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THE MACHINIST

ULTIMATE GUIDE TO PROFITABLE MANUFACTURING

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Yes, we have done it! We have created the first Red Carpet for the Indian manufacturing industry. And we have done it in style. And in doing so, we have indeed created history. Many amongst you may recall that we have been saying so ever since we announced the 2016 edition of 'The Machinist Super Shopfloor Awards'. Well, we have delivered on that promise!

What does it mean? It means the industry acknowledges this platform as the ultimate forum for recognising manufacturing excellence in India. It means our partners have reposed their faith in us. It means that we have been entrusted with a greater responsibility, and we accept it both with pride and humility. Notwithstanding naysayers, competitors and challenging market conditions, we have been able to create a strong and sustainable brand to reckon with. It is here to stay!

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And what a night it was in Pune on May 26! We at The Machinist have always believed that the manufacturing professionals are stars and celebrities in their own right. And we treated them so at our glorious Awards Function. That they came from every corner of the country transformed this event into an absolutely National Event! That's why the show is being presented on National Television. So if you have missed out on attending the awards ceremony, do catch up with the action on 4.30 pm, Saturday, June 18 on ET Now. In case you miss that too, we will bring a repeat telecast on the next day at 5.30 pm. So stay tuned, the journey has just started!

Editor & Chief Community Officer

THE MACHINIST
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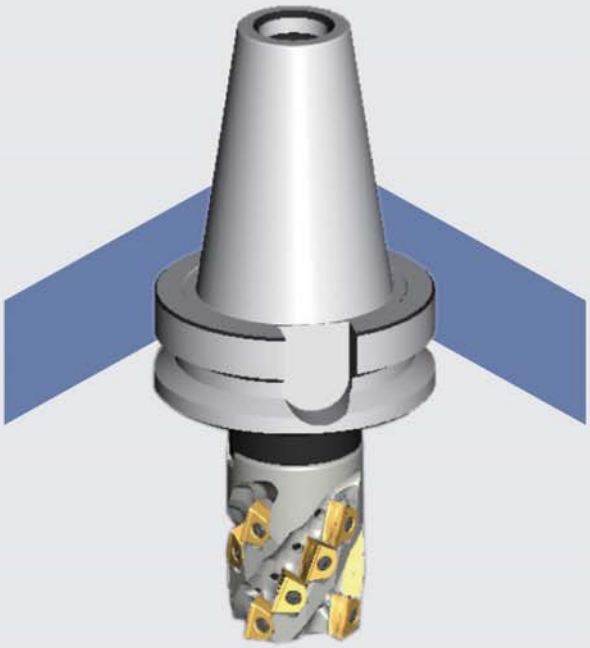

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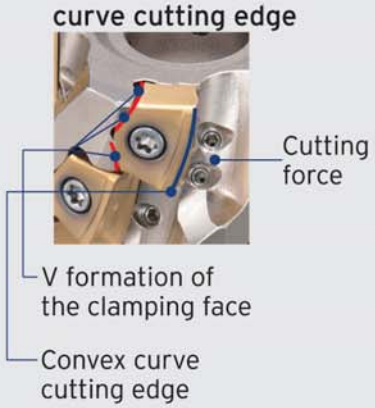

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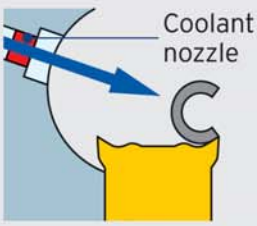

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Will continue to open up our defence sector: PM Modi to the US India Business Council

PRIME MINISTER MODI has said that his Government will continue to open up India's defence sector. During his Keynote Speech at 40th AGM of US India Business Council (USIBC), the PM acknowledged that licensing policies can sometimes slow down the process of investing in India's defence sector.

"We are exploring a simpler and more efficient project licensing approach for defence. In the field of nuclear energy, we are purchasing six nuclear reactors from Westinghouse which will mark a new era in our nuclear and scientific co-operation. I was delighted when GE became one of the first companies to make a major investment in the newly liberalized railway sector. It is setting up a locomotive manufacturing plant in the relatively poor state of Bihar. I expect many more such investments," says the PM

The PM also said that his Government has taken major steps to increase the 'Ease of Doing Business' and have already begun climbing steeply in the global rankings.

"We are encouraging foreign and domestic investors to set up high quality and efficient manufacturing facilities. We have greatly enhanced investment in roads, railways, ports and waterways to improve logistics. We have made major process improvements in our ports to reduce the time taken for cargo to enter and exit," he said.

The PM also appreciated the US' start up eco-system and added that India is making a beginning in replicating it. "Our Start-Up India programme has stimulated a new breed of innovators. In 2016, Bengaluru has become the fifth most preferred location for innovation centres. It was not even in the top 10 in 2015," he said.

Freudenberg continues profitable growth in India, increases sales by 3.7 percent

FREUDENBERG, a global technology group, continued its positive business development in India despite the worldwide challenging conditions, with sales increasing by 3.7 percent from Rs. 1,497 crore in 2014 to Rs. 1,553 crore in 2015. "We have completed another year of profitable and sustainable growth. And our companies in India will continue to grow, much faster than in most other regions of the world. Our share in total global sales should increase disproportionally", said Dr. Jörg Matthias Großmann, Regional Representative India, at the press conference in Bengaluru. The company's global sales grew by 7.6 percent to 7.57 billion euros or Rs. 53,730 crore based on pro-rata consolidation of joint ventures.

At December 31, 2015, Freudenberg employed some 2,800 full-time associates at around 50 locations in India – with four R&D centers and 14 production sites with state-of-the-art shop-floors. Freudenberg's investment in India in 2015 totaled €9.4 million (approx. Rs. 68 crore). Those investments were made to upgrade and expand existing manufacturing as well as research and development facilities at almost all business groups.

The biggest investment was made in a state-of-the-art production site, labs and warehouse in the existing speciality chemicals factory in Mysore. The facility was inaugurated in August and is owned by Klüber Lubrication India. It manufactures various specialty lubricating oils, greases, pastes, aerosols and release agents under the name of the Chem-Trend, OKS and Klüber Lubrication brands.

"These two major investments with a total amount of more than Rs. 290 crore in the past few years underscore our long-term commitment to India. Together with our partners, we will expand our presence and continue to invest in India", said Großmann.

On the basis of its current assessment, despite all the challenges faced, the Freudenberg Group in India expects growth in sales of between 7 and 10 percent above the previous year's figure.

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United States recognises India as a Major Defense Partner

THE PRIME MINISTER of India Narendra Modi and the President of the USA Barack Obama met in the White House recently. Marking their third major bilateral summit, the leaders reviewed the deepening strategic partnership between the two countries. Defense is one of the major areas where the two democracies agree to be partners. Noting that the US–India defense relationship can be an anchor of stability, and given the increasingly strengthened cooperation in defense, the United States hereby recognizes India as a Major Defense Partner. That means: The US will continue to work toward facilitating technology sharing with India to a level commensurate with that of its closest allies and partners. The leaders reached an understanding under which India would receive license-free access to a wide range of dual-use technologies in conjunction with steps that India has committed to take to advance its export control objectives.

In support of India's Make In India initiative, and to support the development of robust defense industries and their integration into the global supply chain, the United States will continue to facilitate the export of goods and technologies, consistent with U.S. law, for projects, programs and joint ventures in support of official U.S.-India defense cooperation. The leaders also committed to enhance cooperation in support of the Government of India's Make in India Initiative and expand the co-production and co-development of technologies under the Defense Technology and Trade Initiative (DTTI). They welcomed the establishment of new DTTI working groups to include agreed items covering Naval Systems, Air Systems, and other Weapons Systems.

Tata Motors signs MoU with Automotive Skill Development Council

TATA Motors has signed a MoU with the Automotive Skill Development Council (ASDC), a Govt. of India recognised Skill Council for a collaborative skill development program in the automotive sector. This partnership will help Tata Motors' skill development centres across its six plants in India and will comply as per competency levels of the NSQF (National Skills Qualification Framework).

The MoU was signed in the presence of Gajendra Chandel, Chief Human Resource Officer, Tata Motors Ltd, and Sunil Chaturvedi, CEO, ASDC with an objective to prepare our country's youth by imparting & enhancing industry-ready occupational skills followed by assessment and certification on the basis of skill levels achieved and certified as per NSQF.

Tamil Nadu tops in green energy with 8300 MW installed capacity: Study

ACCORDING a joint ASSOCHAM-Ernst & Young paper, Tamil Nadu has done a tremendous development in adding capacity of Renewable Energy (RE), which is projected to reach even 72 percent of its peak demand by 2022.

At present, the state has an installed capacity of over 8300 MW of non-conventional energy, which is about 40 percent of the total capacity installed including the conventional sources of thermal and hydro. However, the problem remains about a huge gap between the installed RE capacity and its actual generation. Against the 40 per cent ratio of the installed capacity, the RE sources supply just about 14 per cent of the state's peak demand, thanks to inadequate infrastructure to evacuate the power to the grid and the natural limitations.

WB holds India's growth forecast steady at 7.6 percent; global growth forecast down

The World Bank is downgrading its 2016 global growth forecast to 2.4 percent from the 2.9 percent pace projected in January. The move is due to sluggish growth in advanced economies, stubbornly low commodity prices, weak global trade, and diminishing capital flows.

According to the latest update of its Global Economic Prospects report, commodity-exporting emerging market and developing economies have struggled to adapt to lower prices for oil and other key commodities, and this accounts for half of the downward revision. Growth in these economies is projected to advance at a meager 0.4 percent pace this year, a downward revision of 1.2 percentage points from the January outlook.

Among major emerging market economies, China is forecast to grow at 6.7 percent in 2016 after 6.9 percent last year. India's robust economic expansion is expected to hold steady at 7.6 percent, while Brazil and Russia are projected to remain in deeper recessions than forecast in January. South Africa is forecast to grow at a 0.6 percent rate in 2016, 0.8 of a percentage point more slowly than the January forecast.

"Economic growth remains the most important driver of poverty reduction, and that's why we're very concerned that growth is slowing sharply in commodity-exporting developing countries due to depressed commodity prices," said World Bank Group President Jim Yong Kim.

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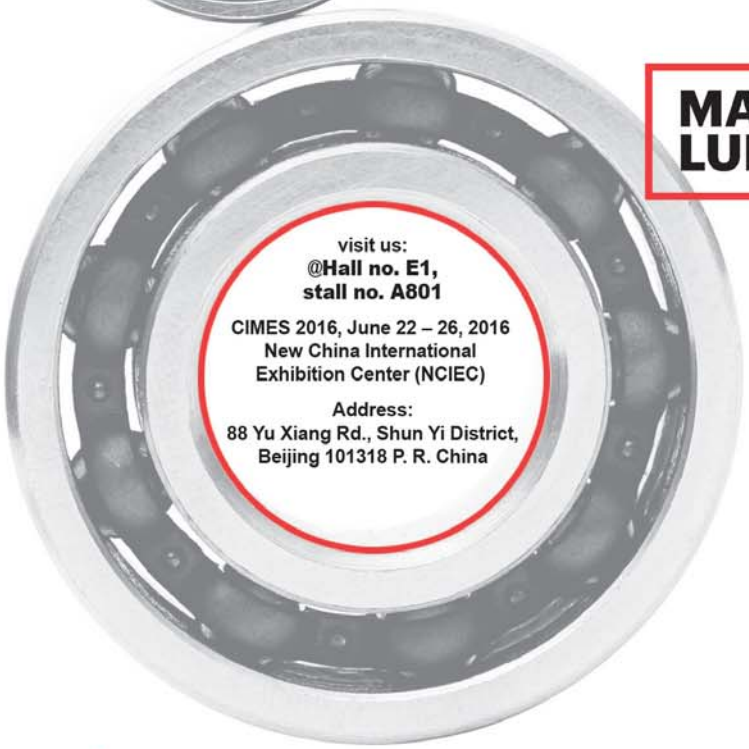

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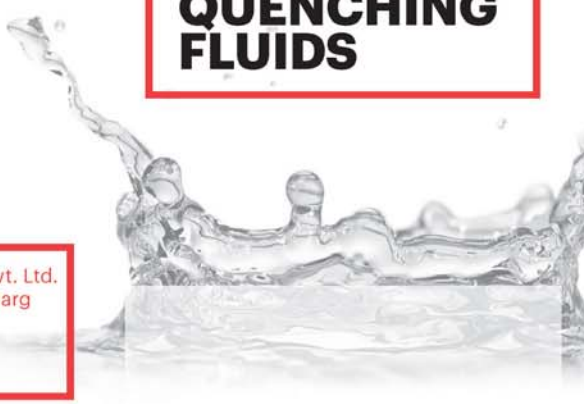

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A list of key events happening between July 2016 to June 2017, both nationally and internationally.

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http://www.amtex-expo.com/

IMTS 2016
September 12-17, 2016,
Chicago (US)
www.imts.com

InnoTrans 2016
September 20-23, 2016,
Berlin, (Germany)
www.innotrans.de/en/

MINExpo International
September 26-28, 2016,
Las Vegas (US)
http://www.minexpo.com/

Pune Machine Tool Expo 2016
September 29-October 2, 2016
Auto Cluster Exhibition Center, Pune
www.mtx.co.in

India International Textile Machinery Exhibition 2016
December 3-8, 2016,
Mumbai
http://itme2016.india-itme.com/

BAUMA CONEXPO India 2016
December 12-15, 2016,
New Delhi
http://www.bcindia.com/

IMTEX 2017
January 26-February 1, 2017,
Bangalore
www.imtex.in/

CONEXPO-CON/ AGG
March 7-11, 2017
Las Vegas, NV (US)
http://www.conexpoconagg.com/

ACMA Automechanika New Delhi 2017
March 21-24, 2017
New Delhi
http://acma-automechanika-newdelhi.in.messefrankfurt.com/newdelhi/en/exhibitors/welcome.html

ProMat 2017
April 3-6, 2017
Chicago, (US)
http://www.promatshow.com/

INTEC 2017
June 1-5, 2017
Codissia Trade Fair Complex, Coimbatore
www.intec.codissia.com

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Stuart Rowley named vice president, Strategy

John Lawler named vice president and controller, succeeding Rowley

China operations to report directly to Dave Schoch, group vice president and president of Asia Pacific

FORD ANNOUNCES LEADERSHIP CHANGES IN CHINA & INDIA

Ford Motor Company has announced changes in its China, India, Global Strategy and Finance leadership team, as it elevates the reporting of its China operations and expands its business model to be both an auto and mobility company.

Stuart Rowley, previously vice president and controller, has been named to the new position of vice president of Strategy. John Lawler, vice president and chairman and chief executive officer, Ford China, is appointed vice president and controller, Ford Motor Company, succeeding Rowley.

"Stuart and John have played key roles in delivering Ford's long-term global growth strategy and strong financial performance," said Mark Fields, President and Chief Executive Officer, Ford. "These moves are part of our commitment to continue developing our leadership team and strengthening their expertise throughout the business."

At the same time, leadership of Ford's operations in China—including the Ford China import business as well as Ford's passenger car joint venture Changan Ford and commercial vehicle joint venture Jiangling Motors Corporation—will be directed by Dave Schoch, group vice president and president of Asia Pacific. Schoch will add the title of chairman and chief executive officer, Ford China.

"As our growth plans in China have developed, this market is delivering an increasingly important portion of our revenue and profits globally," said Fields. "Elevating the reporting of this business right now reflects China's importance in our profitable growth plan going forward."

Marin Burela, president of Changan Ford, has announced his intention to retire October 1 and is named Asia Pacific special advisor, reporting to Schoch in the interim.

"During his 32-year career at Ford, Marin has made significant contributions to our operations globally, including leading the development of our global small car portfolio and building Changan Ford into a very successful business in the world's largest car market," said Schoch. "We are grateful for his many years of service and wish him all the best going forward."

Nigel Harris, President and MD of Ford India is elected a company officer and named president of Changan Ford, succeeding Burela. Harris' successor will be named at a later date. Burela's and Harris' appointments are effective July 1. All other moves are effective immediately.

"Burela's and Harris' appointments are effective July 1. All other moves are effective immediately."

Marin Burela to retire in October, named Asia Pacific special advisor

Nigel Harris named president of Changan Ford, succeeding Burela, and elected a corporate officer

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GM NAMES NEW GLOBAL QUALITY CHIEF

General Motors Co. (GM) has announced that Tony Francavilla has been appointed Vice President, Global Quality, effective immediately. He will report to Mary Barra, Chairman and CEO.

Francavilla, 58, is responsible for leading General Motors' global quality efforts, aimed at providing customers with the highest-quality vehicles as a foundation for its customers' experience. He brings to the role in-depth knowledge and global experience in manufacturing, engineering and supplier quality.

"We intend to earn customers for life by delivering exceptional quality," Mary Barra said. "Tony's diverse technical expertise and global leadership experience position him well to further accelerate GM's progress in every aspect of vehicle quality."

Prior to his new role, Francavilla served in a variety of senior roles within the Quality organization, including executive director of global supplier quality. Before that, he was responsible for leading the company's manufacturing operations at GM's Lansing Grand River, Lansing Delta Township and Flint Truck plants. Francavilla began his career with GM in 1979 as a co-op student at GM Canada in St. Catharines. He has served in various leadership positions, including manufacturing management for a major pickup truck launch, plant manager positions in Ellesmere Port, UK and Gliwice, Poland and as managing director of GM Poland. He earned a Bachelor of Engineering degree in Metallurgy from McGill University in Montreal, Canada and an MBA from Niagara University in New York.

