

# TAGMA TIMES

NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

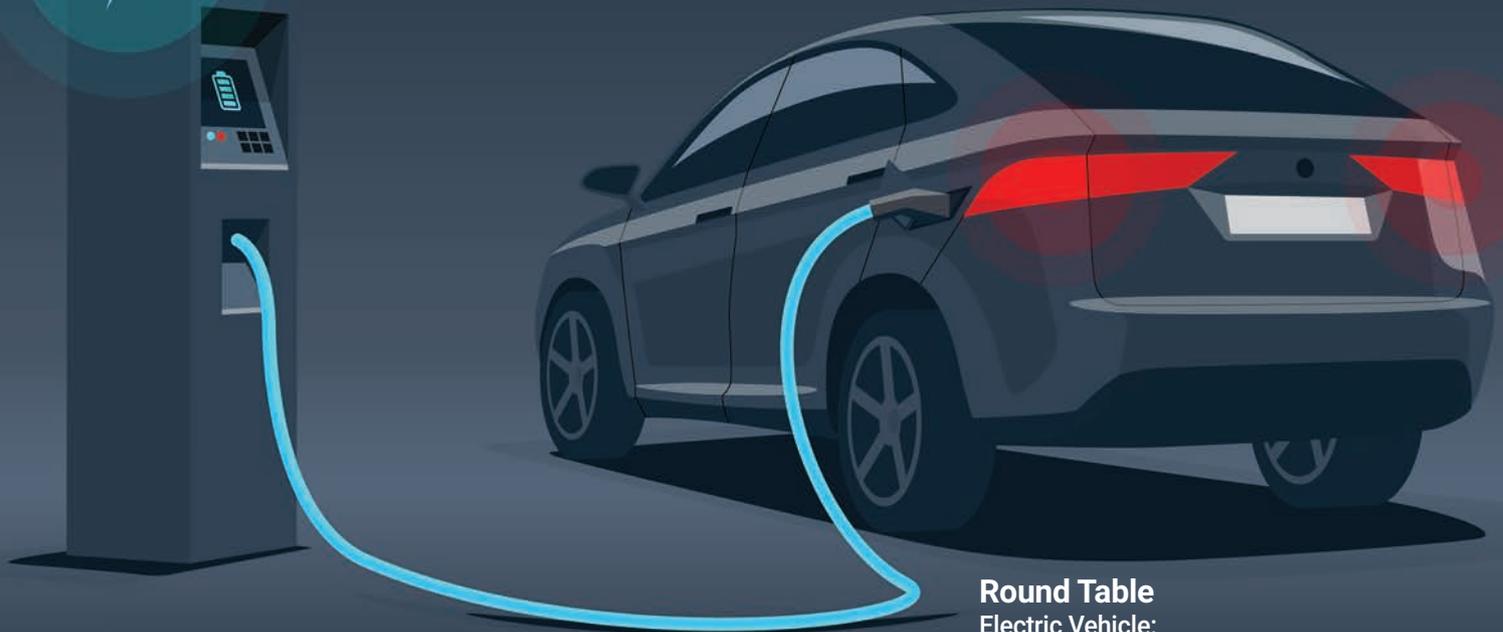
Volume: XXV / No. 09

(Private Circulation for Members Only)

May 2019

Electric Vehicles in India:

## Implication for Tool & Gauge Industry



### Round Table

Electric Vehicle:  
Threat or Opportunity?

### Leaders Speak

Deelip Menezes,  
Managing Director, 3D Systems India

Gourav Ray,  
Senior Director South Asia, GE Additive

### Case Study

Audi Toolmaking Steps  
On The Gas With WORKNC



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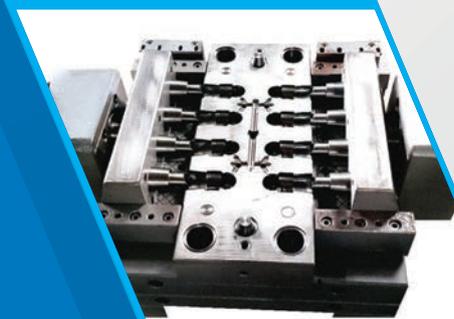
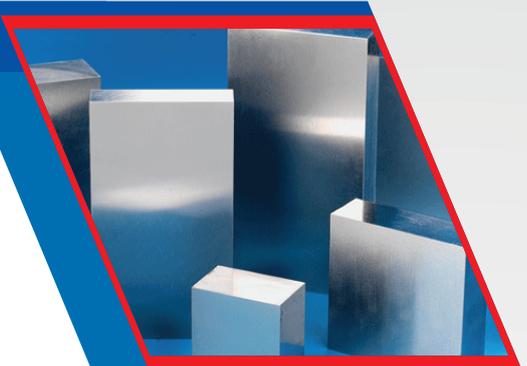


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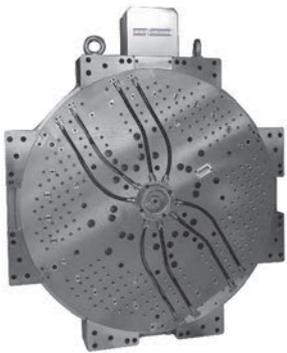
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# PRESIDENT'S MESSAGE



It's been more than 1.5 years that we revamped the TAGMA Times with a dream to keep you all, tool makers, updated with the latest happenings in the industry, provide you views from the domain experts and keep you abreast with the latest trends and technologies in the industry.

With every passing months we are trying our best to improve the TAGMA Times with the most relevant information that impacts our industry.

This month we are talking about the most trending industry, a mega trend that is going to shape the future of our business- Electric Vehicle! Electric vehicle is set to be the biggest disruptor in automotive industry. All the automotive giants are investing heavily on R&D of EVs. Governments, world over are formulating the policies to push the adoption of Electric cars. With such attention and push towards EVs, it is bound to impact the Tier-I and Tier-II suppliers such as component manufacturers, tool makers, machine tool builders and material suppliers. In such scenario, what should tool makers do?

The May edition of TAGMA Times answers all the questions you have in your mind about the emergence of EVs. While the cover story focuses on market outlook, policy frame work and implications for tool makers, the 'Round Table' highlights what various stake holders such as OEMs, Tier-I suppliers and tool makers think about the EVs.

We have also got two 3D printing industry leaders talking about the latest developments in the field of additive manufacturing, benefits for tool makers and future outlook. The May edition also covers some technical articles and customer case studies.

Please go through the magazine and make the most of it. I would also urge you all to have active participation in the outcome of magazine. You can suggest us what you want to read, we will do an in-depth analysis on the topics and come up with articles that will help you have a better understanding of the future dynamics of the industry and assist you in taking well informed business decisions. Share your success stories and let others get inspired by your journey.

**D. K. Sharma**  
President

# PEAK PERFORMANCE WHEN IT MATTERS



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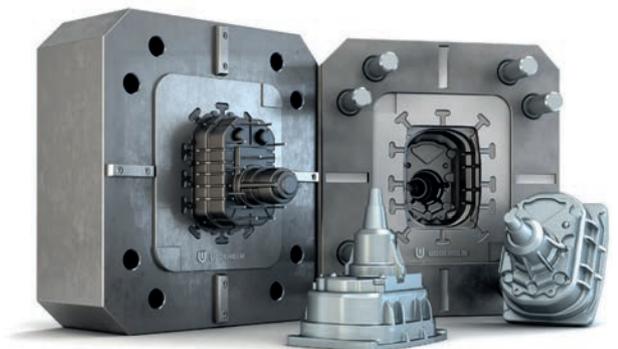
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## Being e-Ready

**F**ew days ago, when Germany opened its first-ever 'electric highway', it took the electrification of mobility to next level. A 6-mile stretch of "eHighway" will charge-up hybrid trucks via overhead cables. It uses 670-volt direct-current overhead cables which let electric trucks draw down power and recharge their batteries on the go.

With such developments and continuous announcement from automotive OEMs regarding the investment towards Electric Vehicles (EVs), it can be comfortably assumed that EVs are here to stay. According to International Energy Agency, EVs will grow from 3 million now to 125 million by 2030.

What does it mean for component suppliers? While an electric car consists of some 200 parts, there are more than 1,000 parts in gasoline or diesel vehicles. This means, the component demand from automotive industry might reduce or there might be a shift in demand.

Time will tell how it will impact the supplier industry, but one thing is clear that there will be some serious business disruption. Tool suppliers, need to be abreast with these changes. They must align themselves, their strategies, technology adoption and skill development according to the changes happening in the automotive industry.

Also, it might be the right time to simultaneously develop skills to serve the other booming industries such as aerospace, consumer good, infrastructure, electronics, among others.

Share your thought on what you feel about the emergence of EVs.

Happy Reading!

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## ACMA-SIAM Report outlines the Digital Transformation Roadmap for India's Automotive Industry

**AUTOMOTIVE** Component Manufacturers Association of India (ACMA), the apex body of the Auto Component Industry in India together with Society of Indian Automobile Manufacturers (SIAM), the apex body of automobile manufacturers in India released the findings of the study 'Digital Transformation Roadmap for India's Automotive Industry', by A.T. Kearney a leading global management consulting firm. The study focusses on developing a transformational

Kearney to launch "first of its kind" industry level Digital Transformation Roadmap. This is the first step towards a globally competitive industry."

Commenting on the findings of the study, Ram Venkataramani said, "The disruptive changes facing the automotive sector, accompanied by, shorter product life-cycles and rise of electric content, are forcing the auto components industry to become agile and digitise.

### Some of the key highlights from the report are:

- ▶ Organisations should start with the development of a clear digital roadmap relevant to their long-term strategy, budget allocation as well as appointing a dedicated digital team in place responsible for end-to-end implementation of digital initiatives.
- ▶ In terms of technologies to adopt, the industry in short term can start with the implementation of big data and advanced analytics for supply chain planning, IoT for connected factory, workforce training through AR/VR platforms, analytics, apps and APIs to improve customer engagement and 3D printing, AR and VR for rapid prototyping.
- ▶ To make the digital transformation successful, the organisations will need to develop technology expertise, deploy internal capabilities as well as update its business processes to align with new technologies.
- ▶ Industry bodies ACMA and SIAM will need to drive standardisation, initiate industrywide blockchain network, launch pilots in collaboration with other industries as well as create a digital knowledge management platform and a centre of excellence to conduct digital benchmarking and share best practices among the industry.
- ▶ The industry will also seek government's support in skill development through upgradation and adoption of relevant skill development institutes, setting up digital infrastructure, ensuring connectivity and data sharing as well as regulating the finance and insurance industry.



roadmap to adopt digital technologies in the automotive industry across the value chain, products and the industry ecosystem.

The report identifies 11 technologies relevant to the automotive industry in terms of their applications and the scale of impact on the automotive value chain and products. The report also presents specific short, mid and long-term action points for companies, industry bodies, government as well as the entire automotive ecosystem.

On the occasion, Rajan Wadhwa, President, SIAM, President – Automotive Sector, Mahindra & Mahindra Limited said, "To continue our effort towards global prominence, SIAM and ACMA partnered with A.T.

The study recommendations will help the sector stay relevant to our customer and maintain our competitiveness."

Manish Mathur, Partner and Asia Pacific Leader, Automotive practice said, "This was a bold and strategic initiative taken at the industry level to ensure there is a widespread common understanding of emerging digital technologies and the opportunities they present."

The study highlights global best practices and relevant case studies to help develop a cohesive roadmap that charts out clear action items for individual companies, industry bodies, associated industries and government bodies.

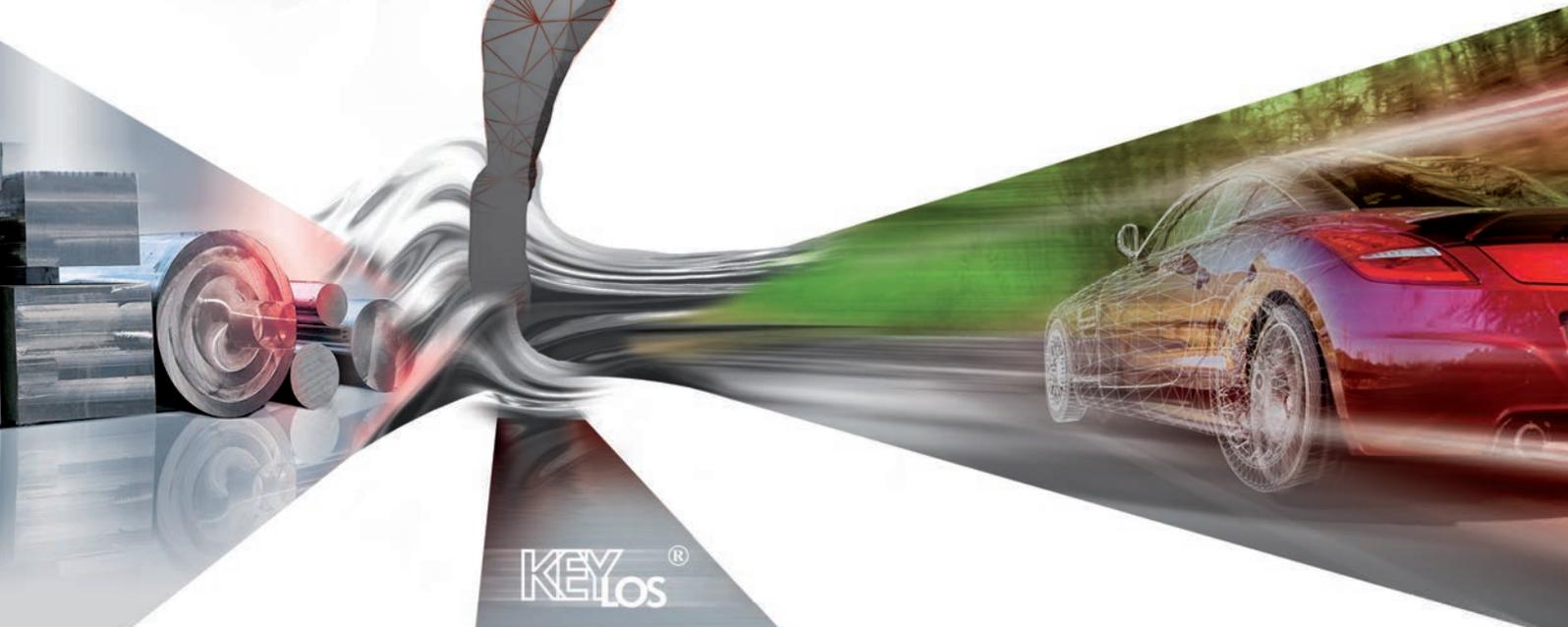


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## MG Motor India commences commercial production of Hector from Gujarat

**THE first Made in India internet car rolls out from its all-new assembly line**

MG (Morris Garages) Motor India today rolled out the first production version of Hector from its state-of-the-art facility at Halol in Gujarat. Hector, MG's first car in India, has gone into commercial production after one million kilometres of testing in diverse road and climatic conditions across India. With extensive localisation, more than 300+ India specific changes have been carried out in the MG Hector to suit the customer preferences and road conditions.

