



Smart and sustainable manufacturing: Saving the industry world

Being smart and sustainable, is what the manufacturing world needs to now. Here, is an exclusive and detailed analysis by the experts on why and how an energy efficient manufacturing process should be implemented.

Manufacturing industry is highly dependent on power for its shopfloor activities. Energy consumption in manufacturing plants incurs higher operational expenses.

Less energy and increased operational efficiency
Increasing energy efficiency by cutting down energy consumption will enable companies to reduce operational costs and sustain competitiveness. Adopting an energy efficient management system is the need of the hour for all manufacturing companies.

P. Ramadas, President, IMTMA says, "With the world moving towards digitisation, Indian companies need to learn the machine language, embrace technologies such as IoT, so that engineers can gain access to information in real time. By integrating IoT enabled innovations in the production line, the management can increase energy efficiency and reduce costs. This will result in economic savings and increase the profitability of the ventures."

Machines are first born in the mind of the creator which is the design department. Design with use of appropriate technology and properly sized motor will ensure optimal energy consumption. T K Ramesh, MD and CEO, Micromatic

Machine Tools Pvt Ltd. says, "The choice of right material manufactured optimally ensures operational efficiency. In addition to this, the use of proper sensors and the technology of IoT can further optimise energy consumption."

Machine tools include numerous motors and auxiliary components. Energy consumption varies significantly during operations. The main spindle drive, coolant system, air conditioning and spindle cooling chiller system.

Mayank Tripathi, Area Manager Sales North India, Hurco India states that the following activities in milling operation to consume power:

- CNC control and spindle motor with all feed axis motors
- Coolant and lubrication process for featuring and machine lubrication
- Compressed air required for dry machining, tool changing operations and cleaning operations
- Electrically powered other auxiliary components like panel AC

Tripathi adds, "Relatively calculated energy for lighting, spindle cooling, and air conditioning must be added to these groups. The energy demand Milling process energy demand depends primarily on the size of the milling machine and the machining task.

It has been proven in the past that the energy consumed by machine tools during machining is significantly greater than the theoretical energy required in chip formation. For instance, the specific cutting energy accounts for less than

15 per cent of the total energy consumed by a modern automatic machine tool during machining.

Maulik Patel, Executive Director, SLTL Group says, "In our laser cutting machines, we've integrated smart fume suction, where the suction system is divided into a number of sections and is only triggered by sections of cutting." One area of potential savings comes from the machine tool base load, which consumes energy even in non-productive phases. Patel adds, "In SLTL Group' machines, we've smartly introduced a feature called 'fly cut' which enables to save the power during movement of cutting head during non-cutting portions. This saves some seconds per piece but overall energy savings in a day of production is considerable."

Dry machining has great potential for improved energy and resource efficiency. Some energy consumers, for example, can be switched OFF by the machine control during non-productive phases.

Rajesh Savergaonkar, BU Head, Grind Master points out the following:

- Standardisation of material usage: Machine tool structures (base, outer structures, motor & gear box mounting brackets) constitute majority of metal part in machine tool. Standardisation of these structures is one of the areas for time and cost reduction.
- Digital manufacturing: Optimisation of material usage (size, weight) can be done by stress analysis and simulations. Optimisation will lead to realisation in material cost, machining process and cost, assembly cost, handling cost, packing and transportation cost. This will also lead to optimum use of motor with optimised power (HP / Kw) & other peripherals (PLC, etc.).
- This will automatically lead to less operational cost. Also intelligent controls (if no load for more than 4 min. everything will be hibernated) will reduce operational cost.

Manufacturing intelligent tools to address key customer requirements

"These are tools that can give out information about machine condition, health use periodically by analysing this information it is possible to design and manufacture optimal tool," says Ramesh.

An effective data portal can save your manufacturing time and money by automating processes, like procurement, manufacturing inventory and sale. Now a day it's an easy job to trace an automobile part manufactured in a unit five years back. It's because of the system or data portal we are using.

Tripathi says, "In the present industrial era, it's mandatory to implement intelligent tools. As your business grows and attracts more customers and users, your infrastructure for engaging with customers' needs, needs to expand and adapt. A data portal is one way to scale as your business grows."

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▶ P. Ramadas, President, IMTMA

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Cost-effectiveness is right but one should not compromise on quality for a short time gain.

