

# TAGMA TIMES

NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

Volume: XXVI / No. 11

(Private Circulation for Members Only)

July 2018

## Additive Manufacturing: 'Rapid' Growth Towards 'Prototyping'

Woman in Tooling :  
Closing The Gap

Why Project Management  
is Important?

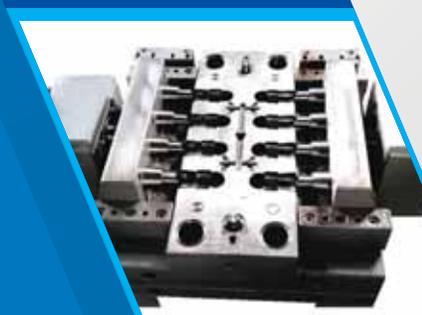
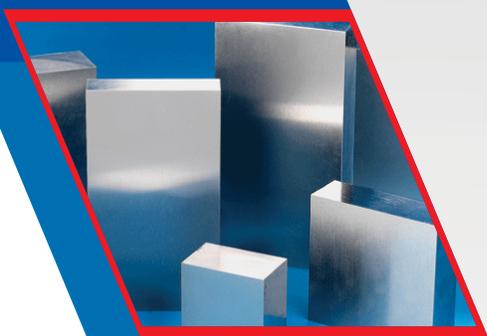
Five Trends in Additive  
Manufacturing

Conformal Cooling Solutions to  
Boost Moulding Productivity

In Conversation With

Akshay Kalyanpur,  
Director,  
Sridevi Tool Engineers Pvt. Ltd





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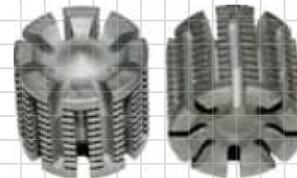


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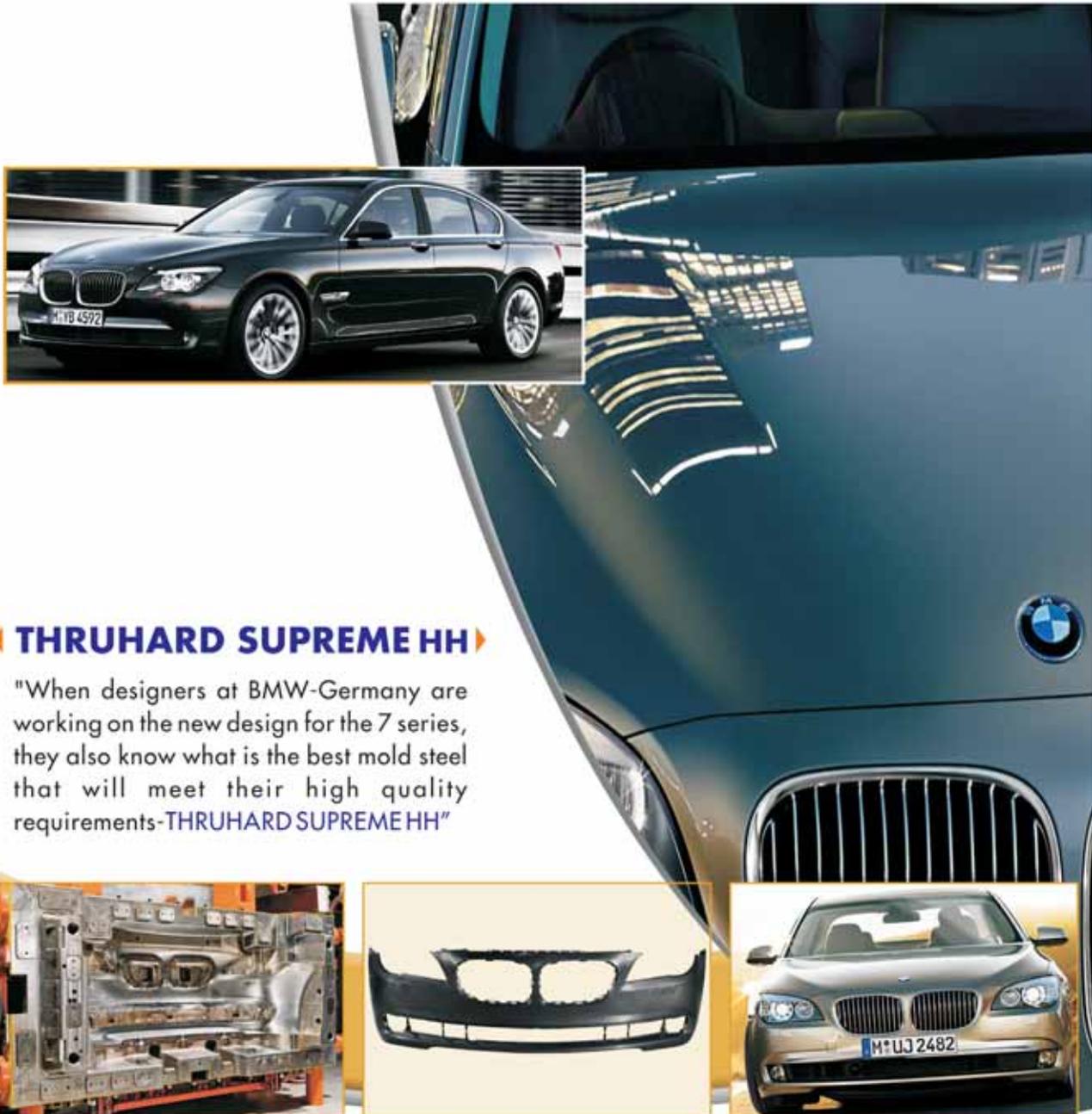
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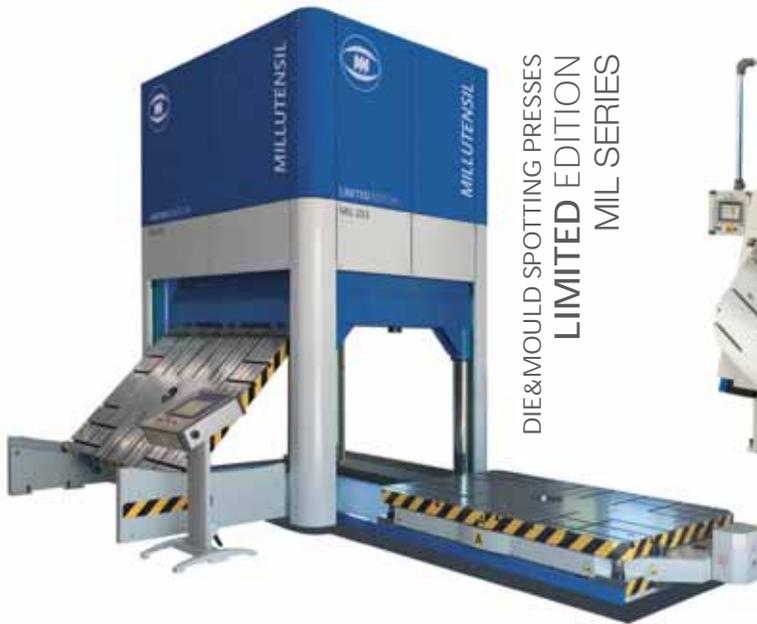
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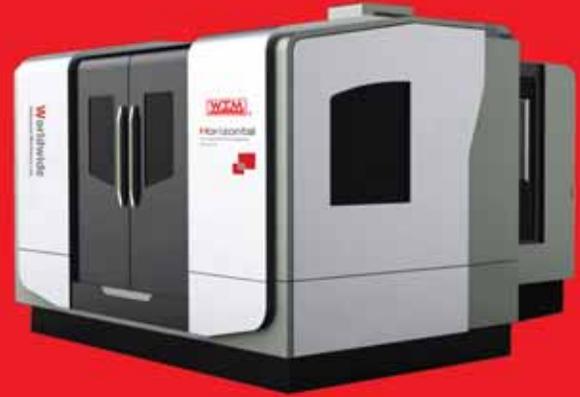
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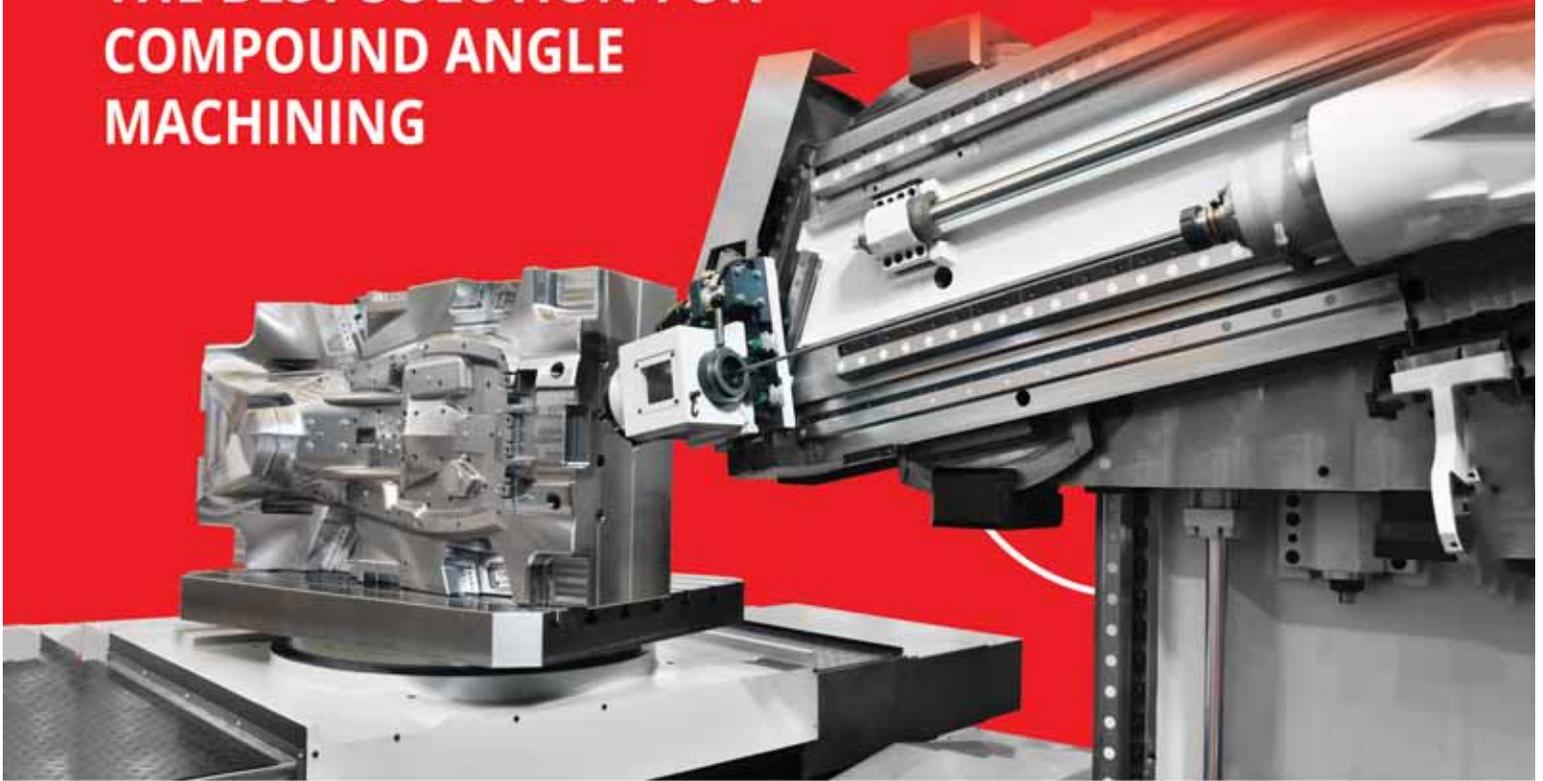
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## The Next Wave



**S**ustainability is mainly divided into three areas: environmental, economic and social. An ideal product is the one that maximises all three areas — is good for the environment, is profitable for the company and is beneficial for the community. Additive Manufacturing (AM) is one of the few things that qualify in all three areas.

Traditional approach to manufacturing is no longer the only way. It's time to think differently and go beyond the traditional methods. In the era of Industrie 4.0, manufacturing with additive opens new doors of opportunity. It eliminates complexity from the final assembly, producing lightweight & high-strength structures and creating hyper-realistic prototypes. AM has made manufacturing competitive than ever before.

AM is a powerful force within digital manufacturing, bringing new applications and markets into focus. According to Wohlers Report 2018, "an estimated 1,768 metal AM systems were sold in 2017, compared to 983 systems in 2016, an increase of nearly 80%. Increasingly, global manufacturers are becoming aware of the benefits of producing metal parts by AM.

For the last decade, AM has been the playground for the maker community, while commercial applications have been limited to prototyping. But now, industrial 3D printing has reached its tipping point, and is about to go mainstream (or may be already created a place for itself in several markets) in a way that will revolutionize the economy.

A major part of the industry seems to have realised the benefits of AM and believes it to be the 'Future of Manufacturing', but there are debates about its impact on the traditional manufacturing technologies and processes. However, a combination of both additive and substantive manufacturing, also referred to as Hybrid Manufacturing seems to be the answer to all those doubts and debates. Hybrid manufacturing will certainly take the centre stage in future.