HUNTSMAN TEXTILE EFFECTS APPOINTS DHEERAJ TALREJA AS COMMERCIAL DIRECTOR

The Textile Effects division of Huntsman Corporation ahs announced the appointment of Dheeraj Talreja, Commercial Director for South Asia, Middle East, Africa region.

In his new role, Dheeraj will develop and execute the commercial strategy for the region. He will also oversee all commercial activities, technical support operations and identify new market opportunities.

Speaking on the appointment, Huntsman Textile Effects Global Vice President for Commercial and Technical Resources, Chuck Hirsch said: "I am very pleased that Dheeraj has accepted the lead commercial role for the South Asia, Middle East, Africa region. Dheeraj is a committed and passionate leader. He has a proven ability to create strategic clarity, drive growth, ensure disciplined execution, and deliver results. I am confident he will contribute to expanding the regional business and bringing it to new levels of success."

Most recently Commercial Director, North East South East Asia for Huntsman's Textile Effects division, a position to which he was appointed in 2011, Dheeraj joined Huntsman in 2002 as Account Manager and progressed through a number of Commercial and Marketing leadership positions. Dheeraj brings over 15 years of valuable textile industry experience, eight of which were spent in India and the region.

VERIZON APPOINTS NEW MD FOR ITS INDIA IT & TECHNOLOGY OPERATIONS

Kalyani Sekar has been appointed as the managing director of Verizon Data Services India, the IT & Technology arm of Verizon in India. Kalyani, who succeeds Santosh Bijur, will lead a 6,700-member workforce in Chennai and Hyderabad responsible for Verizon Communications' India IT & Technology operations creating value for the corporation. Prior to her new appointment, Kalyani was a Senior Delivery Head, based out of Chennai, responsible for a range of Business and Operations Support Systems for Verizon Wireless and FiOS in the US.

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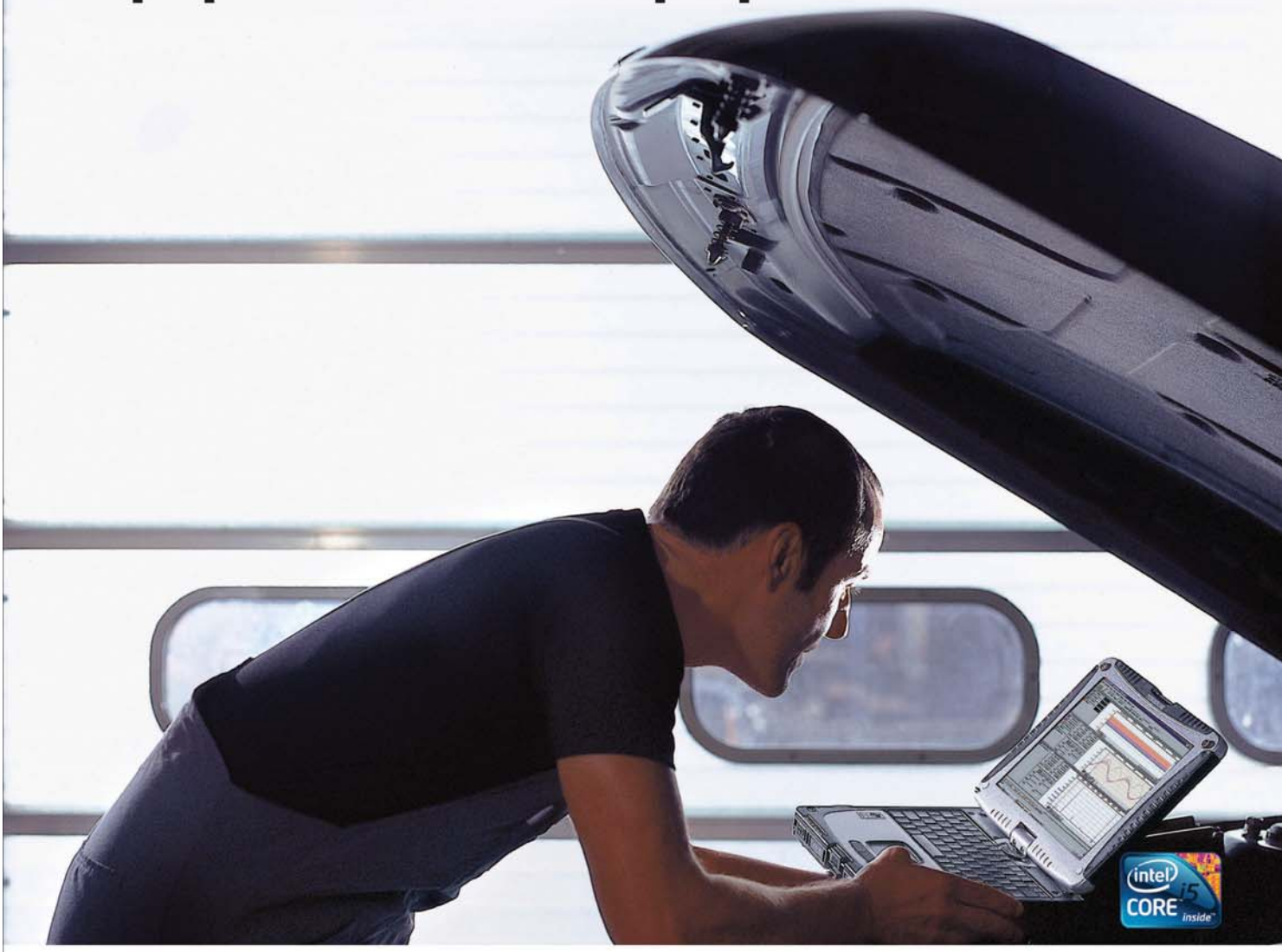

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At the forefront in **India's space programs**

S. M. Vaidya, Executive Vice President and Business Head, Godrej & Boyce talks to The Machinist about the company's involvement and plans in the space programs.

By Swati Deshpande

Q. India has been emphasising on its space programs since last few years. Please tell us the role that Godrej & Boyce is playing in making these missions successful.

Since 1985, Godrej Aerospace has increasingly been entrusted with work from ISRO, especially for complex equipment such as liquid propulsion engines for PSLV and GSLV rockets, thrusters for satellites and antenna systems. Chandrayaan was Godrej's first successful space project. We have been committed to the cause of indigenous manufacturing for India's space programs for about three decades and will continue to do so in the future. Partnering the Indian space program is a way to push the nation's technological advancement as far as possible. Our very first project was to make control module component for space. We also made the liquid propulsion engine for satellite launch vehicles and cryogenic engine for satellite launch vehicles.

Q. What specific technology/product/solution did the company provide to Mangalyaan mission?

Mangalyaan mission was one of the most prestigious projects Godrej aerospace worked for. The team built several components that were critical for the mission such as the liquid fuel engine used in the Polar Satellite Launch Vehicle (PSLV), precision components for the orbiter thruster as well as the ground system and onboard antennae. The team working on Mangalyaan designed and fabricated components that had to take into account the unique parameters for space flight.

In the design and planning phase, the scientists relied heavily on data documented during previous missions as a framework. The documentation was backed by software required for validation, simulation and proving the constants. Real challenge scientists faced before the launch was calculating the satellite's trajectory. The relative position of Earth and Mars keeps changing. Not only did the satellite's trajectory have to take this into account, it had to be done a year before the launch and yet had to be precise to the exact millisecond. This was a crucial challenge -- a gap of even 100km could have led to the team losing contact with Mangalyaan and the mission might have had to be aborted.

Scientists have to deal with a time lag of 12 minutes while communicating with Mangalyaan. That is how long it takes for a signal to cross that distance and for the scientist to receive feedback on whether a command has been activated. The satellite has so far managed to send back crucial data including pictures of Mars' surface and of its moon, Phobos. Despite the odds, Mangalyaan's successful functioning has been a testament to the hard work and determination of ISRO scientists and engineers and the Godrej Aerospace team.

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Q What specific solution did you provide to Chandrayaan mission?

Godrej has been contributing to India's space program led by the ISRO. Chandrayaan–1 was one of the most successful projects we worked for ISRO. We were actively involved in all the aspects of the systems used in it. We developed the launch vehicle, lunar orbiter, remote sensing antenna and ground system antenna for this mission. ISRO identified PSLV as the launch vehicle to put the satellite into polar/solar orbit for remote sensing purpose. The second stage of the PSLV called Vikas Engine is manufactured by Precision Components & Systems (PCS) division. So far we have delivered 50 such engines. Also, the 50N thruster of the fourth stage reaction control system of the launch vehicle was also supplied by PCS.

The challenge for ISRO was to design a light weight spacecraft, which can carry maximum payload and orbit the moon for a long duration of two years. Thrusters of 10N and 22N capacities have been supplied by PCS which were used for maneuvering this spacecraft as per the planned trajectory and also during its orbiting across the moon, throughout its life span.

Due to the far distance it travelled, Chandrayaan–1 required to have a very powerful antenna for receiving and sensing signals and due to the limitation of weight, was required to be made out of composites. PCS supplied the mould of very high accuracy and surface finish for casting this antenna.

Q The company has been working closely with various Indian organisations such as BrahMos, ISRO, etc. How has been the technological prowess of the country transformed in over the period of time?

The Indian aerospace industry is one of the fastest-growing aerospace markets. With the low cost of labour and a pool of engineers, India has emerged as a player in the global market. The growth in India's manufacturing sector and the rising stock of its R&D capabilities are bound to have repercussions not only in India but also in the international aerospace markets. Hence, it has attracted major global aerospace companies to India. All segments in the aerospace industry, including civil and military aviation and space, are showing a significant level of growth. What is needed is a better understanding of where the Indian aerospace is heading to in a highly dynamic political, economic, social and technological environment.

There are several factors driving growth in manufacturing in India's aerospace industry. These include both macro and micro factors—strong economic growth that has resulted in rapidly growing domestic aircraft demand, the liberalisation of civil aviation policies, offset requirements, a strong domestic manufacturing base, cost advantages, a well-educated talent pool, the ability to leverage IT competitiveness and a liberal Special Economic Zones law that provides attractive fiscal benefits for developers and manufacturers. The challenges include access to technology, funding, poor availability and high cost of raw material and certification processes.

The Indian aerospace industry is one of the fastest-growing aerospace markets in the world. With the low cost of labour and a pool of engineers, India has emerged as a player in the global market.

Q Aerospace projects in the defence field, commercial field and space programs have different needs and challenges. How do you work on the same?

The different needs and challenges ask for different types of capabilities to work. We have been working with our expertise in defense and space programs based on the requirements from our customers. The challenges faced in our work have always enhanced our skill sets.

We have acquired expertise in metal joining, surface treatment, NDT processes, He Leak testing, flow calibration testing, Rubber lining etc. Within metal joining, we have exotic material welding (Aluminium alloys, Titanium, Steel grades), friction welding, resistance seam welding, vacuum brazing. Initial development takes time however being AS9100 organisation everything gets documented well and the database keeps on improving. We have NADCAP approval for special processes in welding, NDT, Heat treatment and chemical processing under merit program. We have industry partners who help us in special operations where volumes do not support investment in infrastructure.

Q What other projects is the company undertaking in the area of aerospace in Indian and globally?

Currently we are in built to print—metallic detailed parts and assemblies, which require HT/ST/NDT/Functional Tests. We are working with Tier 1 suppliers of aerospace primes globally. Moreover, we are diversifying to rubber and composites as it is future and most of the metallic structures are already replaced with non-metallic. Rubber & composites infrastructure is already in place. We are adding tube bending capabilities, sheet metal hot forming & hydro forming capabilities. Also, we are exploring in build to specification category as it will give huge domestic market under Make in India.

Q Since aerospace is one of the niche areas, how do you ensure that every employee working in the division has right know-how? Is there emphasis on training?

We have tie-ups with various institutions like IIT, TWI, DRDL, HEMRL labs, etc. Our experts participate in seminars and programs arranged by CII, NCAIR, IIT, etc. Additionally, we participate in training programs organised by certification bodies like Performance Review Institute (PRI) and customers training sessions, which includes quality management systems as well as Self Release Authorisation. Besides, we have internal subject matter experts for planned training sessions who will percolate the latest know-how to the team.

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Electrifying future of the **electrical equipment industry**

HPL Electric & Power is one of the biggest players in electrical equipment. **Gautam Seth,** its Joint MD, talks to The Machinist about the company and its future plans.

> The electric equipment industry has witnessed significant growth, growing at 9.4 percent from fiscal 2014 to fiscal 2015 and is expected to grow at a CAGR of 8–12 percent during 2016-20. Of the total electric equipment industry, T&D equipment accounted for 72 percent of the total market.

Q Please tell us about the company's journey so far

We are an established electric equipment manufacturing company in India, manufacturing a diverse portfolio of electric equipment, including, metering solutions, switchgears, lighting equipment and wires and cables, catering to consumer and institutional customers in the electrical equipment industry. Our manufacturing capabilities are supported by a large sales and distribution network with a pan-India presence. We supply our products through a network of authorised dealers or distributors to institutional, non-institutional and corporate customers. We supply switchgears, lighting equipment and wires and cables, primarily through our pan-India authorized dealer network, which comprised of over 2,000 authorised dealers or distributors as on December 31, 2015, from our warehouses located in 21 states and union territories in India that are managed by our carrying and forwarding agents. In addition, we supply our products to power utilities, which primarily include supply of meters under direct contractual arrangements to electricity boards and power distribution companies, as well as through project contractors. Further, we supply our portfolio of products to developers of residential and commercial building projects, original equipment manufacturers (OEMs) and to industrial customers through a mix of direct sales and supply through our authorized dealer network.

Q Can you please brief us about the growth of the power and electric equipment market in coming years?

The electric equipment industry has witnessed significant growth, growing at 9.4 percent from fiscal 2014 to fiscal 2015 and is expected to grow at a CAGR of 8–12 percent during 2016-20. Of the total electric equipment industry, T&D equipment accounted for 72 percent of the total market. Government of India has implemented several initiatives such as private participation in the transmission segment and development of the National Power Grid to boost growth in the T&D industry. Additionally, the GoI has announced various plans, including recasting 100 cities in India with an estimated expenditure of over Rs. 3,000 billion under its smart cities programme, the 'Housing for all' initiative and by facilitating the domestic production in the Indian electric equipment industry to reach an output of USD 100 billion by balancing exports and imports, pursuant to the Indian Electrical Equipment Industry Mission Plan 2012-22 of the Department of Heavy Industries and Public Enterprises, Government of India (Mission Plan 2012-22). *(Source: Frost & Sullivan Report)*

We believe that these initiatives of the Government will drive the demand for domestic and industrial electric equipment, including for electric equipment that we manufacture. Further, increasing urbanisation in India coupled with rising household income levels have resulted in progressively increasing demand for residential real estate, which has been a significant consumer for variety of low transmission electrical products and lighting solutions. The capacity addition in the real estate sector is expected drive the entire value chain of the electrical 132 industry and will provide a base for significant product and service innovations in the future. Also, the 'Housing for all' initiative is expected to give a thrust to the electrical equipment industry in India, and affordable housing

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HPL Electric & Power Pvt Ltd's wire and cable factory

is expected to promote innovation into low cost and affordable electrical solutions. *(Source: Frost & Sullivan Report)*

Q. Can you please tell us about your manufacturing facilities and their recent upgradation?

Presently, we have six manufacturing facilities located across the states of Haryana and Himachal Pradesh. Our manufacturing process capabilities include design and product development, component design, tool making and commercial production. As on March 2015, our aggregate installed capacity for manufacture of meters was six million, switchgears was 16.51 million, for lighting equipment was 26 million and wires and cables was 194.40 millions. We have consistently undertaken expansion of our manufacturing facilities in the past with a view to capture increasing demand in the future. We believe that our manufacturing facilities enable us to expand our operations with ease to meet future demand at minimized cost of expansion. Additionally, our manufacturing facilities are equipped to manufacture customised products for our institutional customers and undertake modifications in our products for OEMs and other corporate customers.

Q. How important it is to have strong R&D capabilities? Tell us about your company's R&D capabilities.

We believe that our research and development capabilities have enabled us to keep abreast of technological developments in the electric equipment industry. We have a strong focus on consistently upgrading the technology that is used in our products and the processes used in manufacturing thereof, through our continuing research and development efforts. We have established two in-house R&D centres, one each at Kundli (Haryana) and Gurgaon (Haryana). Our research and development efforts include design and development of all types of energy metering solutions, including interactive communication between metering devices and metering infrastructure that includes automatic meter reading (AMR) and advanced metering infrastructure (AMI), prepayment metering solutions, solar net metering solutions, smart meters with two way communication and a complete range DLMS compliant meters, amongst others, and technologies and solutions that allow for active monitoring of energy consumption for electric equipment. For instance, we have developed a street lighting system that helps in saving manpower through automatic settings for sunset and sunrise timings and remote energy metering and dimming of such lights during off-peak hours to save energy.

