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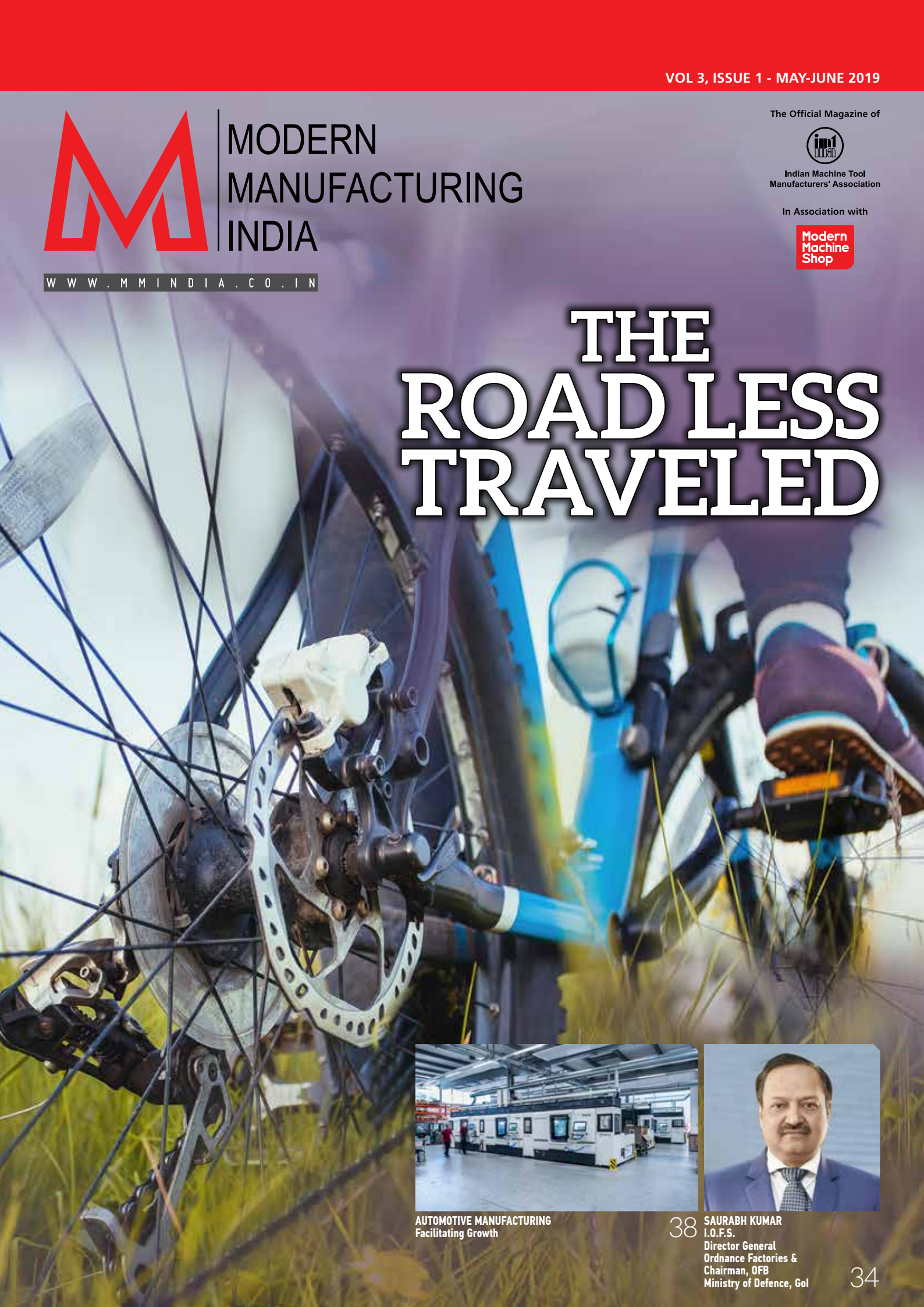


Indian Machine Tool  
Manufacturers' Association

In Association with



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**AUTOMOTIVE MANUFACTURING**  
Facilitating Growth



**38 SAURABH KUMAR**  
I.O.F.S.  
Director General  
Ordnance Factories &  
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Ministry of Defence, GoI



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# IMPRINT

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## A HEARTFELT THANKS TO OUR CUSTOMERS & SUPPLIERS

Thanks to your unwavering support and absolute trust, we have achieved incredible results in 2018-19, setting a new benchmark in the machine tools industry.

Our mission is to provide the industry with smart and innovative solutions ready for the future. We are counting on your encouragement and support in this endeavour of ours.



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## USHERING IN A NEW ERA FOR THE INDIAN MACHINE TOOL INDUSTRY

**T**he Indian machine tool industry grew at an admirable rate of around 30 percent in 2018-19, proving it has the potential to move up the ladder in the global list of 60 countries. Innovations fostered through artificial intelligence, Internet of Things, additive manufacturing, and automation are positively impacting the machine tool market in India in terms of ease of doing business. With the growing demand from user sectors such as automobile and auto components, the machine tool industry is set to witness substantial high-end machine tool manufacturing. With reduced manual interventions, we would be able to get the best from the machines we deploy on factory shop floors. Investment in R&D can help rectify anomalies and increase the industry's market share.

It is estimated that the industry may grow around 20 - 25 percent in FY 2019-2020. Policies such as 'Make in India' and measures to improve infrastructure in urban and rural areas have already led to some robust growth. The order flow in the industry has witnessed about 25 percent growth during 2018-19. Consumption rose by 37 percent in 2018-19, as against 26.5 percent in 2017-18. Machine tool exports from India is estimated to have reached ₹488 crore during 2018-19 compared to ₹355 crore during 2017-18. Indian companies are price competitive in their range, making them suitable for exports. They have grown rapidly over the last decade and marked their presence across all broad product categories of machine tools.

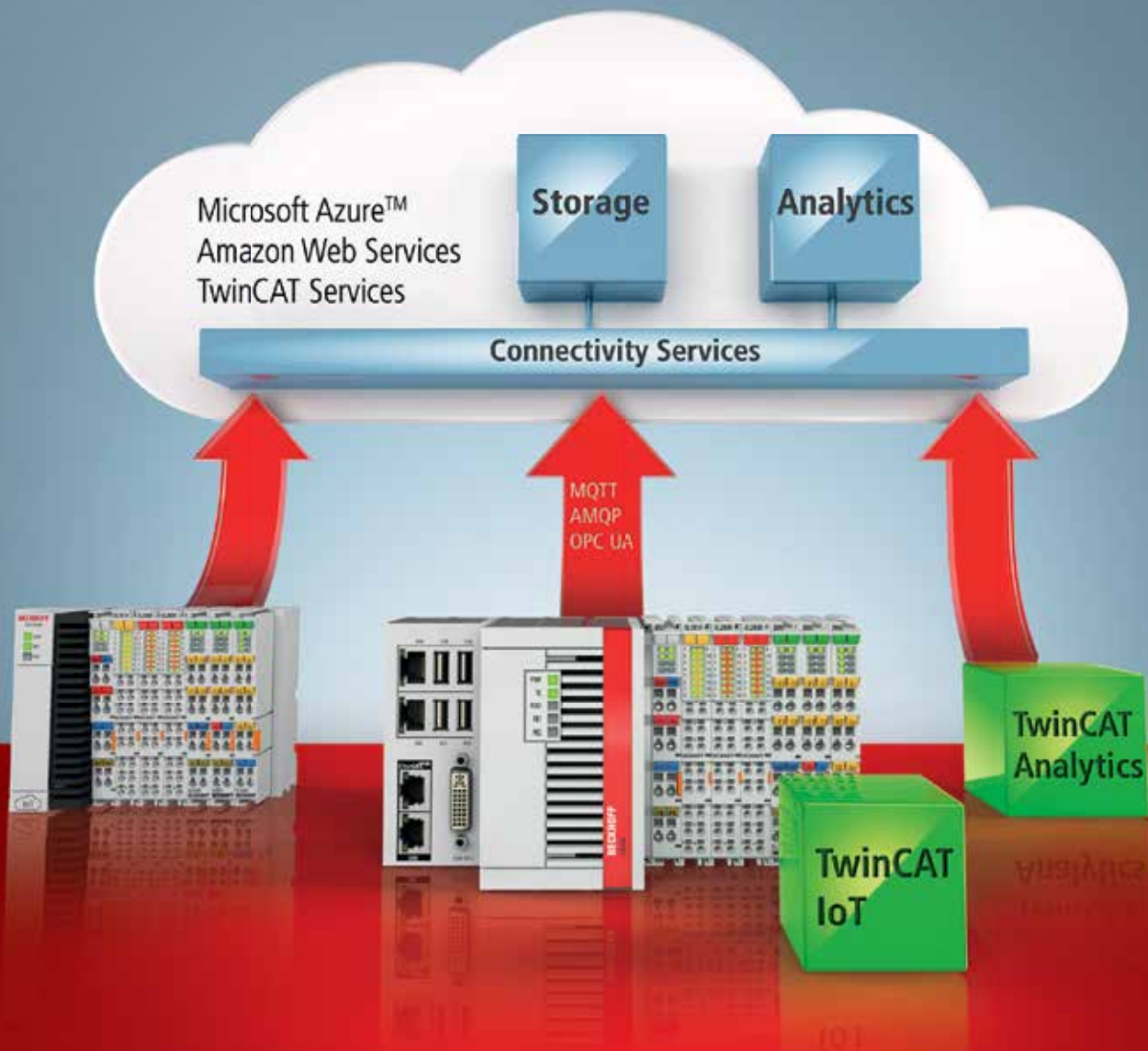
Although the automotive industry spirals the machine tool industry's growth, the winds are changing. The latter is now tapping opportunities in aerospace, defence, railways and other sunshine industries. It is expected that the private sector will make full use of these opportunities and forge technology and production partnerships. The Association will continue its endeavor of projecting machine tool industry as a key enabler of 'Make in India' and strive to make it a global player.

This issue of MMI includes an article mapping the role of metal forming in Indian automotive industry and a special article tracking the R&D initiatives in Indian machine tool sector. The onus is now on the industry to attune itself to the changing needs by adopting cutting-edge technologies.

Happy reading!

**P RAMADAS**  
**President**  
**Indian Machine Tool Manufacturers' Association (IMTMA)**

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**V ANBU**  
DIRECTOR GENERAL & CEO  
IMTMA

Dear MMI Readers,

**W**elcome to the May 2019 issue of Modern Manufacturing India (MMI), the official magazine of Indian Machine Tool Manufacturers' Association (IMTMA). Two eventful years have passed by since the Association began publishing MMI under its banner. Readers' response has been tremendous which encourages us to keep at our endeavor to strengthen manufacturing activities and build a new India.

Manufacturing is widely seen as one of the drivers of economic growth. The sector provides employment to a sizeable section of highly skilled, semi-skilled as well as unskilled job aspirants in the country. The Indian manufacturing industry is aiming to consolidate its position in the market. For this, it is working towards getting its shopfloors upgraded with the latest technologies.

MMI, with its compelling content, new trends, and thought-provoking articles, has been bringing information to the fingertips of manufacturers and aiding their thought process for innovations. From the latest research and development taking place in the global marketplace to new ideas buzzing in the industry, MMI attempts to collect what's trending and deliver it in a format that can keep you hooked.

We understand the influx of information that floods you in your everyday activities and the time required to sort through it can be challenging. To ease your understanding on how the manufacturing industry is changing, our goal is to entice your excitement when you read through MMI. As the magazine continues to evolve, we ask you to provide us with feedback so that we can meet as well as exceed your expectations.

This issue of MMI contains an article on smart manufacturing in the automotive industry and a special article on Indian machine tool industry, created just for you. I hope that you enjoy the articles and are inspired by them. Happy reading!

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*Soumi Mitra*

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## IT'S THE CONTENT THAT COUNTS. ALWAYS!

**A**s your own MMI steps into another year of bringing out curated content for the manufacturing fraternity, we take the opportunity to thank all of you - advertisers, contributors, and the huge reader base - for your continuous encouragement and engagement with us.

In today's mushrooming market where magazines sprout almost fortnightly, replicating each other, our focus and effort have been to produce meaningful content for the discrete manufacturing sector on a regular basis. In doing so, we endeavor to bring to you the most relevant and original.

Reaching this milestone of completing another successful volume of MMI would not have been possible without the industry veterans' handholding of us. They have

*"The talent of success is nothing more than doing what you can do well and doing well whatever you do without thought of fame. If it comes at all it will come because it is deserved, not because it is sought after."*

~ Henry Wadsworth Longfellow

consistently held our backs, offering their valuable time and insights on the current trends to help us curate impactful content with which we could connect with our readers.

We are highly grateful to the industry experts who have guided us in adding segments in terms of latest Technology Articles, Success Stories, Best Practices, Employment Opportunities, Practical Case Studies, and many others to bring MMI to its present avatar.

As we wind up this volume, we take pride in sharing congratulatory messages from the industry luminaries whose acknowledgment of our work will help us go a long way. Their favorable review motivates us to continue in our journey of serving the industry and doing ordinary things extraordinarily well.

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# DMG MORI

# LAURELS FROM LEADERS

MMI has come of age with it completing another successful year. To help us know whether we have done justice so far to what we are set out to do, we have called upon industry leaders to offer their two cents on our endeavor.



“All around us, rapid technology changes are transforming lives and processes, and this holds just as true for the manufacturing industry too. In these changing times, it is important for the Indian industry to keep abreast of the developments afar and share best practices. The role of a magazine like MMI is extremely critical to be a medium for all these purposes, and also share the voice of industry leaders for the benefit of the industry. MMI magazine, in association with IMTMA, has shown concerted efforts by way of its content and campaigns to stay relevant to Indian manufacturing players, professionals and entrepreneurs. My best wishes to the team at MMI.”

**L. Krishnan**  
**Managing Director**  
**TaeguTec India and**  
**Past President,**  
**IMTMA**



“I congratulate MMI Team for completing yet another successful year among the manufacturing community. The magazine has been covering reports on the Indian accomplishments in the global manufacturing world. This encourages the industry to yet go an extra mile in this endeavor of ours. I appreciate your thought-provoking articles that are presented with much clarity. MMI provides a glimpse into the future of the manufacturing world. It reflects the true state of the market in the current turbulent times. Such informative coverage helps us in the decision-making, and get the pulse of the manufacturing environment. It provides authentic updates from the machine tool industry, which are well accepted by the global manufacturing fraternity. MMI helps to bring forward Indian manufacturing competence that attracts capital investors.”

**PG Jadeja**  
**Chairman &**  
**Managing Director**  
**Jyoti CNC**  
**Automation Ltd and**  
**Past President,**  
**IMTMA**



“MMI has been invaluable to me and keeps me informed of what's happening in the machine tool industry and also keeps me up-to-date with the latest trends in the manufacturing sector. A lot of times, we are so busy in our own niche in the industry that we fail to see the bigger picture of how things are evolving outside our neck of the woods. MMI gives me that big picture understanding of how the machine tool industry is evolving and ensures that I don't miss the woods for the trees.”

**Reji Varghese**  
**Managing Director**  
**Forms & Gears**



“Every MMI edition updates the members on the activities of the machine tool industry, advanced manufacturing trends, along with constant developments. The magazine reflects upon the critical issues faced by the industry. Flipping through MMI's company profiles, cover stories, and other articles on digitalization, one can gain knowledge in areas like automation, design, production, and maintenance. It also provides useful information on cutting-edge production technology of 3D printing to the tech-savvy population. Employment pages can be of great help to the young generation looking out for jobs to tap opportunities in the manufacturing industry. SME success stories are yet another inspiration for budding entrepreneurs. Best wishes to MMI to continue being an engaging and entertaining read.”