The July edition of TAGMA Times is dedicated to AM and its impact on mould making fraternity. Do take a look and let us know what you think.

The special highlight of the edition is — 'Women in Tooling', must read.

This edition also marks the beginning for a new section *Management Mantra*. Behind every successful company/project there are some fighters, heroes who lead the execution and manage the team among others. In the July issue we will talk to Project Managers to understand their 'management *mantra*'.

I hope this power packed edition leaves you with useful information and lots of positivity.

Happy reading!

A handwritten signature in black ink that reads "Nishant Kashyap". The signature is written in a cursive style and is positioned above the printed name and contact information.

**Nishant Kashyap**  
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## Godrej Tooling Awarded Green Co – GOLD at CII-Green Co Summit 2018

**GODREJ** Tooling was awarded Green Co – GOLD rating by CII –GBC during the Green Co Summit 2018 held at Chennai on 28th June 2018. This awards marks the recognition by CII-GBC for leadership, vision & effort for implementation Green practices in manufacturing set up.

Godrej Tooling takes pride in being the First Tool Room in India, to have been awarded Gold Certification – and reaffirms its commitment to scale greater heights in its mission to establish an ecologically sustainable business growth.

D K Sharma, Business Head, Godrej Tooling congratulated the team & urged upon spreading the initiative to the SME cluster through channelized efforts of VSME. He said, " It is a proud feeling to be honored as the only Green-Gold Tool room in India. It gives a lot of satisfaction by contributing for improving the environment through our operation and offerings."

Godrej Tooling has set a 2020 Goal on Greener India – reduction of energy by 25%, usage of water by 40% and waste by 50%. The company emphasises Green Product right from design stage till it is in usage.

Godrej Tooling ensures all its products are environment compliant and use minimum natural resources by taking following steps;



- Standardisation of the die elements is done for Sprue bush, Diffuser, Chill vents, Lot mark screws for HPDC dies. STD parts are used in around 30% of dies.
- Maximum use of recyclable material steel . ~ 95 % coverage.
- Use of non-toxic and low environmental impact material for dies.
- Reduce raw material consumption through application of scientific tools like design calculations & optimization of runners, gates, cylinder blocks.
- Use 3D, 2D & Simulation software to eliminate wastages. We target for minimum 60% Yield improvement in each die which is an Industry benchmark worldwide.
- Use of reused and reconditioned mould base for new dies, thereby reducing requirement of virgin

material. Saving of around 2T of steel per die.

Keeping the environment in mind, Godrej Tooling is also developing Smart dies that will help improve die life and reduce rejection at customer end.

### About Green Company Rating System (GreenCo):

The GreenCo Rating System, developed by CII and the first of its kind in the world, is a framework for holistic assessment and analysis of a company's performance on the Green front. Launched in 2012, presently over 450 companies in India are working on GreenCo rating that includes private sector companies, Public sector companies, MNCs, Indian Railways and SMEs; 153 units have been awarded GreenCo ratings, with the first 55 rated companies achieving an annual cumulative savings of ` 990 million.

## 4th edition of International Tooling Summit to take place in Pune

**FLAGSHIP** event of Tool and Gauge Manufacturers Association (TAGMA), the International Tooling Summit (ITS) is scheduled to take place on February 7-8, 2019 at Hyatt Regency, Pune.

Started in 2016 as a platform to bring together tool making fraternity and user industry under one roof, in just 3 editions, ITS has become one of the

most important platform for tool and die maker to understand customer demands, latest trends, demand patters and future outlook. On the other hand, OEMs can get information about the latest technologies, meet new vendors and share their challenges in front of the suppliers. The 2018 edition that held



in Chennai was a grand success with over 400 attendees, packed with four panel discussions, 16 technical sessions, 44 national and international speakers discussing various topics that impact the Indian tooling industry. Registration for the ITS 2019 has started! Stay tuned...

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## Devu Tools celebrates 25th year of dedication and innovation

**FOUNDED** in 1993 to provide high-end cost-effective tools, Devu Tools has come a long way. Today, it is known to be one of the largest tool rooms in India accredited with ISO 9001:2015, ISO 14001:2015, BS OHSAS 18001: 2007. Backed by a technologically sound team of 550 and state-of-the-art machines & high-end software's, the company caters to customers across the globe.

Remembering the early years, DM Sheregar, Founder, Devu Tools Pvt Ltd said, "I come from a small village Gangolli of Taluka Kundapur, Udupi District of Karnataka. With an aim to achieve something in life I migrated to Mumbai in 1983. I started my career as a Mould Technician in one of the reputed Mould manufacturing company. During that period, I did a course on mould designing from a reputed technical institute. My inclination towards the mould industry and looking at the growing industry, I took a bold step and started my proprietorship company in 1993 at a small place of 200 sq.ft in Tilaknagar, Sakinaka, Mumbai."

On July 15, 2018, the company celebrated 25 successful years of operation at its Atgaon factory in the outskirts of Mumbai. The celebration started with a religious function in the presence of several dignitaries, suppliers, customers, members from TAGMA and other professionals from India and abroad.

Devu Tools has become one of the most trusted brands in this category, however the journey was not easy for Sheregar. "I faced several challenges which includes financial support from nationalized banks. It was a difficult phase, one would not get finance unless he/she offers enough collateral security. However, I was partially fortunate that in the initial phase I was supported by my community co operative society "Ramrajya Co Operative Society Ltd " with Rs. 1,25,000/- loan. Subsequently I was able to obtain bank finance from co operative banks but at exorbitant



rate of interest. However I am thankful to those banks for lending support to small entrepreneur like me at the right time..In the initial years of my job, I used to dedicate whole day to understand the technicalities involved in mould manufacturing," he said.

His success mantra remains the same till date, "Never look back once you start the venture."

Devu Tools serves industries like automotive, Pipe Fittings, packaging,



consumer products and plastics, among others. With a list of reputed clients (OEMs), the company is ready to cater to the growing Indian demand as well as increase exports.

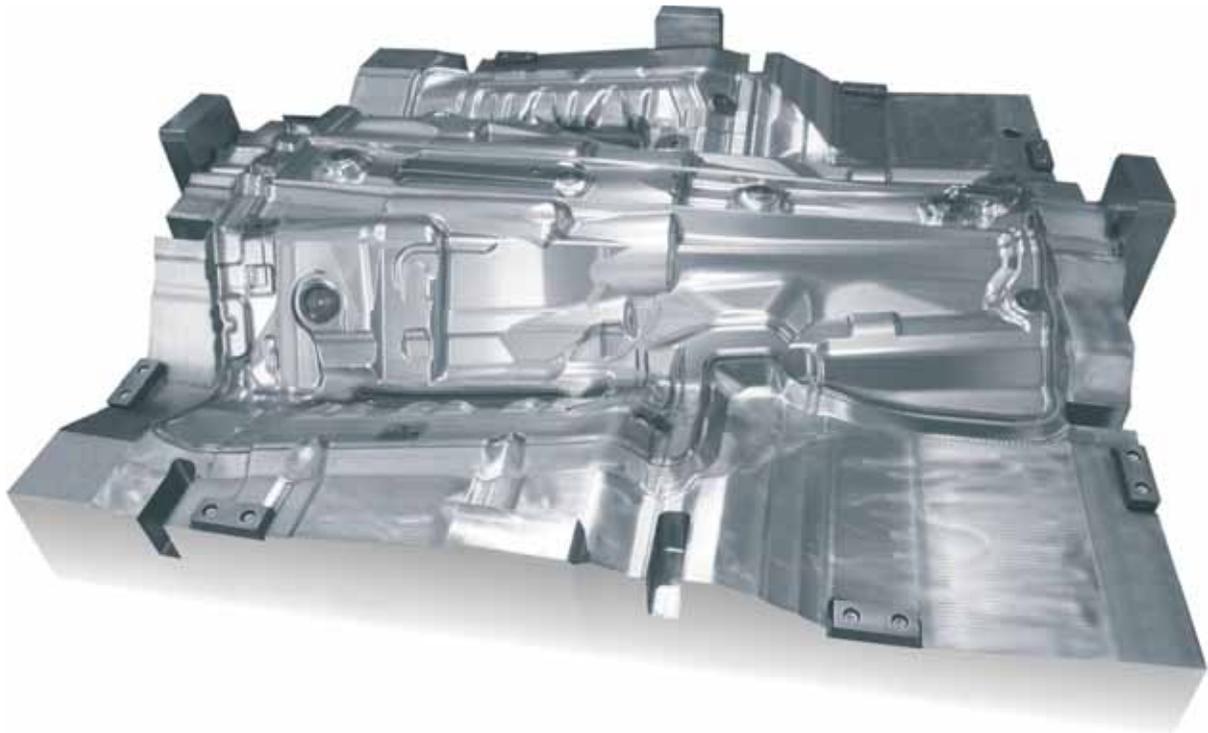
Encouraging the new-age entrepreneurs Sheregar said, "One has to be bold enough to face the challenges. Determination is the key to success. The proactive participation of the Central and State Government with initiatives like 'Stand Up India' and 'Start Up India,' comes as an encouragement for all the new entrepreneurs. The new generation entrepreneurs should explore the opportunities provided and begin their ventures. It will not just help to increase the overall GDP but will also provide employment opportunities." I wish that one day the dream of Make in India is achieved with the contribution of young upcoming entrepreneur.



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## Sigma Electric announce new manufacturing facility at Jaipur

**SIGMA** Electric Manufacturing Corporation, a global leader in the manufacturing of ferrous and non-ferrous castings and precision machined components, announced that it would build a new plant in Jaipur, India. Sigma Electric is investing over INR 100 crore at the new manufacturing facility, adding to four plants already in operation at Jaipur. The plant will be fully operational by September 2019.



Strategically located in Mahindra World City, the new plant will incorporate state-of-the-art technology with high pressure moulding iron casting, with fully integrated machining, electroplating, and powder coating facilities.

The plant will include a world-class Engineering, and Tool Design & Tool Manufacturing facility and comply with Industry 4.0 norms. This 120,000 sq. feet facility with 3500 MT per annum casting capacity, would comply with

green norms and be a zero discharge facility. The plant will generate over 500 new jobs.

“The new plant will enhance our global leadership position in machined castings and support the growing demands of our MNC customers in varied electrical and industrial markets across the world” said Viren Joshi, CEO and President, Sigma Electric.

## Mahindra and Boeing team up to make F/A-18 fighters in India

**INDIA'S** Mahindra Defense Systems, or MDS, a subsidiary of automaker Mahindra & Mahindra, has signed a deal with U.S. aircraft maker Boeing to build F/A-18 Super Hornet fighter jets in India. Hindustan Aeronautics will also participate.

This is Mahindra's first foray into offensive weaponry. Up to now it has made noncombat defense equipment, such as armored vehicles and radar systems. Representatives from the three companies unveiled the deal in April at the Defexpo India trade show in Chennai. A joint statement by the partners said they will manufacture the fighter locally for the Indian armed forces. The companies will also cooperate on research and development, said the statement.

## TATA technologies in pact with Vidarbha Defence

**ENGINEERING** services provider Tata Technologies has signed an MoU with the Vidarbha Defence Industries Association (VDIA) to set up of a new aerospace and defence centre in Nagpur. The centre will help establish Maharashtra as the preferred investment destination for aerospace and defence manufacturing, and promote indigenous and modernised technological capabilities.

It will also help in developing skilled resources to support micro, small & medium enterprises (MSMEs) to be globally competitive in the aerospace and defence sectors, Tata Technologies said in a statement. This will be done by setting up 'Nirman', a not-for-profit common facilitation centre for aerospace and defence, and 'UDAN', an initiative to create high-end skilling centres and provide competency-based education for engineering institutes and universities.

“Our objective is to create an aerospace and defence manufacturing hub in the Nagpur and Vidarbha region. “Tata Technologies is well-positioned to provide the right impetus to this initiative by leveraging their domain expertise,” said Ravindra Thodde, Chairman of VDIA.

## Volkswagen Group invests one billion Euros in Project led by ŠKODA Auto

**GOING** forward ŠKODA AUTO is responsible for leading Volkswagen Group's planned model campaign on the Indian market. Volkswagen Group is investing one billion euros into the implementation of the project, primarily between 2019 and 2021. To ensure closest-possible proximity to the market, a project centre is being set up in India where, for example, vehicle development will take place.

ŠKODA AUTO CEO Bernhard Maier said, “Experts predict that in the next few years India is going to become the



third-largest automotive market worldwide. With our 'INDIA 2.0' project we are now creating the right conditions for sustainable growth there. Our objective

is ambitious, but achievable: together with the Volkswagen brand, we are seeking a market share of up to five per cent in the long term, depending on market and segment development.”

Initially, ŠKODA AUTO is developing the sub-compact MQB A0 platform with a focus on India (MQB-A0-IN). In the second phase, ŠKODA will be assessing the possibility of exporting vehicles manufactured in India. ŠKODA and Volkswagen will develop several products based on this platform. The model campaign will begin in 2020 with an SUV.

# SHOP PLAN

Die Mould ERP / Scheduler



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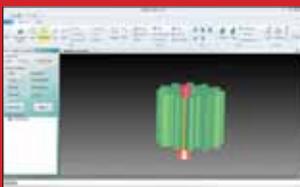


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## Reliable thread turning in tight spaces

**WALTER AG** is completing its range of MX grooving inserts with the A60 and AG60 geometries for small to medium pitches. Just like the existing MX geometries (CF5 and GD8 for all grooving and parting off tasks, RF5 for grooving and copy turning), the A60/AG60 inserts are also designed with four cutting edges.



