take its total battery manufacturing capacity to a 'gigawatt-hour scale' to respond to the surge in demand from the electric vehicles segment, added the news report.

Plans in the pipeline

Although some automakers have already begun manufacturing EVs, there are others who are gearing up to join the EV evolution in India. For instance:

Ola plans to launch electric scooters: According to a PTI News report published in April 2021, Ola Electric said it will bring its electric scooter to the Indian market this July; and is working on setting up a 'Hypercharger Network' to include one lakh charging points across 400 cities. Last year, Ola had announced an INR 2,400 crore investment for setting up its first electric scooter factory in Tamil Nadu. Upon completion, the factory will be the world's largest scooter manufacturing facility that will initially have an annual capacity of 2 million units. "And then, we'll ramp up - over the next 12 months - after the factory is set up...the sale will also start at the same time, so factory gets completed in June, sale starts in July," the news report quoted Bhavish Aggarwal, Ola Chairman and Group CEO, as saying.

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Volvo plans to launch electric car in India: In February this year, PTI News reported that the Indian arm of Swedish luxury car maker Volvo said 50% of its vehicles would be battery operated by 2025 under its global vision plan and the first product 'XC40 Recharge' would be launched in the country later this year. Meanwhile, as part of its ambitious climate plan, which seeks to consistently reduce the lifecycle carbon footprint per car through concrete action, Volvo Cars plans to become a fully electric car company by 2030, the company said in press statement issued in March this year. "To remain successful, we need profitable growth. So instead of investing in a shrinking business, we choose to invest in the future – electric and online," said Håkan Samuelsson, Chief Executive.

Tesla plans India entry: Earlier this year, Tesla CEO Elon Musk confirmed the company's plans to enter the Indian market, within days of the electric vehicle maker registering its arm in the country. According to a regulatory filing, the firm has registered Tesla India Motors and Energy Pvt Ltd with Registrar of Companies (RoC) Bangalore. The company is reportedly in talks with five states as it explores the feasibility of setting up its manufacturing unit and research and development (R&D) centre in India, revealed a PTI News report.

Bajaj Auto signs MoU with the Government of Maharashtra: In 2020, Bajaj Auto, a global two-wheeler and three-wheeler manufacturer, announced that it has signed a Memorandum of Understanding with the Government of Maharashtra to set up a manufacturing facility on a proposed investment of INR 650 crores in Chakan. "The facility is expected to commence production in 2023. This facility will be utilised for manufacturing high-end KTM, Husqvarna and Triumph motorcycles as well as for electric vehicles starting with Chetak. Under the arrangement, the Government of Maharashtra will facilitate Bajaj Auto in obtaining the necessary permissions/ registrations/ approvals/ clearances/ fiscal incentives, etc. from the concerned departments of the State, as per the existing policies/ rules and regulations of the Government of Maharashtra," said a press release issued by the company.

Ashok Leyland and ABB sign MoU: Last year, Ashok Leyland, flagship of Hinduja Group, and ABB Power Products and Systems India Limited, signed a Memorandum of Understanding (MoU) in the public e-mobility space, to expand the ecosystem for efficient and greener electric bus transportation systems in India. The MoU outlines a partnership to develop a pilot electric bus based on ABB's innovative flash-charge technology, TOSA, which tops up the battery in just seconds while passengers get on and off the bus. This avoids the need to take the vehicle out of service for recharging every few hours or having a replacement bus ready, thus minimising the size of the fleet while increasing passenger carrying capacity, informed a press release issued by the company. "We are pushing the boundaries of e-mobility with our flash-charging technology, TOSA, for buses to contribute to a cleaner, greener, and sustainable future. The aim is to provide a zero local emission mass public transportation bus system with high passenger capacity. We are pleased to be working with Ashok Leyland in advancing responsible urban mobility," said Mr. N. Venu, Managing Director, ABB Power Products and Systems India Limited (ABB Power Grids' business in India).

Are Indian toolmakers ready?

The EV market in India is likely to touch the over 63 lakh unit mark per annum by 2027, stated a report by the India Energy Storage Alliance. As EVs begin to dominate the manufacturing landscape, toolmakers will face a jolt. This is because the automotive industry has always thrived on making parts for internal combustion engine (ICE) vehicles and EVs do not require components such as pistons and valves, crankshafts, or even the exhaust system, etc., which are used in ICE vehicles. Industry experts, however, believe that every challenge presents an opportunity. The demand for ICE vehicles' components will not completely end as aircraft, farm equipment, and military vehicles, among others, will require them. A battery-operated system is not feasible to operate these. However, the demand for ICE vehicle components is likely to decrease, they caution.

It is high time toolmakers rise to the challenge and think of ways to move forward. For instance, toolmakers can consider diversifying into manufacturing components for EVs and look at the manufacturing of batteries, battery casings, charging ports, etc., the demand for which is expected to rise over time. For this, they will need to equip themselves with state-of-the-art infrastructure. They will also need to familiarize themselves with the materials and procedures used to manufacture these components. EVs are the future of the automotive industry, say experts. Toolmakers will need to gear up if they want to be a part of the e-mobility evolution.

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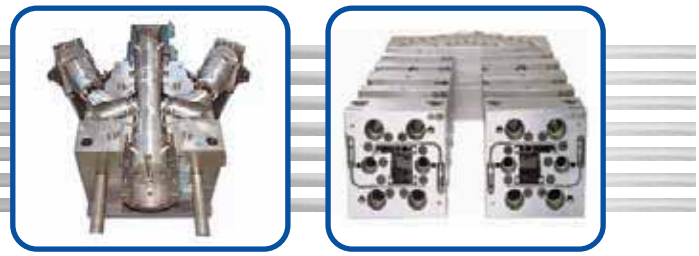

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'On-demand manufacturing will be a boon for Small and Medium Enterprises'

"On-demand manufacturing can certainly help SMEs. It can solve some of the biggest challenges that SMEs face in terms of overcoming inefficiencies stemming from owner dependencies in a business, improving capacity utilisation and limited reach to the global market," says Mr. Soumitra Joshi, Founder & CEO, Truventor.ai.