MG Motor India will begin shipments of the Hector SUV within the next few weeks to its widespread network of 65 showrooms across 50 cities. The Hector SUV will make its global debut on 15th May and pre-orders will begin in the month of June.

"We are proud to be rolling out the first Made in India, feature-rich internet car, the MG Hector, from our all-new assembly line in Gujarat. Adopting the highest quality global manufacturing standards, the Hector has been specially customised to suit Indian customer preferences and road conditions. The MG Hector is poised to become a new benchmark in SUVs," said Rajeev Chaba, President & Managing Director, MG Motor India.

MG India has so far invested INR 2,200

crores in its Gujarat manufacturing plant to roll out the much-awaited MG Hector. The company has set up new assembly line, new press shop, new body shop, new parts distribution centre, testing track and a state-of-the-art training facility in the plant,



within a short span of 18 months. MG's Halol plant currently has a production capacity of 80,000 units per annum and has the provision to increase the capacity going forward depending upon the requirement. The plant operates conforming to world-class manufacturing standards following production parameters beyond the current norm, with the vehicles undergoing various stringent quality tests. Further underlining its commitment to creating products specifically for India, the carmaker had also set up a captive vendor park at its

plant. The carmaker's technologically advanced plant in Gujarat deploys advanced robotic spot welding, robotic roller hemming and robotic brazing facilities to achieve superior weld quality and dimensional consistency. The paint shop uses robotic application

at all stages of coating to achieve superior paint finish quality and colour harmony.

The new assembly line operates with the help of advanced Automated Guided Vehicles (AGV) for various assembly processes. A first in industry, touchscreen pads are available at each assembly work station, enabling MG employees to connect and alert the system centrally to avoid errors, following the "first time right build" philosophy.

## Electric bike co Okinawa to set up ₹ 200 crore plant in Rajasthan

**GURGAON**-based electric two-wheeler manufacturer Okinawa Autotech is investing Rs 200 crore to set up a second manufacturing plant in Rajasthan. The company has acquired land near Bhiwadi for the new plant, which will have a total manufacturing capacity of one million units. The first

phase of the plant will be commissioned towards the beginning of 2020-21. The plant will be funded through a mix of debt and internal accruals, according to the company.

"We expect the market for electric two-wheelers and three-wheelers to grow to

7-8 million units by 2022. We want to gain leadership position in the electric two-wheeler segment and will be ready with the required products, technology and capacity for the same," said Jeetender Sharma, founder, Okinawa Autotech. The company recently received certification from

the Automotive Research Association of India (ARAI) for two products – Okinawa I-Praise and Okinawa Ridge+ - for being compliant to FAME-II (Faster Adoption and Manufacture of Hybrid and Electric Vehicles) standards.

Source: ET Auto



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## ZF reveals electric truck prototype developed for the Japanese market

- ▶▶ The prototype is a fully electric truck of 5-tons Gross Vehicle Weight (GVW), which is the most commonly used size in the Japanese market
- ▶▶ ZF's system enables easy conversion of existing series production models into an electric truck
- ▶▶ The prototype balances driving performance, low noise output, local zero emissions and energy efficiency

ZF Japan Co., Ltd. today announced that the company has developed an electric light commercial vehicle specifically for the Japanese market. Driven by its slogan, "ZF electrifies everything," the company has been electrifying a wide range of systems not only for passenger cars and commercial vehicles but also for industrial machines. This prototype vehicle has been developed by ZF Japan's engineering team at their Tech Center in Yokohama, collaborating with a team in ZF HQ in Germany in order to satisfy Japan's unique requirements. The "CeTrax lite," developed based on ZF's electric drive for passenger vehicles, is an electric drive for light commercial vehicles (LCVs) with a GTW of up to 7.5 tons. Through ZF's systematic approach of integrating an electric motor, power electronics,

transmission and cooling system, the company achieved a compact and light driveline unit with a total weight of 120kg.

"The beauty of our new E-drive module is that it can be installed in existing internal combustion engine (ICE)



models and therefore be converted to a fully electric vehicle without major modifications to the chassis and axles. This is thanks to our 'plug-and-drive' concept. The system is proven in terms of durability and cost efficiency as the electric drive system for passenger cars is already in series production in the market," said Robert T. Seidler, head of R&D at ZF Japan.

An asynchronous motor equipped with the prototype truck generates 150kW and 380Nm ensuring the same level of performance as ICEs in this class while also realising local zero emissions and low noise output. ZF believes this electric truck definitively satisfies the needs of Japanese LCV manufacturers and fleet operators. These needs include delivery to 24 hour stores in residential areas both in the early morning or late at night, frequent stop-and-go style driving to fill drinks in vending machines, parcel home deliveries, and so on. The driveline has enough power, low noise output, and energy efficiency to make the CeTrax lite an invaluable asset to Japanese customers.

"The new prototype is made by replacing the conventional ICE driveline of the most commonly used LCVs in Japan with ZF's CeTrax lite, that is to say, trucks with a 5-ton GVW and load capacity of 2 tons. Starting from this vehicle, ZF will continue to move towards electrification in Japan, as well as globally, while endeavouring to meet the specific requirements of commercial vehicle manufacturers and fleet operators," said Seidler.

## Toyota to transfer electronic component operations to DENSO

**TOYOTA** Motor Corporation (Toyota) and DENSO Corporation (DENSO) announced that they have made a formal decision and reached agreement toward concluding a contract to transfer core electronic component operations to DENSO. In June 2018, both companies reached a basic agreement to consolidate the core electronic component operations of both Toyota and DENSO within DENSO, and began detailed studies. Currently, Toyota's electronic

component operations are conducted by both Toyota and DENSO.

In the future, these development functions and production operations will be consolidated within DENSO.

By consolidating these operations within DENSO, which has a high level of expertise in the field of electronic components, a speedy and competitive development and production structure will

be established. In doing so, the aim is to also maximise resource utilisation, such as by shifting resources

the value of future mobility, thus strengthening the competitiveness of the Toyota Group overall.



created by eliminating duplicate operations within the Toyota Group to new domains that will increase

Initial discussions focused on consolidation of production operations by the end of 2019, and development functions from 2022, but in order to ensure a smooth transfer and to create the new structure faster, both companies agreed to consolidate both development and production in April 2020.



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## India manufacturing PMI loses growth momentum in March

**INDIAN** manufacturing sector experienced a slow down in March with softer upturn in sales dragging output growth to a six-month low, accompanied by subdued inflationary pressures, with rates of increase in input costs and output charges below their respective long-run averages.

The Nikkei India Manufacturing Purchasing Managers Index, or PMI, registered 52.6 in March. Although above the line of expansion, fell from 54.3 in February to a six-month low. Readings above 50 point to expansion, while those below 50 indicate contraction.

There was a widespread slowdown in growth where softer increases were



registered for new orders, production, input buying and employment. The increase in new orders was the slowest in six months, competitive conditions and the upcoming elections reportedly curbing the

upturn. However, firms indicated that strong underlying demand, successful advertising and the receipt of bulk orders underpinned sales growth.

“Although global headwinds

and a general slowdown in trade present some concerns for the future health of Indian manufacturers’ order books, so far companies have been able to weather the storm and secure healthy inflows of new work from abroad,” said Pollyanna De Lima, Principal Economist at IHS Markit which compiles the survey.

On the other hand, “We expect stock-building efforts in the coming months and robust business sentiment to support output growth and further lift payroll numbers,” she added. “Expansionary public policies such as fiscal stimulus and interest rate reduction should also assist the manufacturing sector in gaining some traction in the near term.”

## Samsung to ramp up operation in India, invest ₹ 2,500 cr

**SAMSUNG** is at least one company that is aggressive about India and is set to expand its manufacturing capabilities in the country. Already the South Korean behemoth has established the largest mobile phone making unit near the capital Delhi.



Now, there are two component manufacturing companies of the group, Samsung Display Co and Samsung SDI India planning to set up shop with an investment of ₹ 2,500 crore. While the former is into

manufacturing displays as the name suggests, the latter makes batteries. Once these factories get going, they can supply these smartphone components to the other manufacturers in India as well.

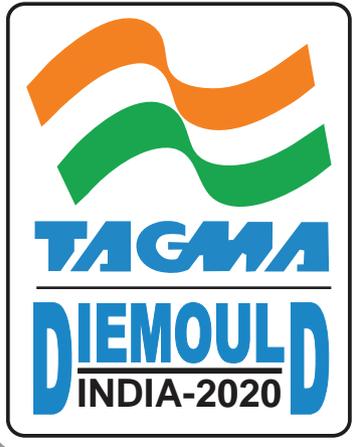
Samsung is also pitching to the government for export incentives so that it can even export components from India. Samsung Display has already signed a memorandum of understanding with the Uttar Pradesh government for a ₹ 1,500-crore plant for manufacturing phone display to be operational by next year April. The plant will come up in Noida, the executives said.

## Xiaomi set to unveil 7<sup>th</sup> manufacturing facility in India

**IN** a bid to accelerate its manufacturing operations in India, Xiaomi has confirmed the unveiling of a new unit which takes its total number of facilities to seven in the country, according to Business Today.

As part of its Make in India programme, the China-based company has collaborated with Chennai-based Flex to roll out the new 1mn sq. ft facility. “We are proud to announce that we’ll be officially unveiling a new manufacturing plant in India in collaboration with Flex. We now have 7 smartphone manufacturing plants across 4 campuses in India with the recent one spanning 1 million square feet in Sriperumbudur,” said Manu Kumar Jain, Managing Director, Xiaomi India.

With its plan to increase manufacturing in India made public in correlation with the launch of Redmi Go smartphone and Mi-Pay service in the nation, Xiaomi now has approximately 20,000 employees in India with 95% being women.



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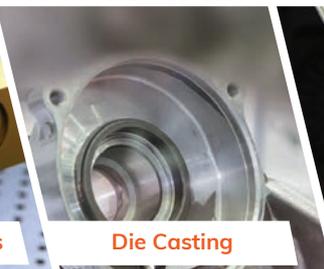
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Electric Vehicles in India:

# Implication for Tool & Gauge Industry

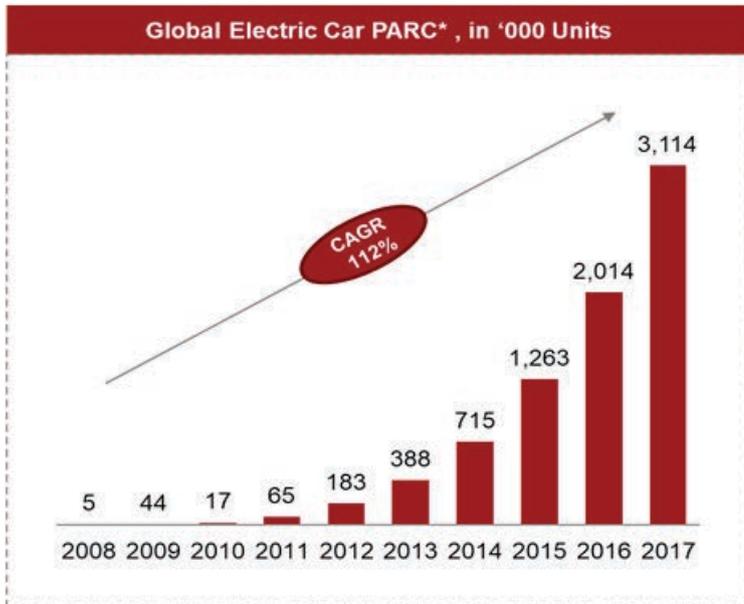


Driven by powerful environmental, macro-economic and technological factors, the global transportation sector is undergoing a historical period of transition. New business models like Mobility as a Service and the increasing economic viability of technologies like Electric Vehicles (EVs) will soon reshape how we travel.