We also operate two tool rooms at Gurgaon and Kundli within our R&D Centres where we have in-house component designing and tool designing facilities. As on December 31, 2015, we employed over 105 engineers at our R&D Centres, with a dedicated team of engineers to manage our ToolRooms. Our Tool Rooms are used for making rapid prototypes, followed by tools that are used to ensure efficient moulding. The data for our Tool Rooms is generated using CAD software and CNC machines that assist in maintaining accuracy of the tools produced therein. We believe that our Tool Rooms allow us to easily adapt to changes in technology or modified specifications given by Power Utilities and/or institutional customers.

Q. HPL Electric & Power Ltd has recently approached markets regulator SEBI to raise Rs 450 crore through an IPO. Can you please elaborate on this?

HPL Electric & Power Ltd has approached markets regulator Sebi to raise Rs 450 crore through an initial public offering. The proceeds of the issue will be utilised for repayment of loans, to fund working capital requirements and for other general corporate purposes. As per the Draft Red Herring Prospectus (DRHP) filed with Sebi, the company's IPO comprises of equity shares worth Rs 450 crore. The issue is being managed by SBI Capital Markets, ICICI Securities and IDFC Bank. The equity shares will be listed on the BSE and NSE.

Q. What are the expansion plans of the company?

We intend to expand the geographical areas in which we sell and distribute our products. We intend to expand into international markets, including to countries in the Middle East, Africa and the south-east Asian region.

Q. Can you please tell about company's exports?

DRHP states that we seek to expand our global reach, through increased customer acceptance of our products in international markets. We currently export our products from India solely on receipt of confirmed orders. We seek to enter new international markets, primarily in the Middle East, Africa and the south-east Asian region. Towards this objective, we intend to focus on building an authorized dealer network in such markets with focus on both domestic and industrial electric equipment. We also propose to undertake promotional activities for our products, aimed primarily at panel builders, to increase acceptability for our products and for strengthening our brand in these markets.

We are presently in the process of obtaining approvals and pre-qualifications in various markets internationally and anticipate that such approvals will assist us in garnering customer acceptance for our products. We intend to exploit our current manufacturing capacities coupled with our research and development capabilities to manufacture products of quality that we believe will enable us to secure approvals from international agencies and satisfy their pre-qualification requirements.

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The National Capital Goods Policy 2016 is conclusive but not entirely comprehensive. It is a much required initiative given the current situation.

By K Shankar, CEO, Feedback Consulting

The National Capital Goods Policy 2016 has been the talking point for some time now. It is a policy that is not short on intent. It is conclusive but not entirely comprehensive. Some critical elements have been surprisingly left out. However, this policy is a much required initiative given the current situation. It may not address all ill but it will provide some impetus to the sector. This sector is extremely critical for the future of India's economic story over the medium term.

Capital goods sector in India

Indian Capital Goods industry is one of the primary engines of precision manufacturing in India. The capital goods industry is always integrated with the core sector industry on the heavy side and the engineering sector on the downstream side. Currently, Size of the Capital goods sector in India is estimated at US$ 96 billion and accounts for nearly 12 percent of the overall manufacturing sector. At net present value this translates to approximately two percent of GDP. Domestic production of capital goods in India is estimated at about US$ 35 billion. The sector employs nearly 1.5 million people across the value chain. For a large country like India that has a huge import bill, this sector aids in improving trade balance if local manufacturing is improved. This sector has been stressed for a while.

The economics of this business is the fine balance between assets deployed on ground and additional assets that are required continually to meet the business objectives of the Industry. There was a distinct inaction by way of policy in the Indian administration for a long time. Investors put assets on ground with a hope that positive policy will allow assets to sweat and in turn create demand for more. In reality the assets have been idle /unused since the last 5-6 years. They have not been able to justify RoI. As a result, the size and cost of debt has increased within the Indian financial ecosystem. It will require for a huge uptick in industrial activity to create additional demand in this sector.

Challenges faced by the sector

There are three major challenges facing the sector.

1. ***Inconsistent domestic demand:*** There is inadequate capacity expansion in manufacturing, infrastructure and utilities industry in India over the last few years primarily due to policy issues, institutional issues such as inadequate inter-ministerial coordination etc. Projects were stalled for a variety of reasons. Contractual clauses in public procurement policy inhibited domestic production and in turn it has reduced domestic value addition. Permission to import second-hand machinery discouraged the domestic production. The provision of a zero import duty concession for several items imported under the "project imports" category discouraged demand for domestic products.
2. ***Technology & Skill availability:*** While the sector is a pivot to industrial development, India's capital goods production has been historically plagued by a variety of issues due to lack of latest technology. Inadequate technology depth is a critical problem. This is primarily due to policy failure. R&D spend in India is pegged at about 0.9 per cent of

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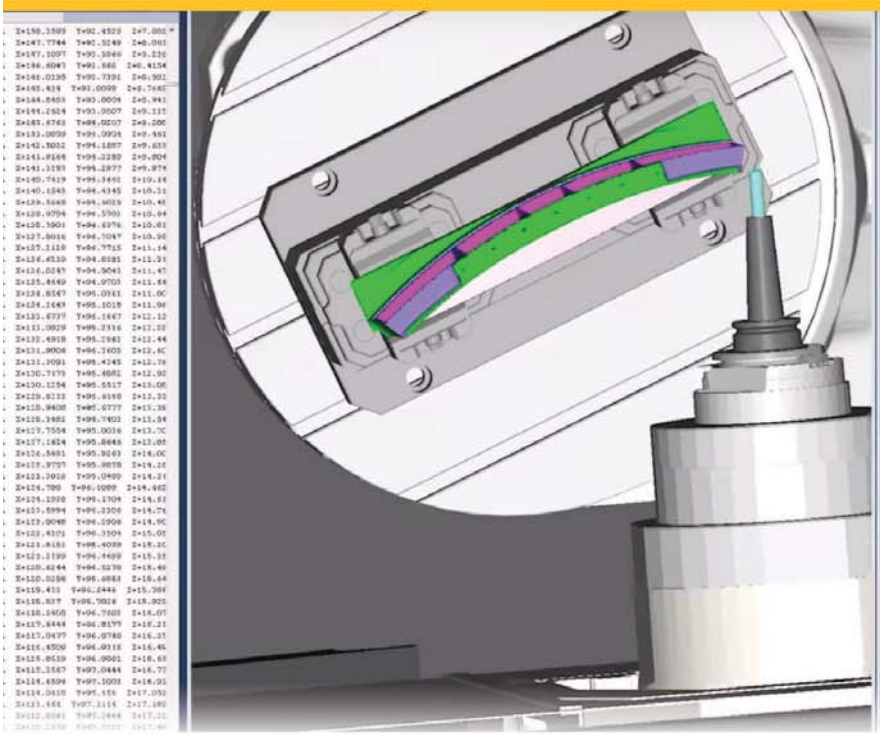

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GDP. This is seriously low when compared to countries as small as Taiwan or South Korea. In India, the Government spend on R&D accounts for 60 percent of total national spend while industry spends 36 percent. In developed nations this is exactly the opposite. Within the Government spend of 60 percent, only six percent is spent on manufacturing.

3. ***Tax and duty structures:*** The capital goods sector is plagued by tax structures that are skewed and inappropriate. Buyers are paying lower import duty on finished capital goods that are imported, while manufacturers of Capital goods in India are paying a very high import duty on raw material and semi-finished components. This has adversely affected the cost structure and competitiveness of the local industry in India and abroad.

Finance is a challenge but not a key concern at this point in time.

"The success or failure of NCGP will depend on the way a new ecosystem will emerge. The numbers projected look very ambitious. However, a lot will be achieved even if 50 percent of projections are met."

National Capital Goods Policy 2016

There are three big takeaways from the NCGP:

1. ***Emphasis on local manufacturing:*** The policy aims to improve the overall contribution of this sector to 20 percent from current levels of 12 percent of total manufacturing activity by 2025. The idea is to increase India's total demand from 60 percent to 80 percent, with exports increasing from current levels of 27 percent to nearly 40 percent. This initiative is expected to make India a dominant exporter capital goods. Further, the policy attempts to facilitate improvement in technology depth across the value chain, train and harness better skills in the sector, improve standardisation, improve financial assistance to the sector and help in capacity building.
2. ***Focus on Technology & Standardisation:*** This policy will address the larger issues of Technology transfer, purchase of IPR's, designs etc. Commercialisation of research will be encouraged through a specific budgetary allocation. The policy proposes to set up a startup center for the sector with participation from the private sector to provide technical, business and financial support. Another major element of the policy is mandatory standardisation according to which minimum standards would be defined. This initiative would go a long way in improving quality of the products. More research institutions are also proposed to be set up. It will improve the overall manufacturing ecosystem in India. Standardisation and improvement in quality will make a lot of MSMEs globally competitive. Acceptance will improve and business will become robust – strong cash flows, forex earnings investible surpluses and profit retention.
3. ***Integration with the umbrella theme:*** Under the larger umbrella initiative of Make in India, Skill India, Smart cities etc. this policy fits in very well. The big idea of making in India is about creating 2.5 million additional jobs every year and also reduce forex out go. If implemented well the fit looks perfect.

Impact on the sector

The present administration has cleared a lot of stalled projects. However more needs to be done for demand offtake. The policy addresses core issues on Technology, Skill, Quality, standardisation, and easing of some controls on core sector businesses. This will help to some extent in the short term. Over the medium term this policy should address issues of cheap working capital for the industry, reducing documentation, simplifying procedures for bringing in fresh capital, relook at inverted duty structure etc.

Investments will come in when these issues are addressed. The success or failure of NCGP will depend on the way a new ecosystem will emerge. The numbers projected look very ambitious. However, a lot will be achieved even if 50 percent of projections are met.

Change initiatives

There are three policy/ change initiatives that could possibly be considered are:

- Technology gaps exist in many capital sectors, particularly in machinery manufacturing. Investment that comes by way of technology should be given special consideration either by allowing the investors to quantify technology as equity infusion into the business here in India. In special cases allow 100 percent FDI status for investors.
- A separate national fund should be created for investments under a ticket size of 50 mil US$ of Indian SME's. These SME's should get financed at special rates of interest and they should in turn justify it through strong export performance. They should also consume at least 50 percent of the material or engineered components from Indian vendors.
- A marketing consortium of Indian vendors with equity participation from the government that can take Indian capital goods abroad and promote them aggressively and consistently.

At an overall level it is a timely well intended policy (I would like to think work in progress). Implementation is going to be critical.

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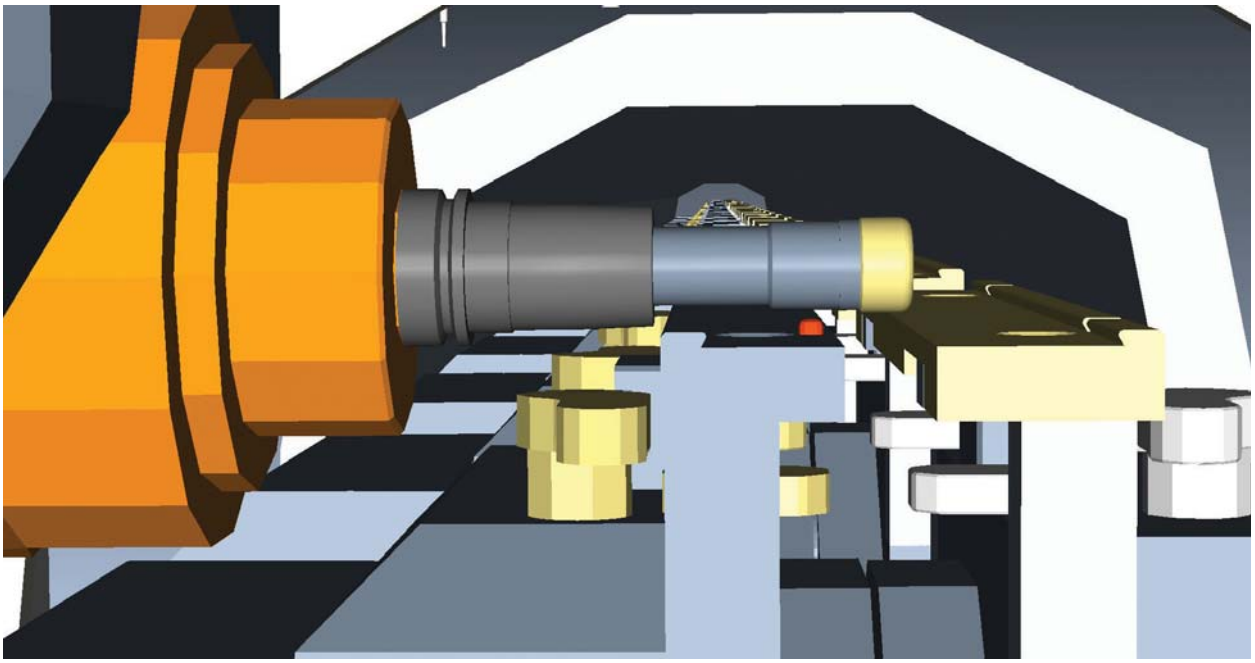

Simulation software reduces manufacturing challenges

Using state-of-the-art CNC simulation software, Triumph Aerostructures—Vought Aircraft Division has been able to quickly transition to new machines, significantly shorten the time for first-part production, and virtually eliminate the chance for machine collisions.

By Bryan Jacobs

Triumph Aerostructures, a subsidiary of Triumph Group, Inc., is a leading global manufacturer of aerostructures for commercial, military and business jet aircraft. The company has full fabrication capabilities and available products include fuselages, wings, empennages, nacelles and helicopter cabins. The company's customer base consists of the world's leading aerospace OEMs. Operating in 70 locations worldwide, Triumph designs, engineers, manufactures, repairs and overhauls a broad portfolio of aerostructures, aircraft components, accessories, subassemblies and systems.

One of the sites, located in Nashville, TN, produces individual parts and sub-assemblies for Airbus, Gulfstream, Cessna, and Lockheed. With approximately 900 employees spread over two million sq ft of work space, the Nashville site has 10 large CNC gantry mills, nine large assembly riveters, and a variety of smaller CNC equipment. In the machining area, there are more than 35 CNC spindles making chips.

"The Nashville facility focuses on parts that are 'long and large'. Most everything we do is longer than 30 ft," said Kevin Chandler, Numerical Control (NC) Manager. "In the past, we made thousands of small parts

Optimised feed rates maintain a more consistent chip load, which reduces wear on the cutters. Cutter wear is also minimised due to the reduced amount of time required to cut each part.

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NC Operator Keith Butler

- parts you could hold in your hand, but those are gone. So too are many of the programmers. At one time Nashville had a staff of 32 programmers, now four remain. We don't have the luxury of multiple try-outs anymore. That's where Vericut has been a life saver – and a job saver."

Part verification

Despite changing ownership several times, the facility has a long history of using NC simulation software. It first began using Vericut software for material removal simulation in 1991, when it was Textron Aerostructures. In 1996 it was purchased by The Carlyle Group and in 2003 it became part of Vought Aircraft Industries. Vought Aircraft Industries, Inc. was acquired by Triumph Group, Inc. in June 2010 and was renamed Triumph Aerostructures—Vought Aircraft Division.

Vericut is a software program that interactively simulates and displays the material removal process of an NC program. NC programmers use Vericut to verify the quality and accuracy of their NC Programs while its 3D simulation of the CNC machine checks for collisions. But the goal of simulation is not simply a collision-free and efficient NC program. The first goal is an NC program that produces the correct workpiece. Vericut's accurate model tells the NC programmer whether or not his NC program makes a correct part. For example, many NC programs use circular interpolation. Vericut emulates the circle motion and creates an as-machined cylinder feature that can be measured to ensure its correctness. Most internal simulations do not emulate circle motion, but instead divide the circle motion into a series of linear motions approximating the cylinder. These segments are not measurable as a cylinder.

CNC machine simulation

Full CNC machine simulation of the actual machine takes verification to another level. "Machine simulation has been the major key to everything we do here," said Bill Gwinn, NC programmer. "Our machines have gotten much more complicated and the risk of collision between vises, bolts, tool changers, and other components is greater than ever. Simulation is so much more than cutting the part."

Chandler and Gwinn are two of the most experienced Vericut software users in the world. Combined, they have more than 40 years experience using Vericut. "Experience has shown us that the more we can simulate on the screen, the less problems we will have down the road. We both agree on the advantages provided by machine simulation," Gwinn said.

Machine simulation detects collisions and near-misses between all machine tool components such as axis slides, heads, turrets, rotary tables, spindles, tool changers, fixtures, work pieces, cutting tools, and other user-defined objects. A user can set up near-miss zones around the components

The goal of simulation is not simply a collision-free and efficient NC program. The first goal is an NC program that produces the correct workpiece. Vericut's accurate model tells the NC programmer whether or not his NC program makes a correct part.

to check for close calls, and detect over-travel errors. Vericut is designed to support advanced control functions including: look-ahead or 3D cutter compensation; tool tip programming and tool length compensation; gage length reference point programming; canned cycles and fixture offsets; rotary axis pivot points; variables, subprograms, and macros; subroutines, looping, and branching logic.

Before Vericut was implemented, the Nashville facility was using Catia V4 and programming in APT, which had a slow check process using a flat-bed plotter. Then they machined the first few parts out of foam, or some other non-production material.