The geometries are made for creating 60° partial-profile external threads in a wide range of pitches (0.5–3.0 mm) and are particularly suited to thread turning in

tight spaces, like near a shoulder or counter spindle. In addition, the system offers general advantages like excellent cost-effectiveness or the ability to use all inserts universally with one toolholder on the left and right.

The MX system is suitable for all materials and enables insert widths between 0.8 and 3.25

mm and cutting depths of up to 6 mm. One special feature is the design of the insert seat: Due to the self-aligning tangential clamping, the insert is pressed against the contact points when the screw is tightened. A special dowel pin helps with accuracy of fit and simultaneously makes it impossible to mount the insert incorrectly.

## Stamps with latching function for even higher process reliability

**MARKING** stamps are used for clear marking of injection-moulded parts. To prevent unintended movement of the arrow insert, Meusburger now offers stamps with a latching function. These ensure even higher process reliability during the injection moulding process, and prevent parts being marked incorrectly.



The latching of the arrow insert into defined positions guarantees that the arrow remains in a fixed position. The main body of the stamp also remains at the same height as the arrow insert (therefore named 'with fixed height'). The stamp can be easily removed at the split line face thanks to a withdrawal thread in the main body. Made of stainless steel 1.4112 with a hardness of 52 HRC, the stamp can be used at temperatures up to 340°C. Thanks to the low installation height, it is also optimally suited for installation in very thin moulding plates. The new stamp is available in different variations: month (E 2420 R), year (E 2424 R), 0-9 (E 2422 R) as well as a blank main body for individual configuration (E 2429 R). The diameters range from 4 to 12 mm. As usual, the CAD data is available in the Meusburger web shop with just a few clicks.

## EOS introduces FORMIGA P 110 Velocis

**EOS**, the world's leading technology supplier in the field of industrial 3D printing of metals and polymers, has refined one of its most successful systems even further with its FORMIGA P 110 Velocis: Based on the FORMIGA P 110 for additive manufacturing (AM) with plastic materials, Velocis, thanks to technical improvements, offers increases in productivity of up to 20 percent, along with more homogeneous part quality. As compact-class additive manufacturing system, the solution is ideal for entry into the area of industrial 3D printing – from rapid prototyping applications to cost-efficient small series production. With an installed base of more than 550 systems, the machines of the FORMIGA family are among the most successful and reliable industrial 3D printers for polymer materials on the market.



## Renishaw improves consistency in additive manufacturing

**RENISHAW** has developed new process monitoring software, InfiniAM Spectral, for use on Renishaw systems. After its successful launch at formnext 2017, Renishaw released the software package to help manufacturers overcome the barriers to AM in critical applications, process stability and part quality.

Laser powder-bed fusion (LPBF) builds components from millions of laser expo-



sures. This process must be highly accurate to produce a functional part. However, there are sources of variation that can occur during the build process, which can produce anomalies that impact the longevity of the part. Real-time spectral monitoring

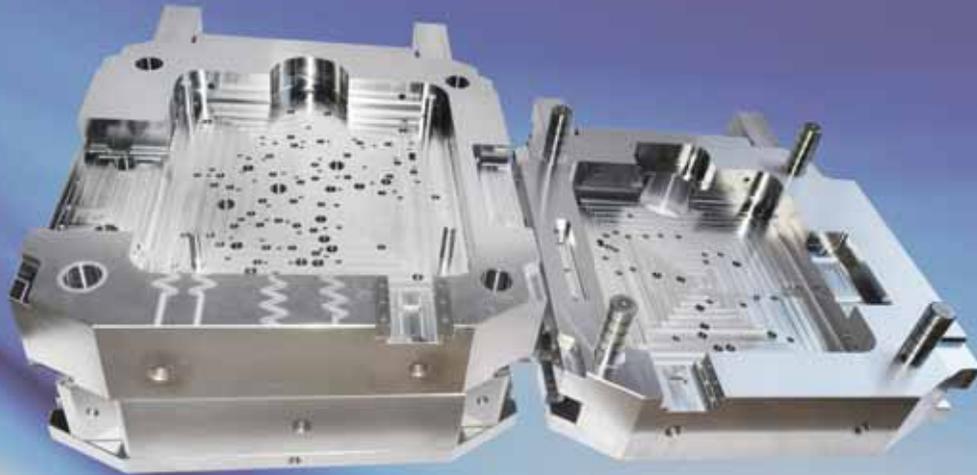
technology enables manufacturers to gather melt-pool data to enable traceable production and process optimisation.

InfiniAM Spectral is part of a developing family of products that helps users capture, evaluate and store process data from Renishaw LPBF technologies. The software enables data capture, presentation and analysis, representing a powerful tool for developing

a deep understanding of the AM process. The new software offers two measurement functions in the sensor modules. The first module, LaserVIEW, uses a photosensitive diode to measure the intensity of the laser energy. The second module, MeltVIEW, captures emissions from the melt pool in the near-infrared and infrared spectral ranges. These two sensor signals can be compared to help identify discrepancies.

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# Additive Manufacturing: 'Rapid' Growth Towards 'Prototyping'

Some say that if Apollo 13 had a 3D printer onboard, it would have radically changed the approach taken to fix the carbon dioxide filtering system. 3D designs could have been sent from ground control to space, where astronauts could directly use them to manufacture the required part in space itself! The possibilities of AM seem limitless as it finds itself emerging in numerous specialised applications.

[Nishant Kashyap](#)

## In Focus

In the last few years, 3D printing also known as Additive Manufacturing (AM) has become extremely useful in manufacturing—and, more specifically, in mould manufacturing. Depending on the size and complexity of a mould, it can take anywhere from 20 minutes to 48 hours to create a single 3D-printed part—but in most cases, in a matter of hours. Although traditional methods are continued to be used more frequently than 3D printing, technology improvements are decreasing costs and increasing the number of suitable applications. As moulds are often produced in low volumes and in complex shapes specific to a particular usage, 3D printing is becoming increasingly attractive to mould manufacturers. Let's take a look at 3D printing and its involvement in the die & mould industry.

The mould industry is one of the oldest industries, and is closely connected to the manufacturing sector. Today, manufacturing is highly dependent on moulds, there are countless product components manufactured by moulding or casting.

Although CNC machining is the most common technique used to manufacture moulds, providing highly reliable results, it is very expensive and time-consuming. This has led several mould manufacturers to opt for a more effective alternative such as additive layer manufacturing (ie, 3D printing or additive manufacturing). As moulds are generally produced in small batches and are more complex in shapes, makes them well suited for 3D Printing.

"As the demand increases for manufactured goods made in India, the cost of production plays a crucial role in determining the offer price to the end user. Hence, the tool life of the Die and Moulds are at question. Then there comes the question of reliability, "Can this die produce X number of products in Y hours without fail?" To be honest, it's not a numbers game, it's the technology used to make these Dies and Moulds that should be looked into, the hardness, the cooling time, the throughput and the warpage. Given the current scenario, traditional manufacturing doesn't really justify the answers. Additive Manufacturing (popularly known as 3D Printing) is the next big thing, proven to be more resilient, profitable, reliable and eco-friendly." Ankit Sahoo, MD, Objectify Technologies Pvt Ltd.

### An Industry Overview

The AM industry has come a long way from the days when Rapid Prototyping (RP) was its forte. A host of special processes have now been developed catering

to specific markets. From tooling, prototyping, scanning, direct part manufacturing to maintenance and repair, AM technologies are gradually establishing themselves as standard processes in production manufacturing.

The fastest growing segment of the 3D printing is metal 3D printing. In the last few years the technology has matured significantly, and applications have evolved from prototyping to production for a number of high-profile applications.

According to Wohlers Report 2018, "an estimated 1,768 metal AM systems were sold in 2017, compared to 983 systems in 2016, an increase of nearly 80%. This dramatic rise in metal AM system installations accompanies improved process monitoring and quality assurance measures in metal AM, although more work is ahead. Increasingly, global manufacturers are becoming aware of the benefits of producing metal parts by additive manufacturing."

"3D printing is no more the future...it is the present. About becoming main stream, well, it is right now a catch 22 situation. But the scenario will change soon," says Guruprasad K.Rao, Director & Mentor, Imaginarium India Pvt Ltd "I wish to state that 3D printing & AM would not fully replace the conventional technologies but will fully complement it."

### 3D printing technology can be used in the following aspects of mould manufacturing:

- Moulding
- Casting
- Machining, Assembly and Testing
- Robot end effector

Images Courtesy: Objectify Technologies Pvt Ltd



## Can 3D Printing take away business from die mould makers?



It will certainly take some business away from other manufacturing processes, but this new production method will provide value to the companies on the overall product development. I feel a combination of both, the existing manufacturing technologies and Additive Manufacturing, would be the future of manufacturing.

**Anand Prakasam,**  
Country Manager, EOS India

In the near future, AM looks to be complementing tooling industry but in long run when AM will overcome the existing challenges it might pose as a threat. Will it replace completely? Definitely not, but might replace tooling in some niche areas.

**TK Ramesh,**  
CEO, Micromatic Machine Tools –  
An ACE Micromatic Group Co



I wish to state that 3D printing & AM would not fully replace the conventional technologies but will fully complement it. The future manufacturing systems would be driven by three technologies: The CNC, robotics and 3D Printing. We can call it as the holy trinity of Hybrid Manufacturing,” concludes Guruprasad.

**Guruprasad K.Rao,**  
Director & Mentor, Imaginarium India Pvt Ltd

### Advantages- 3D printing & Mould Manufacturing

*Cuts down the manufacturing costs:* Metal 3D printed moulds are good news as they are economically advantageous in the production of small series of end products or for certain specific geometries. 3D printing is cost-effective when the materials used are very expensive and the traditional mould making results in high material scrap rates. As 3D printing is flexible it allows engineers to try several iterations at the same time and saves the costs associated with design modifications.

*Shortens mould manufacturing cycle:* 3D printing cuts down the entire product development cycle.

By reducing mould setup times and enabling existing design tools to be updated quickly, 3D printing enables businesses to afford more frequent mould changes and improvements. Currently, there are companies who have invested in 3D printing equipments to make their own moulds, further accelerating product development and increasing adaptability.

*Improves mould design and adds more functionality to the end product:* AM offers engineers unlimited options to improve mould design. 3D printing has the capacity to integrate the design and reduce the number of parts. This simplifies the product assembly process and reduces the tolerances. It also allows for cooling channels of any shape to ensure a more optimal and uniform cooling, resulting in higher quality parts and lower rejection rates.

*Custom mould helps achieve final product customisation:* Shorter production cycles, the creation of more complex geometries, and the ability to reduce final manufacturing costs allow companies to create a large number of personalised tools to support the manufacture of customised parts. 3D printing mould is also very conducive to customised production.

“3D printing has definitely changed the face of prototyping in the industry. Earlier we used to make dies to make few hundred parts or even 10 parts... now with 3D printing one need not make die, but directly print the part. The production cycle has drastically reduced with 3D printing. It is expected, the technology will be even more productive in the coming years as it continues to evolve,” says Akshay Kalyanpur, Director, Sridevi Tools Pvt Ltd.

According to Anand Prakasam, Country Manager, EOS India, “Additive Manufacturing has been continuously evolving to influence both Design and Manufacturing process of the tooling industry. The enablement of latest innovations in software and hardware is driving the Die Mould industry to embrace the path of Additive Manufacturing with the clear intention of lead time reduction, product quality enhancement, smart factory concept (Industry 4.0), design re-thinking such as volume reduction, topology optimisation, etc.”

### Challenges Faced

3D Printing might have a very little effect on the current tooling suppliers, but will take some time to create a stronger impact on the tooling industry.



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3D printing is one of the greatest innovations, but it has its limitations. It is not suitable for mass production, material limitations, and production of **large parts is difficult**. Additive manufacturing is futuristic, but is niche.

D Ravi, Managing Partner,  
Classic Moulds & Dies



Additive Manufacturing (popularly known as 3D Printing) is the next big thing. Proven to be more resilient, **profitable, reliable and eco-friendly**.

Ankit Sahoo,  
MD, Objectify Technologies Pvt Ltd



3D printing has **definitely changed** the face of prototyping in the industry. Earlier we used to make dies to make few hundred parts or even 10 parts...now with 3D printing one need not make die, but directly print the part.

Akshay Kalyanpur,  
Director, Sridevi Tools Pvt Ltd

"3D printing is one of the greatest innovations, but it has its limitations. It is not suitable for mass production, material limitations, and production of large parts is difficult. It will have an edge when it comes to production of certain complicated parts or parts that are difficult to produce through conventional process. Additive manufacturing is futuristic, but is niche," says D Ravi, Managing Partner, Classic Moulds & Dies.

Despite the bullish attitudes toward the growth and potential of 3D printing, a number of challenges remain with existing solutions and the adoption of the practice. Almost all mould manufacturers using 3D printing at their organisation report certain challenges.