**D. Shanmuga Sundaram**  
**Managing Director**  
**S&T Machinery**  
**Pvt Ltd**



“Congratulations on the Anniversary! The Machine tool and manufacturing fraternity in India has found a great mouthpiece through MMI. While helping satisfy the technical curiosity of the readers associated with the said domain, MMI also provides a finer perspective of the micro and macro-economic changes that impact the people and technology that drive manufacturing growth in the country. Well curated and succinctly edited articles are the cornerstone of MMI. Blended with the rich experience of the advisory and editorial team, the magazine provides an enriching experience to its readers. There's no doubt that the magazine continues to inform and influence India's manufacturing growth story.”

**Vineet Seth**  
**Managing Director**  
**South Asia &**  
**Middle East,**  
**Mastercam APAC**



"I would like to thank IMTMA for initiating such a magazine which has become highly important to the machine tool fraternity. Secondly, I would also like to congratulate the editorial team of MMI for doing it all effectively. The best part of the team is that they convey the message in a manner appropriate to the readers. It certainly plays a vital role during IMTEX shows, covering new technologies on display, and collecting visitors' reactions, exhibitors' messages etc. On this anniversary issue, I wish MMI a long life."

**Vivek Nanivadekar**  
Executive Director  
FIBRO India Precision  
Products Pvt Ltd



"We would like to first congratulate MMI for its anniversary. We have been associated with MMI for quite some time now and feel that the magazine stands out in terms of the quality of articles and topics covered. The magazine provides a great opportunity to machine tool builders to reach out to the market with their innovations, case studies and expertise. It also has been providing us the information on the latest trends in the global industry, thereby updating the domestic players and inspiring us to follow suit. We wish great luck to the entire MMI team to keep the good work going. All the very best!"

**Rajesh Ghashi**  
Managing Director  
Chiron India Machine  
Tools Pvt Ltd



"Our sincere thanks to IMTMA for the magazine which is of immense importance to the machine tool industry comprising machine tool makers, users of machine tools, suppliers of various components and accessories to the machine tool makers etc. We congratulate the team of MMI for their meticulous work in the magazine. The editorial team succeeds in bringing out the content that the players here can find relevant and put to practical use. Its extensive coverage on exhibitions and other events happening in the country and abroad provides information on the cutting edge products and technologies. We wish MMI all the very best in all their endeavors."

**Ganapathi Subramanian**  
Vice President -  
Marketing & Sales  
Gedee Weiler Pvt Ltd



"MMI spreads the knowledge of innovations and entrepreneurial thinking through its magazines, online services, and conferences. The magazine, in association with IMTMA, has been an accelerator of cutting-edge development in the manufacturing sector, homing in on the technology trends that really matter and encouraging their adoption in everyday business. An active member of the manufacturing community, MMI has a great history of presenting the latest technology trends, success stories, and best industrial practices. Wishing MMI best luck."

**BC Rao**  
Managing Director  
Kennametal India



"We are happy to be part of the MMI community and to share Imaginarium's latest developments in Advanced Manufacturing. It is wonderful to have found an audience who shares our interest in manufacturing, and we hope to be able to reach out to more experts and enthusiasts through future collaborations."

**Nishant Shah**  
Director  
Imaginarium Rapid  
Pvt Ltd



"Modern Manufacturing India provides a unique platform for us to reach out to customers in various industries. Apart from advertisements, technical articles, and articles on the best industry practices and the latest trends provide huge value to the readers, giving them a clear insight into the happenings in the industry. UCAM in the past has hugely benefited in terms of brand building and creating awareness through ads, technical articles, and product write-ups. We wish to continue the same. Happy Anniversary!"

**Suhas Kumar**  
Manager - Marketing  
UCAM Pvt Ltd



## MAPPING THE ROLE OF METAL FORMING IN AUTOMOTIVE INDUSTRY

Although the metal forming sector makes for just 20 percent of the Indian machine tool industry, its significance cannot be undermined. The country's booming automotive sector is to further boost its importance in the scheme of things.



Source: Magic Wand Media

**W**hen a newly designed car is unveiled, it quite understandably piques the interest of car enthusiasts. They are excited to explore its design, styling cues, embedded tech and connected features. The product becomes the center of attraction and hogs all the possible limelight. In a hotly contested automotive segment in India, the product version comes with sophisticated design elements which you perhaps may have spotted on the billboard adverts creating a buzz in the market. Away from public gaze, it's Metal Forming playing a vital role when it comes to the production

of such manufactured goods beginning with automobile industry to high precision components in instrumentation and electronics industries.

### **Metal forming's vital**

More often than not, Metal Cutting, which comprises around 80 percent of the machine tool industry, is discussed. However, the industry is incomplete without Metal Forming that makes up for the rest 20 percent. Simply put, it is metal forming that completes the machine tool industry. With its significant presence in India, the Metal Forming sector is huge. There are many small to medium players in the

industry spread across geographical regions.

P Ramadas, President, Indian Machine Tool Manufacturers' Association (IMTMA), says, "Metal Forming sector is gaining traction by catering to sectors like Defence, Railways, and more significantly, Automobile. The Indian automotive industry is spread across many regions with a good network of engineers and the country is known for manufacturing global brands. The Metal Forming industry caters to this, and the business opportunities are immense."

According to V Anbu, Director General & CEO, IMTMA, "Indian Metal Forming machinery

industry has been serving the needs of formed parts through the manufacture of metal forming presses, laser metal forming processes, wire forming, sheet metal parts, and the like. Access to latest technologies such as Industry 4.0 and metal additive manufacturing will enhance the manufacturing capacities of domestic manufacturers and give boost to home grown goods. The long-term prospects look good with the demand picking up in consumer durables, electronics and automobile industry as well."

### **Automotive sector to boost metal forming**

The Automotive sector is a significant contributor to India's GDP growth. The long-term outlook for this industry is bright. India is a coveted market for many foreign vehicle manufacturers as well as for component suppliers. Indian OEMs and component suppliers, on the other hand, have established their presence on the global stage. So it works both ways. Emerging preference for SUVs and commercial vehicles

is expected to propel demand. Although two-wheelers will be the mainstay, sales is expected to rise for four-wheelers as well. Also, the emergence of electric vehicles will not dent the prospects of Metal Forming or lead to any change in technology. The demand for sheet metal market will remain high and the potential for growth is immense.

### **Shift to automated machines**

Development of new machines and applications have an important role to play. In sheet metal-working, various developments have taken place in recent years whether it is cutting, bending, punching or forming. With customer requirements on product quality and quantity increasing, many companies are gradually shifting to automated machines from conventional ones. In the automotive industry, there is a high level of automation for cutting, pressing, forming and welding using automated hydraulic presses and robotics for welding. This increases productivity and reduces the chance of defects. Small firms are opting for automated machines despite higher

The emergence of electric vehicles will not dent the prospects of Metal Forming or lead to any change in technology. The demand for sheet metal market will remain high and the potential for growth is immense.

cost factor compared to conventional ones. In the long run, these automated machines deliver the best for them. These machines improve the accuracy of the process and enable to manufacture quality products. The Metal Forming sector will witness technology shifts and high growth in the next 5 years with large / OEM buyers opting for new technologies such as near net shape forming, hydro forming, laser cutting, three point bending and folding, etc. Laser is dominating the Metal Forming industry and replacing some conventional forming process.

### **Showcasing advancements**

IMTEX FORMING, organized by IMTMA every even year, occupies an esteemed space in the metal forming sector. The exhibition showcases the trend shifts towards 3D Printing, Additive Manufacturing, Internet of Things and Smart Manufacturing. All these trends work well with laser cutting and welding solutions. Stay tuned for the latest offerings when the exhibition gets underway in January 2020. 



# When Goals Matter!

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## R&D IN INDIAN MACHINE TOOLS

Research and Development (R&D) is crucial for innovation in the manufacturing industry. Investment in technology for bringing out new products, processes and services builds the industry's competitive advantages and enhances its future capabilities.



Source: Magic Wand Media

**T**he synergy created by the government, academia and industry helps build an ecosystem for innovation. Machine tool building nations in Asia, Europe and America have been working for long with premier academic institutions with the support from their respective governments to develop new-age technologies for addressing the needs of the manufacturing industry and supporting its overall development. The products are commercialized and put into use by various industries.

### **Ecosystem for innovation**

On a similar model, the Government of India, through its Department of Heavy Industry,

Indian Institute of Technology (IIT-Madras) and Indian Machine Tool Manufacturers' Association (IMTMA), has formed the Advanced Manufacturing Technology Development Centre (AMTDC). Various industries have come forward to partner with AMTDC to develop technologies.

### **Boosting research in India**

Indian companies such as Ace Designers, Chennai Metco, Interface Design Associates, Jyoti CNC, MTAB, Micromatic Grinding Technologies, etc. have given their projects to research engineers in AMTDC. The research primarily focuses on bringing products pertaining to machine tools, Industry 4.0, automation and mechatronics, motion control, and robotics.

The products, once fully developed, are expected to bring advanced technologies and lower the cost for the end-consumer, save foreign exchange, and reduce dependence on imports. Many engineering colleges in India are also undertaking such projects. Several of these have been displayed during IMTEX by academic institutions in i2 Academia Pavilion. This helps industry and academia to connect with each other and establish mutual cooperation for enhancing innovations and development in machine tools and manufacturing technologies. IMTMA through its III-C initiative has provided a significant opportunity for such collaborations to take place. 

18<sup>th</sup> Edition



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## A Win for India's Development

**New Delhi, India** - The overwhelming win of the NDA led by Hon'ble Prime Minister Shri Narendra Modi is a historic win for the country. The decisive election results will propel India's growth pace to the next orbit and drive the transformation of the country, stated Vikram S Kirloskar, President, Confederation of Indian Industry (CII).

"We warmly congratulate the NDA on the landslide victory under the visionary leadership of Hon'ble Prime Minister Narendra Modi. The sweeping referendum truly redefines the destiny of the country and makes this India's century," he added.

"This is a win for India, a win for India's people, a win for India's development," he stressed.

A focused and comprehensive agenda for addressing corruption has



Source: CII

Vikram S Kirloskar, President, CII

delivered outstanding results in the last five years. Game-changing reforms such as introduction of Goods and Services Tax (GST), Insolvency and Bankruptcy Code, lowering of tax rates for small enterprises, ease of doing business, and so on have created the right environment for industry to flourish. With India's international leadership greatly strengthened by Prime Minister Modi, the country is already at the high table of global affairs. The massive victory further adds to India's global direction and position.

## Siemens Brings Mendix to MindSphere

**Mumbai, India** - Siemens has announced the immediate availability of Mendix for MindSphere, bringing the digitalization and business benefits of Mendix software, the world's leading low-code application development platform for the enterprise, to software development for the industrial internet of things (IIoT). MindSphere, the cloud-based, open IIoT operating system from Siemens, provides developers with open APIs, services and the support needed to quickly and easily build, test and deliver MindSphere applications.

## Spanish Machine Tool Sector up by 5.4%

**San Sebastian, Spain** - The Spanish machine tool and advanced manufacturing sector reached a new milestone in 2018 with the sales of €1,796.1 million, representing a growth of 5.4 percent with respect to 2017's €1,703.5 million. Performance was up in metal cutting (+15.7%), components (+6.9%), tools (+4.6%) and machining and services (+24.2%). The metal forming sector has been unable to avoid a setback of 7.38 percent this year. César Garbalena, Chairman, AFM, the Spanish Association of Manufacturers of Machine Tools, accessories, parts and tools, said, "Contrary to 2017, 2018 has been notably better for metal cutting than for metal forming. The portfolio of orders accumulated over the last two years has maintained the level of sales in line with the forecasts we made at the beginning of the year." Exports have increased by almost 10 percent, bringing the sector to its highest figure with €1,363.2 million, compared to €1,239.8 million in 2017.



(L-R): Xabier Ortueta, Director General, AFM and César Garbalena, President, AFM addressing the audience

Source: AFM

## EOS Completes 30 Years in Industrial 3D Printing

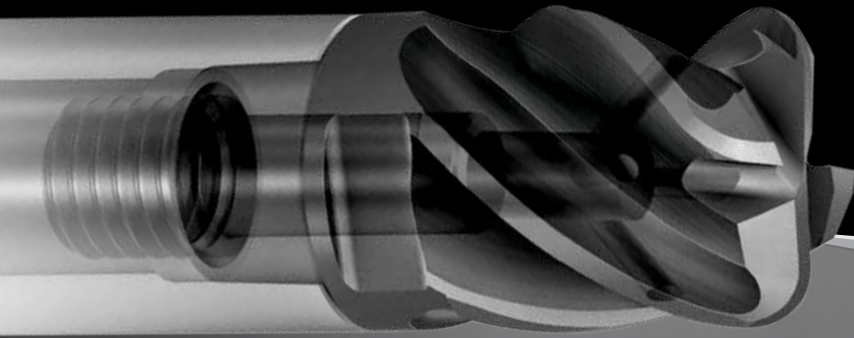
**Bavaria, Germany** - As the world's leading technology and solutions supplier in the field of industrial 3D printing, EOS is celebrating its 30<sup>th</sup> anniversary. Founded in 1989 by Dr Hans J Langer, the company now shapes the world of manufacturing with its innovative solutions. Initially used primarily for rapid prototyping, companies worldwide now leverage additive manufacturing increasingly to meet the needs of serial production. The EOS Ecosystem has meanwhile set the course for the future, enabling industry- and customer-specific 3D printing solutions which shape the digital factory. According to Dr Adrian Keppler, CEO, EOS, "The establishment of complete digital production platforms is a major goal that we are aiming to achieve in the coming years. It's not just about providing the right 3D printing solutions, but about evaluating, planning, setting-up, and optimizing AM production cells to leverage all the advantages and possibilities of digitalization."



Source: Magic Wand Media

## World Market for Machines Lands Safe

**Frankfurt, Germany** - According to estimates by VDMA economists, sales of machinery in 2018 rose by a total of 4 percent to €2.6 trillion. With an increase of 5 percent to just under €1.34 trillion, Asia remained by far the largest manufacturing region in the machinery industry. The growth rate in Europe and in the EU countries corresponded to the global average of plus 4 percent. The EU countries produced significantly fewer machines (€694 billion) than Asia, but more than twice as many as the USA (plus 2 percent to €334 billion). "The growth in worldwide machine sales is encouraging, but could have been even higher in a calmer political environment. We will probably not really see the consequences of the trade disputes or the brexit until this year due to the long lead times in the mechanical engineering sector," commented Dr Ralph Wiechers, Chief Economist, VDMA, on the results.



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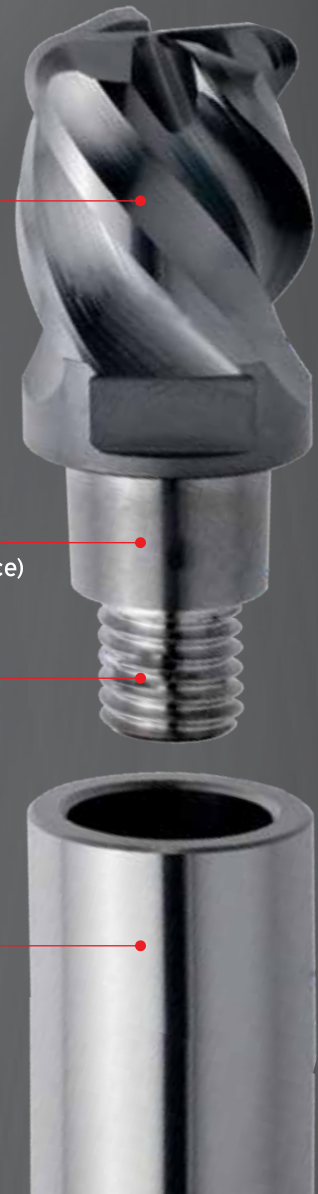


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# COEXISTING WITH ROBOTS

The picture is still a little hazy when it comes to adopting robots on shop floors. Would they really be a great assistance to humans or eventually replace them? Here's the value addition robotics can bring to the cutting tools industry and the pitfalls to watch out for...