▶ Mayank Tripathi, Area Manager Sales North India, Hurco India

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One thing the buyers have to understand is technology and machines cannot be compared with cost.

▶ Maulik Patel, Executive Director, SLTL Group

Savergaonkar says, "Manufacturing tools need to be vulnerable to suit the exact requirement of customers. Reduction in conversion time from engineering to manufacturing to actual usage is the key factor; also, optimising tool life, using same tools for different applications.

Every company needs to have keep special emphasis on Research and Development to understand customer requirement in the market. Patel says, "We, at SLTL Group, invent and involve intelligent tools for our machines as per the customer's require, keeping in mind the capital investment capabilities of customers. Last year, we launched Infinity F1 laser cutting machine, which comes in with advance features to boost productivity and with modular product architecture."

Every customer comes in with some specific requirement and each system produced is different from the previous one. Patel adds, "Our in-house R&D team in support with the We Care team identifies the requirement and develop systems, tailor-made for customers. I think with general improvements it is important to bring in specified details to increase per customer productivity. That's what intelligent systems mean to us."

Key barriers in implementing energy efficiency and smart technologies

A machine tool consists, generally, of machine frame, guides, drives and control units. The integrated electrical components are signal elements, drives and actuators as well as wiring and measuring systems. Power ratings represented as an attribute of the machine tools is a measure of the potential power used under the individually



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► *Rajesh Savergaonkar, BU Head, Grind Master*

assumed operating conditions. It is assigned by the machine tool manufacturer for an observed system designating, for instance, consumption for each component.

Tripathi of Hurco India says, "Throughout the operation of a machine tool, process-induced performance requirements affect the power demand of the components. Depending on the structure of the machine elements and their operation, the power consumption is, therefore, not static but rather dynamic.

Besides enhanced usage of automation technology, the origins of a higher power consumption of machine tools can be attributed to an increased power consumption of its integrated components. The demand for a higher processing performance has been satisfied by increasing the torque of the main spindle resulting in higher power demands.

Ramesh of Micromatic Machine Tools states some of the barriers in implementing smart technology in the shop floor as:

- Not enough awareness
- Lack of digital equipment and cost

In the machine tool sector, the industries are already heavily invested in technologies. Consider, once a company invests a considerable amount in introducing new technology to improve the existing production line and is expected to work for next decade or two. Technology advancements are very volatile these days and every day, there is something new in the market that promises to improve the manufacturing process but the current arrangement of the company might not be favourable to make a shift.

According to Patel of SLTL Group, another big obstacle is the nature of the technology and complexities it comes along with. First, the overall need of the technology. Many systems sound cool and tempting to integrate with line of machines and also, these systems are properly tested and verified to risk increase in cost to the customer without

considerable value to cost difference. Secondly, small scale industries ability to integrate new systems with the existing line of machines, considering their technical and financial setup.

Unawareness about availability of energy and its cost are major factors. Constituting energy team in manufacturing company with clear ownership of its results and regular energy audits can stop the leakages in energy, adds Savergaonkar of Grind Master.

Price war: cost prevails over quality

In the battle to grab the attention of the customer, companies use a wide range of tactics to ward off the competitors. Increasingly, price is the weapon of choice—and frequently the skirmishing degenerates into a price war. To effectively advocate competition, officials must understand when competition itself is the problem's cause, not its cure. Market competition, while harming some participants, often effects quality. For example, two merging firms may well argue that ongoing competition will leave them with insufficient profits to make valuable and necessary investments to serve consumers. Tripathi says, "Price war between two organisations is good for the users. In a longer term, however, it gives a negative result. Your support and quality will be hampered as you are not able to get the desired margins to maintain the brand. Cost-effectiveness is right but one should not compromise on quality for a short time gain."