# In Focus

## I. Introduction: Global Age of EVs

According to research by the International Energy Agency (IEA), the global EV parc has increased from just five thousand vehicles in 2008 to more than



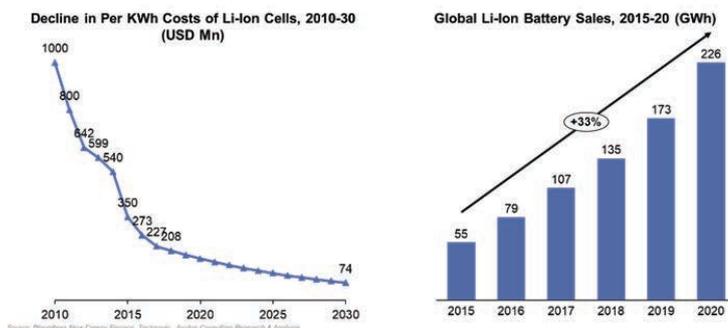
\* Includes Battery and Plug-in Hybrid Electric Vehicles  
Source: IEA EV Outlook Report 2017, Avalon Consulting Research and Analysis

three million by 2017. This has been driven by key underlying trends including mounting environmental concerns, decreasing Lithium-ion battery prices and increasing availability of charging infrastructure. All this has led experts to predict a rapid growth in EV adoption in the next decade – current year on year growth projections range from 27% to 33% until 2030.

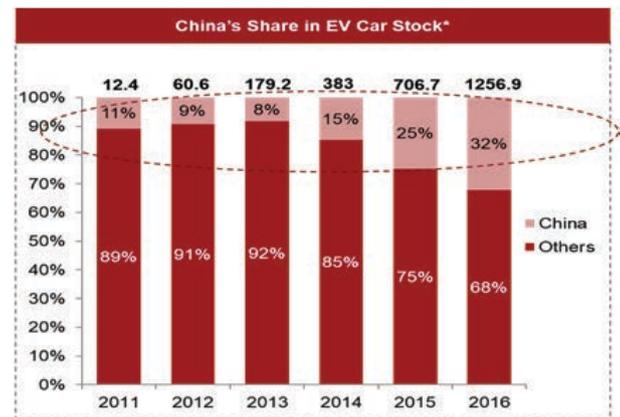
By many metrics, China is leading the world's EV revolution. China's share of the global EV parc grew to 32% in 2016, overtaking the US for the first time.

**Long term cost drivers strongly favour EVs – Li-Ion cell prices will more than half by 2030 and global battery sales are growing 30+% y-o-y**

Li-Ion Trends



Source: Bloomberg New Energy Finance, Technavio, Avalon Consulting Research and Analysis



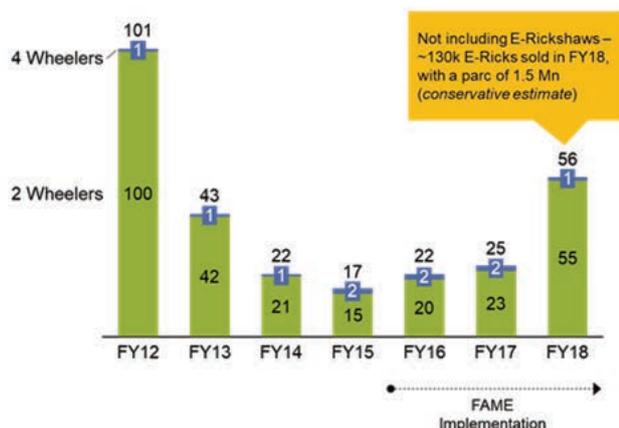
\* Note: Includes Battery and Plug-in Hybrid Electric Vehicles  
Source: IEA Global EV Outlook 2017, Avalon Consulting Research and Analysis

Its share was only 11% in 2011. Private investment is pouring into China from major auto manufacturers like Daimler, BYD, Honda, Toyota and Ford, all of whom are actively exploring how to capitalize on China's expanding market. Several lessons can be drawn from the China story, including its recent transition away from subsidies towards a dual-credit scheme that is expected to be launched in 2019. The dual-credit scheme rewards or penalises carmakers with positive or negative credits based on the car model's fuel consumption and driving range. For example, if an automaker does not produce any EV, it will need to purchase EV credits from an EV maker to meet the government's goal. Those with surplus credits can sell them in the market. EV models with longer electric range will receive more credits. So, the extra cost from the subsidy phase-out can be offset by more credits.

## II. India's Policy and Challenges

In contrast, the 'official' India EV story has been underwhelming so far. Absence of charging infrastructure, inconsistent government support and early product failures have all resulted in stagnant growth in recent years for the conventional vehicles. However, there has been unheralded growth in the electric 3-wheeler rickshaws, unofficial estimates put the number sold at 130,000 (three times the 2 and 4 wheeler volumes!) with an installed base of ~1.5 mn (half the world's population of EVs!). Unfortunately, India would not like to acknowledge this fact as these vehicles are largely unregistered (though many of them operate under our noses in large cities like Delhi!) and recognising them will mean admitting our administrative failures (and acknowledging wide spread corruption at the grassroots level!). Almost all of these electric rickshaws are screwdriver technology, originated

EV Sales in India by Category, FY12-18 (Unit '000)



Source: Society of Maharashtra Electric Vehicles, Avalon Consulting Research and Analysis

through Chinese imports of CKDs which have since been 'indigenised' through local fabrication with only the motors and some critical components being imported. It has inadvertently opened up a large market for lead acid batteries in India. Maybe it is time for us to take our official status as the country with one of the largest population of EVs.

Our official EV policy on the other hand continues to muddle along. We started off with a bang in 2017 when a clear and ambitious goal of 100% EV adoption by 2030 was officially communicated by the government and the country's leading government think tank, NITI Aayog. SIAM countered this with a research paper stating that this is unlikely before 2047 and (justifiably) will put the significant investments being made to transition to BS VI at risk. Since then there has been a lot of backtracking and the confusion in the policy is evident in the latest FAME 2 policy.

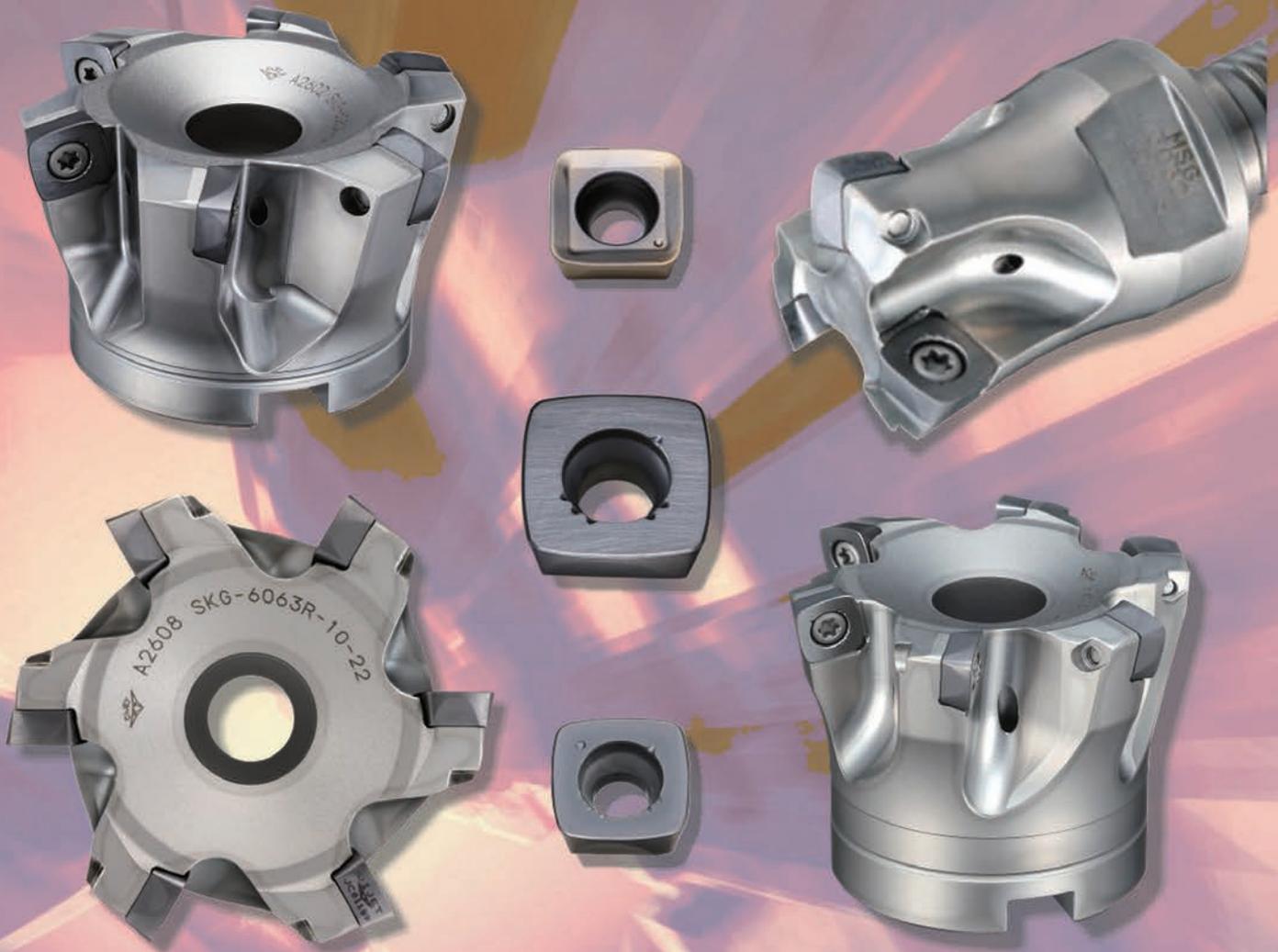
The Government has approved a budget of Rs 10,000 crore for FAME 2, applicable from April 1, 2019 for a period of three years, from 2019 to 2022. But the subsidy will be only applicable on commercial vehicles and public transport along with two-wheelers. The scheme will also offer exemption from road tax and registration charge for hybrids and EVs. However, the benefits of the FAME 2 scheme will be only available on the vehicles powered by lithium-ion batteries or more efficient power source. Additionally, FAME 2 also mentions the development and installation of EV charging infrastructure wherein 2,700 charging stations will be placed at different locations in Tier I as well as other cities in the country. The intention of this is to have at least one charging station in a grid of 3km

x 3km to provide additional convenience to the operators of both commercial and public transport vehicles. These charging stations will be positioned on the highways as well in a distance of 25km.

### FAME 2 has the drafted with the right intentions by:

- ▶▶ officially acknowledging that e-ricks are a critical part of the EV ecosystem in India
- ▶▶ providing subsidy only for Lithium Ion powered vehicles (and not lead acid)
- ▶▶ recognising that we need to have an indigenisation plan in parallel to the growth of the industry which needs to be shaped by policy and we should not repeat the mistakes made with the mobile phone industry where import dependency on China resulted in a booming trade deficit and the lack of strong Indian brands with a cost competitive position
- ▶▶ laying adequate emphasis on public transport (buses and e-ricks) and leveraging demand aggregation through EESL
- ▶▶ focusing on 2 wheelers for driving private vehicle adoption, which will result in the subsidy going a long way in driving volumes
- ▶▶ consciously emphasising battery charging infrastructure and swapping as drivers of growth

However, the devil is in the details. By asking for a minimum level of 50% indigenisation from April 1st 2019 for being eligible for subsidy, the policy has effectively ended subsidy for the industry from this date – there is nobody with this level of indigenisation in the EV industry (the e-ricks are largely unregistered and hence even in the past was not claiming subsidy). By not recognising that the supply ecosystem is not ready and specifying this level of indigenisation from get-go, the policy has effectively killed the organised EV industry till the industry is able to ramp up the indigenisation. One of the largest component in the EV is the Li-ion battery. The fact that there is inadequate capacity for battery pack assembly to meet the needs of the industry has not been considered. Similarly, capability for other key components like motors, powertrain, etc. are yet to be developed of any scale. Given the low volumes of the industry, cost economics and interest and infrastructure among the eco-system players are critical bottlenecks to be addressed as part of any indigenisation journey. Thus, it is logical for the policy to specify such a level of indigenisation from a future date (say April 1st 2020, rather than 2019). This would have given the Indian players the time required to make the adjustments.



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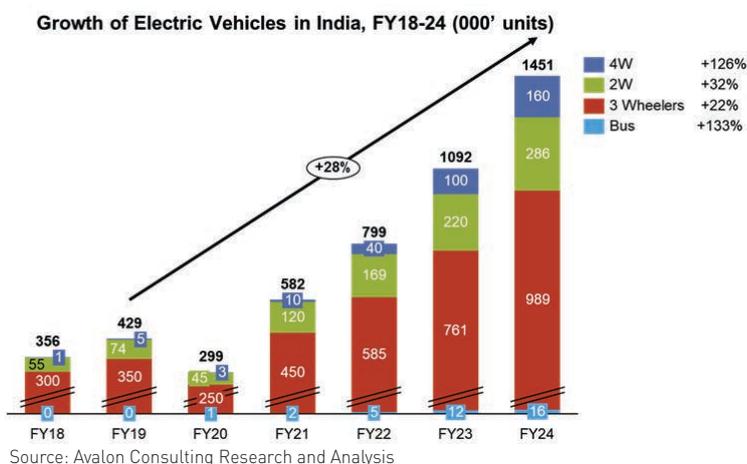
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Industry players are making representations to allow changes to the policy but the outcomes will be known in the next few months. In the meanwhile, one can expect a sharp dip once again in the EV sales in FY20

### III. Implications for India

If both demand aggregation and battery swapping are successfully implemented, we project India reaching EV sales of around 1.5 million vehicles in FY24.

This is an overall Compound Annual Growth Rate (CAGR) of 28% from FY19. Government procurement



and public transport will be the major drivers of this growth, through procurement of vehicles for Government use and 3-wheelers and buses for public transportation. Growth in the 4-wheeler space is likely to be driven first by investments by private fleet operators like Ola and Uber, where higher daily running makes EVs more economically viable. The 2-wheeler space will be largely private ownership and subsidy driven, and will be characterised by a migration from Lead Acid to Lithium-ion batteries and from low speed to high speed vehicles.