Nishant Kashyap

Q On-demand manufacturing is a relatively new concept in the world of manufacturing. What is it all about?

The manufacturing industry is transforming at a fast pace. For instance, there has been a shift in the way new products are brought to market. And then, there are concerns over keeping stock for a long time because of value fluctuations. These and many more factors have led to the emergence of On-demand manufacturing.

Also referred to as cloud manufacturing, On-demand Manufacturing (ODM) is an agile manufacturing model as per which goods are only made as and when they are required. The ODM platform is a network of manufacturing infrastructure managed by an intelligent platform to enhance efficient and effective utilisation of resources. It reduces the volume constraints for customers (part buyers) and enhances capacity utilisation for suppliers (part manufacturers), making it a sustainable model in this competitive world.

Q Can you elaborate on how ODM works?

ODM is like the UBER of machines and factories. The ODM platform onboards several job shops, as manufacturing partners, who can manufacture parts in various manufacturing technologies. Whenever there are enquiries for part manufacturing, the intelligent system identifies the right suppliers based on various data points such as location, infrastructure, competencies, and reviews and ratings, among other factors.

The ODM platform is a network of qualified suppliers, who can manufacture parts in various manufacturing technologies. So, tasks such as taking orders, selecting suppliers, getting them manufactured and dispatching them to customers are managed by the ODM platform. The customer has to only share the enquiry and the supplier has to only focus on production. It's that simple!

Q That's very impressive! How does ODM benefit customers and suppliers?

Currently, job shops face challenges such as fluctuating demand, low capacity utilisation, financial constraints, high costs of operations and

process inefficiencies. ODM can benefit suppliers by:

- Bringing in more customers.
- Increasing capacity utilisation.
- Ensuring process efficiencies.
- Ensuring operational savings.

Customers face challenges such as fluctuating demand, too many touchpoints, transparency and traceability within the supply chain, lead times, and price pressures. ODM can benefit customers by:

- Providing agile manufacturing with massive production capacity.
- Removing volume constraints.
- Providing transparency and traceability.
- Acting as a single-window system.
- Reducing lead times and delivery promise.

Q Can ODM help mould makers or manufacturing MSMEs?

The tooling industry, which is often referred to as the mother industry, plays a vital role in the development of the manufacturing industry. In fact, it should be considered as a strategic sector, as it directly impacts the overall manufacturing industry. However, most tooling companies fall under the category of MSMEs.

To answer your question, ODM can certainly help SMEs. It can solve some of the biggest challenges that SMEs face in terms of overcoming inefficiencies stemming from owner dependencies in a business, improving capacity utilisation and limited reach to the global market. So, ODM will be a boon for SMEs. Here's what the ODM platform can offer SMEs and toolmakers:

- **Acquire new customers:** Most SMEs do not have the bandwidth to spend resources on marketing. The ODM platform can provide them orders by acting as a sales channel.
- **Globalisation:** As cloud manufacturing is a service platform, they can get orders from around the world. The orders can be produced at any small SME.
- **Capacity utilisation:** With more orders, capacity utilisation increases.
- **Improved supply chain:** The ODM platform also becomes a partner for raw materials, working capital and logistics. This implies that companies have to focus on their key strength area, which is manufacturing.

Q What are the technology trends in the manufacturing industry? How will the emergence of Industry 4.0, hybrid manufacturing, and machine learning shape the industry?

Industry 4.0, hybrid manufacturing, machine learning, and cloud manufacturing are considered game changers in the manufacturing industry. Data science is going to be key in the future, as all machines are going to be integrated with sensors that will generate immense amount of data, which can be used for process efficiency and better utilisation of assets. The data generated will be stored in the cloud; with the help of machine learning and AI, one can make predictions about various factors such as future demand, breakdown, and storage capacity, among other factors, thus enhancing efficiency and productivity.

Industry 4.0 is going to change the way we have been manufacturing parts and equipment. Machines and factories are getting smarter day-by-day, thus reducing the chances of human error. In the coming days, company owners will be able to control the shopfloor from any remote location.

At Truventor, our aim is to help SMEs achieve higher efficiency and productivity with the help of the latest technologies. We provide a platform, which can help companies analyse the design, make instant quotations and predict the project timeline along with orders from global customers.

Q There have been a lot of discussions about the disrupted supply chain globally and now, companies are looking at diversifying their resources to many countries/suppliers instead of depending on one country. Do you think such a scenario will benefit India? What role can ODM or Truventor play in helping Indian MSMEs earn orders from overseas companies?

The ongoing pandemic has taught us a lot. It has taught us that in today's world, we cannot depend on one industry, one supplier or one country for the supply of parts and goods. In this volatile market, where you never know how things will turn out, it is better to not to put all your eggs in one basket. For example, most of the tooling and machine tool companies depend on automotive. Any slowdown in the automotive industry will directly impact their business.

Companies around the world are highly dependent on China for various types of goods, equipment, and raw materials, among other things. We saw how the supply chain was disturbed when there were countrywide lockdowns caused by the Corona virus. This shows why over dependence on one supplier/

country/industry might not be a great idea going forward. In such a scenario, ODM can help companies diversify, as, in cloud, one can cater to any industry and any country.

Since the pandemic has emerged, enquiries from overseas buyers looking to expand their supplier base has increased significantly on our platform. Because of such a scenario, and our unique value proposition, we could provide a lot of overseas orders to our Indian suppliers.

Q Any suggestions for Indian MSMEs?

MSMEs are the backbone of the Indian economy. They play a vital role in the development of any nation. However, with changing time, companies should be proactive in adopting new business models, accepting trends, like Industry 4.0, and investing in better technologies & skill development. But I think they must seriously consider:

- **Going digital:** Be it sales, marketing, production, or logistics, every field in this world is adopting digital technologies to enhance their efficiency. However, most Indian manufacturing SMEs are yet to do so. The world is buying and selling digitally, you cannot afford to be offline.

- **Investing in technology:** We need to increase our investment in R&D in order to become globally competitive. This can happen only if we invest in the right technology.

- **Skill development:** Invest in manpower development It is the key for any business to succeed.