Chandler said, "With the introduction of Catia and Vericut, our first time useable part started out at 90pe. With the introduction of machine simulation we improved even more dramatically. A tested and proven result of this happened in 1995 when a new 4-axis machining center was purchased for small parts. Using Catia solid models, Vericut, and Auto-Diff, we were able to get 96 percent first time usable part programs, and 90 percent of those were never modified past Issue 01. Since then, all programs are required to be run through Vericut Machine Simulation before they are released to the machine. As a result, we are experiencing upwards of 98 percent good, first time parts. Since that first test, it has been very easy to convince management that Vericut is a necessary tool to invest in. It cuts the machining hours down to a fraction of what it would have been."

Gwinn added, "When a program is ready, we don't even go out in the shop anymore. Once it's passed through Vericut, there is nothing major that can go wrong. We know it will be cut correctly."

For example, a new high-speed 5-axis Handtmann PBZ milling machine is being employed to machine stringers that

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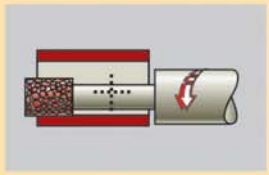
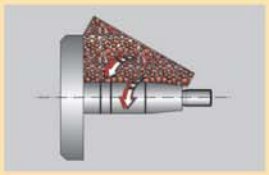


FIG-200 SPL CNC
BIG BORE GRINDER

FIGT-300 CNC
FOUR STATION TURRET

FIGE-150 CNC
ID / OD GRINDER

CNC Cylindrical Grinding



AWH-1500 CNC
LONG SHAFT GRINDER

AWH-2000 CNC
HEAVY DUTY GRINDER

SWH-400 CNC
AUTO LOADING

Surface Grinding

SG-106 CNC
CREEP FEED GRINDER

SGR-60
ROTARY GRINDER

SG-63
HYDRAULIC / PLC

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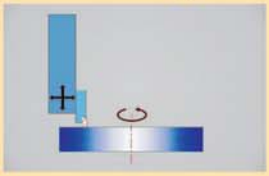
A42/60

Vertical Turning Lathe



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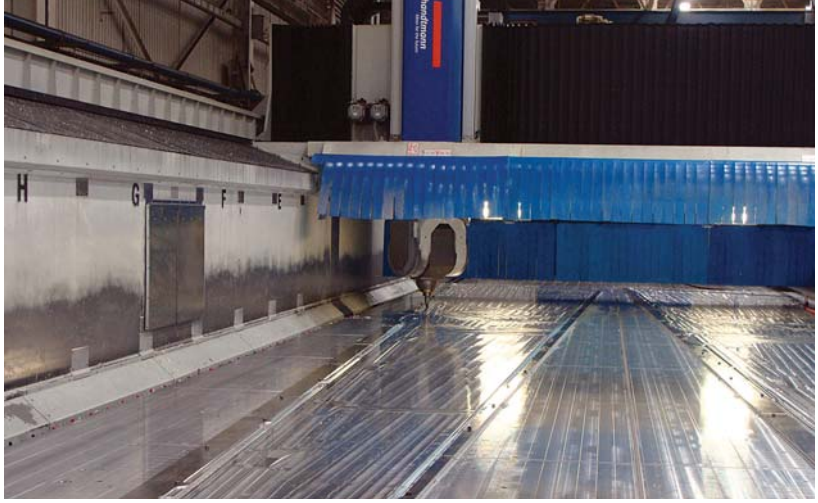
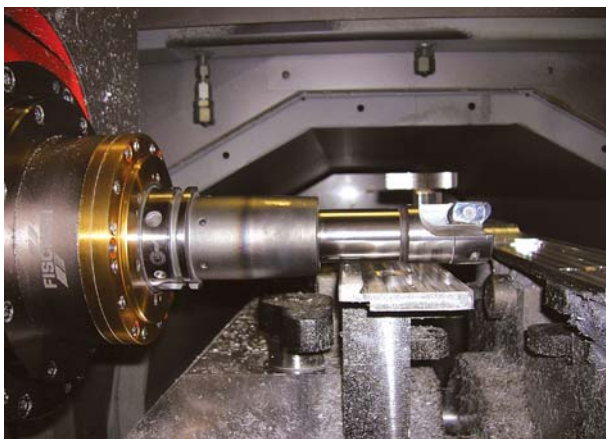
are over 60 feet long. To hold the stringers in place during machining, the Triumph Aerostructures Numerical Control (NC) group designed dovetail-shaped fixtures that they refer to as 'scuff plates.'

"We call it a scuff plate because it's okay to hit it with the cutter. We still want to know when we hit it, but only by a minimal amount. We insert a value of



UBZ-Panel-1



PBZ

-0.022" in Vericut's Collision Tables, between cutter and scuff plates. All the components in this machine get really close -- at times there is only 1mm of clearance between the shank and scuff plate," said Gwinn. "Those cannot collide, so they have a zero collision value."

NC program optimization

The Triumph Aerostructures NC group had a two-fold challenge—they needed to quickly update legacy programs for the new Handtmann UBZ panel milling machine, while in the process of upgrading from Catia V4 to V5. By using Vericut and its NC program optimisation feature, OptiPath, the NC group was able to create NC programs for the new machine -- without re-programming them in Catia V5. First, they re-processed the Catia V4 programs for part location and cutter changes, then re-posted the resulting APT source files for the new machine. Next, they simulated them in Vericut to ensure they would be collision-free, and finally used OptiPath to update the feeds and speeds for the target machine.

"Rather than re-invent the wheel, we took some of our old programs and ran them through OptiPath to get more out of them," said Chandler. "In addition to shortened machining times, we also saved several hundred hours that would have been required to re-program the parts in the new CAM system." OptiPath optimisation software works by analysing the NC program (G-codes or native CAM output) and cutter contact with the ever-changing workpiece. It then divides the motion up into smaller segments to determine what conditions would benefit by increased feed rates, and where the

Machine simulation detects collisions and near-misses between all machine tool components such as axis slides, heads, turrets, rotary tables, spindles, tool changers, fixtures, work pieces, cutting tools, and other user-defined objects. A user can set up near-miss zones around the components to check for close calls, and detect over-travel errors.

feed rate needs to be reduced to protect the cutter. Since the software knows exactly how much material is being removed at each segment, it is able to determine the ideal feed rate. The toolpath trajectory is never altered.

Optimised feed rates maintain a more consistent chip load, which reduces wear on the cutters. Cutter wear is also minimised due to the reduced amount of time required to cut each part. NC programs with optimized feed rates maintain a more constant cutting pressure between the NC machine tool and the workpiece. The machine is subject to less wear and tear not only because of the reduced machining time, but also because of the more constant load. An optimised tool path also produces a better finish because constant cutting pressure causes little or no variation in cutter deflection. Work piece finishes in corners, edges, and blend areas are improved significantly.

Another major benefit for the Triumph Aerostructures NC group has been Vericut's Auto-Diff feature, which enables the programmer to compare a CAD design model to a Vericut simulation model and automatically detect differences. According to Gwinn, "All new programs, especially those generated from Catia V5, have solid models. We didn't always have those in the past using Catia V4, but now we try to make sure all new programs start with solid models, and we use those same models to compare against our NC tool path. We have a slang saying around here that has stuck and holds true: 'Vericut don't lie!' We have come to trust that what you see on the screen in Vericut is what you will get on the machine. It is virtual reality!"

The author is Marketing Communications Manager at CGTech

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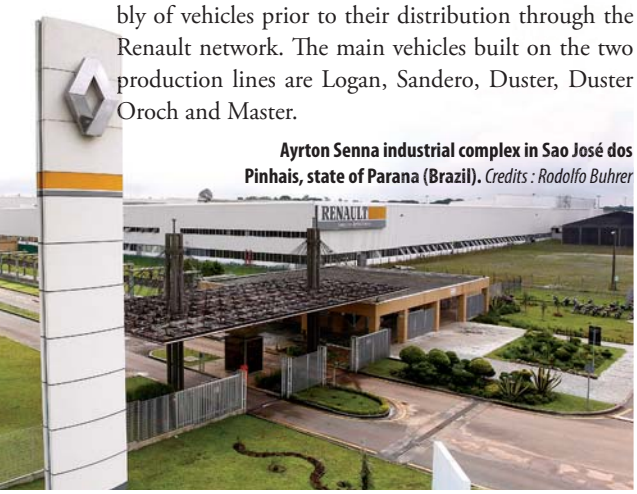
Honda to strengthen R&D of Intelligent Technologies

Honda R&D Co., Ltd., a research and development subsidiary of Honda, has announced plans to further strengthen its research and development of intelligent technologies and, toward that objective, will establish Honda R&D Innovation Lab Tokyo by around September this year in Akasaka, Tokyo, a new operation which will serve as a venue for "co-creation" – where Honda will seek to collaborate with external experts and other research institutes. By adding a new operation, Honda R&D Innovation Lab Tokyo, to the network of existing operations in Germany, the U.S. and Japan, Honda will strive to attract and gather new talent from broad areas of expertise on a global basis. Honda will accelerate practical applications of such technologies in the future while seeking collaboration with external experts and other research institutions.

Renault to manufacture Kwid in Brazil

The new Renault Kwid will be assembled in Brazil by Ayrton Senna industrial complex in Sao José dos Pinhais (state of Parana). This version of Kwid was specially adapted by Renault Technology Americas, which is one of the seven Renault strategic engineering centers across the world. It is established at Brazilian plant. The new Kwid has also benefited from the expertise of Renault Design Latin America (RDLA), one of the five Renault strategic design centers, established in São Paulo. Both of them worked on the interior and exterior design. The Ayrton Senna Complex opened in 1998, one year after the founding of Renault do Brasil, the Group's Brazilian subsidiary. The Curitiba site includes CVP: a passenger car plant (bodywork and assembly); CMO: an engine plant, Mecanica Mercosul, opened in 1999, and CVU: an LCV plant, opened in 2000 and run with Nissan as part of the Alliance. The Curitiba plant manages the pressing, body assembly, paint work and final assembly of vehicles prior to their distribution through the Renault network. The main vehicles built on the two production lines are Logan, Sandero, Duster, Duster Oroch and Master.



Ayrton Senna industrial complex in Sao José dos Pinhais, state of Parana (Brazil). *Credits : Rodolfo Buhrer*

Mercedes-Benz launches its luxury SUV GLC in India; consolidates its SUV portfolio

The country's largest luxury car maker Mercedes-Benz launched the much anticipated luxury SUV, the new GLC 'Edition 1' in New Delhi recently. The GLC is introduced as a CBU and will be available in both petrol and diesel variants. The GLC is Mercedes-Benz's key product that never had a predecessor in India, positioning itself between the GLA and GLE luxury SUVs. Roland Folger, Managing Director & CEO, Mercedes-Benz India said, "We have seen a growing penchant for luxury SUVs amongst the luxury car customers in India and the addition of the GLC is going to redefine the segment completely. We are confident that the GLC will cement Mercedes-Benz's strong presence in the luxury SUV segment in India. The introduction of the GLC also fills the gap in our SUV portfolio, making Mercedes-Benz the luxury car manufacturer with the most extensive range of SUVs, ranging from the GLA to the iconic AMG G 63."

Folger further informed that the GLC has achieved five stars, giving it the maximum score in the Euro NCAP rating. "We are confident that the GLC will replicate its global success in India as well. With the GLC, we have a clear winner of a product and one that the customers have been waiting for."

GM to expand its Spring Hill Manufacturing facility

General Motors will invest $788.7 million for an all-new, high-efficiency engine program, as well as projects to modernize the vehicle programs at its Spring Hill Manufacturing Plant. At the same time, GM announced a $118 million investment at its Bay City Powertrain facility. Since 2010, GM has announced investments of more than $2 billion for the Spring Hill operations. This includes a $148-million investment announced in February to repurpose flexible machining and assembly equipment to build V8 engines. "This investment will help GM and our workforce continue to put the customer at the center of everything we do, providing them with powertrain solutions to meet their changing needs," said Arvin Jones, GM North America manufacturing manager.

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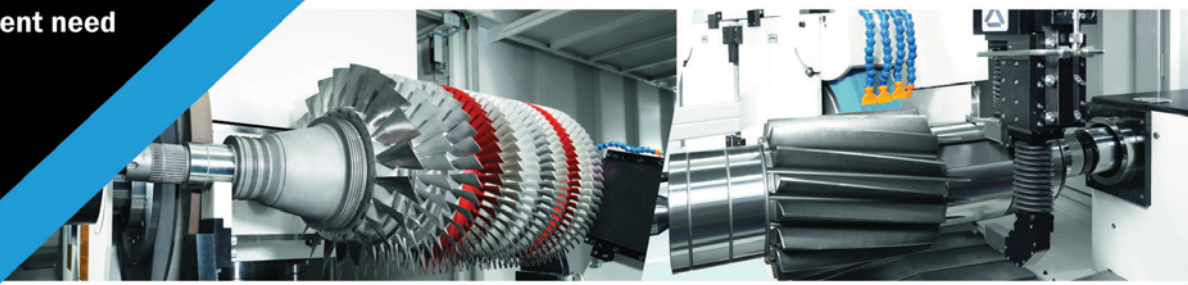

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HUMANITY AT WORK | MONDRAGON

Growth: **High priority**

Indian manufacturers are particularly bullish about their growth potential, says the latest KPMG survey. More Indian executives say they are making growth an extremely high priority versus last year, but far fewer than global average

By Doug Gates and S V Sukumar

The recent KPMG Global Manufacturing Outlook has revealed a few interesting insights. Though the growth and profitability situation of quite a few manufacturing industries are far from satisfactory, the sentiments about the future look pretty bullish.

Seventy-six percent of manufacturing CEOs based in India responding to KPMG International's 2016 Global Manufacturing Outlook (GMO) say they are confident or very confident in their company's growth prospects over the next 2 years versus 64 percent globally.

And while Indian executives says they are making growth an extremely high priority versus last year (9 percent in 2015 versus 19 percent this year) this is still less than their global peers where 31 percent ranked growth as an extremely high priority this year and 18 percent last year.

This year, KPMG's GMO surveyed 360 senior manufacturing executives from around the world. There were 38 respondents from India. 90 percent of the Indian respondents have global annual revenue between USD$1 billion and USD$10 billion.

The top three areas that Indian CEOs identify as having the biggest impact on their company's growth are the economy and the price of raw materials followed by the regulatory environment. However, every area KPMG asked CEOs that may impact growth received a check mark by over 30 percent of Indian respondents. So what are CEOs doing to mitigate any of the challenges to seize where they are opportunities?

Leading manufacturers are activating in many areas including:

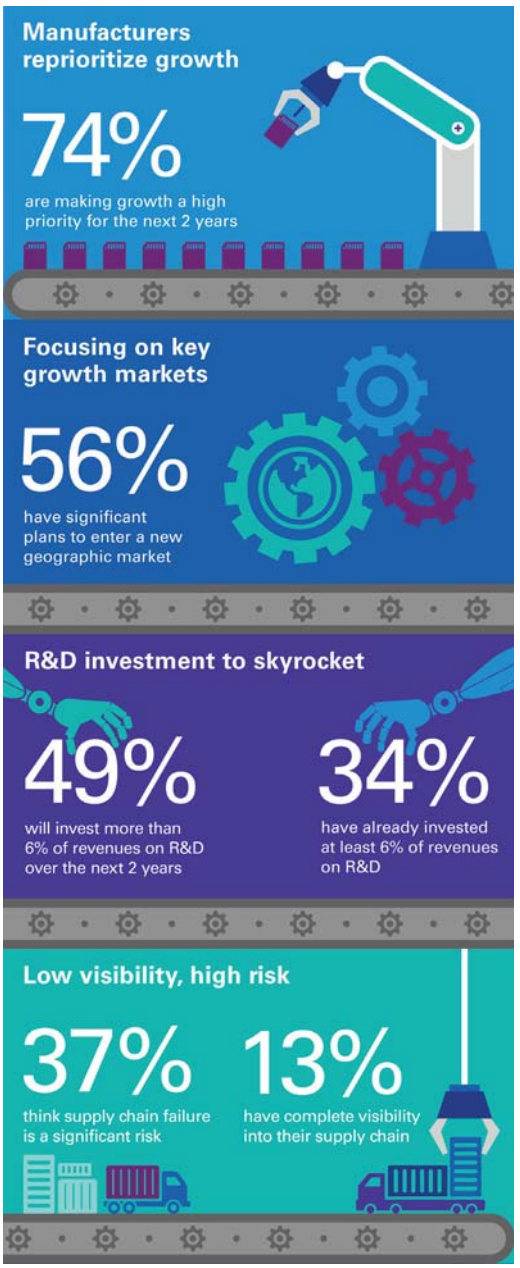
- Evaluating their customer and business segments, products, services, regions and channels to understand the elasticity in each of their markets
- Reassessing the long-term market outlook to ensure their business objectives align to future growth opportunities
- Creating a demand-driven and responsive business model that provides flexibility and agility to respond to increased (even unpredicted) demand and market disruptions

Growing, growing

Indian CEOs say that their top growth options, actions and priorities for the next 12 – 24 months will be:

- Increasing their market share within their existing geographic markets an sectors (37 percent)
- Entering new geographic markets (32 percent)
- Changing the range of products they offer (21 percent)
- Changing the range of products and services they of offer (11 percent)

To address these Indian CEOs say they are focused on organic investments to address their growth priorities. Fifty-three percent of India's respondents said that organic growth would be their predominant strategy versus 39 percent who said they would grow through a merger or acquisition.