### Some of the challenges are:

**Lack of in-house expertise:** Considering how fast the technology is advancing, it can be very difficult to find the right talent to grow the technology in the organisation. To get past this hurdle, existing talent can be cross-trained to get them up to speed with 3D printing. Investing in experienced talent will also be a key to overcome this challenge. Organization can also consider partnership opportunities with universities that have already launched 3D printing labs to deliver training to engineering students.

**Cost of system equipment:** Quality comes at a cost. Therefore it is not surprising to see the cost of system equipment and the cost of materials to be considered as a barrier in 3D printing adoption by many in the industry. So before adopting 3D printing



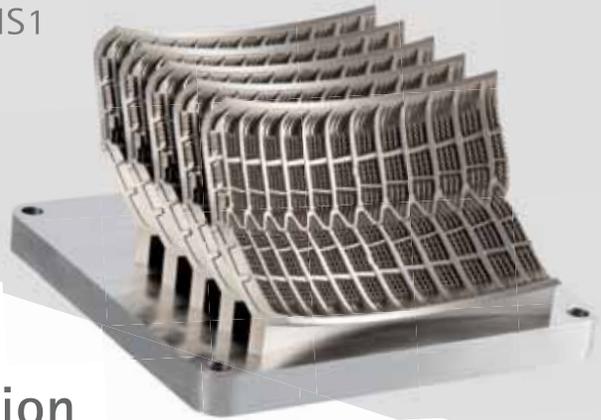
Images Courtesy: Objectify Technologies Pvt Ltd



# Tire application

Snow tire molding segment

Concept of additively manufactured tire segment produced with an EOS M 290 and EOS 400-4 using EOS MaragingSteel MS1



**HIGHLY PRODUCTIVE**  
**Significant reduction**

in production time of 75% (comparison between EOS M 290 and EOS M 400-4)



**EFFICIENT**  
**Less than 10 days**

production time for the complete mold segments



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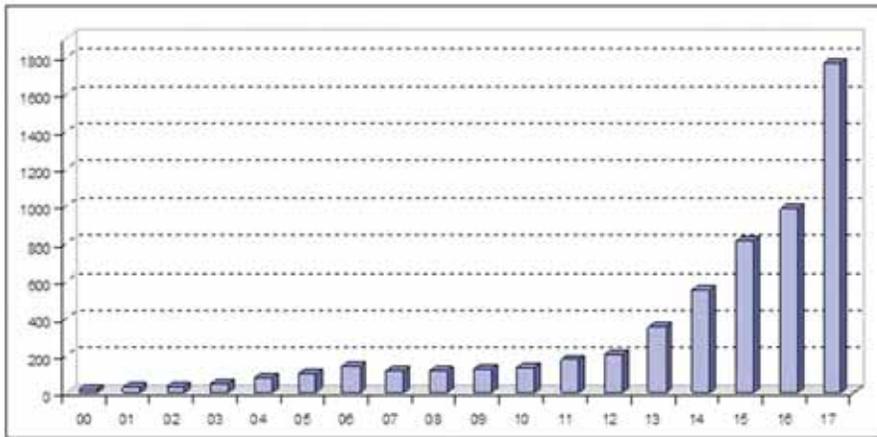
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Dramatic rise in metal AM system sales

Source: Wohlers Report 2018

as a practice, one must first develop a strategy with a budget. 3D printing is a long-term investment for any organisation, if not a complete transformation. Although the systems and materials may seem costly, they may lead to significant cost-savings in productivity, efficiency as well as part properties.

*Part quality:* Part quality is a challenge many mould manufacturers face. While some sectors are doing well and transforming their customer experiences, there are others who haven't yet moved beyond prototyping to part production. Taking into account that the technology has come a long way in the last few years and new materials are introduced, ability to

produce parts that meet client expectations will be strengthened. Since the 3D printing technology can also enable us to consolidate the number of parts used, there are lot of opportunities around the corner.

*Complexity in scaling operations:* Speed to concept, speed to prototype and speed to production is very important in this age of instant gratification. 3D printing is set to meet these demands as the technology advances. Partnerships in the industry are already leading to big results and bringing additive manufacturing much closer to production for a number of industries.

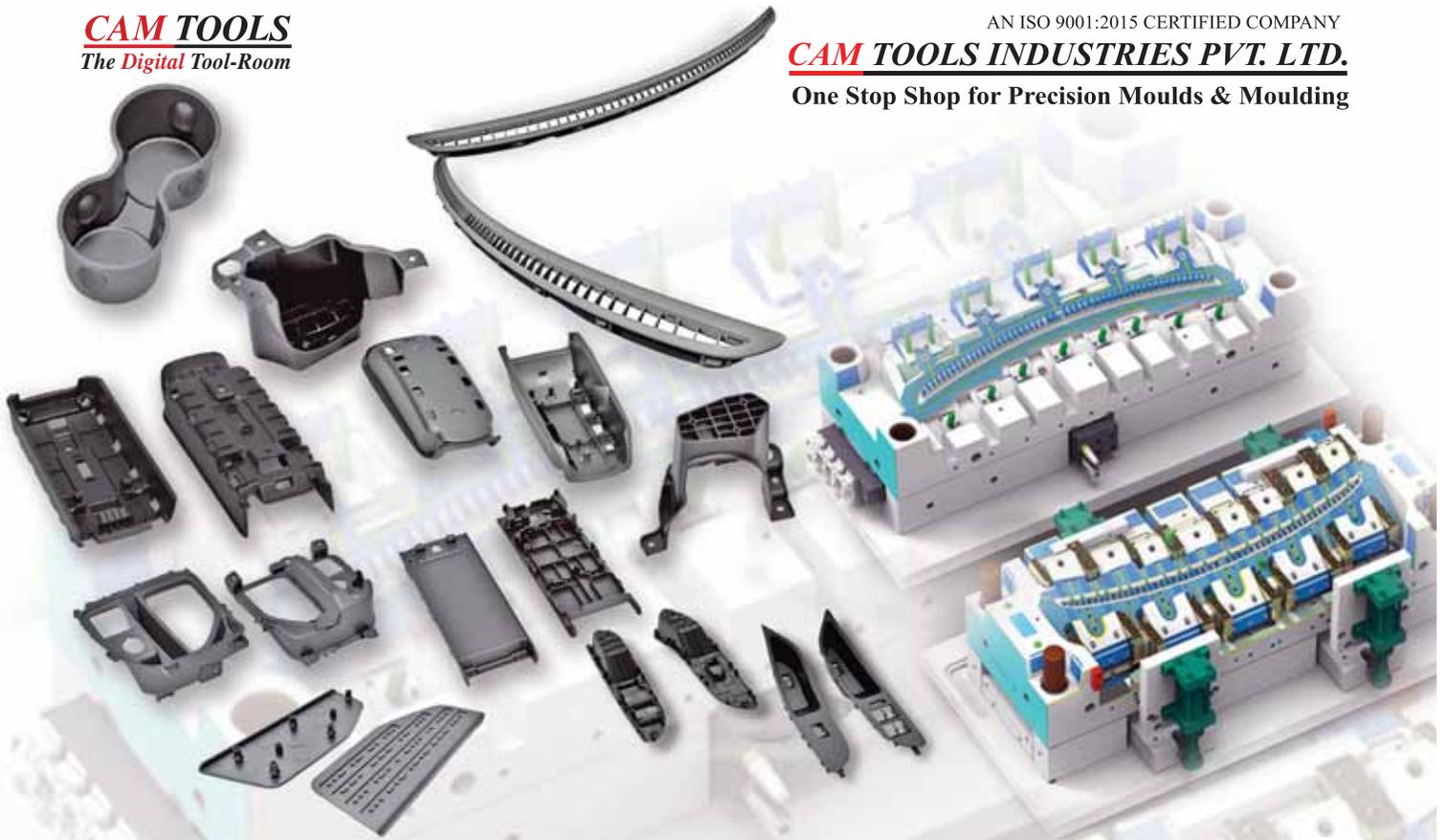
### Future of 3D printing

3D printers are not just making an impact at the consumer level but they're slowly changing the way manufacturers think about design, prototyping and production. As the technology continues to improve, 3D printers can produce more and more parts at a higher ROI than conventional manufacturing techniques. It already plays several roles in the mould manufacturing process, and is poised to make further gains as it is refined and perfected with every passing day.

3-D printing is an unstoppable force and certainly revolutionise the way manufacturing is conducted. Not too long ago, the printing speed and limited output of 3-D printers made them suitable only for rapid prototyping. But in the coming years, 3-D printers will be at the heart of full-scale production capabilities in several industries, from aerospace to automotive to health care to fashion. Manufacturing as we know it will never be the same. 🌈



Images Courtesy: Objectify Technologies Pvt Ltd



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In Conversation With

“It’s a good time to be a tool maker”

“The current government looks very aggressive when it comes to manufacturing with its ‘Make in India’ mission. In my opinion, it has given a sort of impetus to the OEMs to manufacture locally,” says **Akshay Kalyanpur**, Director, Sridevi Tool Engineers Pvt. Ltd in a tête-à-tête with **Nishant Kashyap**.



**Q Tell us about the current stats of Indian die mould industry?**

The overall business sentiment in the Indian manufacturing and automotive industry is very positive, which is a very good sign for tooling companies. The demand for tools in the country is way higher than the supply. At the moment it's a good time to be a tool maker. However, it is a cyclical industry, one day there is lot of business but the next day there may not be many, this bothers the tool room a lot. The high foreign exchange, discontinuation of buyers' credit by RBI and rising cost of steel, are some of the factors that have been a setback for us, but the amount of orders at the moment is enough for us to not worry about these factors at present.

**Q You mentioned that demand is higher than the supply, is it why tools are still imported as the Indian companies are not able to fulfil the local demand?**

The amount of tools required in a car is so high that an automotive OEM cannot rely on one or two tool suppliers; they have to source it from multiple vendors. There cannot be a situation where only two or three tool rooms in India are able to supply and the rest of them are unable to do so. All tools have to be produced at the same time so that vehicle can be launched on time. The OEMs cannot take such risks and they have no choice but to import. Indian tool makers must enhance their capacity for imports to be reduced.

**Q So are we importing tools because we have huge demand or Indian companies lack in technology and efficiency compared to their foreign counterparts?**

One has to understand that the latest technologies in die mould do not easily get implemented in India. The tools produced in India are mostly used to produce low budget cars. A low budget car need not necessarily have a very high budget for tooling as the tool requirement is not that critical. In other developed countries where several high-end cars are produced, the product cost itself is very high and the OEMs don't shy away from paying that kind of cost to tool suppliers. That's why technologies are introduced in developed countries before coming to India. However, I believe, we are well capable of developing any

kind of critical tools in India. Presently, we are producing tools that are in demand, but I am sure Indian companies can cater to the critical demands in tooling once the high-end cars are produced in India.

**Q Indian die and mould industry is getting matured with an average growth of 12% - 15% every year with consistent development in capacity building and international standards. What are the factors driving the demand for the Indian die mould suppliers?**

There are several factors that are favouring the die mould business in India.

The current government looks very aggressive when it comes to manufacturing with its 'Make in India' mission. In my opinion, it has given a sort of impetus to the OEMs to manufacture locally. OEMs that are following this mission have been making sure that their purchase department is more focused on developing local vendors. Also, there are large OEMs such as KIA Motors, SAIC Motors who are setting up manufacturing units in India.

Another factor driving the demand for moulds in the country is the newly introduced emission norms such as BS-6, which requires reducing the weight of vehicle to improve the efficiency. This has led several metal parts being converted to aluminium and plastic.

**Q How will the emergence of Electric vehicles impact the tooling industry?**

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. So 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.

## In Conversation With



“At present, vocational and practical training is missing from the education system, this is where the government and educational institutes can help us.”

**Akshay Kalyanpur**, Director,  
Sridevi Tools Pvt Ltd in tête-à-tête

**Q Most of the tool rooms in India are SMEs, what are the challenges they face?**

The tooling business is very capital intensive and that's why the ROI is not very lucrative. Starting a tool room needs a huge capital even before there is a single order. The cost of borrowing the capital in India is very high, so the growth in this sector is very slow. For several years one has to reinvest the earning in the company in order to increase the capacity.

Another challenge is skilled manpower. Running a toolroom means there is firefighting on daily basis; it comes with its own set of challenges.

Lastly, the demand in the industry is not constant. Some OEMs who are doing good will have frequent product launches but another OEM might not be as aggressive.

**Q What role can the government play in uplifting the condition of Indian die mould industry?**

Capital (long-term as well as working capital) is the biggest bottleneck in the growth of a tool room. If the government can help the industry in some sort of subsidy in areas like finance, it will be a boon for the tooling companies. Also, if the government can reinstate buyers' credit it will also be helpful.

Another factor is increasing imports. For example, steel the raw material for mould is been imported in India. If the government can encourage any steel mill for tooling steel to set up a plant in India, we can eliminate import of steel. For raw materials and hardware we are dependent on imports, it adds up to the overall cost. If the government can help us in import substitution it would be a big help.

Skill development is another factor where the government can help us. There aren't many institutes in India that are producing the right number of candidates suitable for core mechanical engineering sectors like die mould, machine tools, casting & forging, etc.

**Q You mentioned about the lack of skilled manpower in the country. What are the steps that can be taken to train an engineering student?**

Currently, the fresh engineering graduates are not ready for the industry. They lack practical knowledge. We still do not have a dedicated course on die mould. Die Mould industry forms the base of any manufacturing sector, it is very important for any mechanical engineer to know the fundamentals of tooling. At present, vocational and practical training is missing from the education system, this is where the government and educational institutes can help us.