- **Being open to change:** The world in changing rapidly. The demand patterns from customers are changing, new business models are getting introduced, new technologies are coming to the surface faster than ever before. In such a scenario, one must be open to adopting change.

I see an immense opportunity for Indian mould makers and manufacturing SMEs. With a huge demand coming from industries like defence, industrial machinery, electronics, white goods, infrastructure, construction equipment, food processing and agricultural machinery along with traditional industries like automotive, Indian SMEs are likely to play a key role in the coming days. We just have to act in accordance with the demand and adapt to new ways of doing things.

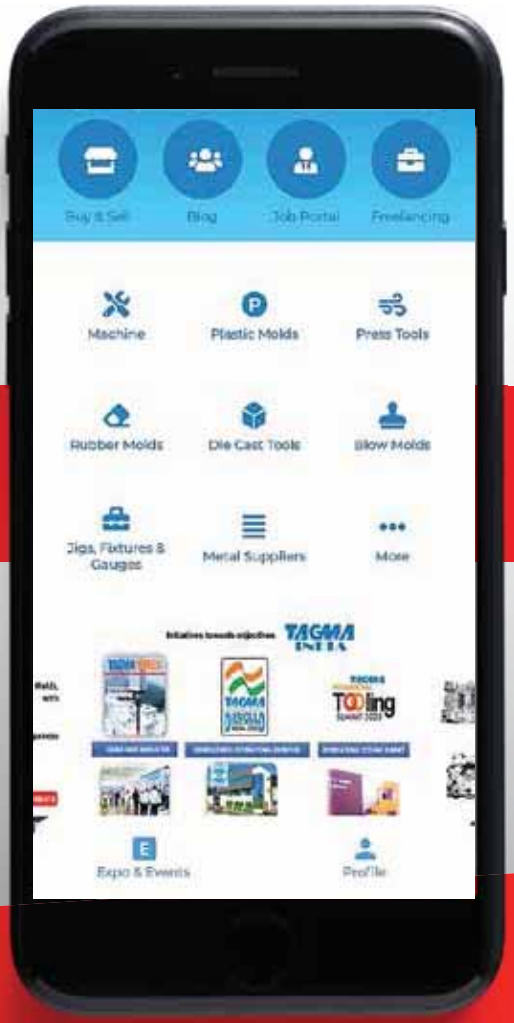
Q What, short & long-term, opportunities do you see amid this COVID-19 crisis and growing geopolitical situation?

Many companies from the US and Europe are looking to diversify their supplier network and are looking at India as one of the target markets in terms of sourcing components. Indian companies need to rise to the occasion and focus on providing quality tools/parts within the required timeline. This is a great opportunity for Indian companies to become suppliers of the world.

In the long term, I see India emerging as one of the preferred countries to source goods and parts. If we act according to the demand and disruption created by the pandemic, I am sure our job shops will gain a lot of global exposure, which will help them in process knowledge improvement, design capabilities and efficiency.

It is time we focus on learning, unlearning and relearning, if we want to grow. As organisations across industries gear up for the next phase, their focus will most likely be on strengthening their business, making it more agile, and embracing new technologies.

COVID-19 has highlighted critical issues faced by the manufacturing sector such as raw material shortage, decrease in demand, disruption in supply chain, scarcity of labourers, cash-flow, and planning concerns. Many businesses chose to diversify to stay in business. Like other sectors, manufacturing is going to witness digital acceleration across all areas – be it helping employees to coordinate and stay productive; helping clients connect with companies; or automated, factories.



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Seamless integration between cars and cloud

Bosch and Microsoft collaborate to develop a software-defined vehicle platform. The collaboration brings together automotive and cloud computing expertise to shape the next generation of vehicle software.

Bosch has teamed up with Microsoft to develop a software platform to seamlessly connect cars to the cloud. The goal of this collaboration is to simplify and accelerate the development and deployment of vehicle software throughout a car's lifetime in accordance with automotive quality standards. The new platform, which will be based on Microsoft Azure and incorporate software modules from Bosch, will enable software to be developed and downloaded to the control units and vehicle computers. A further focus of the collaboration will be on the development of tools that increase efficiency in the software development process. This, in turn, will drive innovation and reduce development costs for vehicle software within and across organisations. For drivers, the platform will mean quicker access to new functions and digital services. The collaboration between Bosch and Microsoft combines the wealth of software, electronics, and systems expertise of the world's leading automotive supplier with Microsoft's know-how in software engineering and cloud computing. Both companies intend to make the new software platform available for first vehicle prototypes by the end of 2021.

Bosch already securely updates car software over the air today. With the comprehensive platform for software-defined cars, we want to further empower automakers to develop new functions and get them on the road faster."

Dr. Markus Heyn,
Member of the Board of Management of Robert Bosch GmbH

"Bosch already securely updates car software over the air today. With the comprehensive platform for software-defined cars, we want to further empower automakers to develop new functions and get them on the road faster," says Dr. Markus Heyn, Member of the Board of Management of Robert Bosch GmbH.

"Our collaboration with Bosch brings together the expertise of one of the world's leading automotive suppliers with the power of the Microsoft cloud, AI and GitHub," says Scott Guthrie, Executive Vice President, Cloud + AI, Microsoft. "With software quickly becoming a key differentiator in the automotive industry, our ambition is to help businesses accelerate the delivery of unique mobility services across passenger cars and commercial fleets at scale."

Developing the automotive future together

Software will play an increasingly important role in future vehicle generations. New trends such as electromobility, automated driving, and modern mobility services would not be possible without it. This will also require more frequent updates and upgrades in the future. However, stringent safety requirements throughout the vehicle's lifetime make wireless software updates and digital services for cars very complex. The wide range of different series and models makes things even more challenging. The collaboration will benefit from Bosch's deep understanding of electrical and electronic architectures, control units, and vehicle computers, which is necessary for over-the-air vehicle updates. In addition, the company will contribute its expertise as well as software-based products and development tools for cars. This includes the basic software and middleware for vehicle computers and control units, as well as cloud-based software modules to bring over-the-air updates to entire vehicle fleets. "Having a comprehensive software platform from the vehicle to the cloud will reduce the complexity of the software development and the vehicle system integration. In this way, we will create the conditions for wireless updates to work just as smoothly and conveniently in vehicles, as they do in smartphones," Heyn says. The pre-integrated platform will greatly reduce the complexity of over-the-air updates, which help ensure that a vehicle's software is always up to date, thanks to the fact that the software architectures of vehicles and the cloud will now fit together seamlessly.