Investment flows/corridors are changing

Globally, 20 percent of the CEOs responding to the GMO survey say they will invest significantly into India and 38 percent of those with existing investments in India say they will invest significantly.

Of those Indian CEOs who have existing investments outside of the country, nine percent say they will decrease investment in the US and Canada, nine percent will reduce investment in Africa and three percent will decrease domestic investment. Countries in which this same group expects to have the most significant increases in investment are China (60 percent), ASEAN (56 percent) and the Middle East (55 percent).

The primary reason for Indian CEOs non-domestic investments is to obtain lower manufacturing costs (55 percent). But a large majority is also re-shoring operations—85 percent say that some part of their domestic investment is related to re-shoring. Mapping and adapting their products and services against the needs of buyers in key regions around the world is of utmost importance as is having the right relationships and supporting infrastructure to win and sustain business in new markets. Assessing how to best enable their strategy will be what supports long-term growth and profitability.

Over all, India is proving itself to be a valuable hub from which to sell to smaller yet growing markets in the region, as well as larger - yet less cost effective and stable - emerging markets. Simply put, manufacturers now see India as both a low cost regional manufacturing center and as a vital customer market.

Doug Gates is Chair, Global Industrial Manufacturing, KPMG International and S V Sukumar is Partner and Head of Industrial Manufacturing, KPMG in India

It's not just about ideas but also about **making those ideas happen**

Innovation is extremely important for businesses as it brings sustainability.

By Swati Deshpande

Innovation is not a mere idea, it is a well-thought idea that leads to transformation through value creation. "Toshiba believes that innovation is not just about new products development or new value creation, but also reflects through quality improvement and process improvements on manufacturing," said Tomohiko Okada, Managing Director, Toshiba India Pvt Ltd. What is important is to develop a culture of innovating in the company as such ideas can come from anyone from the organisation. Therefore, Godrej & Boyce believes that innovation is everybody's job. "Whether one is in a consumer facing function such as sales, marketing and service or whether in enabling functions such as manufacturing, procurement or HR, everyone is encouraged to think about how they can make improvements, both small and large in order to improve what we offer to the consumer. We also have a robust 'Kaizen' movement within the company that has been even recognised at the national level," informed Anil G. Verma, Executive Director & President, Godrej & Boyce Mfg. Co. Ltd.

Similarly, at National Engineering Industries Ltd (NEI) encourages every employee to think innovatively. "We urge them to think beyond the box so they can do their jobs more efficiently and innovate their everyday tasks. For product innovation extensive in house research is a part of the strategy at NEI. But this is not what we restrict ourselves to. We focus on a culture of innovation," mentioned Sanjeev Taparia, Sr. VP Marketing and Sales, National Engineering Industries Ltd.

Why is that the companies are concerned about their innovation and encourage its employees to be one step ahead. Speaking on the same Jayesh Shah, Head - Product Development (General Industry), Henkel IMEA said, "In today's dynamic world, it is impossible to survive without being innovative. Many large organisations, which were once pioneers and market leaders in their respective product categories, have vanished as they were not able

"We believe that innovation is everybody's job. Whether one is in a consumer facing function such as sales and marketing or whether in enabling functions such as manufacturing or HR, everyone is encouraged to think about how they can make improvements, both small and large in order to improve what we offer to the consumer."

Anil G. Verma,
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We believe that innovation is not just about new products development or new value creation, but also reflects through quality improvement and process improvements on manufacturing."

Tomohiko Okada,
Managing Director, Toshiba India Pvt Ltd

Companies are now realising importance of R&D and have started allocating huge budgets for R&D and encourage lot of innovative ideas."

Muralishankar Sambasivam,
Vice President, Association of Indian Forging Industry (AIFI) and Joint Managing Director of Super Auto Forge, Chennai

to adapt fast enough to the changing technology trends and market needs." "Organisations need to innovate or die as they say. Innovation capacity is the driving force behind the country's growth and competitiveness," added. Ramesh Phatak, Vice President-R&D, Schneider Electric India.

Elaborating the same with an example, Muralishankar Sambasivam, Vice President, Association of Indian Forging Industry (AIFI) and Joint Managing Director, Super Auto Forge, Chennai said, "In the area of automotive field with the advent of electrical transmission and hybrid technology, lot of existing automotive parts will become totally obsolete and hence those companies who are making such products have to come up with innovative way & technologies to remain in business. This will be possible only with a very clear vision on long term business strategy, comprehensive market knowledge and a sound internal R&D. The long term strategy will give the organisation the direction for developing new parts and with the market knowledge, they will be able to clearly identify the product family"

However, it is observed that the Indian manufacturing industry does not emphasise on the innovation to a large extent. "As India is an emerging market, the culture of innovation has just commenced. It is still in its infancy and it is only very recently that innovation and the start-up culture have started to evolve," stated Singh. Seconding the same Phatak opined, "Recent advances in start-ups in India is an indication of this evolution towards emphasis on the innovation."

R&D—root of the innovation

In most cases, innovation is an outcome of the research & development, which is why it is the backbone of innovation. "R&D forms the vital link between the present requirements of customers and the future anticipated needs. R&D also contributes in the developing new technologies which are more efficient and value based. Through R&D, companies can work towards improving existing product and service expectations of customers and all stakeholders. In the time of intense competition, R&D helps creates a positive differentiation in the products and services. This differentiation can also improve the working efficiencies of entire businesses," said Jasmeet Singh, Head - Corporate Communications, JCB India Ltd.

Likewise, R&D is also directly related to the business of a company. "A strong interaction between R&D activities and business fosters the generation of innovation. There is huge amount of competition in the market and customers are spoilt for choices. If we have to retain our position as market leaders and maintain the trust of the buyers, it is important to adopt new technologies, techniques and approaches and create a distinguished brand identity. Innovation could be any new, unique idea or an approach that could create value for a customer, for employees or any other stake holder. Innovation does not only means matching the growing needs and demands but also considering futuristic aspects well in advance." Phatak explained.

R&D in India

Though R&D is a backbone of innovation, Indian manufacturing industry seem to have a blind eye on it. "As R&D is a fixed cost and one that typically may not have an immediate impact on sales or profitably. It is one of the first cost heads to be axed in the pursuit of meeting immediate profit objectives," noted Verma. However, Looking at the brighter side, Sambasivam said, "Companies are now realising importance of R&D and have started allocating huge budgets for R&D and encourage lot of innovative ideas."

Super Auto Forge has invested close to Rs5 crore in R&D apart from investing in new technologies. Going forward the company intends to invest a considerable amount in R&D and continue the same trend.

Speaking about National Engineer-

Henkel's innovation Centre in Dubai

"Organisations need to innovate or die as they say. Innovation capacity is the driving force behind the country's growth and competitiveness."

Ramesh Phatak,
Vice President, R&D,
Schneider Electric India

"The way consumer expectation and therefore, customer requirements are evolving R&D will have a major role in the growth of company in times to come."

Sanjeev Taparia,
Sr. VP Marketing and Sales, National Engineering Industries Ltd

ing Ltd's (NEI) investment in R&D, Taparia said, "For 2015-16, close to 1.5 percent of the turnover was invested in R&D, the turnover being Rs1,700 crore. The focus areas for R&D expenditure is new product development, tribology, advance material research, testing & validation.

The vision of NEI is to invest 3 percent of the revenue per year in R&D. We are moving towards our vision gradually." Schneider Electric invests close to 5 percent of its revenues in R&D. With 1000+ employees working on product development and resource enhancement, GTCI's gamuts of activities include research in the fields of electro mechanical design, electronics and software development.

JCB too invests considerably in R&D and has a Design Centre at Pune with over 300 engineers. "It is also JCB's largest Design Center outside of the United Kingdom. This facility was inaugurated in 2014 and is currently in the middle of some very exciting action in terms of new products development," informed Singh.

Simultaneously, India is being looked at the destination for R&D centres by the multinational companies. "This positive sign of growth present an important and significant opportunity for multinational organisations across the globe due to the intellectual capital available in the country. That is the reason why Schneider has chosen India (Bangalore) as one of its global centre for R&D," Phatak said. "We see a lot of global corporations setting up applied research centres in India–a significant cluster being around Bengaluru," said Verma. Toshiba has established a R&D division within Toshiba Software India Pvt. Ltd. (TSIP), Bangalore which is in charge for data analysis technology. "The team in India is in charge of the R&D of analyzing algorithm with support of the data supplements from the potential customers," informed Okada.

Henkel is another company that has established an Innovation Centre in

"In today's dynamic world, it is impossible to survive without being innovative. Many large organisations, which were once pioneers and market leaders in their respective product categories, have vanished as they were not able to adapt fast enough to the changing technology trends and market needs."

Jayesh Shah,
Head - Product Development (General Industry), Henkel IMEA

"Innovation can either be one big bang step or idea, or it can be a series of small ideas in a very short span of time collectively resulting in a significant disruption"

Jasmeet Singh,
Head - Corporate Communications, JCB India

Academia & industry ties in R&D

Structurally, we have an active company-wide Design Council that comprises the R&D Heads of each BU and that drives both, sharing of solutions developed as well as collaboration to address key technological challenges facing the company. Two years ago, the company started a program that drives exploration of new territories. The Horizon program is conducted jointly with the help of faculty from the Institute of Design at the Illinois Institute of Technology, US. Selected employees are dedicated to this program for 6 months to learn the principles of design research and use them to develop new systems / products / services / processes that have the potential to shift where we play.

Sprint – a shorter program challenges employees to take their ideas to the prototype stage in just 90 days.

India. "We have a state-of-the-art Innovation Centre in Pune, which as a part of our global innovation focus, partners with our customers in India solve some of industries' biggest design, efficiency and reliability challenges. One of the products developed by the center is Loctite PC 7000, a high temperature abrasion resistant, which is used for protecting components against abrasion up to 1100°C," noted Shah.

Role of the government

Apart from the boost from various factors, the Indian manufacturing industry has also gained encouragement and guidance from the Government of India. The Make in India initiative is inspiring the companies to be innovative. "Since the launch of 'Make in India' initiative, investments by multi-national companies in India have increased, as these companies see the potential that exists in the country. The newly launched 'Skill India' and 'Digital India' schemes shall further transform the nation into an innovation and manufacturing hub, supplementing the 'Make in India' initiative. Therefore, innovation will play a key role in the success of 'Make in India'," Shah hoped.

The benefit is that it will bring the country at par with the global standards. "The Indian industry is still evolving. Indian companies are gradually realising the value addition R&D brings to the table. Initially the companies were collaborating with global players to bring global technological advancements to India. Now with Make in India programme, Indian companies are trying to go global. We are all looking at exporting from India. Thus, I would say we are evolving to match up to global standards of R&D," asserted Taparia.

Way ahead

All together these initiatives will help the Indian manufactures to sustain in the uncertain market conditions. "The way consumer expectation and therefore, customer requirements are evolving R&D will have a major role in the growth of company in times to come," Taparia added.

According to Verma, India's manufacturing sector has the potential to touch US$ 1 trillion by 2025. "There is potential for the sector to account for 25-30 percent of the country's GDP and create up to 90 million domestic jobs by 2025. However, to make this happen there must be demand and there is no more sustainable way to generate demand than by coming up with new, differentiated solutions for meeting consumers' needs, both articulated and unarticulated," he mentioned.

With the right market conditions, government's support and India has a great potential in the concept of frugal Engineering. "After all, this is the country that successfully launched Magalyaan in first attempt. It is a great example of what engineers in India can do in a fraction of the cost as compared to many other parts of the world," concluded Singh.

3-in-1 innovation

Read more about the thought process and research behind the development of the Multix, Eicher Polaris' 3-in-1 vehicle

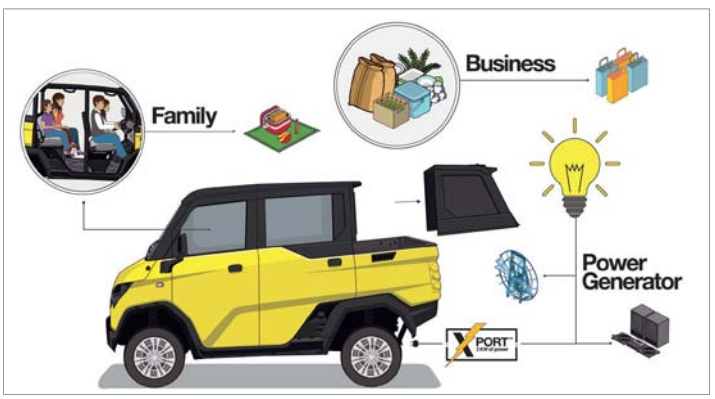
Understanding the customers' needs is a key to innovation. And that's exactly what the manta is for Eicher Polaris Pvt Ltd. "In 2012, Eicher Motors Ltd. and Polaris Industries Inc. got together to form this joint venture company named Eicher Polaris Private Ltd (EPPL). The idea was to create something new for the Indian automobile market. We studied the market to understand, which segment of customers who finds current solutions suboptimal," said Radhesh Chandra Verma, Chief Executive Officer of Eicher Polaris Private Ltd..

Identifying needs

The company identified the segment—that of independent businessmen—who are customers owning their own business, however small it may be, and not working for anyone. "These were also non-metro people, who have no desire to move to bigger cities for their livelihood, but would rather strive for growth in their own towns. These segments of people mostly deal with farm product processing or food processing or even owning a dairy farm, or own a manufacturing business, etc. They may not have moved out from their hometown, but at the same time, they are quite ambitious. Normally, all of their work and business-related commuting would be on a two-wheeler or they would hire a four-wheeler when it came to family needs or special business needs," described Verma.

When the company interacted with these people across different regions, it understood that they wanted to buy a four-wheeler but found the available vehicles in the market did not meet their requirements in both criteria —business and family — together. "While some available options would work fine for family needs, others would work well for business requirements. While they felt that owning something that works well for family needs was nice, they also felt it was not worth investing on an option that worked well for only one part of their needs, especially given their growth ambitions," added Verma.

> Based on the interactions with such businessmen and other associated consumers, the company went about creating a 3-in-1 product that would not only take care of family and business needs, but also generate power for both mechanical and electrical applications through PTO, which can generate 3 KW of electricity, a big enabler for businesses.
>
> **Radhesh C Verma,**
> Chief Executive Officer, Eicher Polaris Private Ltd



Solution

Based on these interactions with such businessmen and other associated consumers, the company went about creating a 3-in-1 product that would not only take care of family and business needs, but also generate power use of the available engine power for both mechanical and electrical applications through PTO, which can generate 3 KW of electricity, a big enabler for businesses. "This power can be deployed to deliver both mechanical and electrical power, depending on requirements, including for running water pumps to irrigate fields and to power pesticide sprayers. Thanks to its independent suspension system, Multix also offers riding comfort and can comfortably handle any type of road. With a 225mm ground clearance, it can also be moved around at construction sites."

For representation only.

Advanced robotic technology in the warehouse

While implementing automation of the plant, often only shopfloors are considered. However, automation of supply chain is also equally important and can deliver substantial results.

By Yaduvendra Singh

The first industrial revolution was driven by the power of steam to mechanise production. The second was led by use of electricity for mass production. In the 1960's digital technology invaded this space with computers, electronics and information technology to automate production. And now, we are at the brink of yet another transformation. This phase will be driven by a fusion of hardware and software, blurring the lines between the physical and the digital. This fourth instalment of the industrial revolution, which we are already experiencing: artificial intelligence, Internet of Things, robotic process automation, autonomous vehicles, 3D printing, cyber-physical systems and connected wearable devices, is a rapidly evolving disruption in the technology space.

In the increasingly competitive industrial environment, technology-driven manufacturing will penetrate the shop floors to enhance efficiency, quality and accuracy in production. From self-driving cars and drones to virtual assistants across the factory floor, artificial intelligence has made noteworthy progress in recent years. Now in the fourth phase of industrial revolution, enterprises will merge their virtual and real production domains as much as possible with the help of advanced software and hardware products. Manufacturers that want to retain their competitive advantage will move towards smart warehousing and logistics and deploy technology and systems along the manufacturing value chain.

> While robots are widely used in manufacturing and assembling, the supply chain vertical has remained technologically starved for a long time. Storage and inventory management constitute 60 percent of the entire supply chain.

Globally, the automotive industry has been the leader in the use of robotic automation technologies for several years. Industrial robots have been around for a few decades now doing high-precision tasks such as welding and assembling, heavy lifting and auto body painting. Robotics have made automotive assembly lines faster, safer, more cost effective, and efficient- all at the same time. While the entry of ro-

botics has been slow in the other industries over the last few years, their applications are now fast expanding to various verticals in a variety of new sectors such as e-commerce, FMCG, Retail and Pharmaceuticals. In terms of the geographic expansion, the countries with the highest number of robots are USA, China and Japan.