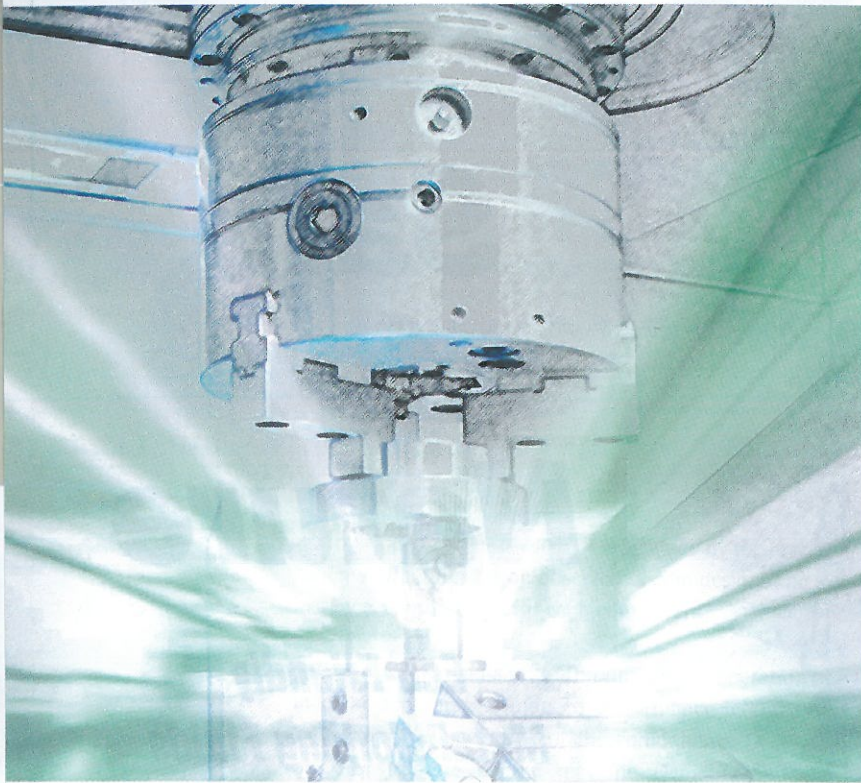
Ramesh of Micromatic Machine Tools says, "Firstly, there is never a cost to quality. In today's situation, either there is quality or it's a waste." Quality in a product or a service and the cost really comes from the materials, human interference etc. He adds, "In the event of a price war, companies that cut quality to reduce cost are extremely short sighted in their approach and are sure losers at the end of the day."

"A decade and a half back when SLTL Group started with fiber laser technology, we were the sole players in the market and we were able to focus on only one thing that is quality to our customers, says Patel. He opines that the market of today is very much crowded with integrators, industries experts who does assembling the product by bringing components from overseas. This has helped them cut the massive cost of R&D but as a result, they have barged quality drastically. These industries claim to be manufacturers but are none more than assemblers and this impacts the reputation of overall manufacturing industries.

Patel says, "The current price war has created a situation termed 'Perfect Competition' where most of the industries trade at almost similar prices. When integrators and fundamental manufacturers (industries with in-house R&D) is compared through cost parameters, it is very likely that customers in manufacturing industries are compromising on quality." One thing the buyers have to understand is technology and machines cannot be compared with cost.



Machine tool industry, on its toes



An exclusive report on the trends in machine tools which keeps the machine tools industry on its toes to change its dimension as per the market behaviour.

The machine tool market in India is increasing day by day. As a result of the growing demand, the country is set to become a key player in terms of global machine tools industry and is likely to see substantial high-end machine tool manufacturing. It is largely expected that the platforms like 'Make in India' coupled with the growth in manufacturing are said to be the results of the growing demand in the machine tools sector.

Machine tool industry needs continual improvement in productivity and costs to sustain itself in the global market. With Additive Manufacturing offering several advantages over CNC machining, there is a general belief that it would replace subtractive manufacturing process in selected areas. "Additive Manufacturing will also work together with CNC machines to deliver productive solutions. Manufacturers who have understood the benefits of this have merged these technologies to create 'hybrid machines.' In this process, the machine will undertake additive process as well as metal cutting process with quick changeover from metal cutting to additive process and vice versa," says V. Anbu, Director General & CEO, IMTMA.

Core trends changing the machine tool industry

According to Keshav Khurana, Executive Director, Wohlhaupter India Pvt Ltd, three trends affecting the global machine tool industry are process automation, additive manufacturing and the rise of electric vehicles.

Process automation

The investment in process automation is expected to reach

120 billion dollars globally by 2019, according to market experts. High quality products with improved precision can be achieved with shorter lead times by automating production processes. Computer numerical control (CNC) is the latest trend in this sector. CNC machines in developed as well as developing economies have created a surge in production efficiency and improved quality in the machine tool industry.