With software quickly becoming a key differentiator in the automotive industry, our ambition is to help businesses accelerate the delivery of unique mobility services across passenger cars and commercial fleets at scale."

Scott Guthrie,
Executive Vice President,
Cloud + AI, Microsoft

New software services for developers

Bosch and Microsoft also plan to enrich existing developer tools that will enable automakers and suppliers to simplify and accelerate their own software development, while adapting to the unique challenges in the automotive industry.

Having a comprehensive software platform from the vehicle to the cloud will reduce the complexity of the software development and the vehicle system integration. In this way, we will create the conditions for wireless updates to work just as smoothly and conveniently in vehicles as they do in smartphones."

Dr. Markus Heyn,
Member of the Board of Management of Robert Bosch GmbH

The companies also plan to use GitHub's fully integrated enterprise platform and to open-source important parts of the new software platform on GitHub.com to encourage code re-use and best practice sharing across the industry.

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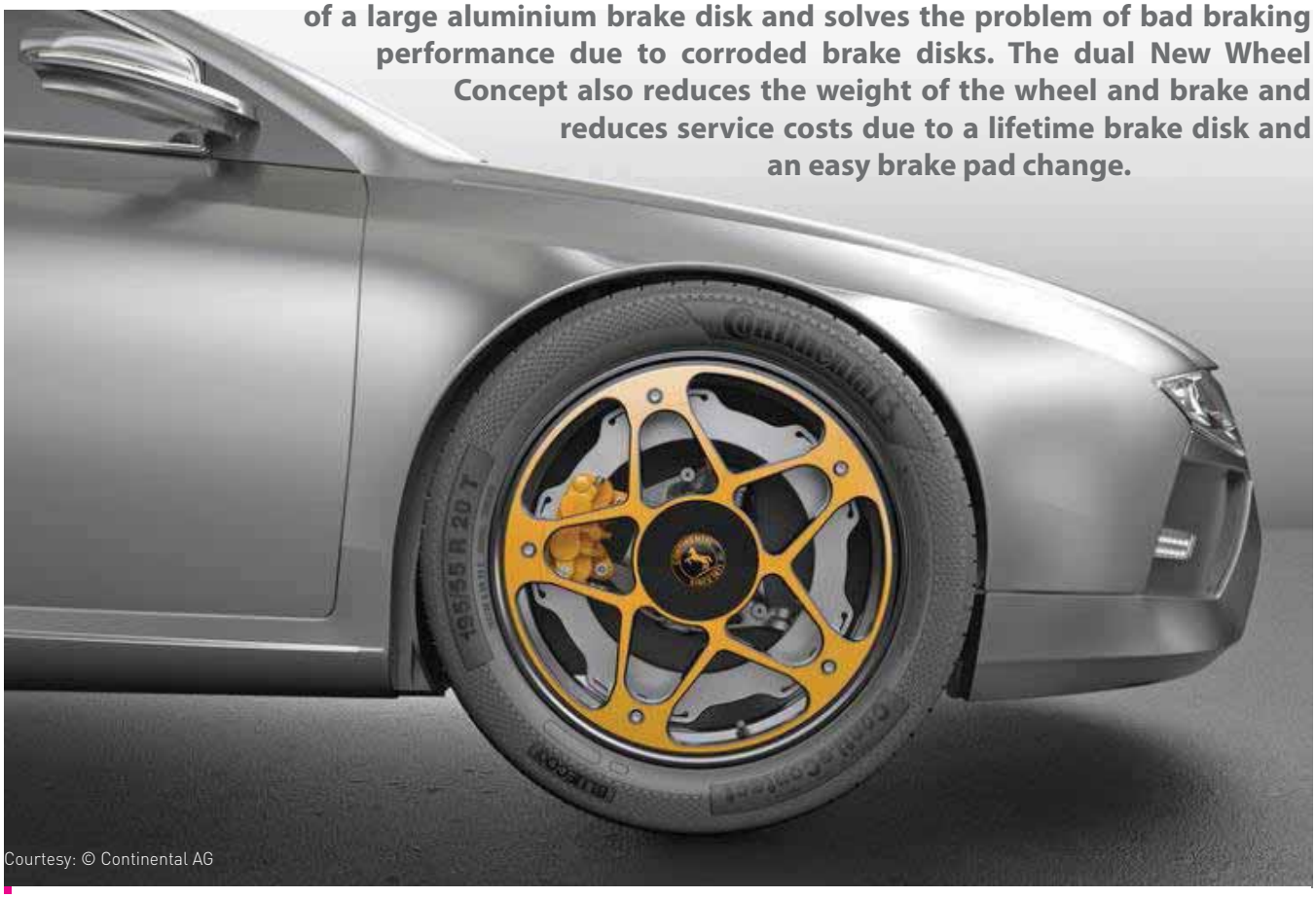
Innovative wheel and braking concept for electric vehicles

Continental presents the New Wheel Concept, which optimizes the braking system specifically of the electric vehicle (EV). The design enables the use of a large aluminium brake disk and solves the problem of bad braking performance due to corroded brake disks. The dual New Wheel Concept also reduces the weight of the wheel and brake and reduces service costs due to a lifetime brake disk and an easy brake pad change.



New division between wheel and axle: The New Wheel Concept optimizes the braking system specifically of the electric vehicle (EV).

Technology company, Continental, has expanded its solution portfolio for electric vehicles, developing the New Wheel Concept to meet the specific requirements of these vehicles. The wheel rim consists of two aluminium (Al) parts, the inner Al carrier star with the Al brake disk and the outer Al rim well with the tire. In contrast to conventional wheel brakes, the New Wheel Concept brake engages the Al disk from the inside. This allows it to have a particularly large diameter, which benefits the braking performance.