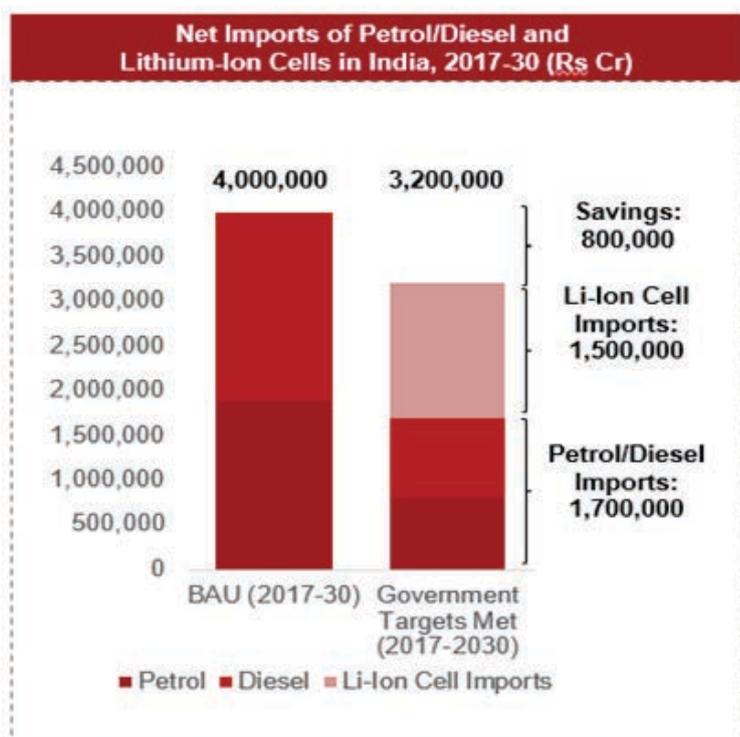
Despite this promising growth, we expect that the originally stated target for full conversion to EVs by 2030 to be very ambitious and are likely to be missed due to the industry and consumers not being ready to adopt rapidly, given the relative economics. Our growth projections suggest that EVs will account for less than 2% of total vehicle sales by 2024. From that position, reaching the government's goal of 100% penetration by 2030 seems far from achievable.

The other key aspect to be noted is that the shift to EV will not necessarily result in a significant reduction in our import dependency. While cumulative oil imports for the automotive industry from 2017-30 in a "Business as Usual" scenario are expected to amount to INR 40 Lakh Cr, India would still have an import bill of INR 15 Lakh Cr for Lithium-ion cells and INR 17 Lakh Cr for oil in case it completes its transition to EVs. This results in a savings of INR 8 Lakh Cr.

While India has a long way to go to achieve its EV ambitions, it is clear that EVs do present a short term high growth opportunity in key segments and will, no doubt be an inevitable disruption in the long-run; one that requires a cohesive strategy at both the government and corporate levels.

### IV. Implications for Tool and Gauge Industry: Time to Re-tool?

Engines and drivetrains are large drivers of the auto components industry. Engine and transmission together account for almost 50% of the total cost of a vehicle. Electric Vehicles would revolutionise this - 149 moving and 24 wearing parts would be replaced by 24 moving and 11 wearing parts in an EV. Over engine and drivetrain, including sub-components, fasteners etc. it is estimated that 2000 parts in an Internal Combustion Engine Vehicle would be replaced by less than 100 in an EV. Additionally, new parts introduced (like battery case



## Battery Electric



**E-Motor Housings**



**Battery Housings**

EV Components: Both are aluminium PDC components manufactured in single shot  
Source: Nemak

(cover, motor casing) would be mostly static and hence require less machining and joining compared to moving parts.

All this has huge implications for the tool and gauge industry. As the number of parts and number of operations in those parts reduce, the requirement of tools would also reduce proportionately. Many these would be aluminium casting dies, sheet metal dies, forging dies as well as machining jigs and

fixtures. Secondly, several of the current customers, particularly small and micro enterprises making small engine and drivetrain components, would need comprehensive overhaul in their business. Several may even go bust.

But on the other hand, EVs would call for more complex single piece constructs, and hence more complex, higher value add tools. The EV revolution is also expected to be accompanied by increasing use of telematics, power electronics etc. which would drive the increasing use of micro-components. Additionally, there would be requirements of plastic, sheet metal and cast components in charging infrastructure as well.

There is thus a need for substantial retooling in the tool and gauge industry. 🌈

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**EVS will have 80% Less Moving Parts**

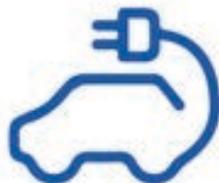


**IC ENGINE**

<b>Moving Parts</b>	<b>Wearing Parts</b>
149	24

**ELECTRIC VEHICLES**

<b>Moving Parts</b>	<b>Wearing Parts</b>
24	11



# 10 Interesting EV facts

1. The first electric car was built in 1884. It was designed and built by Thomas Parker, a London-based innovator in charge of the city's overhead tramways electrification.
2. Ferdinand Porsche, founder of the sports car by the same name, created the Lohner-Porsche Mixte -- the world's first hybrid electric car. The vehicle is powered by electricity stored in a battery and a gas engine.
3. Toyota introduced the first mass-produced hybrid, the Prius in 2000. It became an instant success with celebrities.
4. Up to 80% of the energy in the battery is transferred directly to the vehicle to power up the engine, whereas in case of gasoline-powered vehicles, the number's as low as 14 to 26 at the very most.
5. Electric vehicles don't emit tailpipe pollutants, unlike gasoline-powered cars.
6. The average electric vehicle can travel 160 km per charge
7. According to the Union of Concerned Scientists (UCS) and Environmental Protection Agency (EPA), more carbon emissions are generated in the production of electric cars compared to conventional cars.
8. The electric cars' heavy weight, which is contributed by the batteries, makes them take longer to stop during braking and also keeps the occupants safer during collisions
9. Germany has opened its first-ever "electric highway", which allows hybrid cargo trucks to charge their batteries while they are on the move.
10. China electric car market became the biggest one in 2017. Their EV market grows twice as compare to US (53% growth in 2017).

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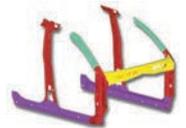


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Gear Box Housing



Motorcycle Engine Components



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# Electric Vehicle: Threat or Opportunity?

**We all know disruption is happening very fast. Automotive industry, the biggest consumer of die mould industry that consumes 70% of tools globally, is going through sea of changes. Electric vehicles, weight reduction and autonomous cars are taking shape faster than expected. Time-to-market for automotive OEMs have come down drastically from years to months. But will this disruption change the course of the industry for better or for worse?**

**E**lectrical Vehicle (EV) market is expected to witness a gigantic transformation in coming years. Experts believe that stricter emission norms, reducing battery prices and increased awareness would ultimately lead towards increased adoption of electric vehicles in India. Government schemes and subsidies are playing a major role in the growth of the market. However, this all will have huge implications in component providers, tooling suppliers and machine tool manufacturers.



## Round Table



**Akshay Kalyanpur,**  
**Director, Sridevi Tools Pvt Ltd**

"The ones who will be really affected by the launch of the EVs would be the component manufacturer not the mould makers. EVs efficiency is also driven by weight so they will have to go for plastics, aesthetics as well as performance plastics (engineering plastics). The motor and batteries are heavy, so to reduce the weight there will be lots of usage of plastics. Hence, plastics injection mould makers will not face any challenges. The emergence of EVs, will also lead to new opportunities for tool makers. For example, manufacturers of plastics that were used under the hood for air filters, engine covers, probably will lose business but can be substituted by the plastics used for covers for battery and battery rack."



**Ashim Sharma,**  
**Partner & Group Head Business Performance Improvement Consulting (Auto, Engg. & Logistics), Nomura Research Institute**

"Electric vehicles contain only 20-25% of the moving parts compared to an equivalent ICE vehicle, hence a big chunk of tooling demand will disappear, especially tooling used in ICE engine and transmission components. However, new opportunities will also arise in the form of motor housings, castings and inserts for batteries etc. Further, the rise in vehicle weight due to the addition of multiple battery modules is likely to be compensated in other places such as the chassis. This will boost the demand for tooling made from lighter materials like aluminum. Usage of electronics is poised to increase; semiconductor content in EVs is up to 10 times more than an equivalent ICE car. Electronic components such as inverters and communication modules employ plastic moulded parts for packaging and assembly. Hence, injection mould manufactures are likely to benefit from the increase in electronic components."

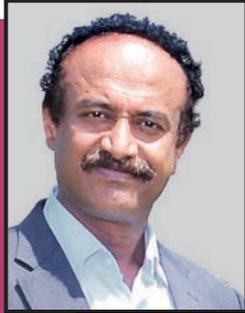


**D. Sundar,**  
**President, Rane (Madras) Limited – Die Casting Division**

Electric vehicles will change the way we as solutions providers and part providers to automotive industry operate. In my opinion, demand for IC engines will reduce, which will also impact the powertrain and transmission manufacturers. Engines will be slowly replaced by the motors, batteries and configuration for other parts will also change. Battery part and motor casing parts configurations and specifications will become complex in the coming days which might be a challenge as well as opportunities for tooling suppliers. The structure itself will be very complex, so high-end dies and tooling will be required in the future.



## Round Table



### **Raju B Ketkale**

**Senior VP & Director - Product Design & Development, Purchase and Quality Assurance Division, Toyota Kirloskar Motor Pvt Ltd**

"India is looking for a vehicle that is safe, clean and green, and hybrid / EV is the answer. Hybrid and electric vehicles demand lighter and high strength component parts. In order to achieve this, more reliable and strong tooling will be mandatory. Lighter and faster vehicles will directly have an impact on the type of raw material used in the component parts. This will call for drastic change in the tooling technology and sudden requirement for new skill may arise. Again, quick adoption to the new technology will be vital."



### **T S Gopalakrishnan,**

**Director, Multiple Special Steel Pvt Ltd**

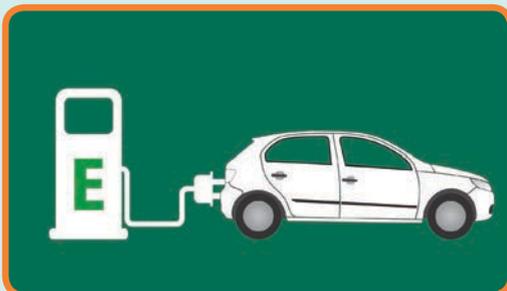
"I would say it's like the survival of the fittest. Those who are ready to embrace change and adapt to the changing scenario will be able to ride the waves. So this calls for new technology adoption for which the government & associations like TAGMA can help by being the interface between the OEM's and the mould makers, trying to understand the problems and difficulties of both the sides and chipping in with the right solutions to resolve them."



### **V Srinivasan,**

**VP - Fine Blanking and Tool Engg, TIDC India**

"There has been a debate of sorts about EVs and its impact on the auto component industry. We are also carefully studying the various developments which are happening and working on our strategies to negate the impact. I personally feel it will open up new set of opportunities to deliver higher order precision parts and we must build capabilities to develop local solutions."



### **Verdict**

Electric vehicles are here to stay and it could be regarded as one of the biggest disruption in automotive industry. Tool suppliers, need to be abreast with these changes. They must align themselves, their strategies, technology adoption, skill development according to the changes happening in the automotive industry. Future of tooling suppliers is very much connected to the automotive industry. The faster you act, the better for you!