Swiss toolmaker Fraisa has invested in automation to reduce production costs by 50 percent.

Source: ANCA CNC Machines

Robots are here to support the humans in the cutting tool industry and beyond. In return, robots need planning, monitoring and programming support from us humans to be their best.

THOMSON MATHEWS  
Software Product  
Manager, ANCA  
indiainfo@anca.com



**T**he rise of the robots is pervasive across all verticals, including the cutting tools industry. As more and more manufacturers turn to leaner processes, robotics have been seen as a way to increase productivity, improve precision and reduce labor costs.

The use of robots is steadily growing. In the United States alone, more than 34,000 robotic systems were introduced in 2016. In particular, the cutting tools industry has been using robotics to take over the repetitive tasks once done by humans. Tasks such as manual loading, checking and removal of tools and materials. Some manufacturers are even using robotics to work 24/7, taking their production to a 'lights out' level with minimal input from humans.

## When robots go wrong

Probably the most famous case of robotics not meeting expectations are at Tesla, with a fully robotic system managing the production of Tesla's Model 3. The

process simply didn't work and Tesla was unable to deliver the volume of cars it had promised. After a dismal first quarter in 2018, Elon Musk was forced to bring in humans to replace the robots. In Musk's own words, "Excessive automation at Tesla was a mistake... humans are underrated."


Tesla's big mistake was not in automating, but in not considering its whole supply chain and planning appropriately. While parts of its automated processes were increasing its production as promised, the chain as a whole was not. In the end, there were production bottlenecks down the supply chain. It didn't matter how fast one part of the process was completed, if the next part of the process couldn't keep up. What we, in the cutting tools industry, can learn from Tesla is that consideration needs to be given to how the entire system works; what connects with what and where the dependencies are. There's no point being faster at one end of the process if the next step can't keep up.

## When robots go right

In contrast, Fraisa - a Swiss-based business that offers its customer a complete range of solid round tools with endmills, drills and taps - shifted to lights out production for 50 hours a week with surprising results.

Not only did it increase its productive hours from 105 per week to 150 per week (per machine), it also reduced its operation costs by half. Workers retained their salary and the business invested more time in upskilling them in other manufacturing processes. The company now has a more engaged and skilled workforce who focus on value-added work rather than monitoring manual processes. It has meant less shift work, more family-friendly work hours and a win-win-win for customers, the business and its workers. Fraisa's success comes from ensuring its machines are fully connected to its ERP systems, so that efficiencies can be monitored throughout its entire supply chain.

## It's not set and forget

Other bottlenecks may occur through lack of in-house programming skills. While one's general labor costs may be cut, extra hours need to be allowed for programming. Either one needs to employ specialized robotic programmers or invest in a system that translates their requirements. Robots are here to support the humans in the cutting tool industry and beyond. In return, robots need planning, monitoring and programming support from us humans to be their best. 



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## DIGITAL TRANSFORMATION MATTERS

**D**igital transformation in our business (machine tools and metal cutting as related to our customers' environment) has been much talked about and experimented for the last few years but its full-fledged adoption has been slow and painful. The reasons are largely to do with diverse unconnected equipment, availability of related infrastructure like connectivity and last mile issues. Competence and the ability to chart a roadmap are the key causes. However, over the last two years, there has been a fair progress. Companies are adopting IoT by connecting devices on their equipment for monitoring them. They are tracking specific outputs like cutting time, idle time, the number of parts produced etc.

### Industry 4.0 engagement in India

As indicated, it has been slow but it appears to be picking up and there is certainly a lot of buzz around it. Companies and industry associations are holding forums to disseminate information and enhance its awareness among the industry players. Programs to get the equipment connected are being discussed and several pilot projects are getting launched. It is expected to pick up pace in the coming year or two. Specific I4.0 initiatives are under active discussion but its implementation is currently limited to the organized sector only. Many solution providing players - both global and local home grown ones - are getting their act together. However, there still remain large gaps in detailing that are to be filled. This calls for a long-term partnering approach with both partners learning and growing along the way in a trusting environment.

### I4.0 globally

The digital transformation journey of the Indian players differs from their global peers as globally I4.0 is being looked as an alternate for humans for doing mundane data recording and collecting activities as the human resource is scarce and expensive, and also the entire environment is more mature and conducive to automation. Large data analysis needs automation and the requirement of predictive analysis is high.

Meanwhile, in India, with the availability of people and a non-conducive environment, the workability and RoI are under question. Data sets are yet to be structured clearly. From a social perspective, the pressure of providing jobs is high and the environment is yet to be clearly structured. There needs to be a stronger push to make I4.0 happen unlike the global peers.

### Enabling engagement in digital transformation

Typically, digital transformation is a continuous, long-term initiative with milestone markers. The engagement into it needs to evolve along the way. Thus, it is very important to have a partnering approach with creative financing as we move on. An evolving methodology - right from budgeting to tranche funding, and its accounting - is crucial to make it viable. Digital transformation investments also have high obsolescence rates and a clear understanding, tight monitoring and speedy implementation is the key.

Typically, digital transformation is a continuous, long-term initiative with milestone markers. The engagement into it needs to evolve along the way. Thus, it is very important to have a partnering approach with creative financing as we move on.

**T K RAMESH**  
Managing Director and CEO  
Micromatic Machine Tools Pvt Ltd

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Source: Magic Wand Media

## THE ROAD LESS TRAVELED

Mechanical Engineering has long been a male dominated space. But over the years, a few pioneering women have refused to conform and forayed into the machine tool industry. Here they talk of coming out of their comfort zone, choosing a path treaded less by their likes, and making a difference as role models.

**T**here is a long history of women who have designed and built machines; a history that even predates the development of engineering as a trade. Women have made significant contributions to engineering throughout history. Hypatia of Alexandria (370 - 415 AD) invented and designed the world's first Hydrometer - an instrument used for measuring the relative density of liquids based on the concept of buoyancy, eons

before the term 'Engineer' was even coined in the 11<sup>th</sup> century.

### **Battling stereotypes**

Coming back to the present times and focusing on our country, Indian women are still to be granted equal status in various walks of life. However, the scene is fast changing with a few out there fighting it out to earn the position they truly deserve. In doing so, they are being a beacon of hope to others.

"Let not the irony of a 'Bachelor's' degree being awarded to a woman be lost," says Annu Varghese, Design Director, Forms and Gears, with a smile as she narrates how it was, studying and building a career in the machine tool industry. She has done Mechanical Engineering from PSG College of Technology, Coimbatore, and also has an MS degree in Manufacturing Systems from the University of Texas, Austin.

Source: Team MMI

“Girls in those days were not encouraged to take up Mechanical Engineering as it involved physical work too. There was just one more girl other than me in a batch of 60. For our Smithy workshops, we had to heat metal workpieces on a furnace using tongs, hold the workpiece on an anvil and forge it into different shapes using a hammer. Certainly, more physically tough than sitting on a computer and writing codes,” she notes.

Her choice of venturing into Mechanical Engineering was inspired by her father who himself was a Mechanical Engineer and had a Fixture Building company, which Varghese now successfully runs along with her brother.

Her colleague K Geetha, Design Manager, Forms and Gears, shares how her sheer will has helped her to reach where she is today, “It was a surprise to find myself as the only girl in the Mechanical Engineering class. It was likewise at Macon Engineers, my first job as design apprentice. Those days, design was done manually on the drafting board. And, although it was physically taxing to stand for hours drawing lines, the vision to make it kept me motivated.” As they say, easy and success do not go together. Geetha has designed over 100 Special Purpose Machines at Macon Engineers and, along with Varghese, is now part of the team at ASM - Forms and Gears that has developed Smartfix 4.0, the world’s first Industry 4.0 and IoT solution for Fixtures and Workholding.

### **Grounded to aim high**

Mohini Kelkar, Managing Director, Grind Master Group, currently plays a role that can intimidate many a man in the field. She heads the Group that specializes



Source: Grind Master Group

“Born in a middle class but highly educated family, I never faced any gender bias at home and was offered equal opportunities as my brother. Encouraged to pursue my heart, I made the choice of studying Mechanical Engineering, which was pretty unusual at the time.”

**Mohini Kelkar**  
Managing Director  
Grind Master Group

in machines for Metal Finishing, Deburring, Micro-finishing, Robotic Machines and Abrasives, providing total solutions for surface finishing requirements. The Group has supplied over 5,500 machines across 6 continents and has a strong IP bank of 30+ patents, 30+ registered designs and 3 trademarks.

On what prompted her to opt for a career in the machine tool industry, Kelkar says, “I was born in a middle class but highly educated family. My brother and I both studied Mechanical Engineering at VJTI Engineering College, Mumbai. At home, we never faced any gender bias and were offered equal opportunity.”

Encouraged to pursue whatever she wanted, she took up Production Engineering in 1978 and found herself to be the first girl to do so. “Electronics and Computer Science were more popular among girls back then. However, I found Mechanical



Source: Forms and Gears

“Stereotyping of girls and boys at an early age is one of the reasons not many women enter the machine tool industry. Girls are taught to play with dolls, while the boys are encouraged to build stuff with Lego and play sports.”

**Annu Varghese**  
Design Director  
Forms and Gears

and Production Engineering more interesting since it satisfied my curiosity to know how things worked, and it also offered ample opportunities,” she adds.

After securing the degree, she took up a job at PMT (Perfect Machine Tools) in Pune as a Design Engineer. “Even though there were a lot of women in HR and Admin, I was the only female engineer in Machine Design. I was quickly hooked on to machine design and its applications and got the confidence to design machines,” she shares.

### **Unvarnished truths be told**

Rajalakshmi Hegde, Strategic Account Management - Global End Users, B&R Industrial Automation Pvt Ltd, points to certain challenges she encountered in her first job as a woman. B&R Industrial Automation is a part of ABB Group and is its global

**The scene is fast changing with a few women out there fighting it out to earn the position they truly deserve and being a beacon of hope to others.**



Source: Guindy Machine Tools Ltd (GMT)

“I have never felt deliberately slighted by anyone at work, or within the industry in India, on the basis of gender. I have not even faced any pay scale difference. On the contrary, I have felt obliged to live up to all the admiration.”

**Jayashree Mani**  
Vice Chairperson  
Guindy Machine Tools Ltd (GMT)

center for machine and factory automation.

Reflecting on the ‘ugly side’ of her experience, she says, “My first job at an industrial automation company was a shock to me. I was the first woman ever to be employed in the organization. And as my employment was in the core engineering field, challenges began from the very basics such as not having ladies toilets on shop floors where I worked, not being allowed to work on the shop floor, male colleagues not acknowledging the fact that I could work with machines or that I could travel long distances etc.”

This kept her in the office doing documentation for a very long time. “Manufacturing industries and the industrial environment, in general, did not accept women at the time. Every step, be it programming, assembling, or commissioning or even travel for that matter, had to be proven by a woman employee before she got a



Source: Jyoti CNC Automation Ltd

“For a woman to build a career in the machine tool industry is quite tough. And you fear if you are being just enough to your responsibilities at home. For this, a reliable and sturdy support system is needed to balance demands from both sides.”

**Mital Desai**  
Design Manager  
Design Department  
Jyoti CNC Automation Ltd

decent project at work. Women were not valued the same as men in the workplace and were often paid much lesser than them,” adds Hegde.

But then there were men who offered her the opportunity and provided her the support to grow and thrive. “I appreciate their contribution to my success,” she notes.

### **Sturdy support system helps**

Mital Desai, Design Manager, Design Department, Jyoti CNC Automation Ltd, has worked on the highest number of products at the company’s R&D. “For a woman to build a career in the machine tool industry is quite tough,” she states recalling that she too was the only girl in the Engineering department when she joined the company in 2001. Jyoti CNC was situated around 15 km away at METODA GIDC, which at the time was quite a distance away due to the dearth of transport options those days. “If constantly proving oneself

was not enough, travel issues added to my woes. Our working hours were from 8am to 8pm and travel to and from Rajkot was difficult,” she adds.

Travel means and safety have improved over the years and women have progressed since then, but other barriers still remain. For a woman there is the added pressure of keeping everyone at home happy and comfortable and there are constant sacrifices to be made. However, women tend to not talk about it and make it appear quite easy to grapple with. “For a woman to work in an industry where only men are your co-workers is a lot to deal with. On top of it, there is pressure from home too, where you fear whether you are being just to your responsibilities there. What we need is a reliable and robust support system at both places to handle this dual responsibility, and luckily for me, I have had both. A supportive family with an encouraging atmosphere at work have helped bring out the best in me,” shares Desai.

### **Gaining accolades**

Jayashree Mani, Vice Chairperson, Guindy Machine Tools Ltd (GMT), has been fortunate to have never fought for gender parity either at work or at home. “I never felt deliberately slighted by anyone at work, or within the industry in India, on the basis of gender. On the contrary, I have felt obliged to live up to all this admiration. There was no discernable discrimination at all even in my first job at Hindustan Brown Boveri (now Asea Brown Boveri Ltd). Nor were the pay scales there different for women,” she notes. Mani is a legend in her own right, heading GMT, one of the oldest and best reputed manufacturers of Chucks and

**Travel means and safety have improved over the years and women have progressed since then. But the real barriers remain until today.**



Source: B&R Industrial Automation Pvt Ltd

“The industrial environment did not accept women at the time. Be it programming, assembling, or commissioning, they had to prove before getting a decent project at work. They were not valued the same as men and were often paid much lesser than them.”

**Rajalakshmi Hegde**  
Strategic Account Management -  
Global End Users  
B&R Industrial Automation Pvt Ltd

Metrology equipment. She has taken the 50 year old company from a turnover of ₹5 crore in 1995 to ₹40 crore today. She has contributed to computerization of production and business processes, new projects and web marketing.

Her first job at Hindustan Brown Boveri in Bombay gave her a broad idea of how large, professional corporations worked, as opposed to a family business. “With that experience in tow, I joined the family business GMT immediately after shifting back to Madras. It was a 23 year old company by the time I joined, with a team of dedicated engineers who had grown used to working with each other. They knew me for long as the boss’ daughter and now accepted me as part of the team,” she shares.

Mani was given the task of making the company ready for CNC machines. “With an Electrical Engineering background, I was eminently suited for this. Our first single axis CNC machines were



Source: Forms and Gears

“It was a surprise to find myself as the only girl in the Mechanical Engineering class. It was likewise at my first job as design apprentice. And, although it was physically taxing to be in the field, the vision to make it kept me motivated.”

**K Geetha**  
Design Manager  
Forms and Gears

already commissioned by then, to grind chuck parts,” she says.

After setting up the Electronics Department, Mani interfaced the systems for the company’s first CNC Surface and Creep Feed Grinders. “These machines were designed and built by our team that saved us several crore of rupees, and GMT chuck T-Slots and Jaw Serrations are still ground on them,” she adds.

Later, she was assigned to develop a Co-ordinate Measuring Machine (CMM), her father’s passion project. “Much later I initiated a project to increase the life of the GMT chuck, by addressing problems of fretting corrosion in the jaw and T-Slot surfaces. The project was a runaway success,” apprises Mani. “I was always in product development and not in mainstream production. Given the poor connectivity and difficulties in accessing materials, and working in the constantly cash strapped, bureaucratic environment of those early years, I think that the production

and sales team had their own nerve racking preoccupations, and I, with my electronics background, must have earned their regard for me. Gender certainly did not stand in the way of our heated arguments, before we eventually settled down to a productive way of working together,” she adds.