To increase the vehicle's range, deceleration in the EV generates as much electricity as possible through recuperation (= braking using the electric motor), so the wheel brake is used less frequently. The corrosion-free Al brake disk also prevents the formation of rust (as is normal on cast-iron disks), which can impair the braking effect.

"Electromobility needs new solutions for braking technology too," says Matthias Matic, Executive Vice President of Business Unit Vehicle Dynamics at

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Continental. "Using conventional brakes is not very effective in this case. The New Wheel Concept meets all the demands that electric driving places on the brake. We used our braking know-how to develop a solution that provides a consistently reliable braking effect in the electric vehicle."

Thanks to the lightweight material, the New Wheel Concept reduces the weight of the wheel and brake, enabling lightweight construction in EVs. Advantages of the concept are much easier wheel and brake pad changes and that the disk is not subject to wear.

Rethinking the wheel

The New Wheel Concept is based on a new division between the wheel and the axle. Here, the wheel consists of two parts: the aluminum carrier star, which remains permanently bolted to the wheel hub, and the rim well, which is bolted to the star. The wheel brake is fastened to the wheel carrier of the axle and engages from the inside with an annular aluminium brake disk, which, in turn, is bolted to the carrier star. The internal brake permits a wide brake disk friction radius, since the space available in the wheel is optimally utilised. During its development, the New Wheel Concept's braking performance was initially designed for medium and compact class vehicles. In accordance with today's requirements for this application, the brake is sturdy and fulfills all the established criteria – although it is used much less frequently in an EV.

"In EVs, it's crucial that the driver expends as little energy as possible on the friction brake," says Paul Linhoff, Head of Brake Pre-Development in the Chassis & Safety Business Unit at Continental. "During a deceleration, the momentum of the vehicle is converted into electricity in the generator to increase the vehicle's range. That's why the driver continues to operate the brake pedal – but it certainly doesn't mean that the wheel brakes are active too." The deceleration torque of the electric motor is only no longer sufficient by itself when the driver brakes more energetically, or braking also has to be carried out with the non-driven axle for driving dynamics reasons. The wheel brake is needed in this situation – and it must be available. "Drivers want to be able to rely on a consistent braking effect – and too much rust on the brake disk in particular can really make this difficult," Linhoff emphasizes. The reason behind the reduced performance is less friction between the brake pad and the brake disk. The automatic emergency braking function also has to fully rely on the availability of the friction brake effect.

Courtesy: © Continental AG

The dual New Wheel Concept also reduces the weight of the wheel and brake and reduces service costs due to a lifetime brake disk and an easy brake pad change

Courtesy: © Continental AG

The design enables the use of a large aluminum brake disk and solves the problem of bad braking performance due to corroded brake disks.

In perfect harmony – material and design

The design of the New Wheel Concept uses the strengths of lightweight aluminium material for the brake. Thanks to the long leverage effect on the large brake disk, relatively low clamping forces are enough to provide a high level of braking efficiency – and since aluminium is a very good heat conductor, the heat generated in the disk during braking is quickly dissipated.

Continental assumes, after the results of the initial practical tests, that the Al disk itself is not subject to wear, unlike cast-iron disks. With the New Wheel Concept, abrasion only takes place on the pads, and the design of the Concept makes replacing them – and the wheels – much easier. The New Wheel Concept has yet another positive: "Because the brake disk is fixed on the outside and the brake engages from the inside, the brake caliper can be designed particularly light and stiff. The force is transmitted largely symmetrically into the centre of the axle, and this has a favourable effect on the noise behaviour of the brake," says Linhoff – and that's a side effect, which is particularly attractive in a quiet EV.

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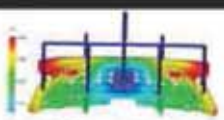

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Role of die-casting industry in electric vehicles

Aluminium die-casting has been at the forefront of the automotive industry development given its ability to produce complex parts with high automation and recyclability. Although aluminium has been used in automobiles for several years, it has now become the fastest growing as well as preferred material for modern automobiles. This is due to more emphasis on lightweight and emission standards by automakers. Given the global consensus to counter climate change, electrical vehicle technology has been given special focus and a united push by many countries. This drive in electrical vehicles will be a boon for aluminium, especially given its strength-to-weight ratio advantages over traditional materials.

The progress in aluminium metallurgy, especially development of Al-Si-Cu-Mg alloys, along with new die-casting techniques, have enabled aluminium casting to replace most iron casting and some sheet metal parts. Although the aluminium die-cast part might have a higher unit price, in comparison to traditional parts, the total manufacturing cost of casting will be lower. The significantly greater freedom of design will create cost savings, especially given that it avoids joining of parts through welding and other assembly services.

Even though internal combustion engines, which contribute roughly 200 aluminium castings per vehicle, will become obsolete, it is estimated that Electric Vehicles (EVs) will use 25% to 27% more aluminium by weight than combustion engine cars. Currently, at an average of 250 kg of aluminium per unit, EVs have already created a demand for around 250,000 million metric tonnes of aluminium, which is expected to soar to 10 million tonnes by 2030. EVs are starting to create a niche market in the automotive sector, accounting for nearly 3.5 million passenger vehicles and 421,000 electric buses sold in 2019. Even though this accounts for less than 5% of the market share, it is expected to rise tenfold through 2030 to 30%. China, which already accounts for nearly 50% of the demand, is in the lead followed by Europe and

the US.