Additive manufacturing

3D Printing has changed the dynamics of the industry and is used extensively in the automobile, defense and medical sectors. Additive manufacturing offers light-weight, cost-effective and quick solutions for concept validation.

Electric vehicles

Electric vehicles (EVs) are on the rise and every nation is experimenting with manufacturing innovations in order to get them commercially on the roads. Many would like to opine that with the advent of electric vehicles there may not be many opportunities for the machine tool sector, but I may argue that statement. Keshav says, "Although internal combustion cars may be phased out over time and replaced by electric vehicles, hybrid vehicles will most likely ease the transformation for several years. I believe our industry will embrace the changes in the automotive sector and adjust accordingly by providing new machine tooling solutions. I am confident we will meet the changing demands of the automotive sector in the future as our industry has a strong history of innovation."

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IMTEX 2019 & Tooltech 2019 Highlights:

- Around 80,000 sq. m. of exhibition space
- 6 exhibition halls
- 7 country-group participation
- Over 20 overseas countries participation
- Special pavilion on "Additive manufacturing" and "Industry 4.0"
- Experience zone (depicting IMTEX 50 years journey)
- 'Tooltech' showcasing a range of cutting tools, tooling systems, machine tool accessories, metrology as well as CAD & CAM software, as a concurrent fair
- International seminar on machining technologies focusing on advancements in machining technologies will be held on 23rd January 2019
- i2 Academia pavilion which will connect institutions with industry
- Connect which will join companies with students on a common platform to source talent for machine tool industry
- Jagruti which will connect students from various cities with institutions
- A buyer-seller meet will also be organised which will give a platform for companies to sell machines and explore mutual business opportunities



Rohit Tupkari, Manager- Marketing & Business Development, Grind Master

High-end surface finishing solutions for high-tech machines

IMTEX is one of the major industrial machine tools exhibition in the world and undisputedly the biggest in India. Many customers from India and overseas regularly visit IMTEX in search of latest machine tools technologies. Grind Master Group being the largest machines tools exporter, has always attracted major audience from India and abroad. Interactions with large number of customers also benefit our team to understand customer needs and expectation which in turn helps in improving product performance. As many strategic industries such as

aerospace and defence are increasing their footprint in India, we expect many high end technologies to be part of the show. IMTEX has always been the major platform for launching high-tech machines. Many industries such as automotive, aerospace, precision manufacturing sectors will be closely following this show looking out for new and advanced technologies. Robotics and additive manufacturing are another key technology which would be most sought after and discussed during the show.

Grind Master Group is known for its high end surface finishing solutions which includes NANOFINISH range consisting of superfinishing and microfinishing machines, specialised machines for metal finishing and deburring applications and ROBOFINISH range of machines. In IMTEX 2019, we have on display our next generation Microfinishing machine which is loaded with advanced Industry 4.0 features. We will also showcase the advanced version of our ROBOFINISH series robotic fettling machine for Ferrous and Non-Ferrous Foundry Sector. Last couple of years have been very exciting in Grind Master Group's history. Grind Master had acquired SPMS SMMA based in France located near Paris. This year, we have established a new technology centre in USA to develop critical ROBOFINISH technologies.