“Over the years, we have had several women electrical or electronic engineers working in maintenance and interfacing of CNC machines and CMMs. They have worked on the shopfloors too, tough women, each one of them, for it could not have been easy. Our technical competence was always respected, and we received unequivocal support when we made mistakes,” she recalls.

### Changing the world

The above women have seldom had it easy, but they’ve persevered through tough times pursuing what they wanted. They had their hearts set on accomplishing goals in a world which was taken up mostly by men. Unwavering, they have marched on, not realizing at the time, they were changing the world in the process. They all, in their own way, have blazed a trail for the future generation. They acknowledge that a lot is left to be done and that gender parity needs to start at home, long before it is practised at work.

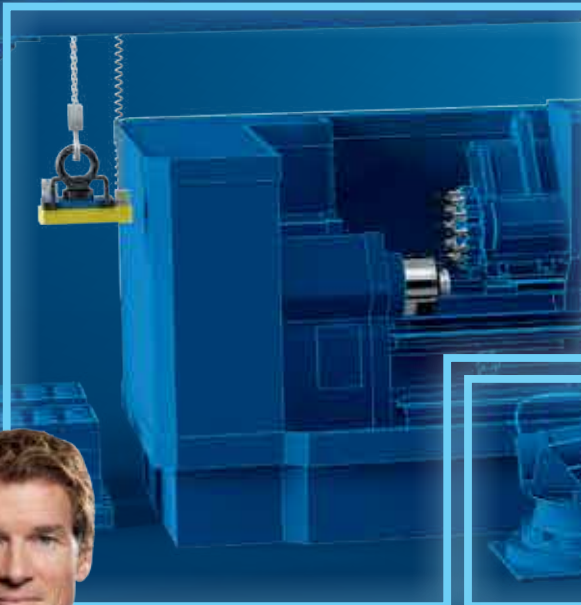
They acknowledge that male allies, both at work and at home, should chip in by shedding their outdated perceptions and offering a supportive and nurturing environment. They recognize that women in the machine tool industry must keep pushing each other for leadership positions, to make this world a little more inclusive - and the road less traveled a bit more easier for the next generation of women to follow.



**Women, importantly, must keep pushing each other for leadership positions, to make this world a little more inclusive and equal.**

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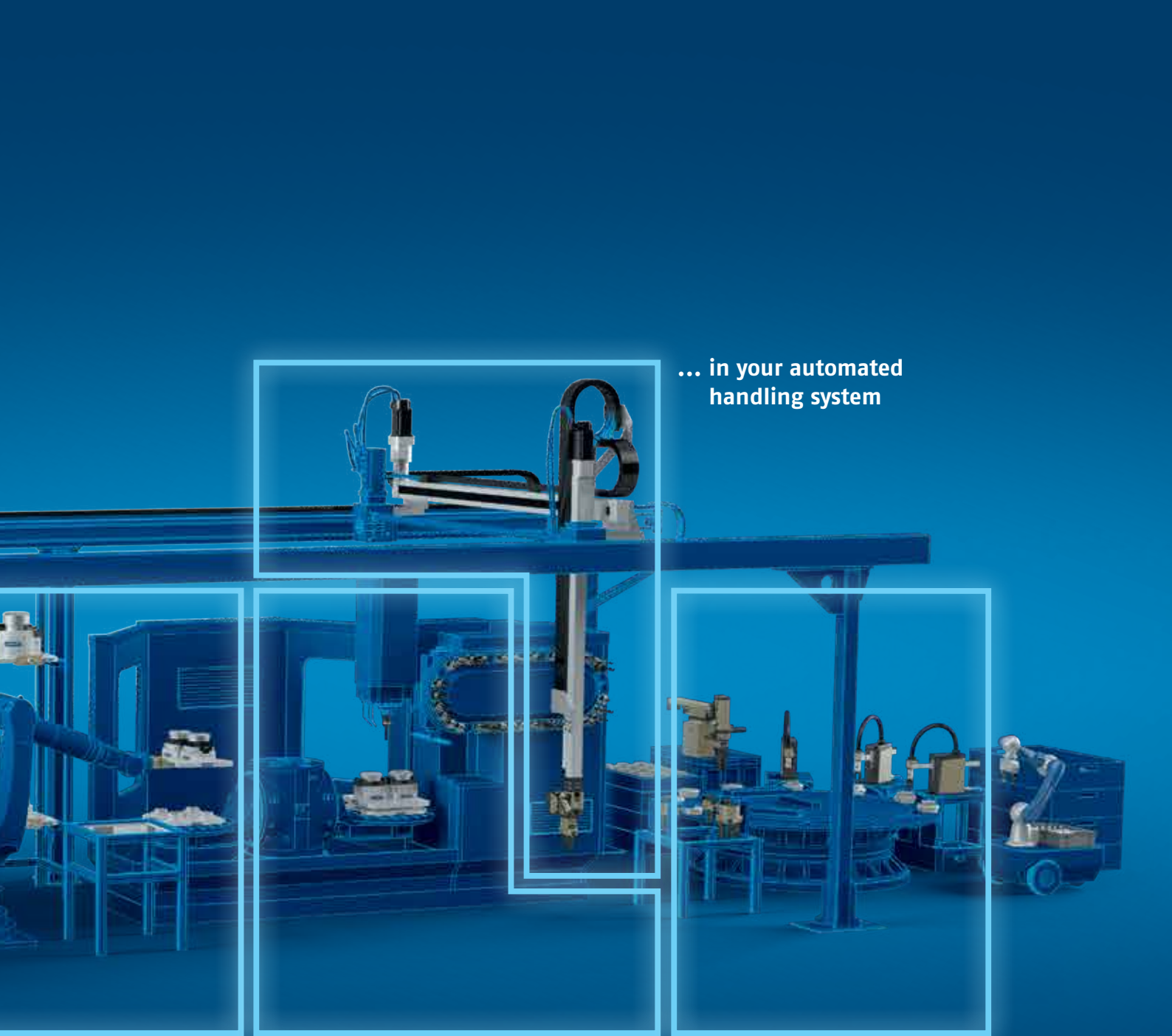
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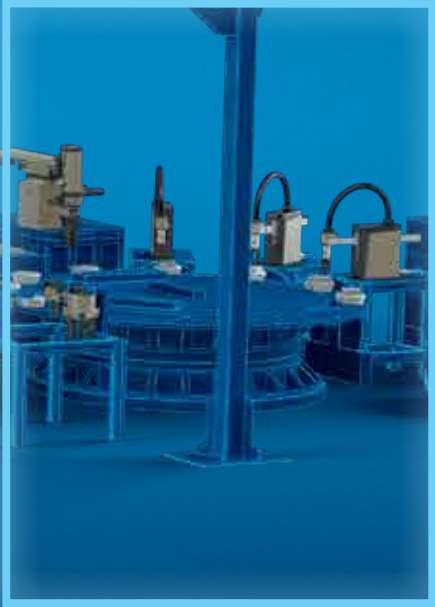
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# EXCHANGING TO GROW

With Germany being India's largest trading partner in Europe, the two countries have been consistently engaged in sharing each other's strengths. Visible progress in this mutual give and take is optimistic and a definite sign for a lot to look forward to in the machine tool space.



Source: Magic Wand Media

“India is one of the world's largest machine tool markets. In 2017, machines worth almost €2 billion were consumed. The country imported 60 percent of this,” says Dr Wilfried Schäfer, Executive Director, VDW (German Machine Tool Builders' Association), pointing out to India's potential in machine tools and its trade with Germany. Based in Frankfurt, the association represents the interests of the German machine tool industry and is well suited to comment on the growing exchange between the two countries.

“With a share of 16 percent, Germany ranks third among the most important suppliers, after Japan and China. In 2017, German deliveries increased by more than a fifth. In the first three quarters of 2018, they lost slightly, 3 percent to just under €150 million. It was mainly parts and accessories, gear cutting machines and machining centers that India's industry had ordered.”

### Optimism prevails

Dr Heinz-Jürgen Prokop, Chairman, VDW, offers his take on the growth expected from Asian countries, especially India, in

terms of machine volume orders in the near future, “Compared to 2018, general economic data in 2019 is below the previous year's results. However, it still signals growth. The driver is Asia with an increase in gross domestic product of 4.4 percent, followed by the Americas with 2.1 percent and Europe with 1.4 percent.” “In terms of investment and machine tool consumption, Asia is the driving force of the triad with growth of 2.7 and 2.6 percent, respectively. Particularly in the smaller countries of Vietnam, Thailand and Indonesia, consumption is expected to rise disproportionately,” he adds.

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According to him, the strongest increase was recorded in the subcontinent of India, where the consumption of machine tools is significantly higher than the Asian average. In China, the largest market, machine tool consumption is slightly above the moderate level of Asia as a whole. "China will continue to be strong in terms of volume in the coming years. Taiwan and South Korea, on the other hand, are struggling with falling rates in the current year," he informs.

### EMO Hannover 2019

In alignment with the rising significance of Industry 4.0 in the global manufacturing industry, VDW-organized this year's world's leading trade fair for metalworking, EMO Hannover, to be held from September 16-21, 2019, has chosen the motto 'Smart technologies driving tomorrow's production'.

Elaborating on the event's focus, Dr Prokop says, "The focus of industrial production is no longer (only) on being 'better, faster, more accurate', but the development and implementation of new functions within the framework of Industry 4.0. Digitization and intelligent networking, in combination with many new developments from Big Data to Data Analysis, Artificial Intelligence and platform economy, create the basis for new business models so that customers and suppliers can reach a new level of productivity. Nevertheless, optimized machines, technologies and pro-



Source: VDW

"Digitization and intelligent networking, in combination with many new developments from Big Data, Data Analysis, Artificial Intelligence to platform economy, create the basis for new business models so that customers and suppliers can reach a new level of productivity."

**Dr Heinz-Jürgen Prokop**  
Chairman  
VDW (German Machine Tool Builders' Association)

cesses in the classic sense will of course also be presented at EMO Hannover 2019."

Dr Schäfer adds in, "The industry expects a quantum leap in terms of higher productivity from intelligent networking, systematic analysis of data obtained in machine operation, and integration of new manufacturing processes into series production. Integrated processes not only in one's own production and at the customer, but also in the value chain, fewer machine failures and downtime, targeted maintenance, new offers at the basis of data analysis are some of the key things that describe the potential of Industry 4.0."



Source: VDW

"The industry expects a quantum leap in terms of higher productivity from intelligent networking, systematic analysis of data obtained in machine operation, and integration of new manufacturing processes into series production."

**Dr Wilfried Schäfer**  
Executive Director  
VDW (German Machine Tool Builders' Association)

### Technology transfer

Drawing attention to the technologies from Germany that can help the present Indian manufacturing sector to upgrade its processes and set-ups, Dr Schäfer notes, "Customers who are exposed to international competition such as the automotive industry or major suppliers, or who are confronted with high-quality demands such as medical technology must constantly improve to survive. Automation, which is closely related to these fields, is witnessing high demand due to quality requirements. German manufacturers specialize in high technology and individual solutions for production requirements of all kinds. Their strength also lies in linking the various components to form complete solutions. For the Indian customer, this means that he does not have to talk to countless individual suppliers but can receive a largely all-round care-free package including training and education."

EMO Hannover 2019 has chosen the motto 'Smart technologies driving tomorrow's production'. World's leading trade fair for metalworking has long since demonstrated that Industry 4.0 has arrived in the machine tool industry.

### German Machine Tools Exports to India

		2016	2017	1-3Q 2018
<b>Total Metal Cutting Machine Tools</b>	1000 EUR	97,807	1,55,722	90,173
	Units	1,528	1,925	1,755
<b>Total Metal Forming Machine Tools</b>	1000 EUR	57,423	40,726	35,874
	Units	652	594	594
<b>Total Machine Tools</b>	1000 EUR	1,80,574	2,20,538	1,49,434
	Units	2,180	2,519	2,349

Source: Official Trade Statistics Germany, VDW

# BOOSTING INDIA'S DEFENCE

In an exclusive interview with Team MMI, Saurabh Kumar, I.O.F.S., Director General, Ordnance Factories & Chairman, Ordnance Factory Board (OFB), Ministry of Defence, Government of India, shares how it is to shoulder a mammoth responsibility of his position, the board's contribution to the growth of the machine tool industry, indigenization of defence manufacture and India's gradual rising as a defence export hub.



155 mm x 45 calibre artillery gun 'Dhanush'



155 mm Up-Gun 'Sharang'

Source: OFB

**You are an expert in the manufacture of ordnance and have been in the Ministry of Defence as Director of Planning and Coordination for quite some time. Please share your experience in holding a portfolio of Director General, Ordnance Factories and Chairman of Ordnance Factory Board (OFB) since the board shoulders a humungous task of looking after the operations of 41-odd Ordnance Factories across the country.**

**Saurabh Kumar:** It is indeed an honor and, at the same time, a tremendous responsibility to assume leadership of the oldest and largest defence

manufacturing organization in the country. Not only do we have a glorious history behind us, but we also have an exciting future ahead.

The Ordnance Factories supply a highly extensive range of weapons and equipment which requires mastery of different technologies and expertise in diverse areas.

OFB is the only organization in the world which makes the entire range of ammunition from 5.56 mm to 155 mm and weapons from the 5.56 mm IN-SAS rifle to 155 mm x 45 calibre 'Dhanush' artillery gun system. At another level, the Metal and

Steel Factory at Ishapore is the world's largest manufacturer of weapons grade steel from secondary sources.

**What are the plans drawn by OFB through 'Make in India' initiative to make the country self-sufficient in the production of arms and ammunition with the twin objectives of reducing imports and meeting nation's requirements?**

**Kumar:** OFB has always been committed to the development of indigenous manufacturing capability and our products have an overall indigenous content of over 90 percent.

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OFB's contribution to 'Make in India' saw the handing over of the 100 percent indigenous engines of T-72 and T-90 tanks in July last year. Ordnance Factory Bhandara's achievement of providing the extended double based boosters and sustainer propellant for the propulsion of the 'Helina', a helicopter-launched anti-tank missile; the successful testing of the 'Pinaka' rocket at Pokhran in July 2018 and the subsequent clearance accorded by ARDE Pune are significant milestones in this direction.

OFB has signed a contract with the Ministry of Defence (MoD) in October 2018 for up-gunning 300 existing 130 mm M-46 artillery guns to 155 mm/45 calibre over a period of four years. This gun is known as 'Sharang'.

The first-ever indigenous 155 mm x 45 calibre artillery gun 'Dhanush' has been handed over to the Indian Army in April 2019. 'Dhanush' is the first long-range artillery gun system being produced in India and it is a major success story of the 'Make in India' initiative.

**To what extent is OFB placing thrust on indigenization? How has the board contributed to the growth of the machine tool industry?**

**Kumar:** OFB has been continuously supporting the machine tool industry since its inception, especially after independence. There has been a consistent investment over the past years, both for the purchase of new machinery and replacement of old and obsolete plants. Capital has been invested in new projects at a steady rate in the last three financial years. There has been a sustained increase in budget allocation for new capital projects for buying from the indigenous manufacturers, which indicates that the Indian machine tool industry is going to be benefited in



Source: OFB

“There has been a sustained increase in budget allocation for new capital projects for buying from the indigenous manufacturers, which indicates that the Indian machine tool industry is going to be benefited in the days to come.”

**Saurabh Kumar**  
**I.O.F.S.**  
**Director General**  
**Ordnance Factories &**  
**Chairman, OFB**  
**Ministry of Defence, GoI**

the days to come. The indigenous content in our renewal and replacement of existing machinery is also growing up steadily.