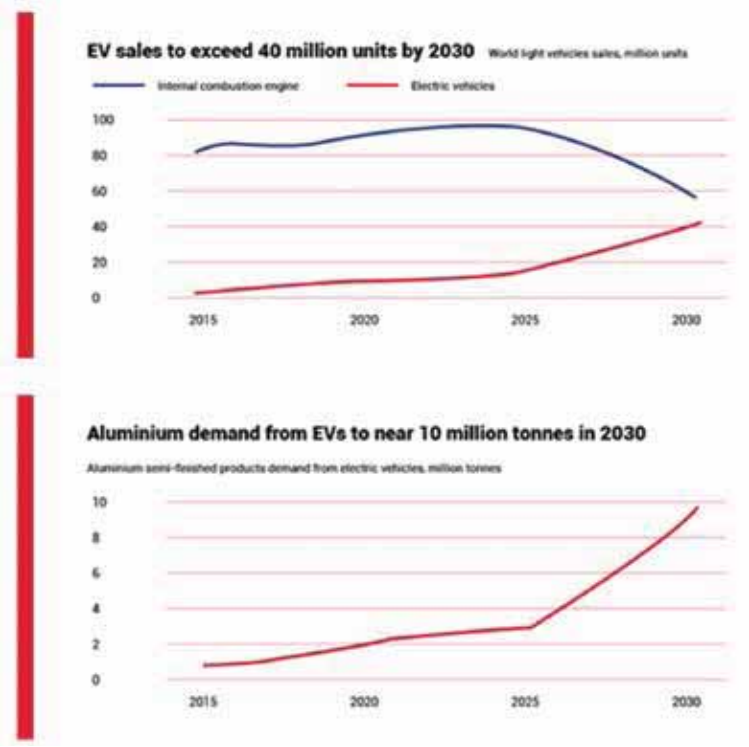
The key challenges

One of the key challenges for EVs vehicles to compete with their internal combustion engine (ICE) counterparts is range. This typically requires better battery technologies and, more importantly, lighter vehicles to compensate the weight of the battery pack, which is around 200 kg to 300 kg. Lightweight structures and weight-reduction solutions have gained significance to address this problem. The demand for high-integrity structural parts through die-cast will increase along with the need for bespoke tooling and design directions for weight reduction solutions through casting simulations. All the four main processes of sand, gravity, high- and low-pressure die-casting technology will be essential in meeting the varied challenges posed by EVs.

The optimised cooling requirement of batteries will require the use of sand cores or inclusion of tubes to produce these complex and functionally integrated solutions. A large proportion of demand will also come from the housing requirements of batteries produced, typically through high-pressure die-casting as well as structural components for body parts such as pillars, strut consoles, rear-side members, mounting for shock absorbers, rear axle cross members, etc., as demonstrated in Fig. 1. A Mercedes C-Class leads to a reduction of 20% to 25% body weight. The same has been demonstrated in Ford F-150 trucks. This will open up new opportunities as well.

Overcoming challenges

However, the die-casting industry will need to rise to meet the challenges posed by EVs. This would include significant improvement in the casting process, developments of alloys to suit applications, simulation of the casting process, design of tools, joint standards for specifications and quality inspections to ensure comparable production processes and results. The larger and more advanced structural components would demand newer die-casting presses with better control over parameters to be able to cast thinner, complex, and variable cross-section parts. For example, Tesla has installed a giga press of 6100 tonnes from IDRA to cast its rear underbody for Model Y, which will replace 70 stamping, extrusions and castings and save 20% labour as well reduce the size of their body shop by 30%. Also, another area where Tesla has made significant strides is the development of new Al alloys. Commercial cast



aluminium can either possess high yield strength (A356-175MPa) or high conductivity (8030 - 60% IACS). Tesla has come up with new aluminium alloys tweaked to achieve high yield strength of 90 to 150 MPa as well as electrical conductivity of 40% to 60% IACS, in addition to having proper fluidity to ensure the cast solidifies well along the entire length of the mould.

The mould/die plays another pivotal role in the entire supplier chain process. The requirements on the tooling will be extreme, considering the intricate and complex parts with varied wall thickness. The casting simulation technologies have developed greatly to accurately predict defects caused by temperature (soldering, hot tear, cold shut etc.,), velocity (erosion, die flash, turbulence), pressure (blow holes, air entrapment), and solidification (shrinkage porosity, non-fill).

Considering the specifications requirements of the components, an optimum feeding system needs to be developed along with thermal balancing in dies to produce robust castings. Real-time process control of parameters needs to be introduced in the dies to identify deviation from the original setup. Die life enhancement methods, including heat treatment of inserts, maintenance standards of die, surface treatment of inserts, optimised cooling systems, etc., need to evolve to meet the traditional stamping tools output.

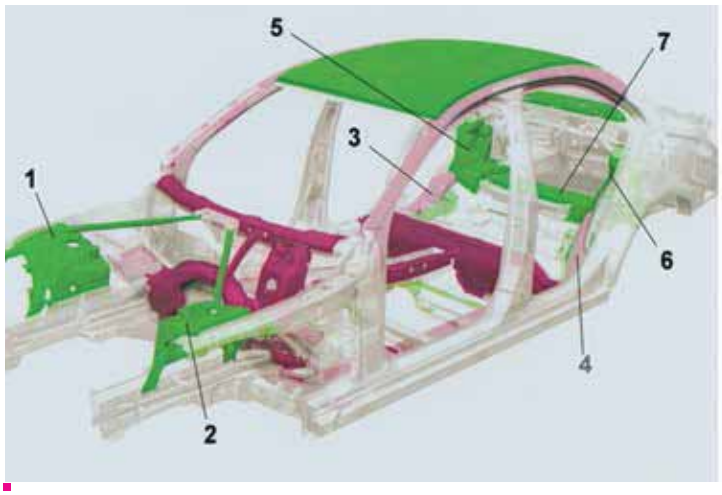


Figure 1: Aluminum structural castings in the body-in-white of the new C-Class: suspension strut consoles (1+2), rear side members (3+4), mountings for shock absorbers (5+6), and rear axle cross-member (7) (Graphics: Daimler AG)

The critical specifications of the structural components would include the mechanical properties of the casting such as tensile strength (>180MPa), yield strength (>120 MPa) and elongation at break (>5-10%). High demands will also be placed on the absence of defects in the casting, which would require high vacuum to ensure good microstructures, squeeze adoption to eliminate shrinkage porosity and good gating system as well as thermal balancing to eliminate cold shuts, end non-filling, peeling as well as soldering related defects. Special requirements also apply to the microstructural and surface quality of the parts. Also, warpage is unavoidable with large- and thin-walled components due to internal stress resulting from the casting process and further exacerbated by heat treatment, which needs to be straightened by the necessary process.