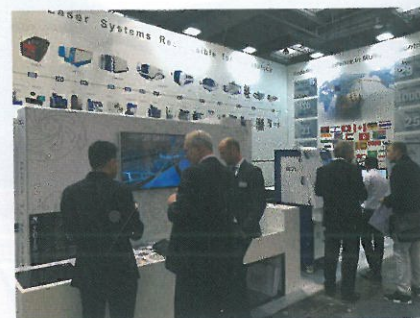


Maulik Patel, Executive Director, SLTL Group

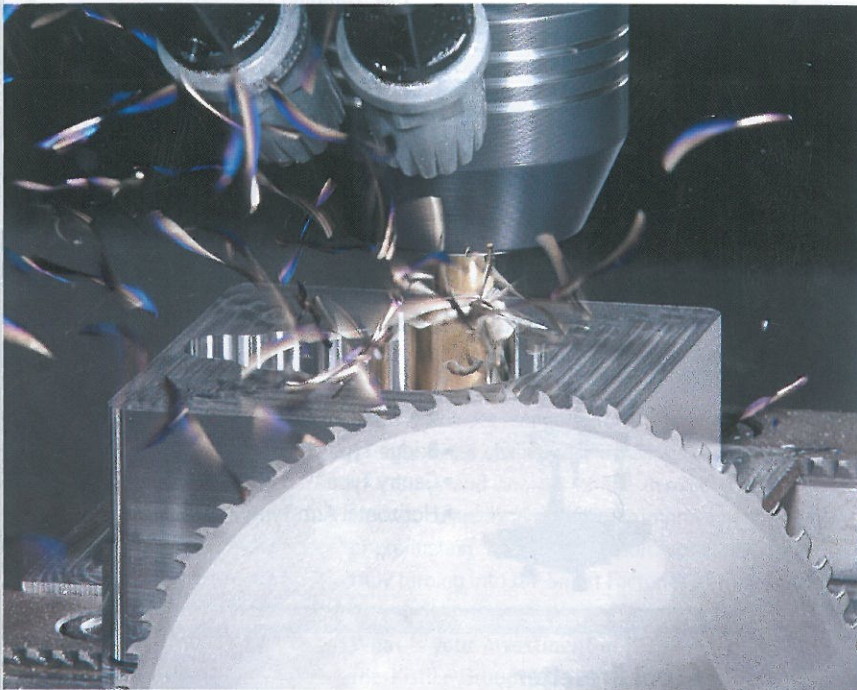
Best in class laser marking and welding systems for smart process

While IMTEX is completing its 50 years this year, it is always delightful to participate and showcase products. This year we can expect a huge number of participants from tooltech industry looking for business opportunities and partnerships to expand product outreach. We believe this year, tooltech industry would be in search for more advanced technologies that can enhance the overall productivity. India is also a thriving market for foreign industries to tap in and also manufacturing industries are a destination for Foreign Direct Investment (FDI).

We are putting forward our OPTIFLY solutions along with best in class laser marking and welding systems. This year we are launching an enhanced version of OPTIFLY which is aimed at making the production process intuitively smart. With this new solution, tool manufacturing industry would benefit in improvising production time and quality of the products. The solution is designed by SLTL Group's in-house R&D team to smartly intervene from identifying the article to operate on and to quality check through the vision system. Henceforth, more quality product and maximum business gains. The solution is the best fit with the company's laser systems.



Sustaining the cutting needs of high end machines



The global push for IoT/ Industry 4.0 concept in manufacturing industries make its mandatory for machinery industry to develop and manufacture indigenous high-end machines that meets high performance and quality standards. This implies the Indian machine tool industry should review their present control technology, present mechanical design concepts implemented with a target for high-performance output.

With the initiation of 'Make in India' and easing of FDI inflow in key sectors such as defence and aerospace, the country has become a fastest growing manufacturing hub. The demand of high-end machine tools is also growing proportionately.

Military and defence sector fits right on the customised tooling manufacturing. Defence industry intakes components and machines in bulk which can be seen as positive indicator for both tooling and forming industry.

Industry demand is not getting fulfilled due to lake of penetration of robotic solution in metal cutting industry as compared to welding and other application. High-end machine, as the name signifies, are either large sized machine tools or high-precision in nature. The local demand of such high-end machine tools, in numbers, is always much smaller (10 per cent or less) than the total demand. To be viable, therefore, manufacturers of such high-end machine tools have to get adequate numbers from the international market through exports.

Metal cutting industry meeting the demands of high-end machine

India is set to become a key player in terms of global machine tools industry and is likely to see substantial high-end machine tool manufacturing. Here, is an industry analysis by experts on how manufacturers are developing technologies in high-end machines, giving fruitful results in coming years and producing cost-effective machines.

Since the 90's, when the Indian manufacturing industry took off, Indian machine tool manufacturers naturally had to first concentrate on the large volume of domestic demand because high-end manufacturing requires very high investments too. Besides, export of any machine tool requires deep pockets to support and sustain the export sales & services.

Ajay Gurjar, Dy. COO & Head, Business Operations says, "Currently, all cutting process which are enabled with robotic technology are best examples of high end cutting machine. Our robots were used for direct cutting application through CAD model which reduces the effort of people to program."