OFB's new procurement manual has come up with several vendor-friendly measures. In addition, vendor meets have been initiated in the factories every month, and every quarter at the Board level. Many factories have launched apps for providing information to vendors regarding the status of contracts and payments. This is also a trend that will gather momentum in the days to come.

OFB is committed to the policy of indigenous manufacturing. It has recently indigenized the Track Assembly for the T-72 Tank; Turbo Charger for the T-90 Tank; Gyro Drift Indicator for the BMP-II; Power Unit Y7K for the T-90 Tank; Automatic Control Unit for the Missile Information Block of the T-90 Tank; Electro-Pneumatic Valve; Mine Protected Vehicle (MPV) and Modernized Mine Protect-

ed Vehicle (MMPV); Bi-Modular Charge System (BMCS) for the 155 mm artillery ammunition, 7.62 x 39 mm Assault Rifle 'Ghatak'; Chaff Launcher 'Kavach MOD-II' and Chaff Naval Gun CRN-91; Aerial Bombs; Night Vision Devices for the Armoured Fighting Vehicles BMP-II; T-72 Tank; T-90 Tanks and variants based on image intensification and thermal imaging; Under Barrel Grenade Launcher etc.

Currently, about 20 percent of our turnover is from products developed through in-house R&D and this is set to increase.

OFB is presently developing an upgraded BMP-II, a Futuristic Infantry Combat Vehicle (FICV), an Air Defence Gun and a 155 mm x 52 Cal Mounted Gun System and related ammunition and electronic fuzes.

Besides catering to the forces, the board is also meeting the requirements of advanced technological materials for research establishments like ISRO, DMRL, NFC and others.

**The larger goal of indigenizing defence manufacture is to eventually become an exporter of defence equipment. How far have we come in this regard?**

**Kumar:** Apart from establishing the credentials of OFB as a world-class manufacturer of artillery, the 'Sharang' and the 'Dhanush' guns have also aroused interest of other countries. The board is also receiving queries related to export of these weapon systems.

Our products have been exported to various regions of the world, covering developing as well as developed nations in the Middle East, West Asia, South Asia, South East Asia, Europe and beyond. An array of products ranging from arms and ammunition, weapon spares, chemicals, explosives and troop comfort items have been exported.

The first-ever indigenous 155 mm x 45 calibre artillery gun 'Dhanush' has been handed over to the Indian Army in April 2019. 'Dhanush' is the first long-range artillery gun system being produced in India and it is a major success story of the 'Make in India' initiative.



Brake Parachute

Vast opportunities exist in the area of export and OFB has made an impact with a quantum leap in exports to over ₹200 crore.

The high quality standards of OFB have also gained recognition in international circles and the board has begun exporting 155 mm barrels for testing purposes to a renowned armament manufacturer. OFB has the potential to be a major exporter of artillery as our systems not only meet the performance parameters required by other countries, but are also cost-effective.

OFB is now an established exporter of 155 mm ammunition. More queries are being received for 155 mm and other calibres too. This will receive a further boost with the installation of the latest digital X-ray at Ordnance Factory Bolangir which will further enhance confidence in the quality of ammunition, thereby increasing the demand for our products.

There is a growing recognition of OFB as a supplier of explosives such as TNT, DNT and RDX. This too is an area which is likely to see growth in the years to come.

Another area where exports have been showing an increasing trend is that of Brake Parachutes for fighter aircraft. OFB has been exporting SU-30 parachutes to South East Asia and now more markets are likely to become accessible, given our cost advantage. These achievements also meet the Government's stated objective of increasing defence exports and earning precious foreign exchange.

We are exploring new markets in Africa and the developing

world. Apart from exporting established products, the board's technological expertise is also leading to enquiries for new products and also for technical expertise in turnkey projects.

Pro-active marketing through participation in international exhibitions and interaction with visiting delegations from target countries and resource firms, along with valuable support from Indian Missions in promotion of products manufactured by the Indian Ordnance Factories, has enabled OFB to establish viable contacts with firms based in India as well as abroad, which act as conduits for boosting exports.

**To keep pace with contemporary manufacturing technologies, OFB has undertaken modernization of ordnance factories. How does the board plan to pan it out?**

**Kumar:** We have spearheaded the modernization program which includes induction of robotic forging technology, new generation CNC machines, predictive maintenance, application of artificial intelligence etc, which will enhance productivity and quality of our products.

There is a conscious effort to harness the advantage of the cluster of new age technologies which collectively makes Industry 4.0.

The rapid pace of technological change has shortened the life cycle of products. OFB has to keep introducing new products so as to

retain relevance in the market. To face the upcoming challenges, we have identified the key areas and accordingly launched 17 R&D growth driver projects.


Great organizations survive by transforming themselves. Transformation has to be all encompassing and simultaneous. Total transformation is envisaged in four broad and interconnected areas: Customer focus; Modernization of plant layout and production process with a view to enhancing productivity; Policies for creating a knowledgeable and motivated work force; and Effective communication for enhancing brand image.

Customer focus helps us to understand the need of the customer better and also to increase the confidence of the customer in our products. Customer requirements – both current and future – and the need to eliminate waste and the shift to international MIL/NATO standards are driving the modernization process.

Once the customer's requirements are known they have to be incorporated in the products and these products have to be produced reliably and safely at acceptable levels of quality and have to be supplied cost-effectively on time.

For this, the ordnance factories are modernizing the production system to be dependable, fast, lean and safe.

As part of the endeavor to have a highly skilled and motivated workforce, employees at all levels are encouraged to increase their knowledge levels by applying for higher educational qualifications. Personnel systems are also being geared to be more responsive and transparent.

A comprehensive system of communication with various stakeholders and proactive public relations policies are being put in place to enhance brand image, visibility and recall. 

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# FACILITATING GROWTH

Linked systems, each comprising three NLX 2500/700s from DMG MORI, have enabled Eisenwerk Erla to evolve from a modern jobbing foundry to a future-oriented full-liner.

Each component is moved to an exact position before it is picked up by the robot, therefore ensuring that it is correctly clamped in the machine.



Source: DMG MORI India Pvt Ltd

**E**isenwerk Erla GmbH, over the course of its 600-year history, has become one of Germany's most efficient and up-to-date jobbing foundries. Under the brand name JKM Erla Automotive, 340 employees develop, produce and finish high-quality castings made of all modern cast iron materials – from large series automotive castings with complicated and core-intensive constructions made of high-alloy materials through to mechanical engineering components. The company derives 90 per-

cent of its turnover from the automotive industry. Audi, BMW, Daimler and VW, and also suppliers such as IHI and BorgWarner, have for many years placed their trust in exhaust system components and engine parts from it. In 2016, Eisenwerk Erla extended its product range, thanks to an order from a major automobile manufacturer. It now produces engine components on 18 linked NLX 2500/700s – three of the DMG MORI Mill & Turn centers being linked by a portal handling system.

### Changing the approach

With high-quality and ready-to-mount cast products for the automotive industry, Eisenwerk Erla offers its customers holistic solutions. These include turbine housings, exhaust pipes and manifolds as well as diverse engine mountings. Erla also has an extensive network of cooperation partners for finishing the castings. "However, we would never have received the order at the end of 2015 with this approach," recalls Dietmar Hahn, CEO, Eisenwerk Erla. "That is why at the turn of the year we

Source: DMG MORI India Pvt Ltd

## Requirement

Eisenwerk Erla wanted to establish a machine shop and extend its product range to fulfill an order from a major automobile manufacturer.

## Solution

DMG MORI-proposed automated system that produces engine components on 18 linked NLX 2500|700s – three of the DMG MORI Mill & Turn centers being linked by a portal handling system. The benefits include a reduced throughput rate of about 100 seconds for each workpiece, a reject rate of less than one percent, with the highlight being BMT turret from DMG MORI with its maximum speed of 10,000 rpm and a torque of up to 40 Nm.

had the idea of establishing a machine shop dedicated to this product family. The products include different variants of components for three, four and six-cylinder engines," he adds.

### Completely automated system

The idea soon developed into a definite project. With an investment volume of around €7 million, the company converted an old boiler house and



Source: DMG MORI India Pvt Ltd

"At first, we wanted to load the machines manually. However, DMG MORI then proposed a completely automated production system. The design of the linked Milling and Turning centers – all NLX 2500|700s – impressed us both from qualitative as well as economic points of view."

**Dietmar Hahn**  
CEO  
Eisenwerk Erla GmbH

prepared it for installing CNC machines. "At first, we wanted to load the machines manually," says Hahn about the original plan. "However, DMG MORI then proposed a completely automated production system. The design of the linked Milling and Turning centers – all NLX 2500|700s – impressed us both from qualitative as well as economic points of view," he adds.

Manual re-clamping between machining steps is more susceptible to errors and without the linked systems the company would have needed more staff. Staff that it would first have to take on and train.

Eisenwerk Erla soon hired 18 skilled personnel to work in its machine shop for 17 shifts a week. "Our aim was to make production as simple as possible for all staff in order to minimize the risk of error," says Rico Klotz, who was involved in setting up the mechanical machining from the very beginning and is today in charge. Every finished component is checked for accuracy in special fixtures. "We use similar fixtures for periodic inspection in the metrology department and the transport boxes are standardized so that components can be removed by robots during assembly and installed immediately," he informs.

### Benefits of automated production

Five of the six linked production cells are absolutely identical; one is also designed for longer components. This configuration enables the company staff to respond flexibly to the respective demand. As far as the machines are concerned, Eisenwerk Erla

Manual re-clamping between machining steps is more susceptible to errors and without the linked systems, the company would have needed more staff to take on and train.

In 2016, Eisenwerk Erla established an automated mechanical machine shop comprising a total of 18 linked NLX 2500|700s.



Source: DMG MORI India Pvt Ltd

Each cell consists of three NLX 2500|700s linked by a portal handling system.



Source: DMG MORI India Pvt Ltd

**The trend is towards being in a position to offer complete solutions. More and more customers are demanding this.**

decided on three linked NLX 2500|700s. According to Klotz, the advantage of a Turn and Mill center compared to a Milling machine lies in the shorter chip-to-chip times. “Thanks to milling with a turret we achieve far shorter throughput times. These have been reduced to about 100 seconds for each workpiece,” he notes. The highlight, according to him, is the BMT turret from DMG MORI with its maximum speed of 10,000 rpm and a torque of up to 40 Nm.

The automated production process starts with storing enough blanks and loading the machines. The conveyor belt is equipped with a laser that detects the load and stops for a moment. Another laser detects which component is on the belt. Each component is moved to an exact position before it is picked up by the robot, therefore ensuring that it is correctly clamped in the machine. “The first machine drills holes and mills datum surfaces. The second pro-

duces the contact surfaces for the contours. The third machine mills further slots,” explains Klotz. Two rotating turn-over stations ensure the workpieces are clamped on the correct side between the machining steps.

**Turnkey project**

For DMG MORI, the installation of the 18 linked machines was a turnkey project which also included writing the associated NC programs. “Only a few minor adjustments were needed after commissioning. Since then the system has been running with virtually no problems,” notes Klotz. A reject rate of less than one percent is an impressive proof. “This guarantees that only fault-free components are sent to the customer,” he adds. Hahn sees the company’s entry into mechanical machining as a positive step and is ready to continue along this path. “The trend is towards being in a position to offer complete solutions. More and more customers are demanding this,” he adds. The foundation was laid with the conversion of the old boiler house. “We have other areas available for further investments,” he sums up.



Source: DMG MORI India Pvt Ltd

The history of Eisenwerk Erla goes back 600 years. Since 2016 the jobbing foundry has been operating its own mechanical machine shop.


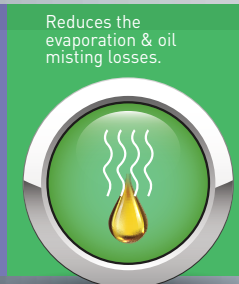


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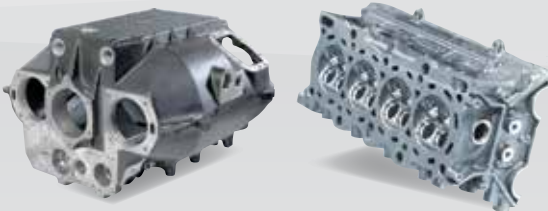
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Loading station(s)		1	8
Loading robot		1	1

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## EFFICIENT ENGINEERING WITH EPLAN

The transition from a traditional software to EPLAN has provided Grind Master Machines a greater advantage in terms of increased production rate, reduced cost structure and quick turnaround time.



Source: EPLAN

**E**stablished in 1984, Grind Master Machines Pvt Ltd has been successfully manufacturing metal finishing and deburring machine tools for the last 33 years. Located in Aurangabad, Maharashtra, India, the company specializes in Metal Finishing, Deburring, Microfinishing, and Robotic Automation.

In addition to India, Grind Master has extended its footprint in China and has been serving customers across India, China, South East Asia, Europe, the USA, and the Middle East countries. Over the years, the company has earned a well-positioned spot in the machine tool industry.

With a workforce of 350, including 160 engineers, Grind Master extensively believes in technology and development and is on a mission to become a global technology leader.

### Optimizing engineering processes

In 2013, Grind Master switched to EPLAN from AutoCAD to optimize its engineering processes. The transition from traditional CAD to EPLAN has provided the company a greater advantage in terms of increased production rate, reduced cost structure and quick turnaround time. The expert design and manufacturing team of Grind Master find EPLAN

extremely convenient and reliable in providing quality engineering solutions.

Having recognized huge opportunities, Grind Master migrated to two of the EPLAN products, which are EPLAN Electric P8 and EPLAN Fluid. With EPLAN, Grind Master has been able to tackle time, the scarcest resource of all. A solid platform to work on, EPLAN Electric P8 allows the company's engineers to easily document and manage every phase of their machinery project. EPLAN Electric P8, which is a design software, is considered a potential choice by engineers for maintaining the reliability, functionality, and speed of a project.

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## Challenge

Grind Master needed a solution to optimize its engineering processes.

## Solution

The company migrated to two of the EPLAN products – EPLAN Electric P8 and EPLAN Fluid. Its transition from traditional CAD to EPLAN has led to increased production rate, reduced cost structure and quick turnaround time.

### **EPLAN Electric P8 and EPLAN Fluid**

Every time a project reaches a certain phase, it is a natural thing to witness at least some percentage of variations from the actual requirement. Manually going through each element of the checklist is time-consuming and unproductive. EPLAN Electric P8, at the press of a button, performs comprehensive check procedures with consistency and efficiency. Post product testing, the EPLAN software is designed to provide engineers with rapid revisions and corrections needed, which is actually a time-saving assistance when compared to tedious manual procedures.

EPLAN Electric P8 helps make a difference. Through this sophisticated support, engineers can smartly plan to build with efficiency. Also, from the initial phase to the final one, the wiring diagrams can be easily modified without any sort of performance degradation. A good amount of time can be conserved through the facility of automatic reports generation that includes BOM creation, terminal diagram, and cable list. Time-consuming tasks such as wire-numbering, device-tagging, cross-referencing and error checking can also be automated.

EPLAN Electric P8's compatibility with international standards such as IEC, NFPA and Chinese GB standards has enabled Grind Master to easily collaborate with

its global clients. With the advantage of Unicode compatibility feature, circuit diagrams, parts list, and other documentation are easily deployed worldwide. The company, in collaboration with EPLAN Electric P8, can now support multilingual parts database to achieve a broadened integration with clients.

In association with another product of the same platform, EPLAN Fluid, Grind Master's engineers find it easier to step up their fluid power engineering processes through the automated design generation and circuit documentation. EPLAN Fluid is an engineering tool that complies with current ISO standards while auto-generating reports. The EPLAN platform, through a standardized database, makes it possible for engineers to maintain direct communication between electrical, fluid power and electrical I&C engineering processes.