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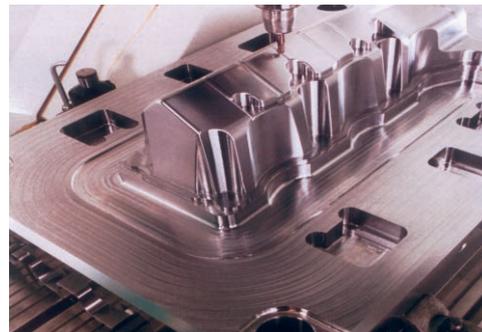
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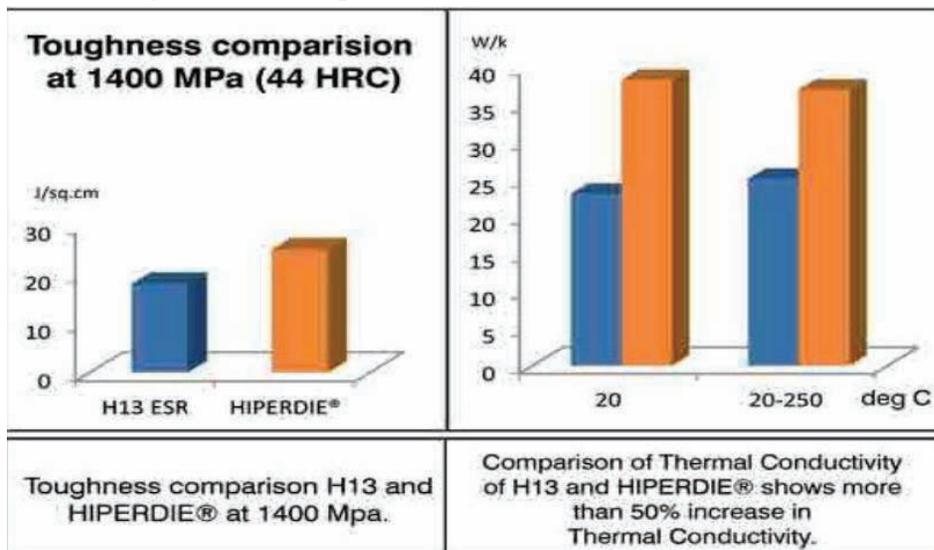
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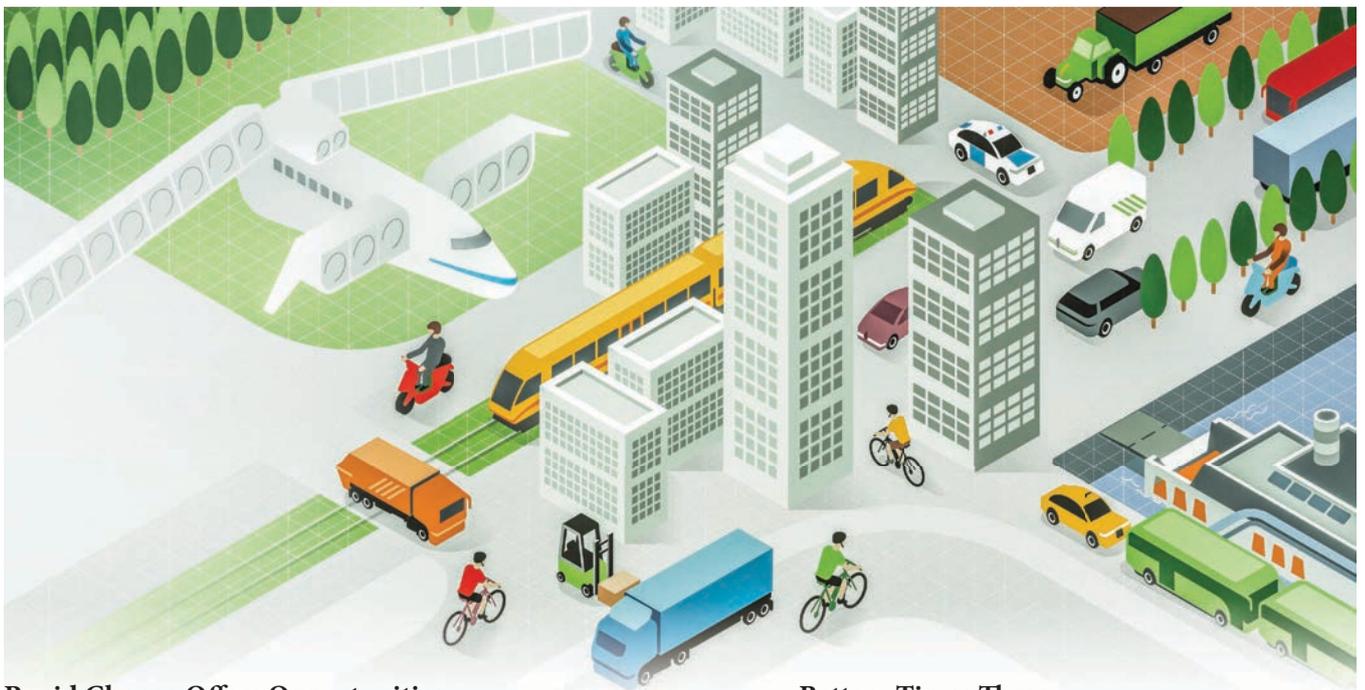
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**Automotive manufacturing is a key future field for TRUMPF. The rate of innovation in this area is high. Alongside the variety of materials used in the vehicle body and power train, the increasing trend toward electric vehicles represents a key field with many new applications.**



## Rapid Change Offers Opportunities

So, the time has come to develop methods of mass production for E- vehicles. The good news is that this accelerated upheaval in drive technology offers real opportunities to newcomers. Over the past 30 years, automakers have clearly shown that the laser is a material processing tool they can use to execute flexible, high-precision steps on the factory floor in next to no time. And many of the key car components—body, interior, lightweight components, brakes, etc.—aren't going anywhere. Even in 2025, electric cars will still need doors, and the carmakers already know how to make them efficiently. But now three new fronts are opening up: batteries, electric drives and high-power electronic systems. EV sales are currently running at about two million a year, and forecasts suggest that will rise to 40 million in just a few years' time. To keep up, many industry players will once again have to rely on laser material processing.

## Battery Times Three

What we loosely refer to as a battery is, in fact, a fairly complex entity. There are actually three components that hold the key to the efficient manufacturing of energy storage devices for electromobility: battery cells, battery modules and battery packs. Lithium-ion battery cells are built up in layers: copper foil and coated aluminium layered together with the electrode foils of lithium metal oxide (cathode) and graphite (anode). Each of the different foils is approximately 100 microns thick, and the easiest way to cut them is with a short-pulse laser. After adding the liquid electrolyte, the next step is to seal the cell with a cap and fit a pressure-relief valve. It is essential that the welds completely seal the cell, but it is equally important that they do not penetrate too deep since this would render the cell useless. So, once again, battery-cell manufacturers turn to the delicate and reliable touch of the laser. Today's

# Expert Blog

market for battery cells is largely divided up between volume manufacturers in China, South Korea and Japan. In contrast, the market for battery modules is still open – so far, no standards have been set for the rest of the process.

## Making Electric Motors faster

As the industry seeks ways to accommodate volume production, companies are also starting to reconsider some of the traditional, yet sluggish, manufacturing methods currently used for electric motors. One example is the coil. Normally, the stators in electric motors are provided with a winding of copper wire. Each individual slot in the stator is wrapped in a winding that goes in and out, in and out, almost like knitting! That takes time – and it's tough to automate.

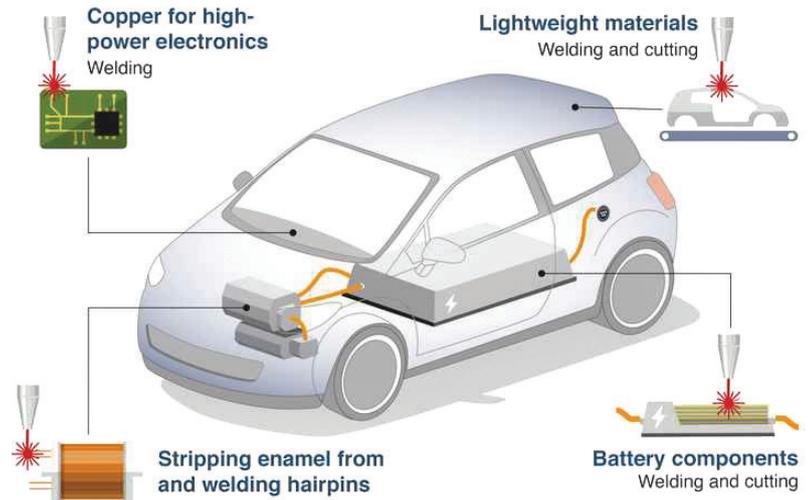
The auto industry considers this process to have reached the limits of its productivity and is banking on a new technique known as hairpins. This involves using a compressed-air pistol to fire a rectangular copper wire similar to a hairpin straight into each slot. This method is several times faster – just one shot per slot – and it completely fills the space with copper, which increases the motor's efficiency. The protruding parts of the hairpin on both sides are then pressed onto each other using a mask or are jammed or twisted together. The problem is that the hairpins are sometimes slightly out of alignment with each other after this process, with unsightly gaps in certain places. That's when scanner welding comes back into play: a camera in the laser optics determines the orientation of the objects within the space and finds the ideal welding point within just a few fractions of a second. The beam focus oscillates and, in little more than a minute, all 200 of the welds required for each motor are finished – and the laser is ready to weld the connections for the next motor. The second benefit of using high-precision scanner laser welding for hairpins is that it reduces the overhang of the weld seam to almost zero. The slots and hairpins can move closer together, and that means the motor takes up less space. At this point the copper hairpins go under the laser for the second time, having already had their insulating enamel removed by a pulsed nanosecond laser earlier in the process, either directly on the coil or before winding. Mechanical methods to remove the enamel – such as planing and milling – can no longer keep pace with the required level of productivity.

## Mobile Power Electronics

For the first time, power electronics such as chargers, transformers, rectifiers and battery-management systems are making massive inroads into the realm

## How laser technology is making electro mobility possible

High-precision laser technology is enabling the mass production of electric cars



Source: TRUMPF

## E-CAR FOR EVERYONE MEANS MORE LASER BASED SERIES PRODUCTION PROCESSES

of cars and their charging infrastructure. While the electronics in cars powered by fossil fuels had to make do with a 48-volt battery, electric cars will soon be using voltages as high as 800 volts. Once again, the companies that manufacture these kinds of power electronics are faced with the dilemma of how to mass-produce these components – and how to make them as small as possible. That's because every millimetre counts for carmakers when it comes to battery-pack size and installation space, and engineers may decide that even the millimetre-sized contact pins are too big. What's more, weld spatter can become a serious problem for contact connectors: a large spatter droplet could easily consign the virtually finished component to the scrap heap. Even worse, spatter could end up stuck to the component, initially harmless, but then suddenly come loose later on when the car is in motion – causing a short circuit and bringing the car to a standstill. The problem is that space is tight when it comes to welding electronic components, so there is simply no space for devices designed to intercept spatter. That's why engineers opt for a disk laser. Combined with special technology that simultaneously overlays two welding foci, a disk laser can create virtually spatter-free welds even in small, cramped environments. The laser welds directly in the groove, which keeps the contact pins below three millimetres. More valuable millimetres shaved off the size of the components – and every little bit helps! 🌈

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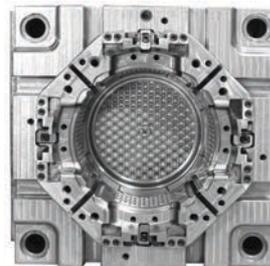


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**Deelip Menezes,**  
Managing Director,  
3D Systems India

## “3D Printing is gradually shifting from Prototype to Production”

**“I would advise tool and mould makers to start exploring the possibility of employing 3D Printing. In any business, if you want to be competitive in a changing market, you need to start adopting upcoming technologies which give your business an advantage over your competition,” says Deelip Menezes, Managing Director, 3D Systems India in conversation with Nishant Kashyap.**

### Q What are the new 3D printing possibilities 3D Systems is exploring?

3D Systems was founded on curiosity, creative thinking, problem solving, and innovation to transform how things are done and revolutionise the 3D printing category. We place the customer at the center of everything we do, and our innovation is fuelled by our customers’ desires to use additive manufacturing for new applications. Our application engineers, in collaboration with our customers, are continuously innovating to bring the power of 3D printing to bear, optimising workflows for the aerospace, dental, healthcare, automotive and consumer goods industries. We look forward to sharing these innovations at the appropriate time.

### Q In your opinion what are the top five trends in industrial 3D Printing segment?

- 1) Move from prototyping to production, especially in metal
- 2) Increased awareness of Design for Additive Manufacturing (DaFM)
- 3) Increased interest in academia
- 4) Increased traction for DLP technology at the cost of FDM
- 5) Increased demand for part quality and surface finish

### Q 3D Printing is always been refereed as ‘Future of Manufacturing’. However, we still classify it as an emerging technology. How long do you think it will really take to become a main stream manufacturing technology?

There are several manufacturers who are already using

3D printing as part of their production workflows. As a company, 3D Systems believes many customers will continue that shift from using additive manufacturing for prototyping to using it for production applications. However, we also believe that additive is not intended to replace traditional manufacturing, instead work in harmony on the production floor. Having said that, there will be some industries where 3D printing will completely replace traditional manufacturing. A good example is jewellery.

### Q How has the technology evolved and what are the new developments in 3D printing?

When Chuck first invented the technology, 3D printing was viewed as a prototyping tool only. Over the past three decades, we have seen 3D printing mature into a variety of technologies – there are seven additional technologies in the market today in addition to stereolithography. Additionally, we have seen tremendous development in materials with improved properties. The technology has proliferated all the major manufacturing industries, and is delivering high-quality, repeatable, and durable end-use parts. It’s helping manufacturers shorten product development cycles with lower total cost of operation while maintaining competitive advantage.

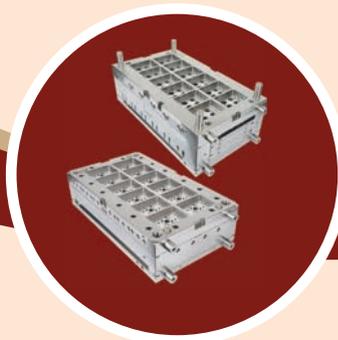
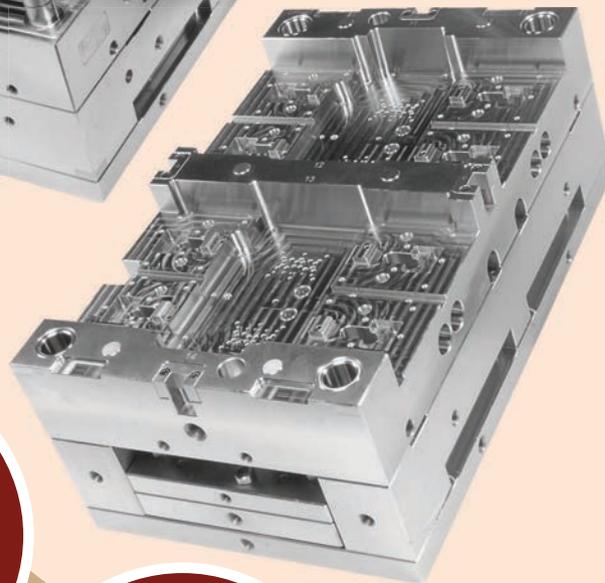
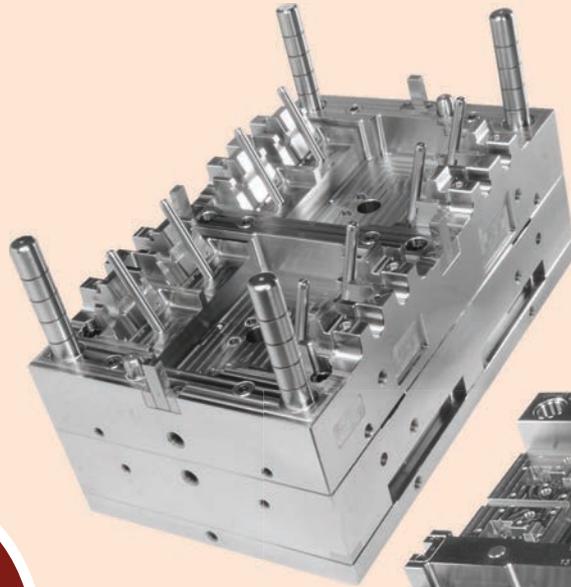
### Q What are the factors driving the demand for the industrial 3D printers?