In India, the adoption of robotics technology has been very sporadic. While robots are widely used in manufacturing and assembling, the supply chain vertical has remained technologically starved for a long time. Storage and inventory management constitute 60 percent of the entire supply chain. Robotics have the potential to transform inventory management and order processing. We are in the phase where primitive godowns are turning into smart warehouses, fulfilment and distribution centers. In the last five years, e-commerce and logistics companies across the globe have pioneered adoption of advanced robotics technology to create high productivity warehouses and optimising supply chains to match the dramatic evolution—in terms of volumes and values.

In India, these developments propelled warehouse operations towards adoption of robotics enabled automation systems, with ecommerce giants like Flipkart leading this trend. The phenomenal growth that the e-commerce industry has seen in a relatively short span of time is presenting several unique distribution challenges. These include handling really high volumes, single-item as well as multiple-items' orders, packages of different shapes and sizes, shipping to numerous locations across India, and services including 'same-day-delivery' and 'next-day-delivery'; add to that the seasonal peak that e-commerce industry experiences. Many of these challenges can be handled by automating inventory management and sortation processes inside a warehouse, fulfilment or distribution centers. Robotics technology automates complex warehouse processes thereby helping in the elimination of error, reducing touch points, checking pilferage and auditing inventory real-time. With a fast ROI and better space utilisation, supply chain optimisation is helping larger players have competitive advantage by providing the best experience to their end-customers, meeting customer expectations and ensuring customer loyalty.

For players like Flipkart, use of advanced robotic technology in their warehouses has aided the process of the order profiling and sortation processes in its fulfilment and transport centres, thereby reducing order fulfilment time and improving dimensioning and weighing accuracy to ensure correct billing. This has helped them not only achieve throughput of 48,000 items per hour, but also reduce OPEX to half and improve revenue recognition by over 10 percent.

With a fast ROI and better space utilisation, supply chain optimisation is helping larger players have competitive advantage by providing the best experience to their end-customers, meeting customer expectations and ensuring customer loyalty.

Another great example is Hong Kong-based Kerry logistics, one of the first 3PLs in Asia to adopt the robotic automation technology, enhanced its fulfilment efficiency and accuracy of orders from retailers and e-commerce players with advanced goods-to-person robots. In this, real-time sales orders are transmitted to the robots which bring goods to the operator at the pick-put-station, post which the warehouse management system indicates the item to be picked by using pick-put-to-light system. This not only improved the picking accuracy to over 99 percent, it also helped Kerry Logistics improve its pick rate by six times!

An example of the warehouse automating solution

Overall, the role of advanced robotic technology in overcoming operational inefficiencies and optimising supply chains will be critical to remain competitive, in the next few decades. With government initiatives like Make in India, we are paving the way for global companies to set up large-scale manufacturing plants in India and supply chain, which is the backbone of manufacturing, will need to be highly optimised with no room for error or delay.

The author is Vice President & Global Head, Sales, Marketing & Solutions Group, GreyOrange

They take home the 'Machie'

Catch up with all the Machie Winners in our Awards Special Digital Edition at www.themachinist.in

When stars of the manufacturing shine on a truly sophisticated red carpet, the evening becomes memorable in all aspects. The Machinist team simply gave these these heroes a grand platform and the glory they truly deserve!

Ace Micromatic Group Presents

THE MACHINIST Super SHOPFLOOR 2016 Awards

www.themachinist.in

Glittery lights, jazzy music, delicious food, a perfect evening! I am not talking about any films and lifestyle related function here. These words are pronounced for first red carpet award ceremony for the manufacturing industry— The Machinist Super Shopfloor 2016 Awards.

The ceremony that took place on May 26, 2016 at Hyatt Regency, Pune, gathered the who's who of the manufacturing industry under the single roof to celebrate the success of winners. In the sparling ceremony the awards were bestowed upon the winners in categories of Safety, Productivity, Technology Adoption, Innovation, Green Manufacturing, Machining Excellence and Quality.

Besides rewarding the best practices, Worldwide Media also recognised the outstanding contribution of the CEOs and industry leaders through People's Award. Nishant Arya, Executive Director, JBM Group is announced as The Machinist

Super Next Generation Leader while Harish Sheth, Founder and Chairman & Managing Director, Setco Automotive Ltd is rewarded as The Machinist Super Entrepreneur for 2016. The Lifetime Achievement Award for the year is bestowed upon to Ravi Chopra, Chairman & Managing Director, Pi-

Industrial Lubricant Partner: MOTUL TECH
Metrology Partner: FARO
Cutting Tools Partner: TOTEM High Performance Cutting Tools
Technology Partner: Delcam Complete CADCAM Solutions
Jury Meet Partner: TYROLIT
Associate Partner: igus
Knowledge Partner: TATA STRATEGIC MANAGEMENT GROUP
Media Partner: ET NOW INDIA'S NO.1 BUSINESS NEWS CHANNEL
Magazine Partner: TopGear India

Bharat Forge wins the Machie in Machining Excellence (Large Enterprises)

Cooper Corporation J2 plant is the Super Shopfloor of the Year-SMEs (Indian)

RSB Transmissions wins the Machie in Quality-SMEs (Indian)

Sigma Electric Manufacturing wins the Machie in Innovation-SMEs (MNC) Chakan, Pune

aggio Vehicles Pvt Ltd. Guillaume Sicard, President, Nissan India Operations holds the 'Machie' for The Machinist Super CEO of the year. These 'stars' of the manufacturing industry made the ceremony truly gleaming.

Mahindra & Mahindra, Cooper Corporation Pvt. Ltd and Cummins Technologies India Pvt Ltd were announced as The Machinist Super Shopfloor of the Year under Large, Small (Indian) and Small (MNC) companies respectively.

Nishant Arya, Executive Director, JBM Group - Super Next Generation Leader 2016

Harish K. Sheth, Founder & CMD, Setco Automotive Ltd. - Super Entrepreneur 2016

Ravi Chopra, CMD, Piaggio Vehicles Pvt. Ltd. - Lifetime Achievement Award 2016

Guillaume Sicard, President, Nissan India operations - Super CEO 2016

THE MACHINIST

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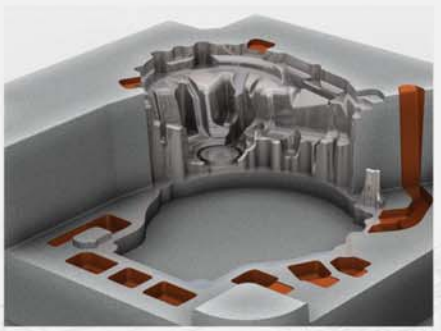
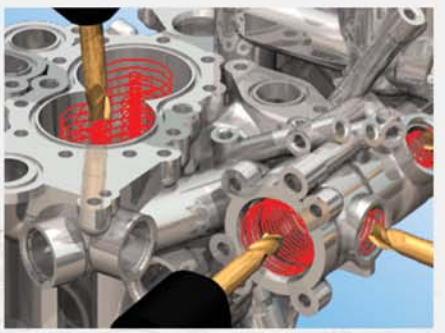
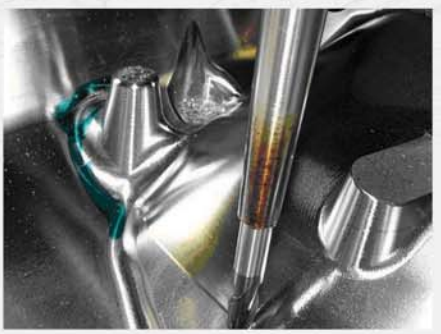


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A **360 degree** transformation

At The Machinist Super Shopfloor Awards 2016, a panel discussion was held which revolved around new age CEO namely CEO 4.0. Here is the gist of the discussion.

While a great industrial transformation is happening around us, we need great industry leaders in place to see it through, noted Niranjan Mudholkar, Editor, The Machinist and also the moderator of this panel discussion. "We all talk about Industry 4.0 but we seldom talk about CEOs 4.0," he pointed out explaining the objective of the discussion. Speaking on the new age manufacturing, V Ramnath, Managing Director, Racold Thermo Pvt. Ltd said, "As we all know there are four or five key mega trends that are influencing everything we do. The first one is obviously Industry 4.0 and we have been talking about

From Left to right:

N. K. Dhand, *Chairman & Managing Director, Micromatic Grinding Technologies Ltd., & MD, Micromatic Machine Tools Pvt. Ltd.*
With almost 45 years of experience in the Machine Tools industry, NKD, as he is known, is indeed a seasoned campaigner. An entrepreneur in his own right, he is considered as a technocrat par excellence with a solid hold over all aspects of business – from operations to strategy and sales.

Suresh KV, *Country Head of ZF in India & Head of ZF India Pvt. Ltd.*
In this role, he is responsible for the performance and development of all lines of business for ZF in India, as well as for the operation function in ZF India Pvt. Ltd. KV, as he is popularly known, started his career way back in 1989 and has worked with companies like Asian Paints Bajaj Auto, Visteon India and Philips in important positions.

Arun Bhatia, *Managing Director, United Technologies Corporation (UTC) India*
In this role, Arun is responsible for overall operations of Carrier and Toshiba Air conditioning and Integrated Building Solutions for India region including Nepal & Sri Lanka. He carries over 24 years of rich experience and is a thought leader in the field of sustainability.

V Ramnath, *Managing Director, Racold Thermo Pvt. Ltd.*
Ram brings with him over 25 years of rich experience in leadership roles across general management, sales, distribution, retail & logistics verticals in high performing global consumer companies including Cadbury (chocolate and beverages) and Nokia (telecom and technology).

Panel Moderator (In the centre): *Niranjan Mudholkar, Editor, The Machinist magazine*

"From the shopfloor level, the operators have to evolve from being just doers to becoming 'thinker-doers.'"

Suresh KV,
Country Head of ZF in India & Head of ZF India Pvt. Ltd

The CEO has to be continuously in touch with what is happening at the shopfloor. Today's leader has to be in touch with reality in real time."

N. K. Dhand,
Chairman & Managing Director, Micromatic Grinding Technologies Ltd., & Managing Director, Micromatic Machine Tools Pvt. Ltd

Listening with rapt attention: The audience during the discussion

it. Technology basically cuts distance and time. It gives you the ability to convert data into insights and that too proactively."

Giving an example of the industry's transformation over the period of decades, Suresh KV, Country Head of ZF in India & Head of ZF India Pvt. Ltd. spoke in the larger context of 'operations'. He pointed out that operations is the backbone of any industry. "Finally how does a particular organisation stand up in an industrial world? It is through key aspects like quality, cost, delivery and so on. Who does that? It's basically the operations. And it has certainly changed. Today, the world is different. Back in 1990s shopfloor having an air conditioned environment was something that was certainly unheard of but today it seems like becoming a norm. Today's machines demand that sort of an environment. Wi-Fi on the shopfloor will also soon become a reality on the shopfloors. If the machines become smart, that will become a necessity. "

Seconding the same, N. K. Dhand, Chairman & Managing Director, Micromatic Grinding Technologies Ltd., & Managing Director, Micromatic Machine Tools Pvt. Ltd. said, "The CEO has to be continuously in touch with what is happening at the shopfloor. Today's leader has to be in touch with reality in real time. And while the transformation is happening, it is the leaders' responsibility to bring the operators up to speed with the change in terms of adequate skilling and training. So that is an important aspect. In fact, upgrading the skill levels not just at the shopfloor but also throughout the chain is going to be very important." Agreeing to the sentiment K V continued, "From the shopfloor level, the operators have to evolve from being just doers to becoming 'thinker-doers'. If that happens then everything else also changes - including the leadership. Leaders today need to understand real-time data today; gone are the days of 'next-day-morning' understanding of what happened yesterday. "It is about what is happening 'right now' on the shopfloor. So leaders have to be tech savvy and they need to know how to capture, analyse and use the real-time data. Things are changing rapidly today and as leaders we need to know what changes are taking place. They need to master data management and be able to change it into information and then use that information to understand how the industry as well as your organisation is going to change in future. So the leadership today has changed from understanding what happened in the past to understanding what is happening now and looking forward to what is going to happen."

Adding another dimension to the discussion, Ramnath said, "By 2020, 60 percent of the millennial population will be based in India and China. This basically means that there is going be a much younger workforce and managers going forward. These people are born in the age of internet; they are more collaborative and they love sharing. And their public and personal lives are intertwined unlike us where we had very private lives and very different work life. Dealing with this aspect is going to be a big challenge for the CEO."

In order to be sustainable in such well-connected future, CEOs and leaders have to think differently. "In a connected world, if we are to survive then we have to respect the value chain and make the ecosystem grow within which we need to have a profitable share. We cannot anymore just think about our part of the value chain and not care about others. This is a big shift so the CEO needs to embed this thinking right from the

"I would say that technology, sustainability and people are actually complementary to each other."

Arun Bhatia,
Managing Director, United Technologies Corporation (UTC) India.

"If we are to survive then we have to respect the value chain and make the ecosystem grow within which we need to have a profitable share."

V Ramnath,
MD, Racold Thermo Pvt. Ltd.

"India deserves to be a manufacturing country. But over and above that, India must be a Research and Development country and an engineering country."

Guillaume Sicard,
President, Nissan India

"Quality is something that we in the top management expect. And the employees often do not understand what exactly is required of them."

Harald Friedrich,
Continental Automotive Components

board to down the shopfloor. The last and very important thing is that the CEO also needs to think about health and wellness. India is one of the largest countries when it comes to lifestyle diseases. Therefore it is extremely important to manage the health and the well-being of everyone from the shopfloor to the boardroom," opined Ramnath.

The moderator also opened the discussion to the audience and asked a pertinent question to Guillaume Sicard, President, Nissan India Operations, in the context of 'Make in India'. "When I arrived in India a year and half ago, there was a big thing about 'Make in India'. I thought it was a good step but not enough. India deserves to be a manufacturing country. But over and above that, India must be a 'Research and Development' country and an engineering country. Because we need to have the know-how and we need to develop those skills if we want to have a bright future," he said. "Manufacturing alone is not enough because there could be some other countries which could also be extremely good in manufacturing. But if we want to develop our leadership and maintain it then we must develop engineering," he added.

Another member of the audience, Harald Friedrich from Continental Automotive Components said that quality and discipline are two other aspects that Indian manufacturing industry has to adapt. Speaking on the same, Friedrich said, "Quality is something that we in the top management expect. And the employees often do not understand what exactly is required of them. What we have to do is that we need to explain it to them and what is much more important is that we have to involve them. If we don't involve them then they will never really understand. At our company, we have a shopfloor empowerment program where we involve the employees to identify as to what needs to be done we can improve the quality and meet the expectations of our customers."

However, if the growth has to be 360 degree, then it is also important to have concern towards the environment. "I would say that technology, sustainability and people are actually complementary to each other. There are enough examples on how new technological changes have lead to sustainability. For example, at UTC we came with a gear turbo fan jet engine, which is going to save 16 percent fuel. When you save 16 percent fuel, you are talking about something like 75 percent less air emissions and you are talking about 50 percent less noise," noted Arun Bhatia, Managing Director, United Technologies Corporation India. Bhatia also shared the example of Infosys in a similar context. "With eighty buildings and campuses across India, they have a large real estate footprint. So they decided a few years back that by using technology they will have net zero buildings. So they build a command center in Bangalore and hooked up all the 80 buildings so that they can get real time data about the energy consumption of each one of those 80 buildings. So that's a very good example of using technology for creating sustainability," he said.

Group photo after felicitation by Rishi Sutrave, Publisher - B2B, WWM (far right)

Making the **Shopfloor 'Super'**

> It is not just the smart machines that we need to have. Even the environment and the people who work on the shopfloors have to be smart. Their training, their skills, their feedback systems, the upgradation of the machines and, in fact, the entire ecosystem has to be part of the super shopfloor.
>
> **N. K. Dhand**

An industry veteran, **N. K. Dhand,** Chairman & Managing Director, Micromatic Grinding Technologies Ltd., & MD, Micromatic Machine Tools Pvt. Ltd speaks about making the shopfloor smart and sustainable in all the aspects

While speaking at The Machinist Super Shopfloor 2016 Awards, N. K. Dhand, Chairman & Managing Director, Micromatic Grinding Technologies Ltd., & MD, Micromatic Machine Tools Pvt. Ltd. shared his experiences of making the 'super shopfloor'. Going down the memory lane, he said, "I feel quite nostalgic about what we have achieved. We started way back in 1973 in Ghaziabad in a small shop. Later on we went on add more factories across India. Together, we have created the universe of Ace Micromatic Group, where we offer end-to-end solutions."

He further added that since its inception the company had a vision of making its shopfloor into 'super shopfloor'. "The most important fact that I want to share with you is that we started as a 'shopfloor' as every other shopfloor would start. But the idea was to make it into a 'super shopfloor'. In the very second year, considering the heat in the north of India, we air-cooled all our assembly halls. When we built our new plant in Ghaziabad in 1996, it was the first completely air conditioned manufacturing plant. Even the second plant, which we built in 2006 was completely air conditioned. So that's how we started with the thought that it's the shopfloor environment which creates the value."

Today, the super shopfloor has multiple dimensions. "It is not just the smart machines that we need to have. Even the environment and the people who work on the shopfloors have to be smart. Their training, their skills, their feedback systems, the upgradation of the machines and, in fact, the entire ecosystem has to be part of the super shopfloor. Moreover, all this needs to be sustainable too."