**Q As a leader in the industry, how do you contribute to skill development?**

We provide internships to students and try to give them maximum learning opportunities at the shop floor. Apart from that we encourage technical institutes for educational visits to our company. We show students the complete production cycle. We also have strict training regimes for our employees; time-to-time training programme is conducted to update our employees about the latest trends and technologies.

**Q Apart from finance and skill development what can India focus on to become a developed tool making nation?**

Having a cluster approach will help us. There is no specific region in India that is known for tool making. If we have a cluster developed for the tool making fraternity we can reduce the development time, save money, and learn from each-others capabilities. If we have a cluster where the whole eco-system is available we all will be able to focus on our core area of expertise. It will help all of us become more efficient.

**Q How can we enhance the collaboration between OEMs and tooling suppliers?**

In India, most of the OEMs offload their tooling requirement to tier-I suppliers and that

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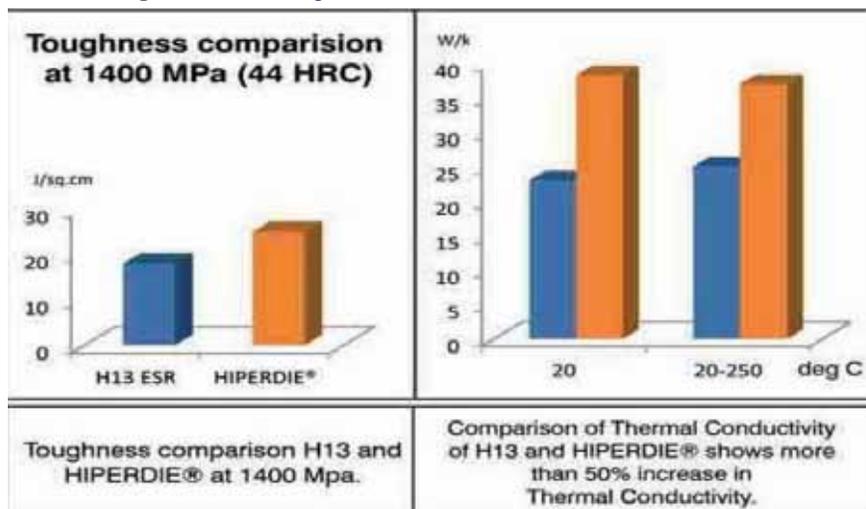
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Tier-I supplier reaches out to us with mould requirement. However, if OEMs invest in their people and form a tooling division in their own company they can directly communicate with tool suppliers. So if OEMs are personally involved in developing the vendor we will be able to help them in many ways. If they look at us as their growth partner and give us assurance of continuous business then the relationship will flourish and we will be able to help them reduce their imports.

**Q As one of the leaders in the industry, what would you suggest the budding entrepreneurs who want to enter the industry?**

Unfortunately, starting a tool room needs lots of capital. You can't just start with one machine; the vendor system is not available for you to be supported. If you see Taiwan and China, entrepreneurs can just install one machine and start making 10 tools in a month but India has not reached that position yet.

A start-up should initially approach larger tool room instead of OEMs. There are many challenges a tool room face on a daily basis, small companies can approach tool makers and aim to solve the challenges faced by them. Tool rooms are also in look out for people/companies who can take up some of the jobs which may or may not be the core business of tool room. For example many standard parts, cylinders and springs are being imported, if they are manufactured locally and support us with the same, it would be win-win situation for all of us.

Credibility is another hurdle a newcomer might face. Would an OEM go to a start-up for their requirement, it's very difficult. OEMs are strict in regards to their timeline so relying on new company would be highly difficult for them. However, if they support larger tool makers there won't be many credibility related questions involved.

So in my opinion, a start-up should take one step at a time and start with supporting larger tool rooms. It is very exciting industry I would always encourage budding entrepreneurs.

**Q How will disruptive technologies like 3D printing and concepts like industrie 4.0 impact the industry in future?**

3D printing has definitely changed the face of prototyping in the industry. Earlier we used to make dies to make few hundred parts or even 10 parts...now with 3D printing one need not make die, but directly print the part. The production cycle has drastically reduced with 3D printing. The technology will be even more productive in the coming years as it continues to evolve and be accepted by majority.

Regarding industrie 4.0, I might be in minority when I say this. The Indian tool room needs capacity enhancement more than automation. Because it is not something that is driven by the customer, your OEM is not asking you to become compatible with industrie 4.0 but instead they are asking you to enhance the capacity. There has to be a very strong reason for an Indian tool room to invest heavily for new 4.0 enabled machine and modify older machines to become industrie 4.0 capable. Secondly, looking at the demand in India right now, a tool room should rather invest in enhancing their capacity rather than opting for industrie 4.0 which will have its own challenges while implementing. Majority of the tool rooms in India are SMEs and most of them are not even using advance manufacturing technologies, one should rather invest in high-end CNC and sophisticated software's among others.

It is not something a low cost country tool room should look at right now. I feel it is best suited for production environment where large number of parts is being manufactured.

**Q The future of Indian tooling industry...**

All the good tool rooms in India will thrive. I feel there will be plenty of work in the next few years, smaller tool rooms will be encouraged to grow. Lots of Tier-I suppliers will reach out to tool room suppliers to meet the demand gap. All OEMs in India are bullish at the moment. Apart from automotive, industries like plastics, electronics, home appliances and packaging among others are also growing in India. As the economy is doing well it enhances the purchasing power of consumers and driving the demand for the above industries. 🌈

# Indian tooling industry can look forward to a period of good order bookings



**R.A.R. Prasad,**  
Advisor - Technical, Aluminium Casters'  
Association of India (Alucast)

**Q Die casting is one of the most important processes that define the overall efficiency of the product. How has the process changed over the years?**

The drive towards light weighting has spawned new alloys, particularly for structural components of automobiles. These give the parts higher strength, elongation and greater crash strengths.

**Q What are the new developments in die casting process?**

Over the years die casting has undergone several changes. Advances in casting process include evolution of technology such as Vacuum Die casting and Lost Core process. Technology in die engineering has witnessed thermal management of dies, special subsurface coatings to extend die life. Apart from these, there is special steel which provides high thermal conductivity and potential to reduce cycle time & boost productivity.

**Q How do you see the business outlook for Indian tooling fraternity?**

Looking at the current demand, I can say the Indian tooling industry can look forward to a period of good order bookings.

**Q Advent of technologies like 3D printing and its impact on the demand for die casting in future...**

3D printing can be considered as a disruptive technology. It may thrive in niche areas but will come to pass sooner than later.

**Q It is a well-known fact that electric vehicles (EV) will impact the entire eco-system of manufacturing technologies. How will the demand pattern change for die casting when EVs become main stream?**

Electric Vehicles are by no means the front runners in the race to displace conventional I.C. engines. Presently there is a tough competition when it comes to cars with I.C. engines, electric cars and other hybrid versions, which are collectively weighed down by the burden of heavy batteries. While one manufacturer believes in continuing with hybrid versions well in to the 2020'S, another one plans to introduce cars with variable compression ratios. Yet another vouches for hybrid versions. Most believe that the scenario could be a mix of extremes, which leaves us without a clue as to the exact nature and number of parts which go on to be the bulk of requirements. Drastic changes in part design may render redundant significant numbers of die casting machines operating with current technology. Not every die caster can do away with losing such machines. He would be well advised to step aside from the customer base which is currently dominated by auto majors, take a close look at other sectors and identify castings with unsatisfied demand and which can be produced efficiently. Expanding the customer base and spread of application can help the die caster to survive. Certain areas that are poised for growth is electrical motor housings and end covers, parts used in domestic appliances, textile machinery, housing for street lamps and heat exchangers.

**Q What are the challenges in Indian tooling industry?**

There are several challenges that the industry faces like controlling the cost of manufacture, maintain the highest quality levels and competition from tool makers in China and Far East.

**Q Your views of future of Indian tooling industry...**

Auto components made by Indian industry has found ready acceptance with most of the multinational auto companies that have a manufacturing base in India. There is a reason to believe similar success with other castings. The Indian tooling industry can look forward to sustained demand in the coming years. 🌈

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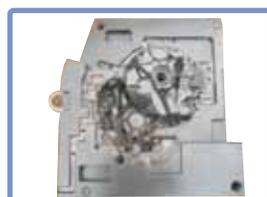
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# 5 Trends in 3D Printing for 2018

2017 has been an exciting year for the 3D printing industry, with plenty of new players appearing on the scene, as well as countless new collaborations and innovations. In such a dynamic industry, we would love to be able to simply peer into a crystal ball to see what the future will bring. Unfortunately, we don't have a crystal ball at Materialise, but we do have many industry experts and visionaries and we've asked them to share their predictions for the 3D printing industry in 2018. We've bundled their input for you in a list of five trends we anticipate for 2018.

## Application-Driven Innovation

Recent developments in Additive Manufacturing have focused on building better, faster, larger and more capable machines and on extending the range of new materials. And while it's important to continue to innovate and increase our manufacturing capabilities, the real transformative power of 3D Printing will not be unleashed by simply building bigger and better machines. The key to unlocking the next industrial transformation will be our true understanding of which applications benefit most from AM technology. In other words, ask not what this machine can do – but what this machine can do for you. In the future, we believe machines and software will become more and more specialized and application-driven to meet very specific customer and industry demands. The potential is huge. When the hearing aids industry discovered the transformative power of 3D Printing, the change was fast and irreversible. Within 500 days, over 90% of hearing aids in the US switched over to Additive Manufacturing. This means that, rather than waiting



for 3D printing technology to mature, manufacturing companies should focus on the applications now. Because the technology is there, but it's applications that will drive the real transformation.

## Automation

As 3D printing technologies are maturing, the focus will turn towards streamlining pre- and post-production processes. While a large segment of 3D-printed production tools and prototypes are ready for use nearly straight out of the machine, with minimal finishing, there's also a huge number of end-



parts that require complex finishing processes. This is not only labor-intensive, but also cost-intensive.

Industrial automation in the form of pick-and-place robotics has the potential to drastically raise efficiency by cutting post-production time and costs. Pair that with software know-how, and we envision an automated post-production system that ensures traceability and speed without over-reliance on manual intervention. Software will also increasingly play a role in the automation of pre-production steps, as illustrated by the surge in interest in simulation software, which is mostly driven by the rising adoption of Metal 3D Printing. While Metal 3D Printing has already proven its vast potential for time- and cost-savings, the cost of wasted material due to build fails quickly becomes unaffordable and we



expect simulation software will play an increasingly important role in predicting failures before they happen.

### Integration

In the last few years we have seen 3D Printing claiming its position in supply chains. With faster lead times and tooling-free production, 3D Printing has proven to be a valuable technology for those applications that are traditionally resource-intensive. It also leads to leaner supply chains and fewer stock risks. We believe that 3D Printing will steadily increase its value in manufacturing supply chains in two ways: by enabling the creation of digital supply chains, which hold the promise of transforming entire business models, such as the hearing aid and eyewear industry; and by becoming more integrated in existing supply chains.

### Collaboration

Collaboration is key to expanding 3D Printing to manufacturing industries. Increasing collaboration between existing players, such as hardware, software and service providers, will lead to optimized and easier-to-integrate product offerings, which will fuel adoption. We also expect to see more collaboration between the 3D printing industry and its customers. Co-creation, which creates a framework that allows for the integration of 3D printing software, engineering and manufacturing knowledge with a customer's specific market knowledge, is the real driver of innovation with transformative impact.

### Metal 3D Printing

Metal 3D Printing is developing rapidly, both in terms of lowering costs and increased adoption, 2018 will see improvement in terms of new technologies, as well as improvements to established ones. We believe that Metal 3D Printing will never replace traditional manufacturing—but as a complimentary manufacturing technology, its position is becoming increasingly important. Looking forward, Metal 3D Printing will become more and more of a necessity when solving specific manufacturing challenges and creating customized, complex end-use products. To that end, we acquired ACTech this year, a German manufacturing company specialized in highly complex metal prototype casting. With their expertise in metal and our knowledge of 3D Printing, we are prepared to bring Metal 3D Printing to the next level. 🚀

Author: **Bart Van Der Schueren**, Chief Technology Officer and Executive Vice President at Materialise



# Renishaw conformal cooling solutions prove a boost to moulding productivity

The use of cores incorporating conformal cooling in the moulds for its plastic casings has allowed Alfred Kärcher GmbH & Co.KG to reduce the cooling time for each part by 55%, giving a huge boost to the company's moulding productivity. The special cores, which were designed by Renishaw, were produced using metal additive manufacturing technology.



**H**igh-pressure washers from Alfred Kärcher GmbH & Co.KG, with their unmistakable bright yellow casings, have become a permanent fixture in many German homes and are growing in international popularity. The devices' power and

reliability encourage people to use their "Kärcher" as part of their daily cleaning routine, both inside and outside the home.

To meet the increasing demand from around the world, Kärcher produces its compact washer by the million every year. More than two million K2 basic pressure washers alone leave the Obersontheim factory every year. However, even this level of production is unable to meet the global demand.