The story of metal 3D printing is a little different from that of plastic 3D printing. Plastic 3D printing was - and

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is - mainly used for prototyping. In prototyping, the part is eventually mass produced using traditional manufacturing methods. The prototype is used to validate the design in the development stage. One may build four or five prototypes before locking down on the design. However, prototyping is a very small part of metal 3D printing. The bulk of metal 3D printing is manufacturing. This means that the geometry of the part, which has been traditionally manufactured, needs to be modified to benefit from 3D printing. The reasons can be different - light-weighting, strength, efficiency, etc. Complex assemblies can be reduced to a single part or a fewer number of parts. Re-engineering takes time to accomplish, but after completed, you are then able to begin manufacturing. So, in the case of plastic printing where you printed four or five prototypes, here you print hundreds or thousands of production parts. This is the main reason for the impressive growth in metal 3D printing. I prefer to call it metal additive manufacturing, because that's what it really is - manufacturing.

**Q How can 3D printers help mould makers? Will it be a threat to the die mould service providers?**

Yes and no. Typically, 3D printing moulds make sense when the production quantities are small (i.e., 50 - 100 parts) and the size of the parts isn't too large (e.g., 150 mm long). For anything else, it's better to use a machined mould. 3D printed moulds also make sense when the design is likely to change. So, as you can see, there will always be a need for machined moulds for the foreseeable future. However, the industry will increasingly start using 3D printed moulds where it makes sense.

**Q Your suggestion to tool and mould makers regarding the adoption of 3D Printing...**

I would advise tool and mould makers to start exploring the possibility of employing 3D Printing for the reasons mentioned earlier. In any business, if you want to be competitive in a changing market, you need to start adopting upcoming technologies which give your business an advantage over your competition. The cost to build a mould for short-run production is significantly more than that of a 3D printed mould. So, it's a question of using the right tool for the job. And for that to happen you need to have the right tools to begin with.

**Q Apart from limitations in 3D Printing segment such as the process is very slow (compare to subtractive manufacturing) and imitations in material usage, what are the other challenges in adoption of additive manufacturing, especially in cost sensitive market like India?**

I don't believe cost plays the large role in adoption as it is made out to be. For a businessman it's simple mathematics. If the value of using 3D printing in a workflow is more than the cost of adopting and implementing the technology, then the decision is easy. In my opinion, the main challenge is awareness. Businesses in India are not exposed to technologies like 3D printing as much as their counterparts in the western world. However, I am seeing a growing trend of companies in India setting up small teams of people to explore 3D printing and find ways to employ the technology in their companies to make them more competitive and efficient. Indians are fast learners and faster adopters.

**Q Your views on hybrid manufacturing.**

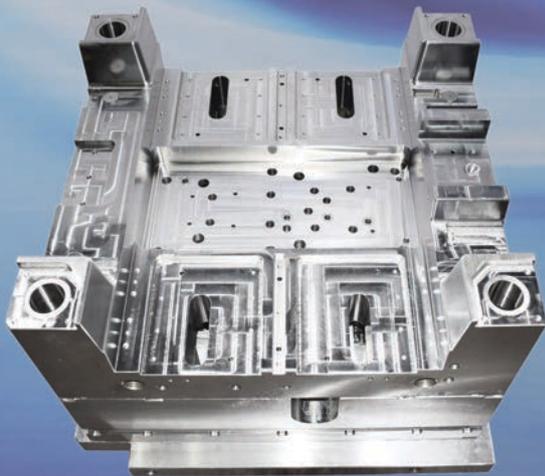
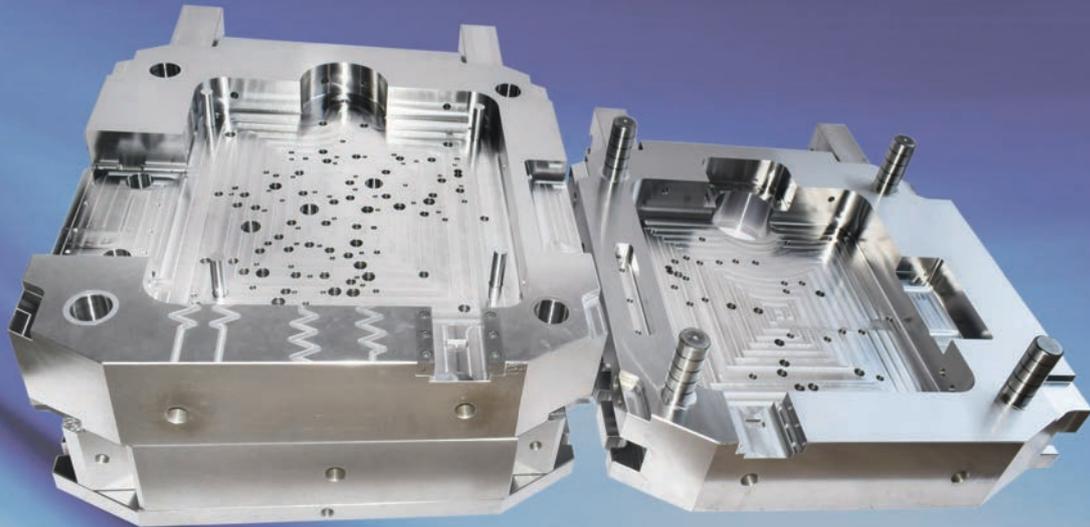
3D Systems believes very strongly in the value of hybrid manufacturing, and the blending of additive and traditional manufacturing, not only on the production floor, but also within the 3D printers. In August 2018, we announced a very exciting partnership with GF Machining Solutions – experts in precision machining. In September 2018, we launched our first metal printing solution developed in partnership with GFMS, the DMP Factory 500. This modular 3D metal printer has integrated automation that minimises manual processes to reduce total cost of operation. It also includes GF Machining Solutions' System 3R referencing and clamping system to enable optimal positioning of the build plate, facilitating a quick transition from the 3D printer to post-processing steps – helping to save significant time and money.

**Q 3D printing is still in nascent stage in India. What kind of initiatives should be taken to spread awareness about the technology?**

I would respectfully disagree that 3D printing is in a nascent stage in India. Jewellery is an industry which has adopted 3D printing with open arms. Dental is adopting 3D printing quite rapidly. We recently launched the ProJet® MJP 2500 IC specifically for the Investment Casting industry. The response has been tremendous. This is apart from industries like automotive, consumer goods, etc, which adopted 3D printing many years ago. So, I would say that as a country we have adopted 3D printing pretty well. However, there are many more industries that could benefit from 3D printing. Apart from OEM's like 3D Systems doing their part in generating awareness through their marketing activities, I believe there is an urgent need to introduce 3D printing as part of curriculum in schools and colleges across India. The technology is there. Adoption is there. The people to support the adoption aren't there yet. This worries me. 🌈

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**Gourav Ray,**  
Senior Director South Asia, GE

## “Additive Manufacturing is an additional tool in a manufacturer’s toolkit”

“3D Printing can find great applications in multiple areas such as orthopaedic implants, dental, space, automotive and tooling. With every passing year, additive manufacturing is becoming more and more affordable as machines are getting faster and larger,” opines **Gourav Ray, Senior Director South Asia, GE Additive** in conversation with **Nishant Kashyap**.

**Q Tell us about GE’s additive initiative and its current activities**

GE Additive was established in late 2016, with the purchase of majority interest stakes in Concept Laser in Germany and Arcam EBM in Sweden, after almost a decade of developing additive technologies internally predominantly for our jet engines. As pioneer and super-user of additive technology ourselves, we know what it takes to design and manufacture additive parts and systems. We feel we have a unique perspective on additive manufacturing in general, but especially with 3D printing with metals. Today, we are both a user and supplier of additive machines and materials and a provider of design engineering consultancy services in the form of GE Additive AddWorks.

**Q Despite being referred as ‘Future of Manufacturing’, 3D Printing is still classified as an emerging technology. How long do you think it will take to make it a main stream manufacturing technology?**

We don’t think about additive completely replacing or rendering conventional manufacturing techniques obsolete. It will always make good business and technical sense to make certain parts using conventional methods. So, we see additive as complementary and an addition to a manufacturer’s toolkit.

Really, it comes down the understanding the business case for additive and where it can add value. Once the business case has been defined, picking the best modality and making sure you’re designing the part to that modality. This might include considerations and requirements on how you design the part, what material properties are important and surface finishes.

**Q What is the market size of global metal 3D printing industry?**

Based on our own estimates and from industry analysts like

SmarTech, over the next 10 years, \$280 billion will be invested in additive manufacturing products and services. This will power an industrial transformation that will change the way we think about design and manufacturing.

The aerospace and healthcare industries have been early adopters of additive technology. SmarTech estimates that 68% of total metal additive solution revenues in 2014 were spent in the aerospace and healthcare industries. Healthcare and aerospace will combine to account for some \$8.2 billion in revenues for metal additive solutions by 2027. However, fast growth is expected as metal additive manufacturing becomes adopted in other sectors, such as automotive and energy.

**Q There is an impressive growth in metal 3D printing and industrial 3D printing. What are the factors driving the demand for the industrial 3D printers?**

In metal additive manufacturing, industrialisation and the shift from prototyping to serial production is front of mind for those customers, who are further along in their additive journeys.

So, in response, the entire additive industry is focused on providing their customers and satisfactorily meet the increased demand in this area with robust, reliable and repeatable machines and systems that can support the transition to production volume. As the demand for the number of machines increase, there will be a rise in the demand for production floor space and the number of operators required to run the production line.

**Q Will 3D printing be a boon or a threat for die mould service providers?**

One of the most effective drivers of innovation is the application of metal Additive Manufacturing in Tooling especially for



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plastic injection moulding and aluminium die casting. The use of creatively designed conformal cooling passages can build tooling with up to 40% lower cycle time. It also reduces warpage and quality rejections.

**Q What are the challenges in the adoption of additive manufacturing, especially in a cost sensitive market like India?**

India is one of the fastest growing emerging markets with a population of 1.37 Billion. We have a GDP growth of almost 7% and are growing into a large vibrant economy.

3D printing can find great applications in multiple areas such as orthopaedic implants, dental, space, automotive and tooling.

**Q With every passing year, additive manufacturing is becoming more and more affordable as machines are getting faster and larger.**

The cost of metal powders has also been reducing with growing demand. Indian companies with vision must recognise the power of a disruptive technology like metal additive manufacturing and be an early mover on the additive learning curve.

“Challenges” in adoption should be perceived as opportunities and not roadblocks. India has a \$2 billion tooling industry and members of TAGMA must take the lead in adopting AM to discover its true potential

**Q 3D printing is still in nascent stage in India. What kind of initiatives should be taken to spread awareness about the technology?**

At the end of last year in the GE Innovation Barometer, executives and around the world told us that they are excited about the potential of additive manufacturing, saying it will have a positive impact, increase creativity and get goods to market faster.

However, at the same time, we heard that 53% believe additive manufacturing is yet to reach its full potential, requiring more education and reassurance. It’s a sentiment that I hear regularly from manufacturers in India.

So, continuing to educate is important. We see our role as guiding and counselling companies as they consider and begin to incorporate additive into their business from their first tentative steps, to selecting their first machines and through to serial production and scaling up.

That education needs to cover not just the tangible value additive can bring to a business – the increased level of choice, flexibility and design freedom, but also the impact on a company’s supply chain, workforce and especially its corporate culture and mindset. All these factors must transform in some way if manufacturers are to successfully integrate additive and the digital thread it brings onto the production floor.