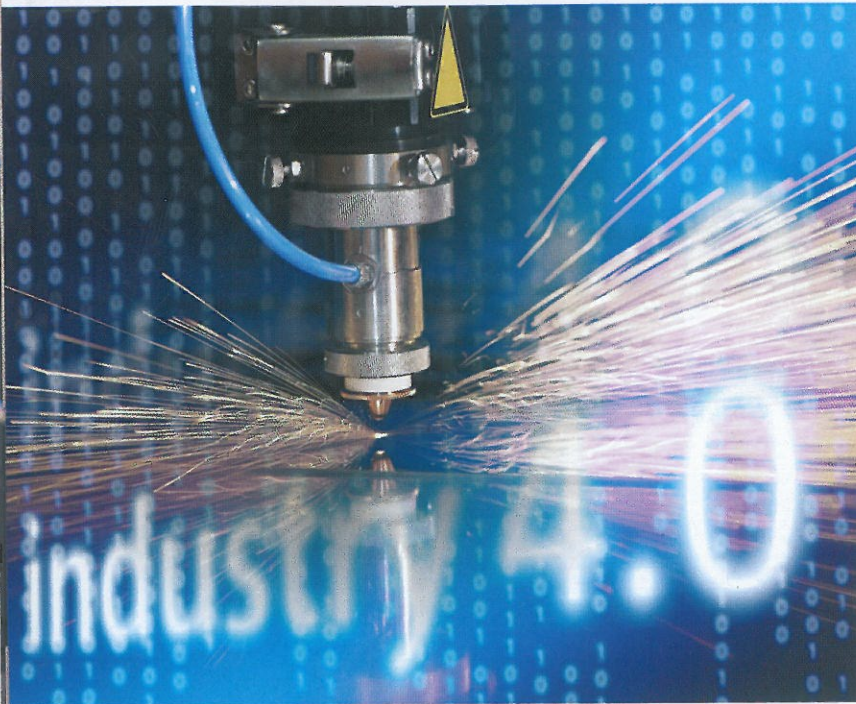
Strategies to potentially meet the demands of high-end machines

High-end machines have the capability to manufacture high complex profiles combining various manufacturing processes into a machine. Such machines are good at multi-tasking, are predominantly larger in size and designed for bringing out high precision products.

V. Anbu, Director General, IMTMA says, "Indian machine tool industry needs to tap both Indian and overseas market by offering high-end machines at reasonable costs. For this, the industry needs to produce machines that are cost-effective." Machines which can give a 30 - 40 per cent savings as against the high-end machines produced by other countries will definitely be an advantage. Indian technology is developing rapidly with the establishment of the Centre of Excellence at IIT-Madras. Manufacturers are developing technologies in high-end

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Seamlessly cutting through



India's metal cutting industry cater to the vast demand of the SMEs and the larger OEMs. Constant growth in implementation and productivity is an absolute necessity. Here, is an industry analysis on how automation and intelligence are then answers to all.

Industry 4.0 is a blessing for manufacturing industry to ramp up their shopfloor efficiencies and productivity to deliver high quality products. The connectivity which is established between machines and operators having knowledge of machine language have led to seamless operations for delivering the end product.

Industry 4.0 influencing an intelligent manufacturing industry

The advancements in software, hardware and control technologies are resulting in machines gaining intelligence. V. Anbu, Director General, IMTMA says, "Machines take care of predictive maintenance, prescriptive maintenance, storing of information for future usages, etc. This has led to transparency in the production process as real time data is available at the fingertips for the top management, middle management and the machine operators working on shopfloors without any blockages."

With Industry 4.0 technologies, a lot of thinking features have been inbuilt into the machine minimising human interventions. Indian machine tool industry is moving towards embracing these technologies. IMTEX 2019 is having a special pavilion on Industry 4.0 where a lot of these technologies will be on display.

The manufacturing sector entered an era driven by cyber physical systems, the Internet of things (IoT) and cloud computing. In Industry 4.0, automation has advanced one step further to not only replace human workers on the assembly lines, but to also provide connectivity to a large amount of data, problem-solving capability and other highly optimised intelligent support.