Rise to meet the challenge

Therefore, electric drive technology will require highly complex aluminium components to complete fully integrated EV modules, internal transmission parts, housing structures for power electronics, electric motor housings, energy recovery components and fuel cell stacks, all of which will offer opportunities to foundries. Thereby, die-casting will play a pivotal role in the development of EVs. However, the industry will need to rise to meet the challenges posed by the new technology.

About the Author

Dr. Arunvinay Prabakaran is the Technical Director of Dietech India Pvt. Ltd. He graduated in Metallurgical Engineering from PSG College of Technology, Coimbatore, with first class with distinction in 2011. He did his PhD research in Materials Science under the supervision of Prof. Nicole Grobert in Nanomaterials by Design Group in the Department of Materials, Oxford University. After completing his PhD, he started his professional career as Assistant Technical Director at Dietech India Pvt Ltd. under the guidance of his father who is well regarded in the field of aluminium die casting.

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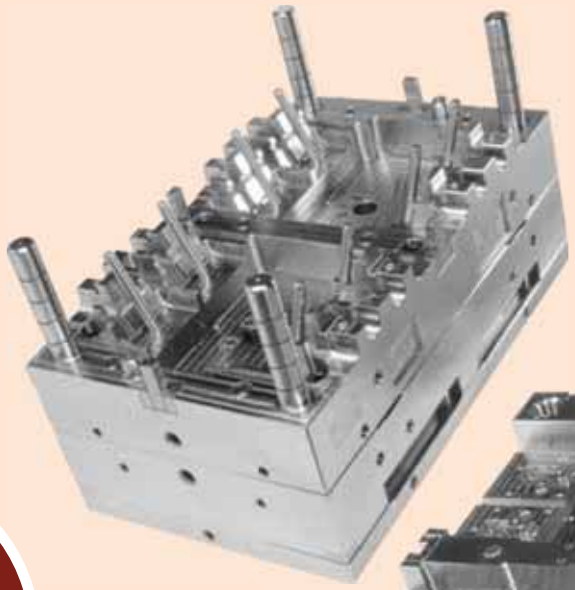

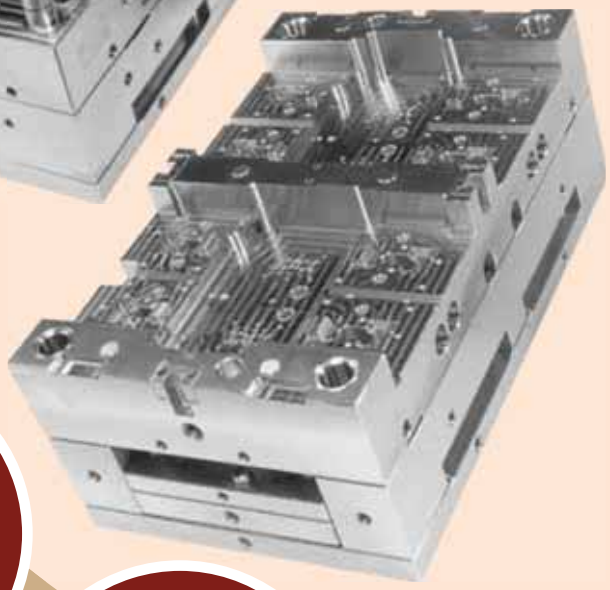

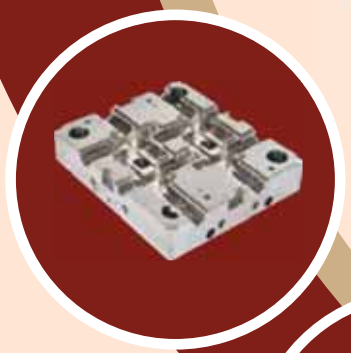

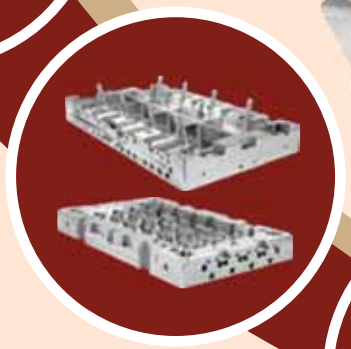

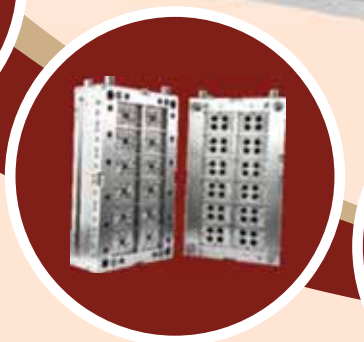

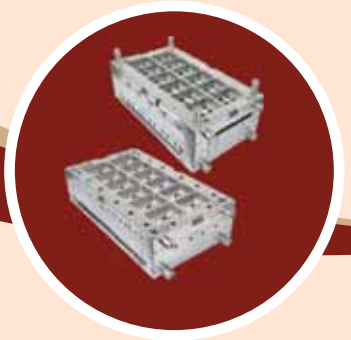

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Machine tools as unique as you

'Standing out from the crowd' is an idea we're all familiar with. But differentiation is a particular challenge for manufacturers, as an unpredictable future drives them to explore new markets, which means producing unfamiliar components from the toughest workpiece materials. Here, James Thorpe, Global Product Manager, Sandvik Coromant, the global leader in metal cutting, explains why customised tooling is the way forward.

The CoroDrill® 860 with -GM geometry is designed for all applications where productivity and hole quality are critical.

Custom manufacturing — the process of designing, engineering, and producing goods based on a customer's exclusive specifications — poses unique challenges for manufacturers. With high volume manufacturing, the goal of the machine shop is to make thousands — or millions — of products at a low cost per unit. Design and manufacturing practices allow companies to deliver goods at prices acceptable to consumers, with a small profit margin-per-unit that multiplies across the whole manufacturing run.

But it's a different story with built-to-order (BTO) one-off parts, or shorter production runs. The operator must adapt the cutting data and choice of tool to guarantee quality and productivity and ensure that the aforementioned price points are met. These parameters should be implemented quickly, to produce a product type the operator may never have worked with before. Furthermore, the process may entail machining tough workpiece materials like hardened steels, unalloyed steels or heat resistant super alloys (HRSA).