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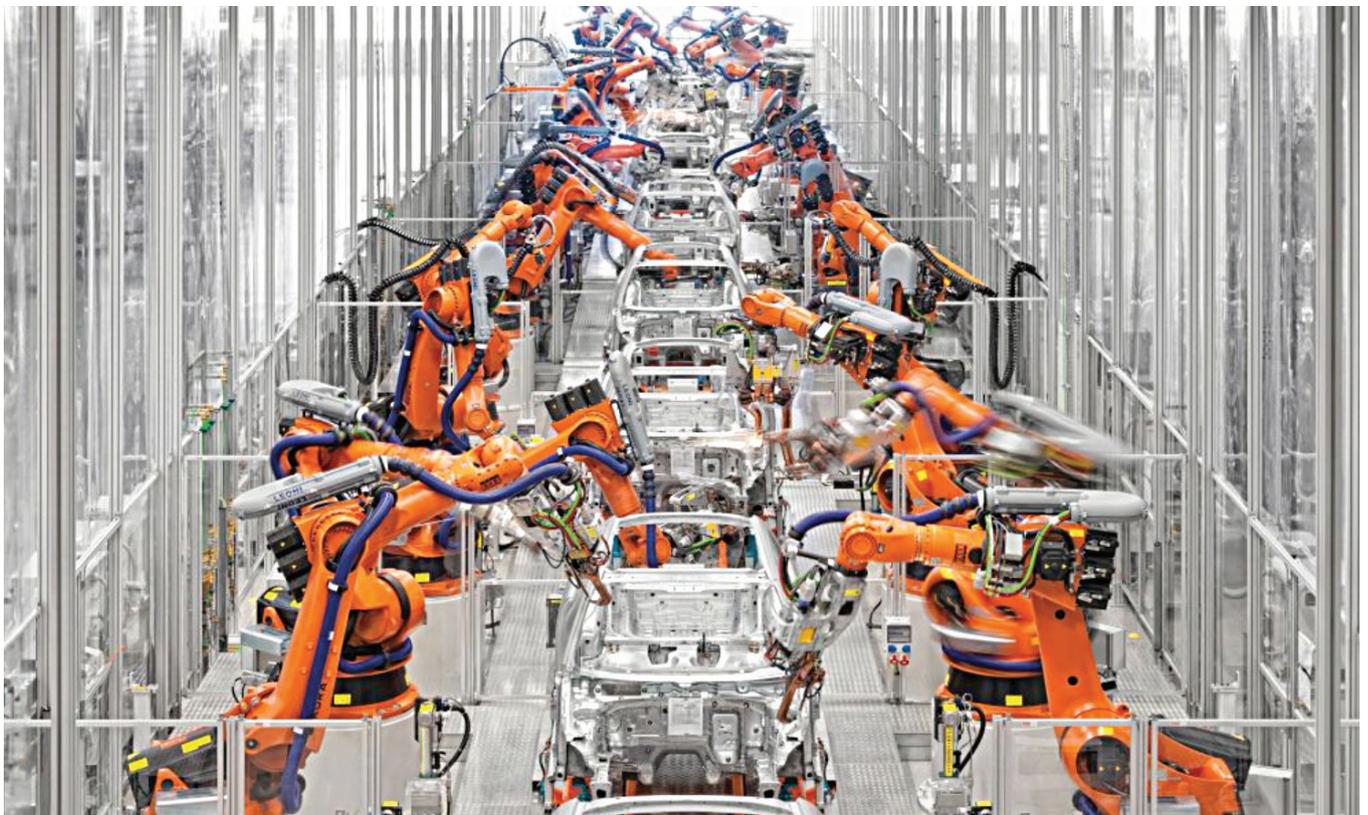
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# Audi Toolmaking Steps On The Gas With WORKNC

The new WORKNC high feed rate strategy reduces machining time during pre-finishing by up to 30 percent for car-making giant, Audi.

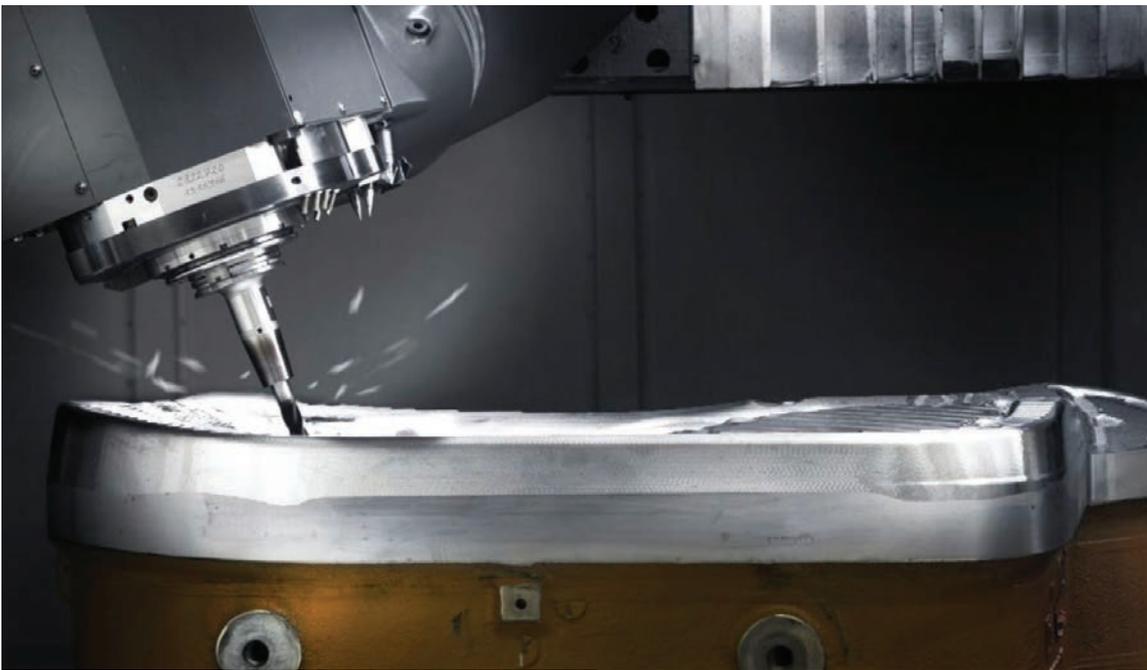


**V**ero Software has developed a new WORKNC high feed rate strategy together with the cutting specialists at Audi Toolmaking. Their achievement: Audi has reduced processing times in various pre-finishing pressing tools by up to 30 percent while tool service life has tripled at the same time.

The toolmaking department at Audi AG (officially known since 2017 as the “competence center for plant equipment and forming technology” or “KCU”) has always been one of the core competences of

Audi AG. It is in charge of press tools for components such as vehicle doors, engine bonnets and side panels, as well as plants for building chassis. Driven to deploy external service providers by international competition, the people in charge are constantly on the lookout for innovations to improve processes and results.

One such person who deals with innovations on a daily basis is Markus Brunner, a member of the Machine Technology Management team at the KCU in Ingolstadt. One of his tasks is optimizing the



toolmaking cutting production in terms of CAD and CAM technology.

“Single-part machining is one of the challenges we are confronted with here, and it gives rise to special requirements,” he explains. “Above all, frequent product changes necessitate high flexibility in machining. Efficient CAM programming is also very important in this regard.

Markus Brunner is primarily occupied with increasing processing quality and throughput times with the use of modern, CAM-programmed machining technologies, thus reducing processing costs. His partner in programming software is Vero Software GmbH, with its WORKNC CAM system, which Audi Toolmaking has been using for many years now. “We continuously use WORKNC from 3 and 3+2 axis to 5-axis simultaneous milling of forming tools, and increasingly 2.5D processing as well,” Markus Brunner explains.

“WORKNC is extremely easy to program and handle, which is especially important in single part machining. It allows us to do the programming for even highly complex parts in a quick and intuitive manner. WORKNC also offers many ways of standardizing and automating machining tasks and the programming for them, in spite of single part production.” He also describes the processing strategies which WORKNC offers as “versatile and efficient,” as they make it possible to “program and process every component in a cost-effective manner.”

Vero is constantly refining WORKNC software in order to make milling work even more efficient in the future. For instance, the current release includes a new high-feed strategy which was proposed by the toolmakers at Audi and created in a close and partner-like co-operative effort.



While high-speed cutting (HSC) primarily involves creating high-quality surfaces, high-feed cutting (HFC) provides short processing times in roughing and pre-finishing. Various suppliers have developed special tools with high-feed geometries for this purpose, with cutting edges that have a much larger line of contact with the workpiece than conventional round inserts.

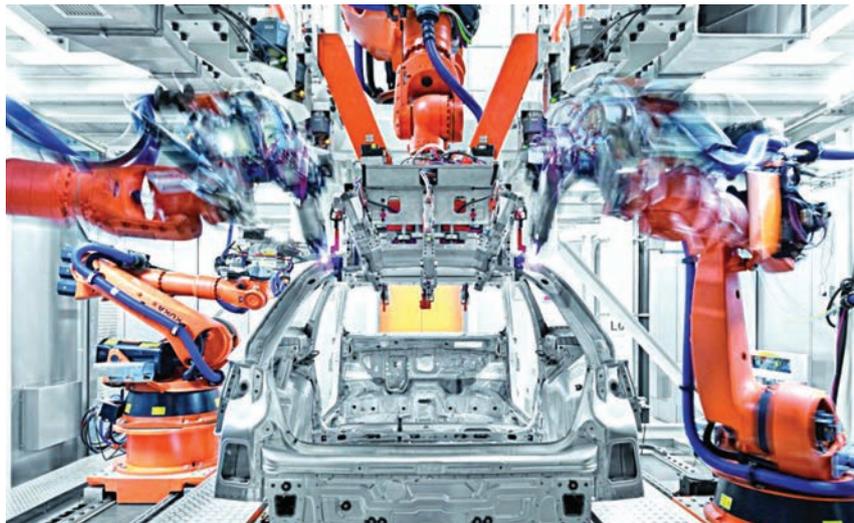
This reduces the radial cutting force load on the mill and the machine spindle so much as to allow significantly higher tooth feeds and increase the metal removal rate many times over. This is especially advantageous for reducing processing time and production costs in roughing and pre-finishing work with intensive cutting.

Before Vero presented its new WORKNC solution, the users found themselves confronted with the following problem when using these tools: Up till then, CAM systems were not able to sufficiently reproduce the new high-feed geometries, which led to an undefined allowance on the component surface. This, in turn, impaired processing reliability in the downstream finishing process.

The new high-feed strategy now factors in deviations in milling tool geometries with irregular cutters. WORKNC thus prevents undefined allowances from appearing on the workpiece. Markus Brunner is enthusiastic about the result: "This new strategy enables us to use milling tools of any contour, even ones with cutters which deviate from a regular geometry such as a sphere or torus. This even allows us to use milling tools which were specifically designed for a defined application case."

His enthusiasm doesn't come from nowhere. After all, Brunner and his colleagues were the driving force behind the new development. They also provided machine capacities for testing purposes. For instance, they cut the negative surface offset of a press tool for a car door. Whereas pre-finishing work for the outer door panel used to take three hours and 15 minutes, and the cutting inserts had to be changed three times, processing with the new WORKNC high-feed strategy only took one hour and 42 minutes – without having to change any inserts. The tool used was a 1DP1E high-feed mill from Ingersoll Cutting Tools (WSP type PEMT0502ZCTR-HR, WSP quality IN2505; 65 mm projection length).

"By using WORKNC's high-feed strategy and the tools to match, we have reduced processing time in pre-finishing work by up to 30 percent," says Markus Brunner. The drifting forces are lower than those with round insert cutters, which contributes to longer tool life. Since the main machining forces arise in the Z-direction (i.e. the spindle direction), vibrations are



"WORKNC is extremely easy to program and handle, which is especially important in single part machining. It allows us to do the programming for even highly complex parts in a quick and intuitive manner."

**Markus Brunner**  
**Machine Technology Management**

reduced and the tool generally runs more quietly, which has a positive effect on the cutting process.

"The new WORKNC strategy can also be used with negative surface offset, which I believe is not possible with any other CAM supplier at present. In the future, we will definitely be using it with all components in the pre-finishing processing step."

To the Audi team, the new high-feed strategy is an example of the productive, partnership with Vero and the WORKNC developers. However, their satisfaction extended to a great many other aspects: "WORKNC's options for subsequently modifying programmed milling paths, such as offsetting and cutting paths, are extremely important to us." He is also impressed with the short calculation times, thanks to 64 bit and multiprocessor technology, which he says is very important, especially when programming large parts.

"The flexibility of the overall system is also much appreciated. For instance, WORKNC's post-processors are not encrypted, and can be adjusted by the user at any time. This has enabled us to significantly increase the level of automation in our single-part production over the past few years." In addition, this allows it to quickly adjust the CAM output to the increasingly complex machine technology, so as to exploit the full potential of the tool machines. 🌈



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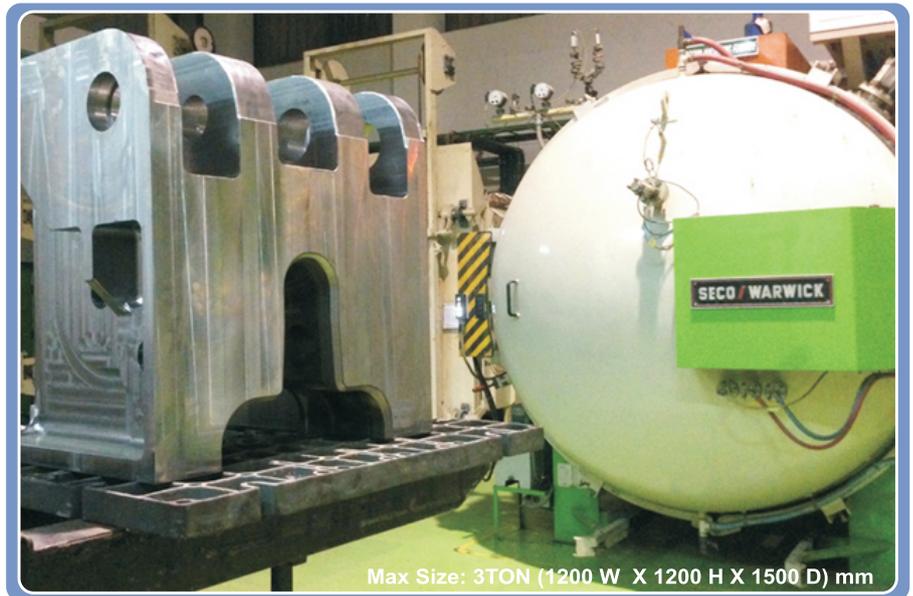
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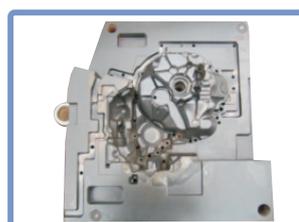
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# Moulding Expo: The entire spectrum of a fascinating industry



# Curtain Raiser

**M**OULDING EXPO, which will take place from 21 to 24 May 2019, will provide an extensive overview of the quality of the European tool, pattern and mould making industry, as well as of its suppliers. The products and services presented by exhibitors at MOULDING EXPO will cover all areas of tool, pattern and mould making. During the trade fair in Stuttgart, trade visitors will meet representatives from hundreds of companies from the core area of tool, pattern and mould making on the exhibition stands in Halls 5 and 7. In the Jacques Lanners Hall (Hall 3) and Hall 9, visitors can get a picture of the latest developments in the areas of components, software and accessories or search for trends in machine tools, cutting and machining tools, and systems for additive manufacturing. The wide range of international exhibitors makes MOULDING EXPO in Stuttgart the most important networking meeting point for the industry.