### Challenge

One of the Kärcher washers' most recognisable features is their bright yellow casings. This was also one of the key bottlenecks in the manufacturing process. For example, the casings for the K2 series washer are produced on six injection moulding machines, each capable of moulding 1,496 casings a day. This was not enough for Kärcher, which has four assembly lines, operating three shifts per day, to give a production capacity of 12,000 assembled and packed K2 high pressure washers each day.

Clearly, one option would be to add more moulding machines. However, Leopold Hoffer, the coordinator for injection moulding at Kärcher's Obersontheim factory, believed that it should be possible to generate more productivity from the existing equipment. "Our aim was to reduce the cycle time from the original 52 seconds to between 40 and 42 seconds," he explained. He approached Pliezhausen-based LBC Engineering, which was acquired by Renishaw GmbH in May 2013, to work on improving the cooling time in the moulds.

### Solution

"The first stage of the project was to obtain data for the existing moulds to determine whether Kärcher's goal was feasible," recalled Carlo Hüsken,

# KÄRCHER



who coordinated the project for Renishaw. The existing injection moulding process was mapped with thermographic images provided by Kärcher and simulated using Cadmould® 3D-F simulation software. This revealed that, within the 52 second cycle time, cooling accounted for 22 seconds, with melting at 220°C and de-moulding at 100°C. The mould tool temperature was controlled with water at a temperature of 35°C and a throughput of 10 litres/minute. Hotspots, detected by the thermography, were also modelled, as these areas were responsible for the extended cycle time and needed to be analysed in more detail. With this data, a simulation of 20 cycles was completed, including an analysis of the wall temperature.

Based on a suggestion from Mr Hüsken, the temperature control on the nozzle side was improved for the second simulation run. The beryllium copper, threaded fitting dome, for the body cover was provided with additional cooling by inserting two conventional cooling channels into the mould plate on the nozzle side.

Two simulations were then run to assess potential improvements through the use of conformal cooling. Conventional mould cooling is made up of a network of drilled channels. Drilling the channels limits the

“The results were better than expected. Renishaw sold us a complete improvement package, with a holistic consideration and analysis of the mould used to achieve the best results.”

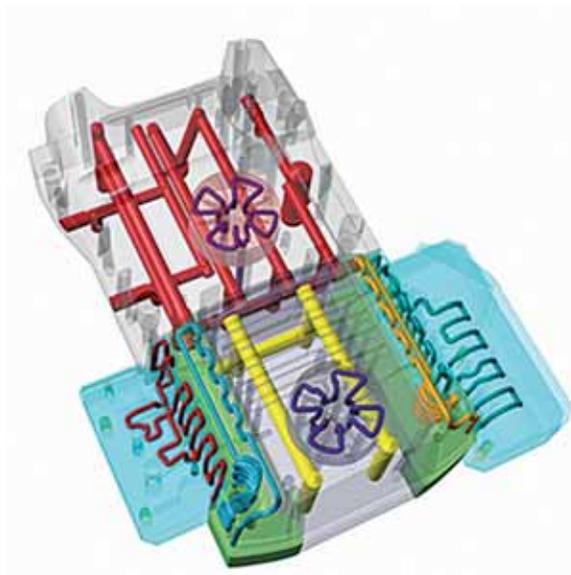
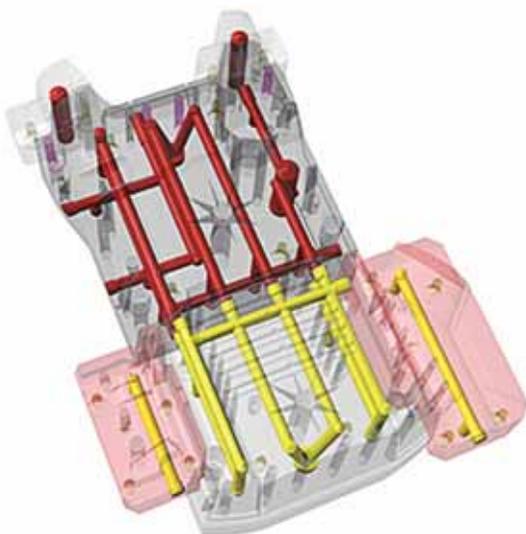
— Kärcher (Germany)

geometries that can be produced so, while this is adequate for simpler moulds, it cannot provide the most efficient cooling in more complex examples. Conformal cooling is based on the use of metal additive manufacturing to produce the core of the mould. Additive manufacturing builds the cores in a series of thin layers. The flexibility of this approach means that cooling channels of almost unlimited complexity can be incorporated. Typically, conformal cooling is used to keep the channels at a more equal distance from the moulding, giving more even cooling, or to focus on areas where hot spots are known to exist to give more rapid cooling in those areas.

The simulations showed that practically all of the hotspot areas could be improved through conformal cooling, with the wall temperatures reduced by up to 70°C.

Finally, in one area where there was insufficient space in the mould to incorporate conformal cooling, Kärcher made clever improvements to the product design in order to alleviate the problem.

Based on the results of the simulations, Renishaw presented a comprehensive improvement plan to Kärcher. This showed that conformal cooling could



# Case Study



be used to improve the temperature control of the mould hotspots, thereby achieving a more uniform cooling rate and a reduced cooling time. A modified mould design was proposed that would incorporate two additively manufactured cores to provide conformal cooling at the identified hotspots.

## Results

The results from the modified mould design were checked by Renishaw, using thermographic images supplied. These confirmed that the wall temperatures could be reduced by 40°C to 70°C. The cooling time was reduced from 22 seconds to 10 seconds, a 55% reduction. Volker Neu, technology and Plastics group leader at Kärcher, produced figures confirming that the new mould design, combined with the re-alignment of some peripheral components (material feed, handling systems, etc.), made it possible to reduce the cycle time from 52 seconds to 37 seconds. As a result, the daily capacity on one machine could

be increased from 1,496 to 2,101 castings.

Kärcher then implemented the design changes for the other moulds. The additively manufactured hybrid inserts for these moulds were produced and supplied by Renishaw, with Mr. Hüsken actively supporting the mould-maker during the manufacture of the tooling.

Having been sceptical about the project initially, Mr. Hoffer said, "At the end of the day, the results were better than expected. Renishaw sold us a complete improvement package, with a holistic consideration and analysis of the mould used to achieve the best results."

Renishaw always bases its client-specific solutions on a combination of technology. "In our case, this meant a mix of conventional cooling technology, project-specific cores produced using additive manufacturing, and vacuum-brazed cores" he added. "From these ingredients, we created the right recipe for the application."

From this project, Mr. Hoffer has gathered important knowledge and experience. "In future, we will give more attention to cooling in the design phase," he stated. "Cooling calculations will be an essential stage of each mould design at Kärcher. Using this information, we can then make the decision whether to work with conventional cooling or a conformal cooling solution."

"Renishaw's support was excellent. For this project, Renishaw was the right choice and the company will also be the right partner when we need close-contour temperature control in the future," concluded Mr. Hoffer. 🌈

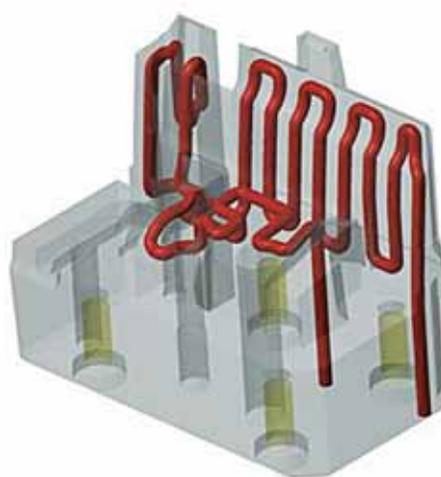
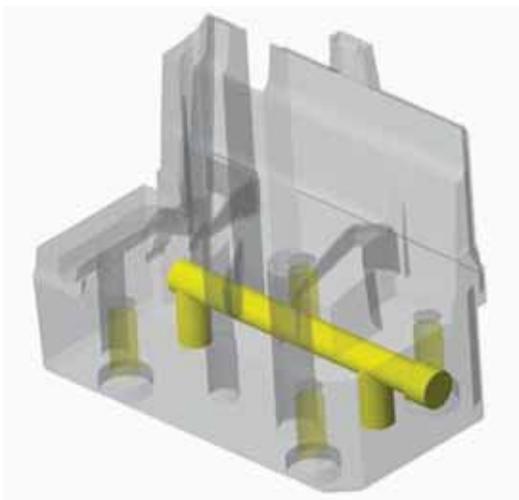


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# Women in Tooling: Closing The Gap

Manufacturing has been a male dominated sector, but fresh opportunities in the last few years have attracted several highly skilled women. People in the industry are increasingly becoming aware how gender diversity in the workforce drives innovation. As manufacturing is fast

## “Be brave to enter this male dominated sector”



**Sonal Potdar,**  
Founder, Solid Vision

### Q Journey till date...

I have been associated with the manufacturing industry since 1993. We started the journey with a vision to provide latest technology to the manufacturing industry in the form of training, services and products. We have served more than 5000 customers till date with respect to Design, Manufacturing and Inspection. Our company brings the latest and cutting edge technology from across the globe to the doorsteps of the Indian manufacturing industry and helps them implement the same successfully. We provide training to their in-house team and throughout support.

I personally had a roller coaster journey. There were many ups and downs. It has been a thrilling experience because when I entered in this industry there weren't any women. Being the 'only lady' in a room full of men at various business gatherings and conferences, made me extremely proud of my accomplishments.

### Q Overcoming challenges...

To be honest, I was lucky enough to be surrounded by people who have always acknowledged my work and have had a supportive family. Breaking the prejudice about women single handedly looking after a business has been the biggest challenge and

having a strong team, backed by family and industry support has been my biggest strength.

Handling motherhood and business simultaneously is the biggest challenge women in this industry face. Having a responsible and understanding partner who took equal responsibility and my perseverance towards my goals helped me throughout.

### Q According to a study by Consulate General of Sweden in India, women are underrepresented in India's manufacturing sector with participation ranging from only three to 12%. Your views...

That is true. We don't even have a 1:10 ratio of women in this industry. We have directly been associated with Top manufacturing industry, so being a front handler in my company; I have always seen that the top decision makers are always men in this Industry. Even in jewelry industry, the top decision makers in manufacturing are always men.

### Q In 2012, Yamaha Motor India experimented with 'Pink Assembly Line' initiative in collaboration with Uttar Pradesh government to run an assembly line for scooters managed entirely by women workers. Do you think such initiatives can encourage women to be a part of the male dominated manufacturing industry?

It was definitely a good initiative taken by the company. Major issues faced by females are family responsibilities. So if incentives like time flexibilities, equal pay scale and travelling allowances are provided, we can definitely see improvement in the number of women involved in the manufacturing industry.

### Q What else can encourage women?

More efficient counseling for both children as well as their parents regarding the vast opportunities in manufacturing industry. There should be more campaigns in the non-metropolitan cities about these opportunities.

### Q Government and women entrepreneurs in this industry...

The government is coming up with many schemes. We need more awareness about these schemes so that we have a nation with more women entrepreneurs venturing the manufacturing segment.

### Q Advice to women who want to enter the manufacturing industry...

Be brave to enter this male dominated sector. Do well and with honesty, your work will speak for you and you will always be rewarded.

### Q Role model...

Mrs. Sudha Murthy

evolving from traditional to technologically advanced, it is high time to create a culture where unique strengths can thrive. We bring you two such women who broke stereotypes to be an active part of this sector. Let's hear their story.

## “Accept challenges and work towards fulfillment of the target”



**Reny Joseph,**  
Director, Zion Precision Pvt Ltd

### Q Journey till date...

I started my career as a professional in sales and marketing by representing one of the world's best companies in the field of metrology, MAHR, catering to automobile, aerospace and engineering industries. After few years, I also started the business of home and industrial automation in collaboration with an Italian brand 'NICE'. Even though I am in the business of import and marketing and have no technical qualification, my ambition was always to start a manufacturing plant.

Since last 18 years, we are importing materials from Europe and distributing in India, where the investment and hassle are ours and the value and name is taken by the foreign manufacturer. So I thought why not produce ourselves and provide world class quality in India. I got inspired during Godrej's tooling partners meet in 2013 and with their whole-hearted support, we achieved the desired goal. My inspiration towards the manufacturing field was my daughter. To succeed in tooling industry, one needs to have patience and passion.

### Q Initial challenges and overcoming them...

Initially, the biggest challenge was to get the right and dedicated employees. Selecting and maintaining the machines and power fluctuation during working hours. More investment and managing strategy has helped overcome the situation today.

### Q According to a study by Consulate General of Sweden in India, women are underrepresented in India's manufacturing sector with participation ranging from only three to 12%. Your views...

It's very true. Women after education prefer to take up a job instead of becoming an entrepreneur. Secondly, we need to provide safety and security to our women. They still feel unsafe working in male dominated areas like production lines. We also need to provide better training to our women for the same jobs, what men have been doing in manufacturing. If women have the efficiency, confidence and courage, they can prove to be better performers.

If women are given greater responsibilities, freedom to make their own choice, they can make a significant change in our industries. As it is rightly said, if a woman is educated in a family, the whole family gets educated and so would the whole nation be educated one day. Women are fast learners and multi-taskers as they have always been trained to play different kinds of role simultaneously.