This is enough of a challenge for machine shops that are used to manufacturing a variety of bespoke products, from different tough materials, on a day-to-day basis. But now, there is a need for other manufacturers to become proactive. As the continued COVID-19 pandemic has unpredictable effects on the industry, particularly in relation to supply and demand, manufacturers are being encouraged to explore new revenue opportunities, vendor bases and products.

Machining Mantra

A recent 'Make UK' report revealed that it will take until 2022 for UK manufacturing to recover to pre COVID-19 levels, potentially costing £35.7 billion in Gross Added Value this year alone. The report also examined the world's most established manufacturing nations, including the US and Germany. Make UK's findings reiterate that manufacturers must diversify their customer bases to help achieve growth, maintain demand and avoid over reliance on any one specific market or customer.

So, machine shops, which once specialised in a certain area of production, are opening their CNC lathes and mills to a wider variety of tough and challenging materials, with minimised changeovers between production batches. This equates to new parts, tooling geometries and specifications; and operators require real-time adaptable control and data systems to match.

It is also likely that off-the-shelf tools will not always be equipped to deliver the best results. Instead, manufacturers should consider custom tooling solutions to continued product quality. But how can they do so quickly and profitably?

Why customise?

First, let's examine what goes into customising a drill and why it's important. The drill's flute geometry, core, cutting edges and chamfers are all intrinsically linked to end results, like hole quality, productivity and tool wear; and operational factors like the levels of cutting force and torque that can be applied to the drill.

For Sandvik Coromant's tooling specialists, the design of the drill is everything. This is particularly evident in its optimised range of solid carbide drills, with enhanced designs that include advanced optimised point and flute geometry, reinforced core and corner chamfers, edge preparation to remove cutting-edge micro defects, and a double margin to enhance drilling stability.

A good example is the CoroDrill® 860 with -GM geometry. This drill is especially popular among general engineering and mix-production manufacturers, as it's designed for all applications where productivity and hole quality are critical. The CD860-GM is also used in aerospace, oil and gas, nuclear and renewable power industries.

Its optimised design is also proven in automotive production, including the drilling of engine blocks, casings, flanges and manifolds. In Korea, an automotive manufacturer used the CoroDrill 860-GM to drill through holes for automotive transmission connectors.

A competitor's drill produced 200 components, 1600 holes in total with a cutting speed (Vc) of 80m/min (3102 RPM) and cutting feed (Vf) of 381 mm/min. The CoroDrill 860-GM, meanwhile, produced 2300 components (18400 holes) with a Vc of 100m/min (3878 RPM) and Vf of 814 mm/min.

The result was a significantly improved tool life of 1150% and shows the importance of combining drill design and cutting data in ways that yield optimal performance.

Going the extra mile

But what if a machine shop needs extra performance from its tooling solution that standard available options can't match? Most operators will have been in a position where a shorter drill, or different diameter, would have yielded better results.

Then this is where tool customisation comes into play which, thanks to modern technology, can entail customised existing standard tools or developing a new one from scratch. In this case, 'modern technology' refers to Sandvik Coromant's Tailor Made, an online tool that allows users to specify tailor-made tooling according to their own specific part manufacturing needs.

In short, users can login and enter their own configurations into the software, which might entail customising an existing drill — like the CoroDrill 860-GM, for instance. Let's say they want an 18 mm diameter, 36 mm usable length and Weldon shank. All of these parameters can be added, giving the user freedom to specify their own dimensions and requirements. The software can also recommend parameters, like drill length.

The Tailor Made resource is an example of how engineers and plant managers are increasingly turning to online tools to gain real-life advantages. Customised tooling is especially useful when machining components with many holes and many applications, like automotive engine blocks.

There are also time advantages, as the end user doesn't need to sit around waiting for a quotation. Indeed, Tailor Made can be accessed twenty-four-seven; an example of how manufacturers are increasingly going online to communicate.

With suppliers. According to research by Sana, 19% of manufacturers now buy at least 90% of their products online.

An advantage, here, is a faster turnaround. This is especially useful when manufacturers must quickly adapt to new orders for BTO or one-off parts, without losing time or quality.

Just a click away

However, the most important advantages of customised tool design relate to machining and performance. Take, for instance, one manufacturer who sought to achieve productivity gains on one of its product lines. The customer had been using two tools to produce a feature, specifically a hole and countersink for an M10 fine thread bolt. The manufactured components had 45 holes, and up-to 90 holes in some cases.

With Sandvik Coromant's Tailor Made online tool, users can specify tooling according to their own manufacturing needs.

The customer's standard solution, a step drill with the drill and countersink combined, had proven unsuitable. This was caused by the geometry of the feature and that the two existing tools would not produce a large enough countersink.

Instead, by using Sandvik Coromant's Tailor Made, the customer was able go online and design a new tool. Within a few minutes, the software generated a 2D DXF file, and also a 3D rendering, along with the price and lead time. The customer could also see that a couple of slight changes were required within the tool's geometry.

This took only a few moments, and the tool was re-submitted and returned promptly with updated models and drawings. A few weeks later, the solution was delivered to the customer and a new tool was then implemented into its manufacturing procedure.

The customer said it was very impressed by the how easy it was to create a new solution, and how quickly the Tailor Made returned the results. In addition, the new cycle time achieved with this process, achieved with Tailor Made, was measured against the old. It was found that, by going online, the customer had reduced its cycle time by 10%.

Manufacturers can build on this performance further with other online tools, like Sandvik Coromant's CoroPlus® Tool Guide, which allows users to calculate the optimal cutting data for their requirements, and match this to the right tool.

In addition, these online tools cover product groups within all areas of metalworking: turning, milling, and hole making, and are all available for customisation. The advantages for manufacturers are two-fold. Firstly, it helps them adapt quickly to manufacturing — perhaps unfamiliar — one-off or BTO parts. Secondly, it can help manufacturers manage the practicalities of diversification, such as running a greater variety of tough materials or data through their CNC machines from one day to the next.

With online tools, like Sandvik Coromant's Tailor Made, 'standing out from the crowd' can be not just an idea, but a solution for manufacturers to diversify and grasp new opportunities.

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