He further added that the efforts of making smart workforce start from nurturing young minds. "It's the ecosystem that we need to work upon with the young people. The industry and academia working together will bring us the fruits of all the hard work and help us achieve what we all aspire to do so. I am really proud that we are really making it happen in India," Dhand mentioned.

The Engine **Downsizing Revolution!**

Standard carbide inserts are often only able to machine a few parts before failing. In many cases these tool breakage problems can lead to crash downs and machine and other expensive equipment damages.

Today's engines are becoming smaller, lighter, more economical and environment-friendly, increasingly refined and quieter, whilst delivering 25-30 percent more power and torque than previous generation power units.

The now ubiquitous Turbocharger plays a key role in ICE Optimisation. A turbocharger uses the engine's previously wasted exhaust gases to rotate a turbine that activates an air compressor. When propelled into the engine's combustion chambers, the resulting air/fuel mixture significantly increases the engine's performance, and vastly improves its efficiency.

An unwelcome consequence of the use of a turbocharger is that the heat generated increases turbine housing temperatures to 900°C in diesel engines, and up to 1100°C in gasoline powered units. As it is crucial that these components function efficiently at such high temperatures, turbine housings are manufactured from austenitic, heat-resistant cast steels, which have relatively high-creep strength, good thermal stability and excellent castability.

> "As it is crucial that these components function efficiently at such high temperatures, turbine housings are manufactured from austenitic, heat-resistant cast steels, which have relatively high-creep strength, good thermal stability and excellent castability."

This material solution would be perfect if turbine housings could be machined easily, however many turbocharger manufacturers face problems when using standard tools for machining turbine housings. Standard carbide inserts are often only able to machine a few parts before failing. In many cases these tool breakage problems can lead to crash downs and machine and other expensive equipment damages.

As a leading supplier to the global automotive sector, ISCAR's automotive department was called upon to assist in rectifying the above issues. Essentially, there were two main problems to solve: To prolong the life of the tool's cutting edge and to design special cutting tools to minimise the machining times of these complicated parts, which are being produced in millions all over the world.

Figure 1

Longer tool life minimises machine downtime and makes the process much more efficient. As a result ISCAR's R&D department has developed several advanced new carbide grades which are able to run at extremely fast cutting speeds. An unbeatable combination of our advanced new carbide grades, innovative cutting edge geometries and revolutionary pre and post-coating treatments guarantee that the tools' cutting edges last much longer and that machining times are slashed.

The MS32, one of the new grades is intended mainly to be used in rough and finish milling. A carbide substrate provides an excellent balance between hardness and toughness, in combination with a superior CVD coating MS32 provides new levels of abrasion resistance. This advanced new grade has been proven in dry, wet and even MQL machining environments.

For example, ISCAR's Ø100mm face milling cutter SOF45 8/16-D100-10-32R *(fig.1)*, equipped with 10 standard inserts S845 SNHU 1305…MS32 easily removes up to 6 mm stock of a Heat Resistant Austenitic Cast Steel at Vc=150 m/min and f=3mm/rev and reaches a tool life of 25-30 parts. Competitors' products barely achieve 12 parts per an edge.

Additional time savings are gained from the elimination of several standard operations by the provision of a single, combined and multifunctional tool. For example, the tool shown below on the right is able to perform 5 different operations; rough boring, filleting, finish boring, counter boring and chamfering in one single axial move. Assuming that each operation takes an average of 5 seconds off the machining time

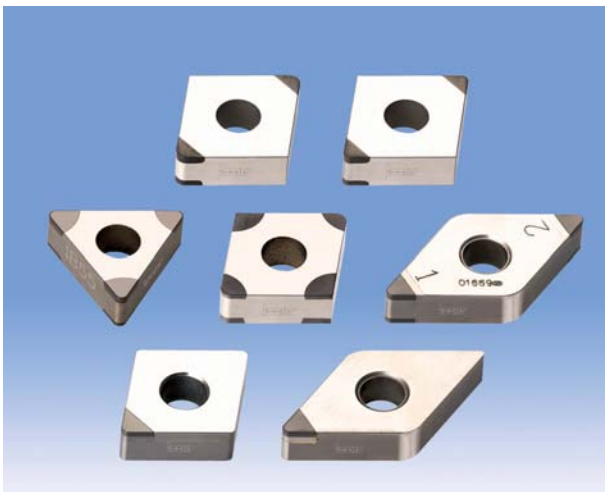


Figure 2

by using the illustrated tool, ISCAR can save 20 valuable seconds per cycle.

As a consequence of the above, additional unforeseen savings are also achieved by the elimination of tool changing times. Assuming that each tool change takes approximately 5 seconds, another 20 seconds from the cycle time is cut.

To summarise, by implementing such effective tools, we are able to eliminate 40 seconds from cycle times, which contributes directly to customer's profitability. These conservative figures do not take into account other advantageous factors such as energy savings, set-up times, machine and equipment amortization savings, etc.

Cylinder Blocks

Approximately 10-15 years ago, the most commonly used cast iron cylinder blocks were largely replaced by bi-metal blocks (aluminum blocks with inserted cast iron liners). Today, more and more car makers have replaced this method with thermal spray processes (or CBC – Cylinder Bore Coating), i.e. a special coating layer, which is applied directly on aluminum cylinder walls. There are a few different thermal spray methods: PTWA (Plasma Transferred Wire Arc Spraying), APS (Atmospheric Plasma Spray), TWA (Thermal Wire Arc Spraying), etc. These coatings deliver many advantages to engine/car performance, the two most important being:

1. Weight - Engines are much lighter without the presence of heavy cast iron liners.
2. Lubrication – Friction between cylinders and pistons is reduced due to the coatings' microstructures.

A major manufacturing issue with the CBC coating is that its hardness is relatively high and its thickness is relatively uneven. Therefore, a cylinder honing operation to achieve the final size can be a long and complicated process. ISCAR's engineers have targeted the honing cycle to enable these times to be minimized. They did so by first replacing a few time consuming rough-honing stages with one very fast boring operation. The tool is equipped with 4 to 6 ISCAR PCBN inserts, which are individually adjusted to a precise diameter.

PCBN enables operations to run at very fast parameters. For example, for boring Ø100mm cylinder we work at Vc=400-700 m/min and f=1-1.2 mm/rev.

In some cases, when the chip evacuation becomes an issue, the PCBN insert is designed with a dedicated chipformer on its top. When the boring operation is accomplished, the cutting edges move towards the cutter's center to prevent scratching the cylinder surface on exit. *(fig.2)*

There are two common mechanisms (depending on the machine): actuation by a linear draw bar, which has only two positions ('on' during the boring operation and 'off' during the feed out) and actuation by a fully numerically controlled rotation bar, which can change the tool diameter in real time. For example, for producing conical, barrel or other shaped holes for internal grooving or for bore diameter correction/compensation (due to the insert's wear).

"A carbide substrate provides an excellent balance between hardness and toughness, in combination with a superior CVD coating MS32 provides new levels of abrasion resistance. This advanced new grade has been proven in dry, wet and even MQL machining environments."

A key factor in the success of these operations is the selection of the appropriate PCBN grade related to the material being machined. The correct balance between the hardness and toughness of the grade has to be considered. Although using PCBN with coolant is not recommended, some automotive manufacturers insist on a wet machining process. In these cases, the machining environment (emulsion or oil coolant, MQL, dry machining, etc.) has to be considered. The cutting edge geometry derives from the machined material, cutting parameters and a depth of cut (T-land, E-land, S-land, sharp or honed edge, etc.).

Valves

The gas exchange valves, particularly exhaust valves, are always under intensive thermal loads. As previously mentioned, the temperatures of the exhaust gases reach more than 900°C, which constitutes a big challenge for valve materials and can lead to excessive wear and premature fatigue. A few leading companies have developed new technologies to solve this problem. One of these solutions is to gundrill the valve stem up to its head and to fill this cavity with sodium. During the engine's operation, the sodium absorbs the generated heat and melts.

(fig.3) ISCAR's solid carbide gundrills deliver outstanding surface finish, which is crucial for hollow valve applications. Diameter range: Ø0.9 – Ø16 mm (full solid carbide).

Figure 3

- Drilling accuracy from IT7
- Excellent straightness and concentricity
- Maintains high precision hole center alignment
- Surface roughness of Ra 0.4 - 1.6 µm can be easily obtained
- Reboring operations are often unnecessary

The shaking effect forces this liquid to move up and down along the stem, which dissipates the heat from the valve head to the stem and cools it. As a result, the valve head remains cooler and hence lasts much longer and the risk of valve burning, pre-ignition and detonation is reduced.

When undertaking these manufacturing operations, in order to enable the sodium to slide easily inside the valve stem, the surface finish of the internal cavity needs to be as fine as possible. For this particular application, we suggest working with gundrills with an integral tip and body made of solid carbide with either steel or a carbide driver. These drills are designed for conventional machines, machining centers, lathes and dedicated gundrill machines. They are available from Ø0.9mm, while providing superior rigidity and optimal coolant flow rates. As a result of being made of solid carbide, when compared to brazed versions, these gundrills can work with up to 100 percent higher feeds and speed parameters.

Our experts offer a very wide variety of gundrill geometrical shapes, which are designated for different drilling rates, hole accuracy and surface finish quality. The drill's shape, together with its profile must be matched to the workpiece material. In fact, this is exactly what our specialists did in this particular case.

However, selecting the correct gundrill geometry is only one important step towards a successful result. A suitable cutting edge treatment (rake face polishing and edge honing to the right size) improves the surface finish even more. It also improves the drill's performance and prolongs tool life. In addition, the gundrill body itself is being polished. It becomes very smooth and enables the chips to slide easily inside the gullet on their long evacuation. The best results in gundrilling hollow valves have been achieved by using one of ISCAR's finest submicron carbide grades IC08 that is protected by a AlTiN nano-layer PVD coating.

Camshaft

A relatively new concept for making much lighter (up to 45 percent) and remarkably cheaper camshafts, in comparison to the traditional method of machining from cast or forged bar stock, is assembling camshafts from modules. This system uses thermal expansion as the process principle, some OEMs fix pre-heated individual cams on to a pre-cooled precision steel tube. Others fix individual cams on to the steel tube then, by using hot air pressure, expand the tubes diameter in the places where it engages with the cams. In both cases, the lobes of each individual cam are precisely arranged in accordance with the geometry of the camshaft.

"A relatively new concept for making much lighter (up to 45 percent) and remarkably cheaper camshafts, in comparison to the traditional method of machining from cast or forged bar stock, is assembling camshafts from modules."

The individual cams are produced either from pressed and sintered powder metal or from hardened steels. As there are millions of these cam produced each year, manufacturers are eager to reduce machining cycle times to a minimum. As OEMs need to remain flexible, to react immediately to the frequently changing market and when possible - to spend less money - they prefer to invest in special cutting tools rather than purchase new machine tools.

In order to minimize cycle time in this area, We have developed a revolutionary concept – a single innovative insert that is able to complete the entire cam machining process. The remarkable insert is able to complete face turning, internal rough turning, internal finish turning and chamfering. The extremely durable, tangentially clamped insert faces all four operations, including cam lobe profile, at the highest possible cutting parameter with equal ease and completes the cam machining cycle within a few seconds.

For deep hole drilling in forged camshafts, ISCAR offers a different approach – a deep drill with an exchangeable carbide insert. This new idea brings many advantages to OEMs. It makes the process much more cost-effective when compared to using conventional gundrills. The standard insert is always available in stock, it has 3 cutting edges and it negates the need for re-grinding. The insert has a positive pressed chipformer and serrated cutting edges that split chips into multiple small segments, which reduces the machining torque (i.e. enables it to work with higher feeds) and improves chip evacuation. In addition, a small wiper at the end of the cutting edge provides

Figure 4

very fine hole surface. *(fig.4)* ISCAR's TRIDEEP drilling line (GD-DH…) holds IT10 tolerance field and covers a range of Ø 16-28 mm. A standard TOGT insert has three serrated edges that create thin and short chip segments for smoother cut.

These efficient, cost effective tools are highly recommended for deep drilling camshaft applications and can be used on both lathes and dedicated gundrill machines. The GD-DH drills are available at 10, 15 and 25 drilling lengths to diameter ratios. As tailored 'specials', We are able to produce up to 2400 mm long TRI-DEEP drills.

Pistons

Much shorter and thin walled (sometimes friction welded) steel pistons are lighter than the conventional examples and are able to withstand much higher loads than those made from aluminum. T-piston geometry becomes more complicated and requires new and creative engineering ideas for machining difficult to access surfaces. *(fig.5)*

Top photo: A special tool for machining four piston ring grooves in one plunging operation.

Bottom photo: ISCAR's profiling tool with precise and easily replaceable GRIP type insert machines, hardly accessible and a complicated combustion bowl on the upper part of a piston.

Our goals in machining steel pistons are:

To reduce the number of tools needed in order to shorten expensive cycle times. This requires a high level of creativity due to the fact that the machined areas are relatively hard to access. Although the tool has to be thin enough to penetrate into the piston without collision, it has to be strong enough to withstand high cutting forces. ISCAR's GRIP line products provide the required rigidity and versatility. The user-friendly insert clamping concept that doesn't have removable parts, generates very high gripping forces that secure the insert in the tool pocket even when cutting directions are being changed, i.e. the tool is able to perform face grooving, right- and left side turning and profiling operations (without vibrations) and to leave a smooth and shiny surface.

Also, to efficiently evacuate chips from the complicated cavities, we provide a wide variety of chipbreaking geometries that split chips into small segments and allow quick removal.

To prolong the life of the cutting edge. A short tool life means a high number of machine stops, i.e. – inefficient machining. However we have proven that the use of its Jet HP concept, which brings a high pressure coolant jet right to the cutting zone, has delivered much improved life per a cutting edge. In addition, the Jet HP coolant method contributes to an efficient chipbreaking process.

Automotive manufacturers' timeframes for launching new platforms and models become shorter every year, therefore OEMs continuously pressurize Tier 2 and 3 suppliers with demands for ever shorter delivery times. Although the majority of ISCAR's automotive projects are designed at its headquarters, the company's logistics coordination pays special attention to the requested lead times. ISCAR has production facilities all over the world, and in many cases, for the manufacturing of special tools in the shortest possible time, we choose a facility that is closest to the customer's location. In addition to the time and logistics aspects, this concept brings many economic

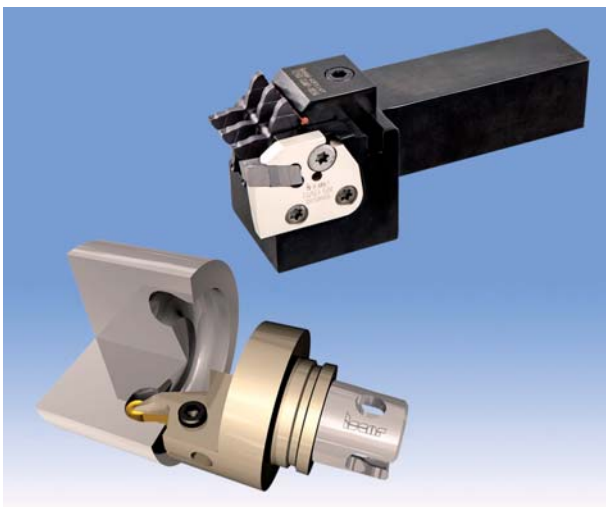


Figure 5

advantages (less tax, lower shipment costs, etc.).

Our skilled and experienced specialists provide outstanding support and service all over the world. Our teams accompany customer production processes until the final run-off completion and full project acceptance.

The environmental restrictions for much cleaner manufacturing play an important role in today's market. Our contribution to building a better world today and in the future includes offering efficient carbide recycling program, longer lasting tools, products with reduced power consumption characteristics and the supply of MQL compatible tools.

Source: ISCAR

Walter BLAXX milling cutters with cryogenic cooling: Other channel diameters and orientations required a complete redesign.

Cryogenic machining

Titanium aluminides are materials of the future for power plant construction. They are only around half as heavy as nickel-based alloys, yet are able to withstand high temperatures. The drawback: They are difficult to machine. But this can be addressed.

Titanium aluminides are materials of the future for power plant construction. They are only around half as heavy as nickel-based alloys, yet are able to withstand high temperatures. The drawback: They are difficult to machine. This is where Walter AG's special tools come in. These have been developed to provide cryogenic cooling directly at the cutting edge. This extends tool life by approximately 70 percent.

Energy efficiency is at the top of the agenda in all industry sectors. Two approaches that seem particularly promising are raising the temperature in energy converters and reducing weight. We are seeing research laboratories engineer a growing number of innovative materials that meet precisely these requirements. The challenge: Often, these materials are so tough that it is nigh on impossible to machine them with conventional tools and machining concepts. The need to change tools every minute, coupled with the complexity of full jet cooling using emulsion, drives costs skywards.

The machining experts at precision tool manufacturer Walter, based in Tübingen, Germany, identified this trend some years ago now, and set to work on finding solutions to this problem. "Cryogenic machining using carbon dioxide as a coolant is now at a commercially viable stage," says Thomas Schaarschmidt, Director of Business & Application Development at Walter AG. In collaboration with a number of machine manufacturers and the Institut für Produktionstechnik [Institute for Production Engineering] (IfP) at the West Saxon University of Applied Sciences of Zwickau (WHZ), Walter has been able to demonstrate that this technology is suitable for use in machining turbine blades for generating energy, titanium structural components for the aerospace industry, and turbochargers for the automotive industry.