Engineers at Grind Master can see a complete transition in the project lifecycle after having switched to the EPLAN platform. A quick documentation and evaluation process gives the company a good chance to achieve its target with reduced engineering time while promising its clients quick turnaround implementations.

### **The transition phase: Preparing for EPLAN**

A team of six engineers including one design engineer was trained to adopt EPLAN technology. On-spot support and guidance were provided to keep the team more comfortable about the new adoption. Members on board were thoroughly trained to work on this new platform.

EPLAN is a valuable tool that has increased both efficiency and productivity at Grind Master. From the day this new technology was adopted, the company's engineers are able to complete their tasks in a faster and better way.




Source: Grind Master Machines Pvt Ltd

"EPLAN is a highly flexible software. It has helped us in significantly increasing our productivity along with subsequent cost reduction."

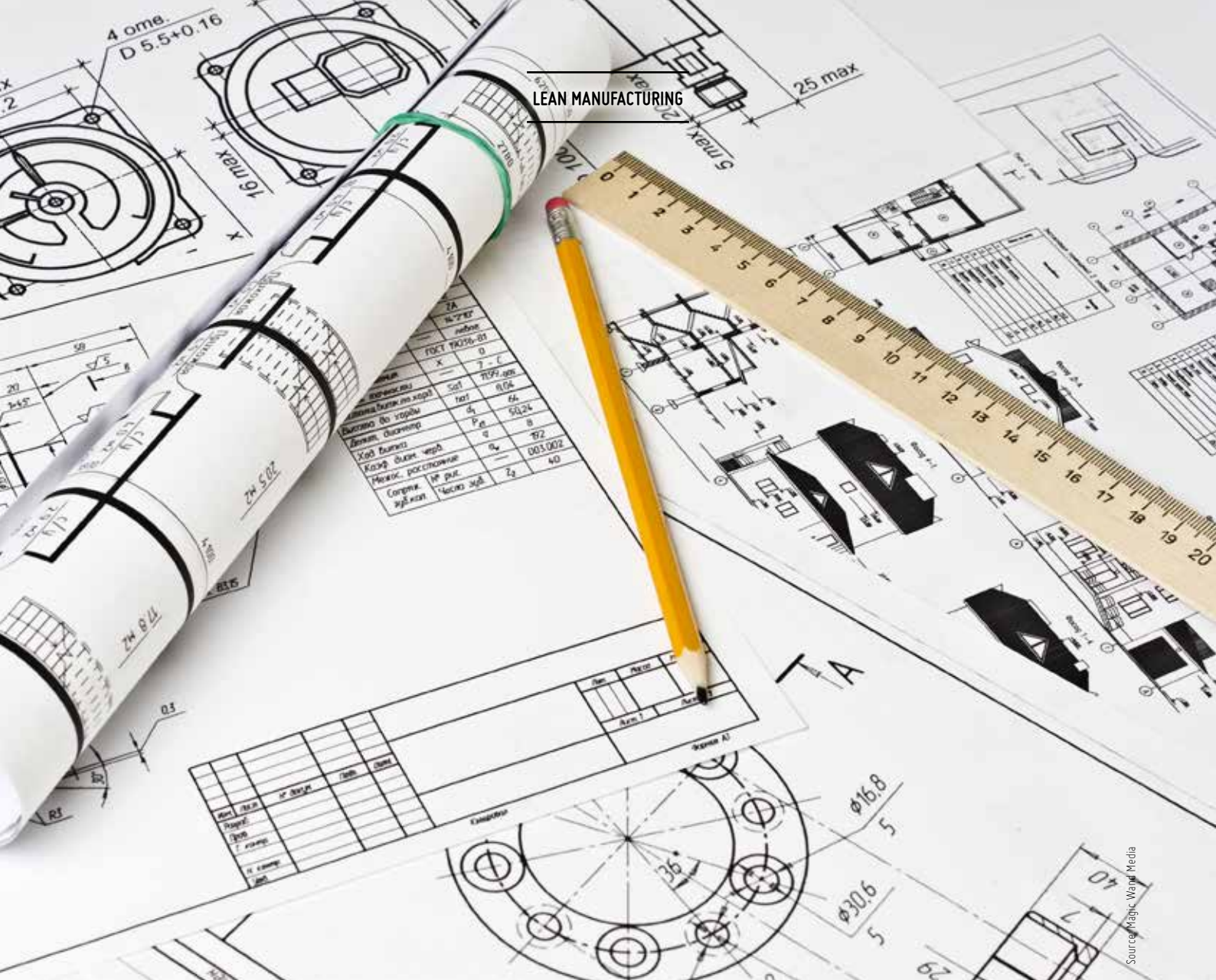
**Sameer Kelkar**  
CEO & R&D Head  
Grind Master Machines Pvt Ltd

### **Achieving workflow consistency**

Prior to EPLAN, Grind Master had consistency issues regarding GA, BOM, and schematic circuits. Today, under EPLAN, complicated panels and schemes are being completed with less number of revisions.

The reduced processing time has increased the service efficiency of Grind Master. With consistency in engineering, time gain, increased quality, and flexibility, there has been a positive impact on the production rate of the company. The advantage of logical functioning and automated reporting has reduced the bottlenecks in the overall workflow. With proper terminal plans, cable schedules and interconnection diagrams, the field service team is witnessing a smoother process. Fewer production delays and quick data modification have enabled Grind Master to provide accurate project quotes. Out of 10, Grind Master has rated EPLAN with 8 due to the efficiency gained in overall terms. 

The advantage of logical functioning and automated reporting has reduced the bottlenecks in the overall workflow. With proper terminal plans, cable schedules and interconnection diagrams, the field service team is witnessing a smoother process.



LEAN MANUFACTURING

## STRATEGIC SOLUTIONS AND COMPETITIVE ADVANTAGES

It's almost four decades that University Professors and Consultants have been studying Toyota and trying to comprehend how and what it does. With scores of books on lean management and an oversupply of seminars, trainings, master classes etc., most claim to know and even practise 'lean', falling short of replicating Toyota or Mysore Kirloskar. Here's revisiting some fundamentals that can come handy in one's lean journey...

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**M**arkets all over the world are witnessing the trends of 'disruption', 'customer empowerment' and 'mass customization'. These trends have made products better,

more customer-centric, cost-effective, and even changed the way businesses are conducted. Lesser lead times for product introductions, shorter product life cycles, fluctuating demands, varying share of businesses,

just-in-time (JIT) supplies and expectation of price reductions characterize today's business and are here to stay. Old business models that worked well for several decades are no longer effective.

Source: Magic Wand Media

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Some are not even relevant, forcing companies to revisit their business strategies and processes to find innovative ways to continuously delight customers by offering products and services that exceed their expectations in the areas of features, quality, price and purchasing convenience. This is the only way of gaining and retaining competitive edge in the market place. Companies that succeed in creating value for their customers by offering outstanding products and services at competitive prices will be able to survive and prosper. It is not a one-time effort. It must be a continuous activity that results in ever increasing value delivery to its customers.

### Enhancing productivity and quality

Bringing down the cost of production through improving productivity by eliminating wastes from the value stream has become a major objective for all industries. The Lean Manufacturing System has been proven to be a systematic approach to attain that. The aim is to deliver whatever, whenever and wherever the customers want, using a minimum of human effort, inventories, resources and floor space, at the highest possible response speed. Profit is relative to satisfaction, inefficiency and also a blinder since many businesses do not realise how much money they lose when they make profits. The principles that Taiichi Ohno first pronounced after decades of work is known to us as the Toyota Production System. Outside Toyota, it is 'Lean Manufacturing', which offers all organizations with the best option to find strategic solutions and competitive advantages. How to go about the change

### Expected results through Lean Management System

- Cutting down up to 90 percent of present order to delivery times
- Reduction in lead times by up to 90 percent
- Cutting down inventory by 75–90 percent
- Performing at above 99 percent on-time delivery
- Quality improvement above 95–99 percent of current levels
- Reducing floor space usage by 30–40 percent
- Cost reduction up to 60 percent
- Reduction in number of vendors
- Increased market share
- Permanent price reduction to customer (not discount) (30 percent has been demonstrated)
- Upping the profitability by many times
- No significant addition in manpower, surplus could be redeployed in growth areas.
- Profitability becomes independent of the economic situation
- High level of motivation among all stake holders and a motivated environment
- Continuous learning culture

process? Lean is an end to end solution and constantly needs a value stream perspective. I have found it easy to work on the change processes across the value stream simultaneously at all places starting first from the customer end.

### Critical success factors

The prime factors to succeed include knowledge about lean methodology, top management support, and employee

involvement. The key principles are doing things differently, being assisted by a firsthand experienced teacher, believing that change is continuous and accepting that the leadership too needs to get trained to get equipped with the knowledge necessary for lean transformation and build a lean culture across the organization. The good news is it is all possible, as leaderships in organizations have demonstrated it.

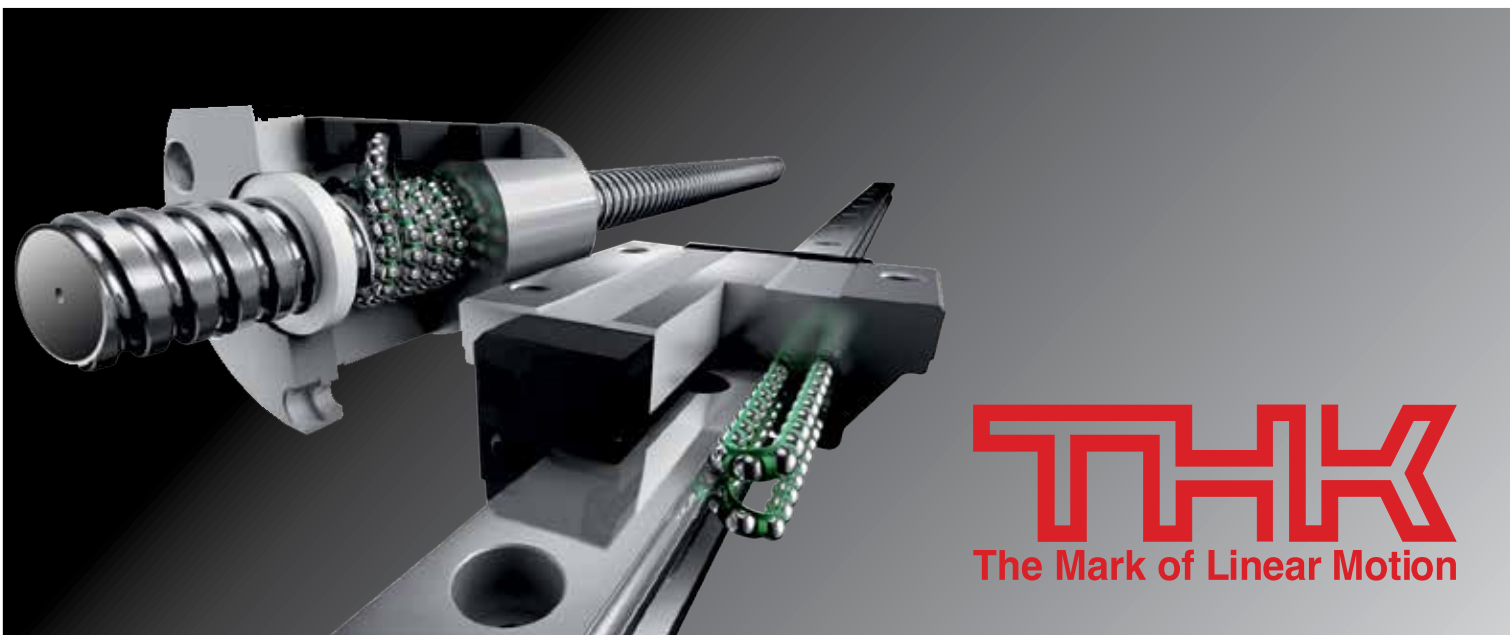
### Top management support

Implementing Lean Manufacturing System is the best-known competitive strategy today, a breakthrough improvement enabler that touches every aspect of the working of a business and calls for major readjustments. Such an effort can only succeed with the active and visible involvement of the top management. In places where the CEO is far (not on site) from the core value stream, the implementor should be empowered to take all the decisions, with the management above him out of the way. The lean initiative should be elevated to the level of a company's number one strategy. The organizational responsibilities should be rearranged in such a way that shop floor managers be responsible for the value streams instead of conventional departments. Operators should run the production without interference from staff or management, make systemic improvements, train the workmen, and participate by assisting operators to solve problems. Lean metrics should be made an important part of the annual performance appraisal for everyone.

### Employee involvement

Involving the employees who

The lean initiative should be elevated to the level of a company's number one strategy.



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will have to work in the lean environment right from the start of the change process is essential. The objectives should be clearly explained and their ideas for improvements must be solicited and seriously considered. If explained properly and if there are no hidden agendas for the management, the employees will normally be happy to participate in the improvement process.

### Methodology

It is not necessary but an advantage to implement Lean Manufacturing System with the help of a Sensei – a Lean Teacher who has enterprise lean transformational successes under their belt. In majority of cases, factories in existence aspire to become lean. I do not believe in a model cell creation for many reasons. A lean journey begins with understanding 'value' (lean's first principal) and then developing a strategy to deliver that value in the most efficient way. Lean is a strategy work. Hence, understanding customer demands in terms of cost, quality, delivery logistics, lead times, demand rate and fluctuation bandwidth, sale rates, prevalent gaps, customer satisfaction levels, product strategies, generic strategies, competitive forces and competitors, SWOT, core competences, portfolios analysis etc. is necessary in designing a company's lean journey.


Most companies work on the push system where variations are internally produced, usually from weak marketing systems that are visible in frequent plan changes or schedule interruptions. Therefore, excess inventory and wastages of various kinds are only to be expected. Lean is a strategy that has to be applied end to end and hence, it is recommended to apply it across the value stream concurrently. It being a discipline of the higher order, companies need to improvise in their discipline towards systems, processes, behaviors, routines, work ethics, personal discipline and commitment. In companies that have weak systems or discipline in their customer interface, that's where one needs to make a beginning.

### How much time will it take?

The rate or speed of change is directly proportional to the willingness of companies and their top managements to change, and lead the change by exhibiting new routines. Usually Lean implementation is over a period of time. It is not a fly by night operation. It is not a mechanical readjustment of dysfunctional systems or processes. It is about bringing in a cultural change and a change in the way of thinking and doing. It involves people, old ways, habits, comfort zones, beliefs, hardened attitudes,

resistance to change etc. This is why it takes different time frames for different companies to get to significant levels of lean results. At Mysore Kirloskar, our initial phase took about two and a half to three years. Toyota began its journey after the Second World War and is still learning and changing. That's why lean is a journey and not an event. However, one begins to see vast benefits of the change from the early stages if things are done right in the lean way.

### Will lean tools make you lean?

The word 'lean' might have become a cliché. Companies in Europe and America have developed production systems using 12 to 16 tools aided by a tool improvement measuring systems. Companies in India have followed suit in formalizing such production systems. Some have tried to use Kobayashi's 20 tools and called it lean! Toyota uses more than 90 tools and techniques and that really is the just in time (JIT) basket. How can one expect to replicate Toyota results using a small percentage of Toyota's JIT basket, and expect change by continuing to do things in the same old ways? There is also a soft connection between different tools, and if all tools and techniques are not in the repertoire of the user, gaps are bound to show up in the results. How can one expect organizations, trying to use a dozen odd tools; struggling to cope with demand changes; unable to build lean thinking, necessary routines and behaviors; to ever replicate lean like Toyota or Mysore Kirloskar? Tools alone will not make a company lean. We need to use tools appropriately to solve problems and not randomly apply them with the expectation to become lean. 