### Q In 2012, Yamaha Motor India experimented with 'Pink Assembly Line' initiative in collaboration with Uttar Pradesh government to run an assembly line for scooters managed entirely by women workers. Do you think such initiatives can encourage women to be a part of the male dominated manufacturing industry?

I do not agree to the concept of women workers in 'Pink Assembly Line'. I feel there should be equal rights for men and women. It should not be a monopoly for men/women. "Work is worship". Team work will be more successful in my opinion.

### Q What else can encourage women to actively be a part of this industry?

Women should be given same respect and privileges so that, they come out and learn and give their best.

### Q Is the government doing enough?

Government has introduced many plans for women entrepreneurs, but how many people are getting the opportunities and benefit, that's questionable. They should plan on how to create awareness among the right people.

### Q Advice to women who want to enter the manufacturing industry...

My advice is to believe in your strengths and have the ability to learn and handle the things in a better way. The most important is to employ and support fellow female workers and provide equal opportunities to them while selecting for manufacturing jobs. Accept challenges and work towards fulfillment of the target.

### Q Role model...

My mother is my role model and I admire Dr. APJ Abdul Kalam.

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**Roopraj Bhatt,**  
GM – Operations, Sridevi Tool Engineers Pvt. Ltd.

## “Dealing with Multiple stakeholders makes Project Managers job challenging and exciting”

Since most of the tool rooms are dealing with automotive industry, it is very critical for them as well to finish the job on time for a timely launch of the vehicle. Since the change/correction in project occurs very frequently we estimate the time accordingly.

### Q What is project management according to you?

It is the ability to manage the project given by the customer efficiently. It includes adhering to deadlines, meeting the quality requirement and getting things done within targets to reduce cost overruns. It also means managing manpower and other resources effectively.

### Q How important is the role of a Project Manager in the tooling industry?

It's a highly critical job and plays a direct role in a company's growth, due to its dynamic nature of work like meeting customer demands, time management and managing internal / external resources. A project manager must deal with multiple stake holders such as customers, vendors and within company with departments like design, production, quality, logistics, etc throughout the project.

Project managers communicate with everyone from shop floor operators all the way up to the top management. They must manage their own staff along with outside contractors. And, they must do all of this while keeping the project on schedule and within budget.

### Q It is not unknown that at times customers make changes in design, specifications while keeping the same deadline. How do you deal with such situations?

It happens in almost all the projects and that is what makes our jobs interesting and challenging. When a customer changes the design, but wants us to abide by the same deadline, it becomes a challenge for us. We then focus on optimising all our resources smartly to ensure timely delivery. When such a situation arises, we explore several options such as rescheduling of projects, outsourcing non-critical work, increasing resources, among others. If they are still not within timeline, we give them a realistic scenario regarding what can be done and what not.

### Q How challenging and exciting Project Manager's role in tooling industry?

Ours is not a monotonous job, we have different challenges to face every day and it makes our work very dynamic and exciting. Because of the criticality of the project we need to be on our toes all the time.

According to you what are the necessary skills required to be a good Project Manager?

- ♦ Sound technical knowledge
- ♦ Good planning skills
- ♦ Calm head to foresee murphy's law
- ♦ People management
- ♦ Good communication skills

### Q What are the important factors to keep in mind while managing certain projects?

The most important factor is to keep the quality requirement in mind while adhering to the deadline. One must learn from the similar projects done before to ensure smooth operations and delivery. A Project Manager should also be aware of the abilities of his team members and delegate work according to their skill sets.

### Q How does a typical day in the life of a Project Manager look like?

Every project, every day comes with its own set of challenges, that means we must deal with some or the other issue every day. A typical day for us involves planning of resources, allocation of man power, trouble shooting, and development of skill set of subordinates, among others.

### Q Words of wisdom for the aspiring Project Managers...

- ♦ Be positive
- ♦ Have patience
- ♦ Find a way to work around constraints
- ♦ Take your team along
- ♦ Clear & simple communications
- ♦ Time management
- ♦ Willingness to put in hard work. 🌈



**Amit S Nerkar,**  
Chief Manager – Projects, Godrej Tooling

## “Project Manager should spend more time in initiating & planning and less on execution”

for ECN/ECRS w.r.t. previous working experience with OEMs and accommodate changes.

The last and most common scenario is when the customer asks for changes and the toolmaker has to implement them keeping the original deadline intact. In this case, Change Management plays a very important role. Speed of studying change scope and communicating feasibility and impact should be very fast. Project Manager should visualise the scope according to the stage at which the change occurred and how concurrently activities can be proceeded. This might lead to some additional expenditure in engineering and some idle slots in capacity, but the Project Manager has to capture the same logically and pass on to customer under ECN costs.

**Q What is project management according to you?**

Project Management is managing a project with application of knowledge and skills to meet the requirement of a project as per the scope and quality within a stipulated timeline.

**Q How important is the role of a Project Manager in the tooling industry?**

Project Manager plays a very critical role in the tooling industry. All toolmakers catering to the automotive industry know how important the vehicle build events are which are directly linked with tooling parts supply. These days, not only Japanese and Europeans but Indian OEMs are also very strict on the vehicle build dates. Tooling orders placements may get delayed but milestones date is not going to change, this means Project Manager at tool suppliers will have to manage the critical timeline without compromising the quality.

**Q It is not unknown that at times customers make changes in design, specifications while keeping the same deadline. How do you deal with such situations?**

As all OEMs say ECN/ECR (Engineering Change Note/ Engineering Change Request) are part of project lifecycle and a toolmaker must go with it.

When OEMs release 3D part data with tooling suppliers there are high chances the company will make some changes in designs/features – under such circumstances early involvement of toolmaker during product design with OEMs may help, so that upfront ECR will be passed on to the OEM.

In another scenario, where early involvement is not feasible, the Project Manager must budget some time

**Q How challenging and exciting is a Project Manager's role in the tooling industry?**

Most of the Commercial Tool Rooms have a functional organisational structure because of the core technical dependencies involved. Though the Project Manager is answerable for timelines, Functional Managers also reserves some authorities when it comes to decision making. In this case, the Project Manager plays the role like that of a Project Co-ordinator or Expeditor. In such cases, aiming to meet the customer expectations, Project Manager has to keep up high esteemed. Escalation at the appropriate time will help meet the plans rather than reporting delays, recovery actions, create war room forums to get the help from top levels.

Empathy and teamwork is the key to success for a Project Manager. It helps manage internal and external stakeholders of the project.

**Q According to you what are the necessary skills required to be a good Project Manager?**

Buffer management is a critical skill which a Project Manager should use while managing a project. In a multiple project environment like tooling, if buffer management is not done properly at the initial stage, the Project Manager might end up focusing more on execution at the fag end. During this period, they might lose focus on the fresh projects which are at the initial stage, and it goes on. Project Manager should spend more time in initiating & planning and less on execution.

**Q What are the important factors to keep in mind while managing certain important / complicated projects?**

Scope documentation, WBS work breakdown structure, acceptance criteria and critical timelines are the important factors while a project. This will ensure there is no conflict with stakeholders involved in the project.

**Q How does a typical day in the life of Project Manager look like?**

Project Managers are in firefighting situations almost every day. A Project Manager should ensure that during a day the high energy time must be utilised for planning and not for execution. If planning is done properly, he/she will be able to guide execution functions more effectively.

**Q Words of wisdom for the aspiring Project Managers...**

Technical knowhow plays a critical role in project management. I am writing contradictory to the proverb, but it is important for a Project Manager to be, a "Jack of all trades and master of one" and that 'one' is project management skill.

Specially in the automotive tooling industry, a Project Manager should be aware of customer's behaviour in terms of the way the customer works, events & milestones, policies, criticality of events etc. Use of technology for planning and communication is a must these days as the Indian toolmakers now cater to overseas OEMs. 🌈

## New Members

**1. AMAN METAL PRODUCTS**

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Email: amanmetal@gmail.com

**Contact Person: Mr. Rajinder Singh** - Proprietor  
**Activities:** Press Tool Design & Manufacturing, Sheet Metal Components Production & Job Work on CNC Wire Cut & Vertical Machining Centre

**2. CAM TOOLS INDUSTRIES PVT LTD**

M-3, Mehra Industrial Compound, Opp. Sakinaka Tele Exchange, A.K. Road, Sakinaka, Andheri (East), Mumbai - 400 072, Maharashtra  
Mob: 9821081981  
Email: paresh@digitaltoolroom.com  
Website: www.digitaltoolroom.com

**Contact Person: Mr. Paresh Panchal** - Proprietor  
**Activities:** Injection Moulds, CAD/CAM Services, CSD/ CAM Software Selling, CAD/CAM Training, Reverse Engineering, 3D Machining

**3. DESIGNTECH SYSTEMS LIMITED**

6, Commerce Center, Rambaug Colony, Paud Road, Pune - 411038, Maharashtra  
Tel: 020-41311200/201; Fax: 020-41311233  
Email: info@designtechsys.com  
Website: www.designtechsys.com

**Contact Person: Mr. Mahesh Kothwala** - Asst. General Manager  
**Activities:** Designtech System is a leading CAD/CAM/CAE/ PLM/RPT solutions, additive manufacturing Technologies and Engineering services provider from India.

**4. MECHASOFT**

Plot No. 81,82,83,84. Sector "C", Phase II, Parvati Industrial Estate, Yadrav. Dist-Kolhapur, Ichalkaranji, Maharashtra  
Tel: 023-22252807  
Email: tsulkarni@mechasoft.in  
Website: www.mechasoft.in

**Contact Person: Mr. Tushar S. Kulkarni** - Managing Partner  
**Activities:** Die and Mould for Pressure Die Castings

**5. CRAFTWELL MOLD ENGINEERS**

#53/2, 4th Main, 2nd Cross, Magadi Main Road, Kottigepalya, Sriganhadakaval, Vishwaneedum Post, Bangalore - 580091, Karnataka  
Email: contact@craftwellmoldengineers.com

**Contact Person:** Mr.Suresh Baru A.V. - Managing Partner

**Activities:** Product design, Injection mould, Jigs & Fixture, Press tools & Blow moulds, Pre production (protomould) manufacturing, Supply of Critical (miniature) molded & stamped parts.

**6. DIE CRAFT TOOLINGS**

No. 1/A, 9th Cross, Shiva farm Industrial Estate, Sannakkibayalu, Magadi Main Road, Kamakshipalya, Bangalore - 560079, Karnataka  
Tel: 9663103333/4444  
Email: diecrafttoolings@gmail.com

**Contact Person: Mr. Arulkumar. V** - Managing Partner  
**Activities:** Tool design & development Of Injection moulds, PDC Dies, Jigs & Fixtures, Precision Machine Components, Mould Base & Die sets.

**7. INTELOGYS**

#232, 1st Floor, 7th 'D' Main,3rd Satge, 4th Block, Basaveshwaranagar, Bangalore - 560079, Karnataka  
Email: manjunath@intelogys.com  
Website: www.intelogys.com

**Contact Person: Mr. Manjunath B.S.K** - Proprietor  
**Activities:** Tool Design & Development (injection mould, Die Casting) Jigs & Fixtures, Product design, Special purpose machine etc.

**8. MACRO TECHNOLOGIES**

65/2, R5, KCG Industrial Estate, Kamakshipalya, Bangalore - 560079, Karnataka  
Tel: 080-23480122  
Email: shreeram@macrogrp.com / parthasarathy@macrogrp.com

**Contact Person: Mr. Shreeram S.** - Partner / **Parthasarathy G.** - Partner  
**Activities:** Plastic Injection Moulds Manufacturer

**9. MACZIN TOOLS**

Sy. No. 127, Site No. 3, Kempaiah Garden, Near BTS 9th Depot, 4th Phase, 2nd Stage, Peenya Indl. Area, Bangoore - 560058, Karnataka  
Tel: 080-43726963; Mob: 9844783203  
Email: maczintools@gmail.com

**Contact Person: Mr. James Jacob** - Partner  
**Activities:** Tool & Die Making and Moulded Components

**10. POLYMET DIMENSIONS**

#79, Sajepalya, Pete Chennappa Industrial Area, Kamakshipalya, Magadi Main Road,

Bangalore - 560079, Karnataka

Tel: 080-23486636;  
Mob: 7411041599  
Email: polymetdimensions@gmail.com / joseph@polymetdimensions.com

**Contact Person: Mr. Rajesh S. B. / Mr. Joseph Franklin I.** - Partner  
**Activities:** Development of injection moulding Tools & Components, Precision machine parts, Jigs & Fixtures.

**11. INDUSTRY LANE SOLUTIONS PVT LTD**

No. 58, 3rd Floor, Railway Parallel Road, Kumara Park West, Bangalore - 560020, Karnataka  
Tel: 080-40962556/ 3556;  
Mob: 9902026198  
Email: rahul.narang@industrylane.com  
Website: www.industrylane.com

**Contact Person: Mr. Rahul Narang** - Director

**12. GAN TOOLS AND COMPONENTS**

B-121, 3rd Main, Peenya, Industrial Estate, 2nd Stage, Peenya, Bangalore - 560058, Karnataka  
Tel: 080-41538169  
Email: gantools@gmail.com  
Website: www.gantools.com

**Contact Person: Mr Praveen Kumar Gangolli**  
**Activities:** Manufacturers of precision moulding tools, components and CNC, VMC machined parts.