Ajay Gurjar, Dy. COO & Head, Business Operations, Yaskawa India Pvt Ltd says, "Industrial robotic technology is a part of the driving force behind the evolution of automation and promotes the computerisation of manufacturing. With the integration of big data and remote monitoring, manufacturing process can be efficiently evaluated and improved for better work quality and cost savings."

IoT-enabled manufacturing environments, human-to-human, human-to-machine, and machine-to-machine connections are realised for intelligent perception. Therefore, on-demand use and efficient sharing of resources can be enabled by the application of IoT technologies in manufacturing. The IoT is considered to be a modern manufacturing concept under Industry 4.0 and has adopted recent advances, such as cutting-edge information technology (IT) infrastructure for data acquisition and sharing, which greatly influence the performance of a manufacturing system. Yaskawa Motoman Cockpit Industry 4.0 supports to set up the optimum utilisation of product.

Gurjar adds, "Cutting tools play a vital role for high precision metal-removal robots. Sharpness in the cutting edge is required for low cutting resistance. At the same time, too much sharpness can cause the cutting edge to chip easily."

Paired with the right tooling, advanced robotic systems can offer manufacturers the ability to easily manage and optimise machining processes, reducing the need for expensive, large and specialised multi-

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A smart cutting robot is a true money-maker for your entire production flow.

▶ *Ajay Gurjar, Dy. COO & Head, Business Operations*



The advancements in software, hardware and control technologies are resulting in machines gaining intelligence.

▶ *V. Anbu, Director General, IMTMA*

axis CNC machines. Intelligent mass production is not far from the future. "Once technology further matures, robotic systems designed for metal-cutting applications will be able to better support physical workers in their increasingly complex work with flexible solutions, revolutionising the way of manufacturing where with the help of old database through industry 4.0 tool life & cutting speed estimation can be done," says Gurjar.

Automate or enable industrial robots for metal cutting operations?

In metal cutting, task procedure of cutting is the key factor for empowering the robot. In the same manner, plasma, laser and waterjet are the best cutting procedures to empower mechanical robots; a good arrangement with better ROI. In pursuit to expand the structure of modern robots and programming, cutting devices utilised for metal-removal robots keeps on developing. Robots offer incredible freedom for cutting complex shapes. This will save valuable time in any 'later stage' assembly phase. A smart cutting robot is a true money-maker for your entire production flow.

Gurjar says, "Robot make exceptionally complex cuts with exactness, sparing any manual modification. The robot will make immaculate weld arrangements, making the get together and welding work significantly simpler. Better cutting means better fitting parts, making the robot cutting cell a true money maker."

Emerging automation technologies you expect in 2019 Gurjar says, "Our true value is in three-dimensional digital data solutions, created by synthesising our knowledge of mechatronics. We maximise "i cube" to resolve problems affecting your manufacturing facilities and corporate goals, with solutions optimised for your specific requirements."

Collaborative robots can work safely alongside humans and are often far cheaper than their industrial counterparts. As collaborative robots become more capable in tough industrial settings, they will see greater adoption by manufacturers with strict ROI requirements. He adds, "YASKAWA aims to create value with our customers as we envision a more prosperous future in which people and mechatronics coexist."

In 2019 robotics and automation will continue to transform manufacturing in numerous ways, but there are few major trends in robotic automation that will play a key role in the near future

With the adoption of Industry 4.0, robots and automation will increasingly deploy smart sensors at the edge of production to collect data previously inaccessible to manufacturers. This trend is currently underway and will lead to new levels of productivity and efficiency. Also, as far as industrial cybersecurity is concerned, as robots become more connected to internal systems for data collection, the cybersecurity risk increases. Manufacturers will be forced to address vulnerabilities in their processes and invest heavily in cybersecurity to ensure safe, reliable production.

Robots will become a key source of information on the factory floor. The collection of data (BIG Data analysis), however, is just one piece of the puzzle. Manufacturers will have to implement systems to organise and analyse all of this information in order to act on it.

As robotic automation gains widespread adoption, the need for open automation architectures grows. Large industry players will work with industry organisations to produce standards and open documentation that make robotic integration easier while improving product compatibility.

"Virtual solutions will become an integral part of industrial robotics. One current growing application is the virtual representation of robotic systems for proof of concept and offline programming," concludes Gurjar.