Lean is about bringing in a cultural change and a change in the way of thinking and doing. It involves people, old ways, habits, comfort zones, beliefs, hardened attitudes, resistance to change etc.

### Critical Success Factors

- Acquiring Knowledge of Lean Methodology
- Top Management Involvement and Support
- Employee Involvement
- Doing Things Differently
- Being Assisted by a Sensei
- Believing that Change is Continuous
- Accepting that the Leadership also Requires Training

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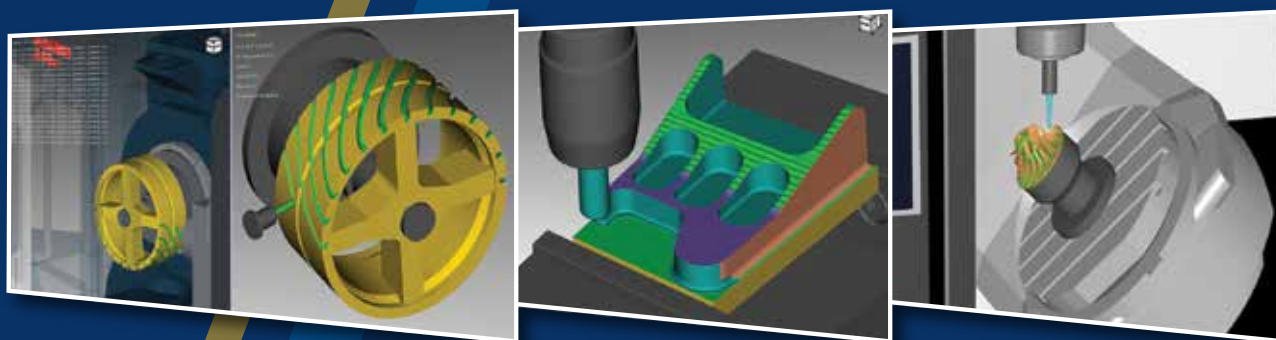
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## LEVERAGING TECHNOLOGY

A compelling account of how the implementation of an innovative and unmanned robotic system helped Distinct Productivity Solutions, an SME, to earn customer delight.

Dr Sudheendra Director, DPS (left) and Ramprakash Holla, Director, DPS (right) are entrepreneurs who keep on experimenting with engineering concepts in their machine shop with a fleet of 65 CNC machines and die casting machines. The company exports around 35 percent of their products to countries such as the US, Canada, Italy, and Germany.



Source: Distinct Productivity Solutions

**E**stablished in 2004, Distinct Productivity Solutions (DPS) at Bangalore is recognized as a competent player in the areas of Precision Component manufacturing, Design & Development of Jigs & Fixtures, and Training in CNC & Automation.

The starting phase of the business saw the founders leveraging their experience in the application engineering of machine tools with leading Indian machine tool companies, and foraying into entrepreneurship with the selling of a few leading brands of cutting tools. This led to the design and development of fixtures, which was followed by DPS executing several projects of fixture design and development integrated with the tooling solutions before finally launching its own precision component manufacturing machine shop.

### Scaling up

The tools selling and the fixture making experience came in handy for the company to adopt the most productive methods to profitably cut metal. The approach added a significant value to DPS' products and earned the company its customers' confidence to develop their critical components as import substitutes.

"This was a high-volume, low-variety situation. While productivity approach is important to be profitable in any machining scenario, high-volume situations are easier to realize the results. We, therefore, decided to manufacture the parts in the best competitive way possible, yet not compromising on flexibility, reliability, accuracy and adaptability to digital technology," explained DR Sudheendra, Director, DPS.

### Challenges cropping up

"We were in such a situation where a highly critical part was to be made in high volume by sophisticated CNC machines. The operator was expected to produce one part at an interval of 20 sec, which is the takt time," shared Ramprakash Holla, Director, DPS. The physical fatigue due to the short cycle time, and the mental fatigue due to the repetitive nature of the component hitting a cutting time to non-cutting time ratio of 60:40 led to the manpower productivity going down considerably, affecting the OEE (Overall Equipment Efficiency).

### Robotic system as the solution

To overcome the challenge, the DPS team started looking at various options of automating the manufacturing process. "Automa-

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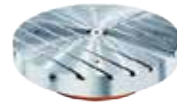
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tion is not new to the manufacturing industry. Several frugal automations are in practice that use pneumatic actuators and are controlled through PLCs. But these systems are relatively rigid in nature. In the current scenario of fast-changing customer demands, compromising on flexibility is not advisable," noted Holla.

Although rigid automation could have been economical for DPS, it was not the solution the company sought. "We decided to go with an automated system which was robotic with suitable grippers, and infeed and outfeed strategy," he added.

DPS opted for a flexible CNC Machine with 4 spindles in which 2 spindles faced the other 2 (Fig. 1). It was possible to load and unload on 2 spindles while the machining was being carried out on the other 2 spindles. With this, 40 percent of the loading unloading time was completely removed, thereby using the machine only for machining. It was precisely similar to a pallet changer concept adopted in a special turning center. A Fanuc Robot was integrated with a suitable slat conveyor as infeed strategy, and a belt conveyor as outfeed strategy. The system became completely unmanned. The uncertainties related to manpower productivity, performance and quality issues creeping due to that were also eliminated. This upped OEE by about 15 to 18 percent.

#### Factors that matter

"The whole journey was not as easy as we have narrated. Several other challenges were also faced and overcome before the system finally got stabilized," stated Sudheendra.

Other factors that were taken into consideration include:

**Reliability of the whole system:** Generally, robots have a very high reliability factor clocking



Fig. 1: 4 Spindle Machine → 2 spindles (left) for Operation and 2 spindles (right) for Loading Unloading

Source: Distinct Productivity Solutions

MTBF of at least 2 years. Indian machine tools have come a long way and are also fairly reliable but the accessories like infeed systems, outfeed conveyors etc. have also to be equally reliable.

**End Effectors:** End effectors play a vital role in successful implementation. There is a general tendency to buy global robots and local end effectors. The end effector design, keeping in mind the locations and orientation concepts, helps effective clamping without damaging / denting the component.

**Robot Teaching:** Robot teaching is relatively easier than CNC Programming. However, its initial learning is expensive as there is a dependence on OEMs.

**Robot Installation:** As big masses move at a high speed, a lot of inertia is generated. To withstand that, proper grouting of the robot should be planned otherwise it results into vibration and improper operations of the system.


**Input Components:** Input components need to be clean and burr-free. Operators can understand these aspects and avoid while loading, but robots do not. A consistent infeed component profile and quality is very important for

collision-free operations. However, software techniques and logics are available in robots to make a system collision-free.

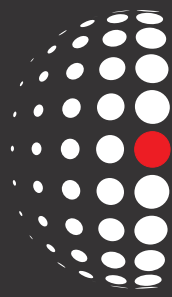
**Safety:** Safety aspects should never be compromised. Generally, operators, visitors, and customers have a tendency to watch systems closely. Proper interlocks, electronic curtains, physical fencing etc. are to be implemented before putting robots into operation.

#### Conclusion

Robotic automation is preferred over frugal automation as robots can be employed for any type of work by changing the end effectors. The manpower cost reduction cannot be a reason for robotic implementation. The real reason is to address the manpower performance factor in OEE.

"The implementation of this innovative, futuristic, flexible, accurate, unmanned robotic system helped us demonstrate our commitment to our customer. This transformed him from being a satisfied customer to a delighted one, which is the very purpose of emerging SMEs like us to be in the business," summed up Holla. 

Generally, robots have a very high reliability factor clocking MTBF of at least 2 years. Indian machine tools have come a long way and are also fairly reliable but the accessories like infeed systems, outfeed conveyors etc. have also to be equally reliable.



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## COGNIZANT OF EACH OTHER'S NEEDS

After having remained as two separate entities confined to their own focus areas for long, the industry and the academia now acknowledge that their goals overlap, and, hence, have joined hands in their pursuit. Dassault Systèmes Foundation's initiative at NK Orchid College of Engineering & Technology, Solapur, is an encouraging move in this direction.



Source: NK Orchid College of Engineering & Technology, Solapur

**I**n line with that, Dassault Systèmes, through the foundation it has set up in India, Dassault Systèmes Foundation, executes and supports various programs for Academia Transformation. The initiative is already reaping beneficial results with students being able to receive better career opportunities. In this backdrop says Hemant Gadgil, Executive Director, Dassault Systèmes Foundation, India, "We strongly believe that the industry should come forward and support academia to upgrade them on newer technology domains, curriculum development and skill enhancement for students."

### Enhancing skills in solar domain

With the aim to develop the solar

domain skills of the youth of the tier II city, Dassault Systèmes Foundation has funded 'Solar Innovation and Competency Development Center' in NK Orchid College of Engineering Technology, Solapur.

Elaborating on the program and its purpose, Dr Shrinivas S Metan, Head of Mechanical Engineering Department, NK Orchid College of Engineering Technology, Solapur, states, "Launched in January 2019, the program aims to make the young generation industry ready for Solar Energy Power Projects. This will encourage new entrepreneurs to foray into this emerging green energy domain and develop different solar gadgets with research and development component in it. One of the major objectives is to develop a state-of-

the-art solar research facility in this region which can be useful for entrepreneurs, industries and other institutes."

### Together for a higher goal

For the project, the college has developed a holistic skill development course in Solar PV technology and Thermal Energy area. Comprehensive learning in Design, Fabrication, Operations, Maintenance, and Testing from Mechanical, Electrical, Electronics, Computer, and Civil aspects in solar applications is offered to the students. The 120 hours duration of the course will be divided equally for theory and practical training.

"Dassault Systèmes Foundation's research projects at the academia are for greater social cause and social impact," notes

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Gadgil. To this end, NK Orchid College of Engineering Technology will be conducting solar lab visits of high school students and solar domain seminars at the Center in order to create solar energy awareness and enhance its utilization in the city. “Workshops for Diploma Engineering and ITI students are also to be held. There are plans that the trained students will carry out two major projects in solar domain – Solar Car and Solar Dryer,” explains Dr Metan. The developed laboratory facility can also be utilized for the different courses run by the Government of India under Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and different agencies like NISE (National Institute of Solar Energy) etc.

**Boosting India’s research**

The foundation’s focus is to promote Research in the Indian Academia. “The foundation is already supporting various interesting research projects which have great social impact and are in line with our national priorities,” apprises Gadgil. Other than the Solar Energy Research Center at NK Orchid College, Solapur, the foundation is also engaged with other institutes on innovative chemotherapy treatment to cure cancer and developing means for converting raw water into drinkable water



Source: NK Orchid College of Engineering & Technology, Solapur

“Like in developed countries, the Indian industry should give the first priority for its CSR funding to deserving institutions for developing state-of-the-art labs to produce a skilled workforce as well as for the research work.”

**Dr Shrinivas S Metan**  
**Head of Mechanical Engineering Department**  
**NK Orchid College of Engineering & Technology, Solapur**



Source: Dassault Systèmes Foundation, India

“Students need to get skilled on the skills required by the future of the industry. Dassault Systèmes Foundation’s objective is to help academia in bridging the gap between the skills expected by the industry and what they see in the fresh graduating engineers.”

**Hemant Gadgil**  
**Executive Director**  
**Dassault Systèmes Foundation, India**

**Towards a ‘Future Ready’ workforce**

The education system in India in the recent years witnesses a sea change as the corporates reach out to the academic institutions to enhance the skills of the graduates to make them industry ready. “Now the technical education is focused on the skill development along with the conceptual learning through practical work. The industry is also extending its services through knowledge sharing from their experts, faculty development programs, technology workshops for students in the institutes,” points out Dr Metan.

Various national level competitions for students are also being conducted including Akruti, TIFAN, Go Kart, SUPRA, Hackathon etc. These help enhance technical skills such as designing, 3D modelling, manufacturing, testing, software and hardware development etc. along with non-technical skills such as team building, getting sponsorships, time management, budgeting etc.



One of the major objectives is to develop a state-of-the-art solar research facility in the region which can be useful for entrepreneurs, industries and other institutes.



Source: NK Orchid College of Engineering & Technology, Solapur



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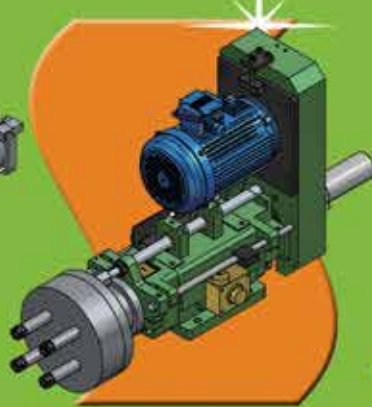
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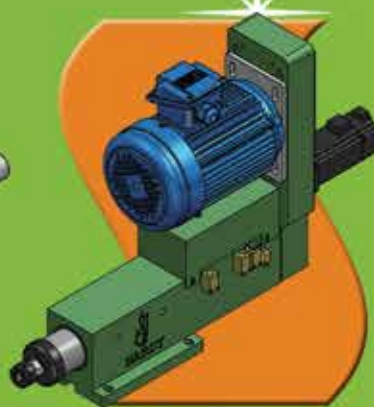
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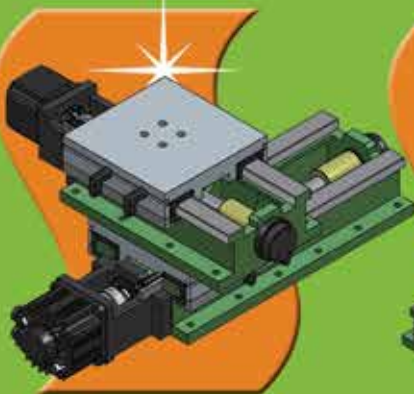
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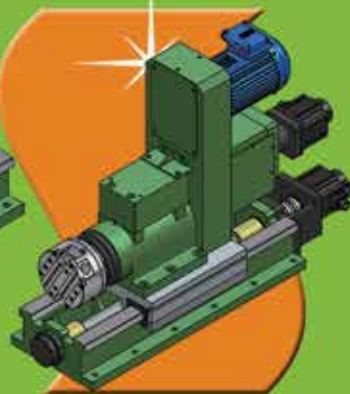
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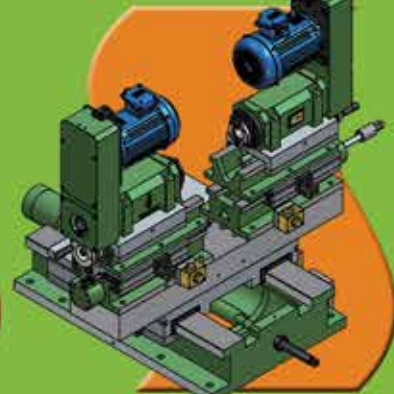
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# HELPING EACH PROGRESS

In its endeavor to aid Taiwan's machine tool manufacturers explore and tap the potential of Indian automotive and auto component industries, Taiwan External Trade Development Council (TAITRA) provided them with a platform to gauge the opportunities awaiting in the auto clusters of India.

Representatives from Taiwan companies along with dignitaries pose during the Forum



The export of Taiwan machine tools to India grew by 42 percent in 2018.

**T**aking cognizance of the fact that India is the world's 5<sup>th</sup> and the largest in the car manufacturing and production, and that the Indian automotive industry is constantly on a lookout for cutting-edge machine tools, Taiwan's machine tools manufacturers are keen to make the most of this opportunity. Additionally, India's Automotive Mission Plan 2026 (AMP 2026) opens up promising prospects for them with the demand of medium- and high-end equipment by the Indian automotive component manufacturers on the rise.

Taiwan is currently the 4<sup>th</sup> largest exporter of machine tools in the world market. Its advanced metal processing technologies and extensive experience in the domain has fetched the country a significant reputé among world-renowned auto makers.