**13. GENX TOOLS**

B-178, 4th Main, Peenya, Industrial Estate, Peenya 2nd Phase, Bangalore - 560058, Karnataka  
Tel: 08028369396  
Email: genxtools15@gmail.com / vpgenxtool@gmail.com

**Contact Person: Mr. Somanathan K.** - Vice President  
**Activities:** Manufacturers of Tear trim Dies of Rubber moulds, Compression mould, injection mould, transfer mould fabrication and supply PAN India.

**14. GRS INDUSTRIES**

C-38/2, 2nd Main, 2nd Stage, Peenya Industrial Estate, Bangalore - 560058, Karnataka  
Mob: 988626127  
Email: grsindustries9@gmail.com

**Contact Person: Mr. Gopalkrishna** - Proprietor  
**Activities:** Manufacturing of Injection moulds, press tools, die casting dies & jigs & fixtures.



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# 7 Interesting Things to Ever Be 3D Printed

- **3D Printed Vincent van Gogh Ear:** If you are an art enthusiast with you might be aware of the fact that famous artist Vincent van Gogh cut off his own ear. Recently, artist Diemut Strebe, teamed with researchers to 3D bioprint an ear using van Gogh's own relative's DNA. Yes, you read it right!

- **Dead People:** 3D printing extinct animals is a passé now. Scientists at Loughborough University in the U.K. have printed a full 3D replica of King Richard III who has been dead since 1485. The British royal isn't the only one to be resurrected by 3D printing. A Belgium-based 3D-manufacturing firm, Materialise, has created a full-scale 3D clone of King Tut, the young pharaoh who has been mummified since 1323 B.C.

- **Aston Martin DB4:** With 3D printers and decent knowledge of computer aided design (CAD) one can re-create the old world magic. Ivan Sentsch, a programmer from Auckland, New Zealand is currently printing a 1961 Aston Martin DB4 using a \$500 Solidoodle 3D Printer. Ivan is now about 75% of the way through the printing but with over 2,500 pieces of plastic to put together. Ivan has also set up a website where he updates his growing audience with pictures and news. His estimations calculate that the finished product will cost \$1,800 (£1,100), after installing parts such as the engine, drive train and suspension, taken from a Nissan Skyline.

- **Fetus:** Japan-based Fasotec can take magnetic resonance images (MRI) of a developing fetus in the womb and convert them into a 3D-printed paperweight of your fetus in white plastic, surrounded by a clear plastic tummy. Fasotec's main gig is creating 3D prints of scanned organs for doctors and medical students, so fetus keepsakes are something of a promotional sideline. Japanese moms can get theirs for about 100,000 yen (approximately \$975), not including the cost of the MRI.

- **Urbee 2:** This car is the first vehicle in existence that has been manufactured chiefly from 3D-printed parts. Urbee 2 is a three-wheeled car and is cheaper and more fuel efficient than just about any vehicle today. Its inventors aspire to drive the 3D-printed vehicle across the U.S. within the next two years. Right now, the car is nowhere near compliant with the U.S. highway code.

- **Moon Houses:** Ever imagined how cool it would be to live on the moon? Also, how about 3D-printed houses on the moon? MIT has developed a system for 3D printing whole buildings that may make this possible. Let's hope for the best, who knows we actually might need them.

- **Chocolate:** Who doesn't like chocolates? The Cocoa Press, created by University of Pennsylvania student Evan Weinstein, prints and cools melted chocolate into all sorts of delicious shapes. After all chocolates make everything better.



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- Tie rod diameter=145 MM • Ejector stroke=250 MM • Ejector force=11.7 Tons • Maximum mould weight=7.5 Tons. • Air Ejection 2 Stage • Hydraulic Core Pull 3 Stage • Hydraulic Mould Gate Valve 4 Stage • Pneumatic Mould Gate Valve 4 Stage



### (ii) Maxima Servo 850 :-

- Injection capacity=3288 Gm • Injection pressure=1896 Bar • Injection rate=585 CC/Sec • Injection screw stroke=440 MM • Screw diameter=100 MM • Screw speed=160 RPM • Screw torque@172 bar=6550 NM • Clamp stroke=1850 MM • Maximum Daylight=2250MM • Minimum mould thickness=400 MM • Maximum mould thickness = 1200MM • Platen size(H×V)=1790×1470 MM • Distance

- between Tie rods (H×V)=1390×1070 MM • Tie rod diameter=195MM • Ejector stroke=250 MM • Ejector force=18.2 Tons • Maximum mould weight=17.2 Tons • Air Ejection 2 Stage • Hydraulic Core Pull 3 Stage • Hydraulic Mould Gate Valve 8 Stage • Pneumatic Mould Gate Valve 8 Stage

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## National:

### AMTEX Delhi 2018

**11th AMTEX** Delhi 2018 is dedicated to exploring the technological innovations and opportunities of the global machine tool sector, on a single platform. The highlight of the event will be the unique experience created for the Exhibitors and the Business Visitors, through sessions of Networking and Knowledge sharing; July 6-9, 2018; Pragati Maidan, New Delhi.

#### Contact Details:

#### Reed Triune Exhibitions Pvt Ltd

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Vasanthnagar, Bangalore - 560 052.  
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Web: www.amtex-expo.com

### Rajkot Machine Tool Show 2018

**RMTS** 2018 shall unveil the latest manufacturing technologies and machine

tools solutions which would enable large industries and other small and medium enterprises (SMEs) to leverage and enhance their manufacturing capabilities; Nov 28 – Dec 1, 2018; NSIC Ground, AJI GIDC, Rajkot, Gujarat.

#### Contact Details:

#### K and D Communication Limited

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Sumangalam Society, Above HDFC Bank,  
Opp. Drive-In Cinema, Bodakdev,  
Ahmedabad – 380054,  
Gujarat, India  
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Web: www.kdclglobal.com

### Automation Expo 2018

**Automation** Expo, one of the largest Automation & Instrumentation exhibition in South-East Asia is all set to showcase latest in automation technologies, August 29, September 1, 2018, Mumbai.

#### Contact details:

#### Ied Communications Ltd

64, Empire Building D N Road,  
Fort, Mumbai 400001  
Email: arokiaswamy@  
iedcommunications.com  
Web: www.automationindiaexpo.com

### IMTEX 2019

**AN** initiative of IMTMA, IMTEX is a flagship event for the Indian metal cutting industry. The mega event attracts visitors from a wide spectrum of manufacturing and ancillary industries including key decision and policy makers; January 24 – 30, Bangalore International Exhibition Centre (BIEC)

#### Contact Details:

#### IMTMA

Tel: +91 80 6624 6600  
Email: imtma@imtma.in  
Web: www.imtex.in

## International:

### Mold & Die Industry Fair

The Taipei Int'l Mold & Die Industry Fair is one of the veteran manufacturing industrial shows in Taiwan, integrating diverse themes to create comprehensive Industry 4.0 solutions and lay solid foundation for the manufacturing industries, August 29 - September 1, 2018; Taipei, Taiwan.

#### Contact Details:

#### CHAN CHAO INTERNATIONAL CO., LTD.

3F, No. 185, Kangchien Rd., Neihu Dist.  
Taipei, Taiwan  
Tel: +886-2-2659-6000  
Fax: +886-2-2659-7000  
Email: show@chanchao.com.tw  
Web: www.odm-dmi.com

### IMTS 2012

**AMERICA'S** largest manufacturing show—the International Manufacturing Technology Show (IMTS) 2012—is one of the largest global industrial trade shows,

with over 2,500 exhibitors & 115,000 visitors; September 10 – 15, 2018, at McCormick Place, Chicago, USA.

#### Contact Details:

#### The Association for Manufacturing Technology John Krisko

AMT Director – Exhibitions 7901  
Westpark Drive, McLean,  
VA 22102-4206,  
USA  
Phone: +1-703-893-2900  
Fax: +1-703-893-1151  
Email: AMT@AMTonline.org  
Web Site: www.AMTonline.org

### BI-MU 2018

**THE** 31st international event will showcase latest in metal forming, metal cutting machines, robots, automation and auxiliary technologies; October 09-13, 2018; fieramilano, Italy

#### Contact Details:

**BI-MU c/o CEU-CENTRO ESPOSIZIONI**  
UCIMU SPA, viale Fulvio Testi 128,

20092 Cinisello Balsamo MI (Italy)  
Tel: +39 0226 255 234/860  
Fax: +39 0226 255 897  
Email: bimu.esp@ucimu.it  
Web: www.bimu.it

### EuroBLECH 2018

**EuroBLECH** has been serving the sheet metal working industry as their leading international trade exhibition for almost fifty years. The event is a showcase for technological developments, an economic and trend barometer as well as a marketplace for business on a global scale, October 23-26, 2018; Hanover, Germany.

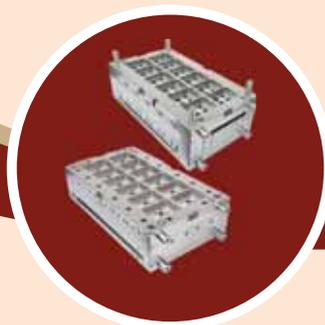
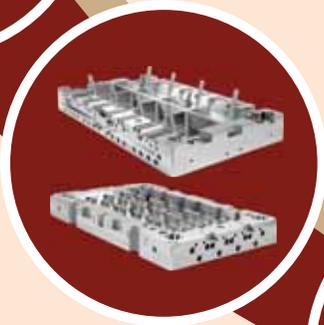
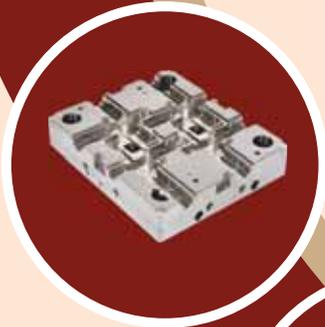
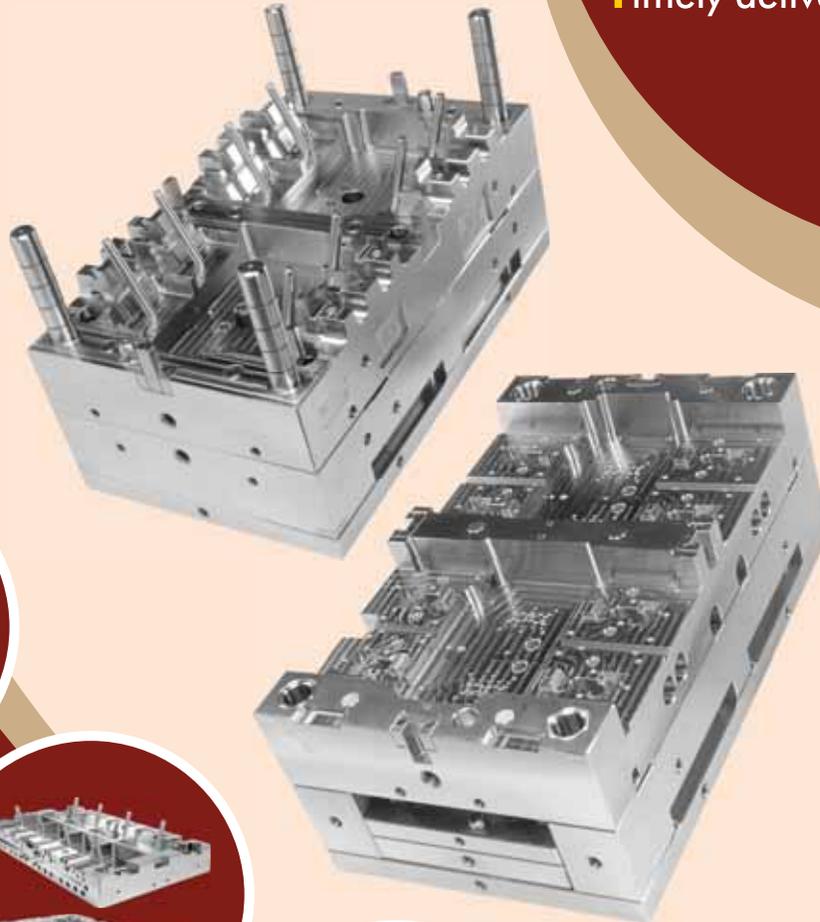
#### Contact details:

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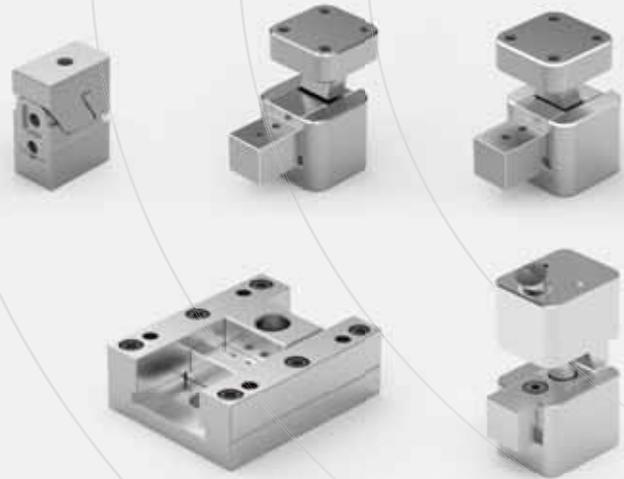
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