## Experience the means of production for the future world

“Our industry is driven by innovations. Everything revolves around manufacturing of the means of production for products in our future world – from a lightweight hybrid part for the automobile industry and electronic devices through to medical applications such as metering systems or artificial heart valves,” said Ralf Dürrwächter. The Managing Director of the Association of German Tool and Mould Makers (VDWF) is emphasising here that visitors to the trade fair will also be able to see milling and eroding machines without which high-precision working and processing of shaping cavities would be inconceivable. According to Dürrwächter, the complete range of exhibitors at MOULDING EXPO is the success factor here for the tool, pattern and mould making industry. With 70 co-exhibitors on an area of around 1,100 square metres in Hall 7, VDWF wants to play its part in turning the entire fascination of the industry into a real experience. “Anyone wanting to make their processes more efficient – either as a tool maker working with metal or an injection moulder during parts production, will find that MOULDING EXPO is an ideal platform in Europe to gain inspiration, identify the right ‘team mates’ or simply obtain security for their new production steps,” explained Dürrwächter.

## Demonstrating expertise throughout the value-added chain

In the opinion of Peter Gärtner from the German Association of Pattern and Mould Making (BVMF),

the breadth of the exhibited expertise is what makes MOULDING EXPO so special: “The pattern making industry is traditionally very far ahead in the process chain between design and series production.” In 2019, his Association will be represented by a joint stand on which 20 member companies and network partners will exhibit on an area of 500 square metres in Hall 5.

In the past, the majority of pattern manufacturers focused on one of the traditional disciplines, i.e. foundry pattern making, body and production pattern making or display pattern making. However, the companies now have a much wider and deeper basis. Gärtner added, “The transitions between the areas have become more fluid. Some companies are also involved in tool making and low-volume production.” An increasing number of companies are also covering the entire process chain.

“The trend towards digitalisation is evolving rapidly,” added Gärtner. “Highly topical issues at MOULDING EXPO will therefore include the use of high-quality CNC machining centres – by robots and additive manufacturing processes. And even though additive manufacturing is still not a mass phenomenon, 3-D printing technologies have already become established in prototype construction and low-volume production. In tool construction and mould making, additive manufacturing processes are opening up new work areas and contain enormous development potential, for example in conformal cooling or in lightweight construction. All this is also integrated in the portfolio of the exhibitors or can be experienced through the offers of high-tech service providers for trade visitors at MOULDING EXPO.

### Industry sectors that will exhibit at Moulding Expo 2019:

- Tool, pattern and mould making
- Components and accessories (materials, standard parts, etc.)
- Machine tools
- Cutting and machining tools
- Automation
- Software
- Systems for additive manufacturing
- Contract manufacturing and services



## A networking trade fair for every sector of the industry

The trade fair also acts as a large marketplace where peripheral suppliers and users can meet. "Machine manufacturers primarily exhibit at MOULDING EXPO because there they can meet customers who process metal or plastic most exactly and most demandingly," said Dr. Wilfried Schäfer, Managing Director of the German Machine Tool Builders' Association (VDW). The VDW represents around 120 member companies from the machine tool industry, a mechanical engineering sector which is one of the five largest in Germany. According to the VDW, the tool, pattern and mould making companies among machine manufacturers are

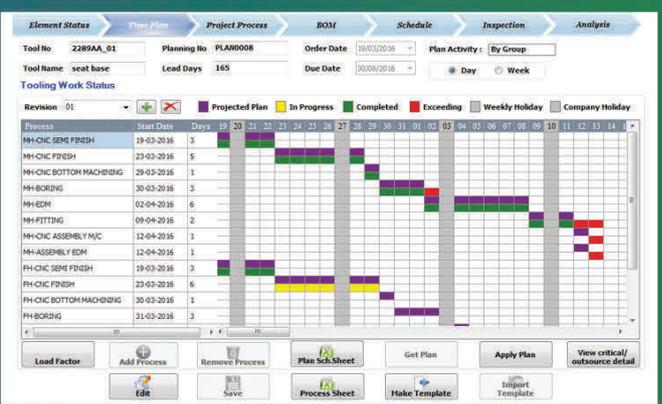
responsible for a sales volume which is at par with aerospace engineering and the fast-growing medical technology industry. The tool, pattern and mould making industry is also continuously faced with a growing number of new technological challenges. "The expectations of end customers are increasing constantly," said Schäfer. "Premium consumer products such as smartphones, tablets or domestic appliances demonstrate that increasingly higher quality demands for design and aesthetics can be fulfilled. The "look and feel" of surfaces, minimum or concealed assembly gaps and increasingly new ideas for component design are constantly posing new challenges for machine manufacturers and users."

The increasing requirements in metal working and processing are also emphasised by Markus Heseding, Managing Director of the VDMA Precision Tools Association. This Association, whose members include manufacturers of punching and forming tools, moulds, jigs and standard parts, will be represented on its own stand in Hall 9. "We will show trade visitors the important contribution that innovative metal cutting tools, chucking tools and standard parts can make in efficient tool construction," said Heseding. "Suppliers will become part of the industry at this networking trade fair. Although the trade fair concept focuses on tool, pattern and mould making, it also positions around this sector the means of production which are required for the necessary precision – from software and measuring systems through to machine tools." According to Heseding, the trade fair is therefore essential to obtain an overview of new developments and trends in this high-tech industry. The exhibitors and visitors come from all over Europe and further afield. As the global partner of MOULDING EXPO, the International Special Tooling and Machining Association (ISTMA) will show here the international relevance of the trade fair. It will take part in order to clarify technical trends and developments in the fascinating tool, pattern and mould making industry. 🌍



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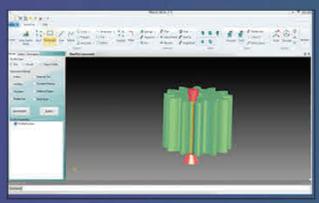
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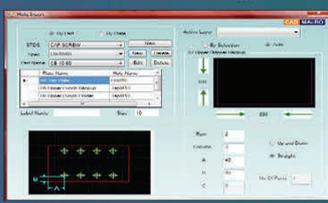
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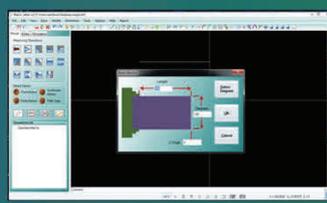
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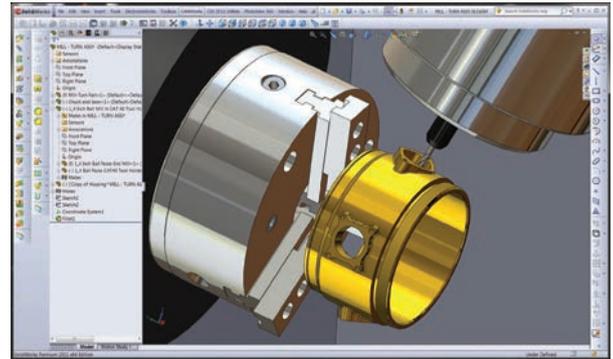
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## 3D CAM Software

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Aligning with industry initiatives such as Smart Manufacturing and Industry 4.0 for advanced manufacturing, CAMWorks has been uniquely structured to realize the benefits of automated CNC program generation based on tolerance, surface finish, and other annotations in SOLIDWORKS 3D parts. This functionality is possible due to CAMWorks' ability to extract manufacturing features like pockets, bosses, holes, etc..., and automatically create toolpaths based on an internal knowledge base of user definable tools, feeds, speeds, and strategies.



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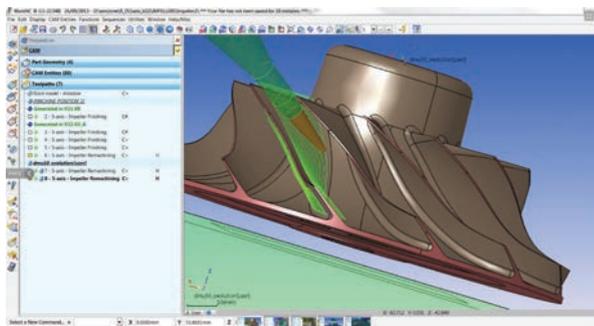
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### Automotive Engineering Show

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## International:

### Moulding Expo

**INTERNATIONAL** Trade Fair for Tool, Pattern and Mould Making. In its third edition the exhibition will showcase all the latest happenings in the world of die mould industry; May 21-24, 2019; Messe Stuttgart, Stuttgart, Germany.

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### Die & Mould China

**INTERNATIONAL** Exhibition on Die & Mould Technology and Equipment; June

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### InterMold Thailand 2019

InterMold Thailand 2019 s ASEAN's largest ensemble of mold making technology suppliers to offer all solutions mold makers need to cover every facet of mold making, June 19-22, 2019; Bangkok, Thailand.

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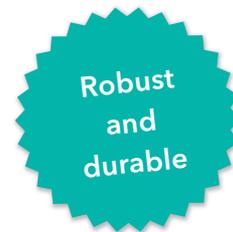


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### 1. ASA ENGICON

503, Maitri Tower, Nr. Kamala Vihar Sports Club, Mahavir Nagar, Kandivali West, Mumbai – 400067, Maharashtra

**Tel:** 9870244416,

**Email:** asagarwal100@gmail.com; atul.agarwal@asaengicon.com

**Contact Person:** Mr. Atul S. Agarwal

**Activities:** Consulting for injection Mold-Making. Operational efficiency improvement

### 2. DIE-TEK SPRINGS PRIVATE LIMITED

Plot No.2, Dewan Udyog Nagar, Aliyali, Kacheri Road, Palghar west, Palghar – 401404, Maharashtra

**Tel:** 91-45440365, **Email:** info@wirerings.in, Website: www.wirerings.in

**Contact Person:** Mr. Ashish Patankar – Director

**Activities:** Manufacturer

### 3. PPAP AUTOMOTIVE LTD.

B-206 A Sector 81, Phase II, Noida – 201305, Uttar Pradesh

**Tel:** 91-120-246552/553, **Mob:** 9999169513

**Email:** ktrpathi@ppapco.com, **Website:** www.ppapco.in

**Contact Person:** Mr.Kapinjal Tripathi – Sr.General Manager

**Activities:** Manufacturing of Injection moulds

### 4. ROBIN PRECISION PRODUCTS PVT LTD

Metoda GIDC, Plot No. G/1515-1552/A, Almighty Gate, Tal. Lodhika, Dist. Rajkot, Rajkot- 360021, Gujarat

**Tel:** 91-2827-287634, **Email:** ravi@bloodtools.com

**Website:** www.bloodtools.com

**Contact Person:** Mr. Ravi Vora – Director

**Activities:** Manufacturers of all types of solid carbide cutting tools,CNC toolings, Carbide inserts & insert holders, Tool trolleys, Work holding devices

### 5. SRIYANTRA ENGINEERS (P) LTD

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**Tel:** 080-41637133, **Email:** info@sriyantra.co.in

**Website:** www.sriyantra.co.in

**Contact Person:** Mr. K J Jayaraman, Director

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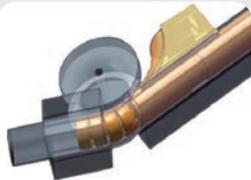
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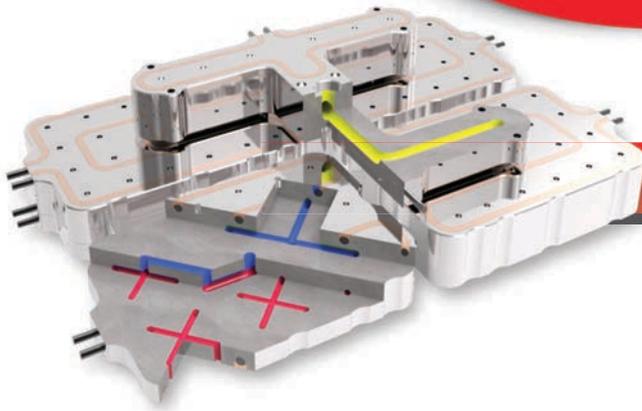
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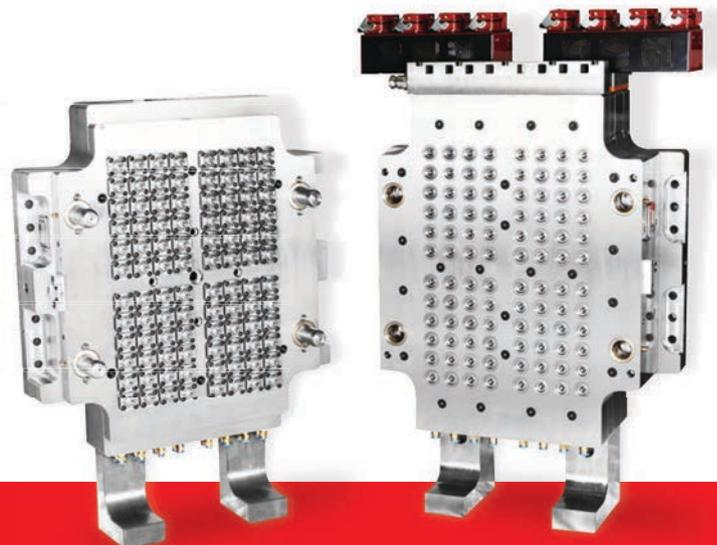
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