## Building bridges

Hence, to facilitate alliance between them, TAITRA held a Taiwan Smart Machinery Forum in April 2019 in Ahmedabad and Bangalore. Leading manufacturers from Taiwan such as Palmary Machinery, Manford Machinery, SEYI, Roller King Enterprise, Kao Ming Machinery Industrial, Chin Fong Machine Industrial, Ducis Enterprise and Chiah Chyun Machinery made their way to the two cities to actively explore their automotive clusters.

## The forum

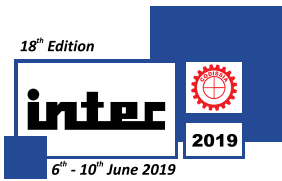
About 140 buyers from the auto sector attended the Forum and B2B sessions. D Thara, Vice Chairman & Managing Director, Gujarat Industrial Development Corporation (GIDC); Chung Kwang Tien, H.E. Ambassador and Representative, Taipei Economic and Cultural Center (TECC) in India; Premal Dave,

Deputy Director Gujarat Western Region, The Confederation of Indian Industry (CII); S Baligar, Zonal Co-ordinator, Karnataka & Hosur Zone, Automotive Component Manufacturers Association of India (ACMA) and Lincy Varghese, Executive Officer, ACMA, were among the ones present. "I invite Taiwanese companies to invest and set up their manufacturing base in the state of Gujarat," said Thara. Krist YB Yen, Deputy Executive Director Industry Marketing Development, TAITRA, said, "Taiwanese quality machine tools are highly competitive in India. Hence, we have invited the leaders from Taiwan machine tool industry in India to demonstrate their latest technology involving CNC machines," To this added, Dave Tsai, Director, Taipei World Trade Center, Chennai, that the Taiwan machine tools are increasingly getting more popular in the Indian market. 

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# INTERNATIONAL MACHINE TOOLS & INDUSTRIAL TRADE FAIR



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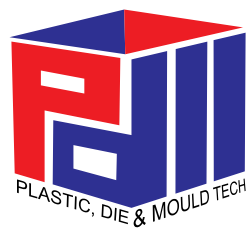
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## CHANGING MANUFACTURING WAYS

Having garnered an overwhelming response on its first attempt at raising awareness on Industry 4.0 and its importance in the manufacturing space, German Engineering Federation (VDMA) once again organized a second symposium on 'Industry 4.0 – the Future Concept of Manufacturing' on April 25 and 26, 2019 in Ahmadabad and Chennai respectively. Highlights...



Source: VDMA

The event that convened more than 250 delegates focused on why Industry 4.0 is so important to implement in the manufacturing process and how to do it.

The event, that had its focus on implementing Industry 4.0 in Manufacturing including Automotive, Aerospace, Machine tools, Construction & Material Handling, Food Processing & Packaging, and Heavy and Process Engineering sectors, convened more than 250 delegates comprising industry veterans, policy makers, academia, research institutions, and media from both the cities.

### Ahmedabad event

The event had Nitin Tiwari, Head – Business IT, Manufacturing Execution System, TATA Motors Ltd, Sanand, as the Guest of Honor; and Amit P Dharva, Technical Advisor, Industries Commissionerate, Government of Gujarat, as the Chief Guest. Dietmar Goericke, Managing Director, Forum Industrie 4.0 at VDMA Frankfurt; and Sandip Roy, Regional Head – East, VDMA India, were also among the ones gracing it.

While Tiwari spoke on Industry 4.0 and the 'Digital Transformation of the Automotive Industry in India' from the perspective of an OEM, Dharva highlighted the importance of Industry 4.0 and briefly touched upon the initiative of the Gujarat Government to attract FDI in manufacturing.


### Chennai event

Dr Seshu Bhagavathula, CTO, Ashok Leyland Group, was the Chief Guest, while Karin Stoll, Consul General, Consulate General of Federal Republic of Germany, Chennai, played the Guest of Honor. Rajesh Nath, Managing Director, VDMA India; Dietmar Goericke; and Sandip Roy were also present.

Nath covered the various aspects of Indo-German bilateral relation and emphasized on the importance of adopting Industry 4.0 to achieve the ambitious target of making India a global hub for manufacturing, design and innovation.

There were total seven speakers for technical sessions in both the cities from VDMA member companies like Beckhoff Automation, Bosch Rexroth, Pepperl + Fuchs, SAP India, Schaeffler Group and Siemens.

Yogesh Mali, Application Manager, Beckhoff Automation, made a presentation on 'Open Automation Technology - PC-based Machine Control for Industry 4.0' Whereas Ravi Agarwal, Managing Director, and Regional Director - MEI, Pepperl+Fuchs Factory Automation, enlightened the audience on 'Implementing Smart Manufacturing Solutions in India' and how the country can benefit by harnessing automation in the manufacturing sector.

While, most speakers expounded on 'why' important is Industry 4.0, the speakers from SAP spoke at large on 'how' to implement Industry 4.0 either in an organization or a country. 



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## IN CELEBRATION OF PRECISION MACHINING

The United Grinding Group hosted its fourth Grinding Symposium in Switzerland's picturesque Thun, a medieval castle city in the Bernese Oberland. Held between May 8-10, 2019, the event made for a picture-perfect setting to discover technical innovations and trends in all areas of precision machining.

(Fourth from left): Stephan Nell, CEO, United Grinding Group, stressed during the Symposium that no customer is like the other. Hence, the company aims to make them come back by offering them customer care in the manner and language they want. The Group has 550 customer care employees in 14 nations, and 50 helplines in 10 languages worldwide.



Source: United Grinding Group

**W**ith a turnover of more than €700 million, the United Grinding Group is one of the world's leading manufacturers of precision machines for grinding, eroding, lasering and combination machining.

With its eight company brands, the Group offers a broad application knowledge, an extensive product portfolio and a complete array of services for surface and profile grinding, cylindrical grinding and tool machining. The eight company brands include: Mägerle, Blohm, Jung, Studer, Schaudt, Mikrosa, Walter and Ewag.

### Grinding Symposium 2019

The three-day event, held under the motto 'United for your Success', focused on the issues of networked production, machine learning and intelligent workpieces attracting over 1,500 visitors from all over the

world, including customers of the Group and international journalists to experience new technologies in precision machining and current trends in the manufacturing industry.

### Knowledge sharing

Technology presentations and lectures by partner companies and suppliers have always been the highlight of the Group's Grinding Symposium. The new entrant this year was FutureLAB that presented innovative technologies of tomorrow.

Among the speakers, Marc Blaser, CEO, Blaser Swisslube AG, spoke on the 'influence of coolant on manufacturing costs'; Dr David Bosshart, CEO, the Gottlieb Duttweiler Institute for Economic and Social Studies, presented his take on 'how can human and machine best complement each other?'; and Christoph Plüss, CTO, United Grinding Group, offered his views

on digitalization and the Group's DigitalSolutions™ that can be of customer benefit.

There were also production topics such as practical experiences with the innovative WireDress® dressing technology from the United Grinding Group.

The partner companies presented their latest hardware and software solutions, including three product premieres.

### Focus on customer success

"With the Grinding Symposium we offer our guests a forum for

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Helitronic Power 400

Source: United Grinding Group



Source: Motherson Techno Tools Ltd

“Seeing is believing. It was great to see new products with upgraded technology under one roof. We were really impressed with the usage of Industry 4.0 on next generation CNC machines.”

**Nipun Chauhan**  
**DGM Operations**  
**Motherson Techno Tools Ltd**

international, expert exchange at a top-class level,” said Stephan Nell, CEO, United Grinding Group, addressing world media in the press conference at the event. Heinz Poklekowski, CFO, United Grinding Group, also shared the stage with him. Nell stressed on the goal which the company consistently strives to pursue, which is to make its customers even more successful. “With Precision and Passion as our corporate philosophy, our focus is on our customers and their success. Their success translates into ours,” he added.

### **A glimpse of tomorrow**

The main highlight of the event was FutureLAB, through which the United Grinding Group demonstrated its future

innovations which included additive manufacturing technologies and 3D simulation scenarios. The audience participation was high as the innovations fascinated them and piqued their curiosity as to what the future held for them. The Group already offers products and services for the area of Industry 4.0 under the DigitalSolutions™ label. The FutureLAB further examined which digital solutions are conceivable in the production environment.

“Our aim in presenting these future technologies is to create a dialogue with our customers and to discover more about their individual expectations and requirements,” explained Plüss.

### **New offerings**

Nearly 20 machine tools from partner companies were on display to demonstrate new processing technologies and complete solutions of the Group. The brand-new ones included Mägerle MFP 30, Studer S31, Walter Helitronic Power. With only 7.3 sq mt footprint, Mägerle MFP 30 is a 5-axis grinding center ideally suited for grinding complex geometries, particularly in the case of guide and rotor blades as well as heat shields for aircraft turbines. Studer S31 is a cylindrical grinding machine that performs complex and varied grinding tasks. It can be used to produce small to large workpieces in



Source: Indo Schöttle Auto Parts Pvt Ltd

“The symposium has helped us know about the Group’s partner companies with their individual offerings in precision grinding machines. The machines’ practical demonstration provided the much-needed clarity. The information gained will come handy while adopting new grinding techniques or in troubleshooting of our existing machines.”

**Omkar Joshi**  
**Associate Manager - Engineering**  
**Indo Schöttle Auto Parts Pvt Ltd**

single, small and large series production. It can machine workpieces with a maximum weight of 150 kg. Walter Helitronic Power 400 and Walter Helitronic Power Diamond 400 were two new Helitronic models displayed. Walter’s latest grinding and eroding machines feature a grinding wheel/electrode changer and extended traverse, and can now machine up to 380 mm in length, surpassing the previous limit of 280 mm. This is an increase of over 35 percent.

### **Value-added take away**

With a wide variety of options in machine tools displayed for an array of applications, the United Grinding Symposium 2019 ensured it offered all that is possible in precision machining. The views from the participants from India bear testimony to the Group’s successful endeavor to showcase the best and latest from the Group and disseminate knowledge on the current trends and technologies.

Over the course of 16 lectures, world-renowned experts expounded on the current and future trends from the grinding machine sector and the manufacturing industry.



Source: United Grinding Group

A technical session in progress during the Symposium

Source: Beckhoff Automation Pvt Ltd



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## Towards Autonomous Gripping

SCHUNK is exploring the possibilities of how digitalization and artificial intelligence can enhance handling processes.

SCHUNK has expanded some of its product lines such as the pneumatic flagship PGN-plus-P, and is also pushing its activities in the segment of mechatronic products. The challenge of integrating electrical control systems with gripping tools has resulted in interconnecting more and more mechatronic components. The company is soon to unveil a DGUV-certified gripper for collaborative applications that has a gripping force of 450 N, which far exceeds what was previously cus-



Source: SCHUNK Intec India Pvt Ltd

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tomary and possible. As a consequence, the company is opening up the collaborative application market to accommodate handling weights well beyond those of small parts assembly. The automotive supplier industry and the automotive industry will benefit from this innovation. SCHUNK has also come up with a flexible mechatronic gripper with a long stroke for a wide variety of industrial applications. This gripper is controlled via PROFINET and positions its fingers extremely fast.

Source: Chiron India Machine Tools Pvt Ltd



The FZ 16 S five axis with 5-axis tilt rotary table is the ideal solution for meeting the special requirements of the aerospace sector.

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Turnkey machines are particularly important for the aerospace sector. These complete solutions with end-to-end automation are matched to individual customer requirements. In addition to the holding fixture and selection of the right cutting tools, the software provided also makes a contribution to greater productivity and dynamics in machining for customer solutions of this kind. The software systems in the SmartLine portfolio from CHIRON establish the ideal basis for making full use of the performance offered by the machining centers. In terms of CNC control systems, customers can choose between the established solutions in the market from Siemens, Fanuc, or Heidenhain - all of which support the best possible machining quality and performance.

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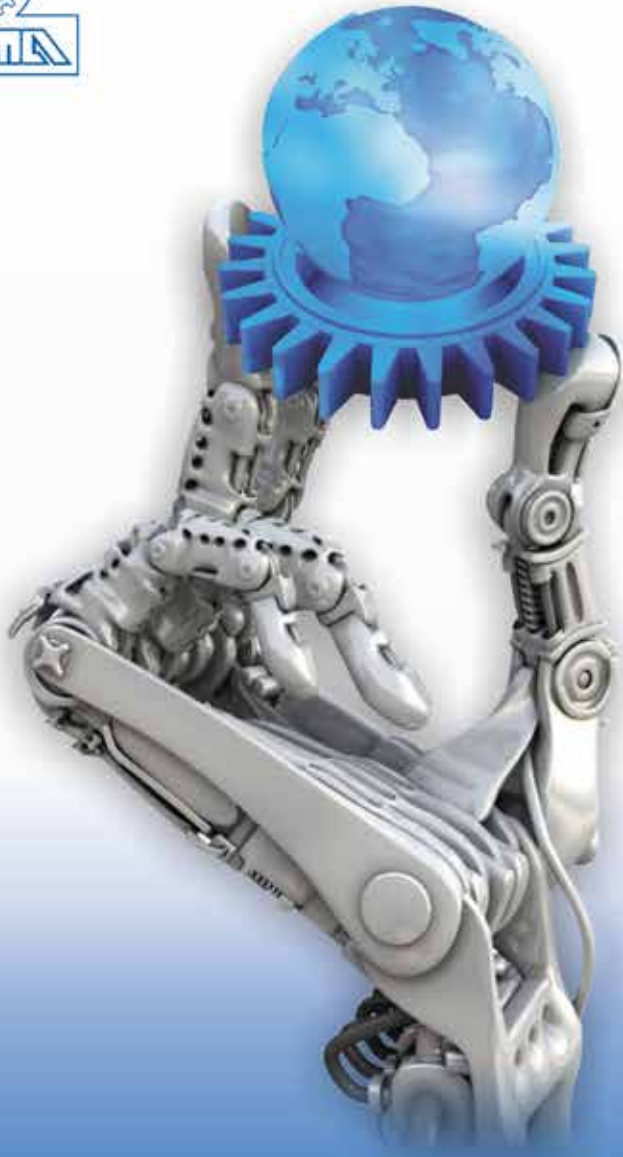
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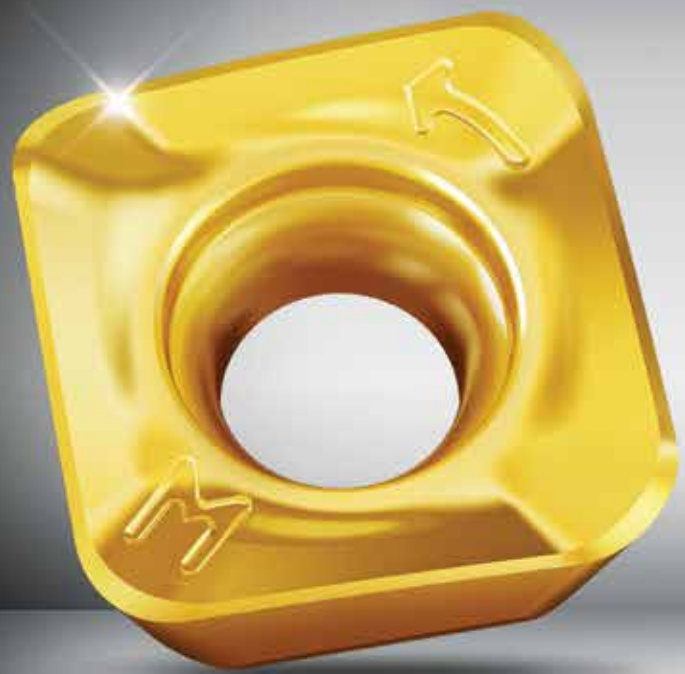
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