Cryogenic machining is ideal for machining titanium aluminide

Titanium aluminide, also known as gamma titanium, is the material of the future for gas turbine blades in the aerospace industry. It comprises intermetallic compounds of titanium and aluminium, developed by the Max Planck Institute for Iron Research in Düsseldorf and the Helmholtz-Zentrum Geesthacht [Helmholtz Centre in Geesthacht]. This material is causing a stir amongst aviation engineers: Although it weighs less than half as much as the nickel-based alloys used to date (with a density of between 3.8 g/cm³ and 8.5 g/cm³), titanium aluminide is able to withstand the high temperatures found in the power plants and is creep-resistant.

In power plant turbine blades, keeping the weight low is particularly important as the increase in centrifugal force relative to weight is quadratic, which is to say that if the weight is halved, the centrifugal forces will be reduced to a quarter of

their starting value. This explains why this material is also the preferred material for low-pressure turbines, as they have the largest diameters. The discs to which the blades are attached thus can be designed to be more lightweight. The power plants become more streamlined, and the entire aircraft becomes lighter, needs less fuel and flies more efficiently. Additionally, the reduced fuel consumption results in lower CO2 emissions.

The only drawback is the fact that the material is extremely difficult to machine. "The tool wear rate is ridiculously high – tools last around a minute at most," relates Lucas Günther (Dipl.-Ing. (FH)), Scientific Assistant in the Machining research group at the IfP. Led by Professor Dr. sc. techn. Michael Schneeweiß, the team's research focuses on machining turbine blades and developing tools and cutting materials. Cryogenic machining seems to be the perfect solution for machining titanium aluminide. According to Thomas Schaarschmidt, "Abrasive materials and materials that are difficult to cut, such as gamma titanium aluminide and high-strength titanium- and nickel-based alloys, are a key issue in the aerospace industry, and are an ideal application for cryogenic cooling."

Time is of the essence, as mass production using the material has already begun at turbine-manufacturing facilities. The Airbus 320neo is the first aircraft to be fitted with titanium aluminide turbine blades. Manufacturers are currently having to make do with conventional emulsion and high-pressure cooling technologies. In Lucas Günther's words, "Due to the extensive system equipment required, the cooling lubricant procurement costs, and the costs of care, maintenance and disposal, however, this proves to be very expensive. Not only that, but the use of these technologies is potentially hazardous to human health and harmful to the environment. This stands in contrast to carbon dioxide, which is relatively simple and cost-effective to deliver where it's needed and then extract again afterwards." As Thomas Schaarschmidt says, once word got out about CO2-based cryogenic machining in the first few publications, the demand from the aerospace industry, as you would expect, was huge.

Hot and cold

The challenge that engineers face when working with titanium aluminide is this: On the one hand, high temperatures are more conducive to machining, as the material starts to soften a little above 750 °C, making it easier to machine. On the other hand, the heat that is generated causes tools to wear extremely quickly, which is why it is so important to ensure that the cutting edge, which is subjected to significant stress, is cooled as directly as possible. Two processes are currently in the running to be used for cryogenic machining in mass production: The first is cooling using liquid nitrogen, and the second is cooling using dry ice (frozen carbon dioxide). The key difference is the temperature at which the two substances exist in their respective states. Liquid nitrogen will be at a temperature of approximately -195 °C, whereas CO2 will be at a temperature of -78.5 °C.

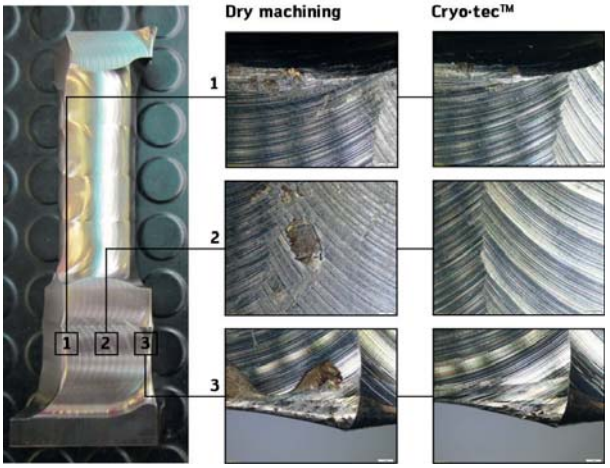
"Our findings showed that CO2 cooling increases the metal removal rate by 70 percent."

Thomas Schaarschmidt,
Director of Business & Application Development at Walter AG

For Lucas Günther, dry ice is the clear favourite: "Due to the extremely low temperature, nitrogen requires a specially adapted machine concept in order to integrate the cooling system, as well as significant insulation to prevent the machine tool from icing up." In addition, nitrogen is several times more expensive than the "industrial waste product carbon dioxide, which just needs to be compressed." Because -195 °C is such a low temperature, there is a risk of thermal shock occurring if the wrong amount of coolant is delivered. "This may result in cracking in the tool's cutting edge, whereas CO2 is easier to deal with and its cooling effect is perfectly adequate," continues Lucas Günther.

To ensure that the dry ice is delivered as near as possible to where it is required on the cutting edge, Walter has worked with a number of technology partners to develop a two-channel delivery system via the spindle and tool. Schaarschmidt says: "One channel conveys the CO2, and the other conveys the lubricant, compressed air or emulsion directly to the cutting edge." Unlike external delivery systems, this barely cools the workpiece; the temperature required to make machining less difficult is therefore easier to achieve.

The use of a CO2 channel entails certain strict requirements, however. Between the gas cylinder and the tool,



When viewed side by side, the improvement in the workpiece's surface quality is evident.

in order to maintain a pressure of 57 bar at room temperature, the diameter of the channel must not deviate from a precisely defined value, "otherwise the liquid gas will expand and the channel will ice up immediately," explains IfP expert Lucas Günther. At both the IfP and at Walter in Tübingen, an Aerosol Master 4000cryolub system from Rother Technologie GmbH & Co. KG is used for supplying the CO2 and cooling lubricant. It combines the aerosol dry lubrication technology (ATS) developed by Rother with cryogenic cooling technology. Depending on requirements, it can be used to adjust the supply of liquid CO2 or aerosol as required, meaning that the supply can be adapted according to the component and material. "Controlling the amount of coolant delivered allows us to very precisely control the degree of cooling," says Thomas Schaarschmidt.

Time-tested tools now with cryogenic cooling

Walter is offering the required tools as custom solutions, tailored to individual needs. "Our customers can order all our time-tested tooling systems, such as Walter BLAXX milling cutters, for cooling with CO2. At the moment, this is a semi-standard option, but there are plans to develop it into a standard option in the future, with prices comparable to those for standard tools. "In the long term, we plan to make these tools available to our customers via our Walter Xpress special tools delivery service," promises Schaarschmidt.

> "Abrasive materials and materials that are difficult to cut, such as gamma titanium aluminide and high-strength titanium- and nickel-based alloys, are a key issue in the aerospace industry, and are an ideal application for cryogenic cooling."
>
> **Thomas Schaarschmidt**

Every bit as important as cutting edge cooling is adopting the right machining strategy: "Together with the IfP, we have accumulated a wealth of experience in order to cope with the change in temperature conditions in the shear plane. For example, long cuts are significantly more effective than broken cuts, so the machining strategy should be adapted to incorporate long, continuous cuts as far as possible." Walter is working on new cutting materials specifically designed for cryogenic machining, which may also bring about improvements.

Industrial mass production cannot take place without taking occupational and industrial safety and process reliability into account. Although the amount of CO2 generated during machining is far below harmful limits, the use of CO2 still requires a safety concept that can be implemented in the event of leaks. "For this reason, we established a working group with Walter and 14 other companies from various sectors. The aim of this working group is to create and document regulations and technical solutions for the safe operation of machine tools with CO2 cooling. This is a crucial prerequisite that must be fulfilled before cryogenic machining can become widespread in industry," says Lucas Günther.

"Titanium aluminide is causing a stir amongst aviation engineers: Although it weighs less than half as much as the nickel-based alloys used to date (with a density of between 3.8 g/cm^3 and 8.5 g/cm^3), it is able to withstand the high temperatures found in the power plants and is creep-resistant."

Turning with great potential

When they first started working together, the IfP and Walter examined turbine blade and turbine disc materials that were typically milled: High-alloyed nickel steels. Thomas Schaarschmidt says: "Our findings showed that CO2 cooling increases the metal removal rate by 70 percent without increasing the tool wear rate. Conversely, by maintaining the same metal removal rate as you had without the CO2 technology, the tool life would be extended accordingly. We were also able to demonstrate this for turbocharger materials for the automotive industry and titanium structural components manufactured from TiAl6V4. "We are currently broadening the scope of our research: We are now systematically investigating which processes and materials CO2 cooling might benefit," says Lucas Günther.

Other than milling, turning currently appears to have the greatest potential. "Even with relatively simple steels such as 42CrMo4, we are already seeing a 25 percent increase in tool life compared with conventional dry turning," says Schaarschmidt.

Source: Walter AG

Low weight, easy assembly and cable-friendly design

Due to the modular design, the E4.1L energy chain can be adapted to any specific application. As an open standard version for cable routing, with brackets for hoses, or enclosed in a chip-resistant tube in a guide trough – just three of many customising options. *(Source: igus GmbH)*

Optimum use of installation space, light weight and high stability – these are just some of the benefits of the E4.1L energy chain from igus, which is now available in new heights and widths from stock. Compared to the E4.1, weight can be reduced by 30 percent, with this light version, meaning that the chain is well suited to highly dynamic applications. It was developed especially for unsupported applications; long gliding travels are also possible with the e-chain.

The E4.1L of the motion plastics specialist igus combines the strengths of different series of chains from igus and also has a design that is very kind to all the surfaces in contact with the cables. "Rounded edges of the crossbars and separators of the chain ensure a long service life of hoses and cables," explains Harald Nehring, authorised representative for e-chain systems at igus. "You can therefore call E4.1L an energy chain in which the moving cables feel at ease." In addition to the rounded surfaces that come in contact with cables, gridding and positioning scales are used for the best possible separation of the chain. Along with the easy assembly and high stability it displays its strengths especially in fast unsupported applications, such as in automation or in machine tools.

> "Rounded edges of the crossbars and separators of the chain ensure a long service life of hoses and cables."
>
> **Harald Nehring,** authorised representative for e-chain systems at igus

Technical tricks for design freedom

The simple snap-open mechanism of the crossbars in the outer and inner radius ensures a quick filling of the e-chain. The captive crossbars, which can be opened with a screwdriver, open by 115 degrees and latch into final position. If necessary, they can even be removed completely, placed again and closed by simply pressing in. The patented positive-fit tongue and groove of the chain links and the double stop dogs with large stop surfaces that allow a high degree of stability were carried over from the heavy duty E4.1 chain. Here a 'brake' also ensures a lower rolling noise and a very smooth chain travel. Due to the variable mounting of the outer links, the chain can be installed either with or without camber. This is a decisive advantage especially in limited installation space, such as in machine tools.

Perhaps the best e-chain in the world

Compared to E4.1, the application-oriented design of the E4.1 L could save so much mass that the chain is about 30 percent lighter. This brings an additional advantage: "In this way, users save not only a lot of drive power," says Harald Nehring. "It can also accommodate more hoses and cables in a given space envelope – all these advantages perhaps make the E4.1L the best e-chain in the world." The energy chain is now available from stock in more interior heights between 31 and 64 millimetres and new widths, as well as fully enclosed options for the protection against chips. As for the open energy chain, igus also has an ESD version and even a high-temperature option for the enclosed energy tube.

> Due to the variable mounting of the outer links, the chain can be installed either with or without camber.

For more details, contact: Harish Booshan, Product Manager, E-ChainSystems® & ReadyChains®, igus (India) Pvt. Ltd., Email: Harish@igus.in; Website: Visit us on www.igus.in

A perfect finish as part of the milling process

In mold making, the combination of ultra-precision machining centers and SCHUNK TRIBOS polygonal toolholders achieve perfect surfaces.

Straightaway to a perfect finish and perfect quality: What in the past would have been hardly conceivable in milling is now becoming a regular trend due to modern machine concepts and tools. The number of precision applications in which milling is no longer followed by grinding, polishing or eroding is growing continuously. In these applications the toolholding systems perform several tasks: they ensure exact run-out accuracy of the tools, compensate vibrations, and guarantee both high geometric precision and perfect surface quality.

Whether in the watch and clock industry, machine making or medical technology: in virtually all machining disciplines, companies are searching for efficient ways to streamline processes. Especially manufacturers who use ultra-precision machining processes, in which the engravers and finishers put the final touch on surfaces by hand, are pioneers in this respect. In view of machining times of up to 100 hours for a single workpiece, investments in innovative machine concepts, air bearing spindles, and modern tools pay off quickly – assuming the high precision of the machine is retained all the way to the cutting edge. The toolholding systems play a decisive role in this connection.

Mirror finishes with precise geometry: The levels of quality that can be achieved with precision machining nowadays fascinate even experienced users. Often the quality that can be achieved is equal to the results of eroding, grinding, polishing or laser-beam machining, yet much faster and therefore more economical. Test series with an aerostatically surface guided ultra-precision machining center at the ETH Zürich show that a consistent surface quality of Ra < 25 nm can be achieved with line-by-line milling, and Ra < 3 nm with surface milling. These levels of quality correspond to polished surfaces, and also exhibit high-precision geometry. While injection molds for high-gloss plastic parts in the past were first milled and then finished using an intricate polishing process, today it is possible to produce objects with extremely flat and smooth surfaces during the precision machining process. The effect is even more pronounced in the case of non-ferrous metals: through milling alone with diamond tools, it is possible to achieve geometrically precise mirror-finish surfaces that are suitable for use in laser optics, for example. The result is a combination of several effects: the time-consuming process of finishing is reduced significantly, while reducing the risk of convexities occurring or corners being rounded during grinding and polishing.

Wear-free clamping: Conventional toolholding systems, such as collet chucks or heat-shrink toolholders, generally are not capable of such demanding machining tasks. Users repeatedly complain of chatter marks, damaged tools, imprecisions in the workpiece and concentricity errors, which are caused by minute contamination of the clamping faces. However, SCHUNK TRIBOS polygonal clamping technology features special properties: even the standard version of the patented technology from SCHUNK, the competence leader for clamping technology and gripping systems, achieves run-out and repeat accuracy of < 0.003 mm with an unclamped length of 2.5 x D, and a balancing grade of G 2.5 at 25,000 rpm. Since TRIBOS polygonal toolholders have no moving parts, they are not mechanically sensitive, and therefore ensure virtually maintenance-free and wear-free clamping. Even after several thousand clamping set-ups there is no material fatigue. In addition, they feature excellent vibration damping. With a hydraulic toolholder, tool change is achieved with minimal

cleaning within a few seconds, to ensure a stable process. Depending on the type, the toolholders, which are suitable for all tool shanks in h6 quality, have been tested at speeds up to 205,000 rpm. Even tools with very small shank diameters starting at 1 mm can be clamped and changed while maintaining process stability.

Reduction of chatter marks in volume machining: That toolholders also have a significant effect on the surface quality in volume machining was confirmed in a study by the wbk Institute for Production Technology in Karlsruhe, which was conducted under the supervision of Prof. Dr.-Ing. Jürgen Fleischer and presented in 2014. Different toolholders were tested in full slot and half slot milling on several machines. It was demonstrated that the SCHUNK high-performance hydraulic expansion toolholder TENDO E compact achieves up to 300 percent longer tool life than a comparable heat shrink holder. Especially noteworthy: with only one exception the SCHUNK TENDO E compact hydraulic expansion toolholder always achieved better surface qualities than heat shrink toolholders. The deeper the grooves, the stronger was the effect of chatter marks. The damping properties of hydraulic expansion tech¬nology results in longer tool life as well as significantly better surface quality. Even at an identical surface quality it is possible to achieve higher cutting and feed rates.

Effective double for 5-axis machining: For high-precision 5-axis machining SCHUNK TENDO E compact hydraulic expansion toolholders, and SCHUNK extensions can be combined to produce extremely effective clamping units. In the case of minimal interfering contours the hydraulic expansion toolholders provide strong support for the extensions while damping the vibrations that occur during machining. The combination of run-out accuracy, and vibration damping protects the tool cutting edge, lengthens the tool life and provides for brilliant workpiece surfaces. For stable tool change, TENDO hydraulic expansion toolholders require only a conventional Allen key; for TRIBOS SVL, a simple, manually actuated clamping device is sufficient. The entire clamping process is completed within a few seconds. Both clamping devices are maintenance-free and insensitive to impurities.

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New 40-ton electric press brake to product line

LVD Company nv has expanded its Dyna-Press Series of compact, high-speed electric press brakes with the addition of the Dyna-Press 40/15 Plus, a new 40-ton model that offers a working length of 1530mm featuring a precision four-axis back gauge and LVD's exclusive TOUCH-B touch screen CNC control.

Like the other Dyna-Press models in LVD's product portfolio, the new Dyna-Press 40/15 Plus is designed to efficiently bend parts at high bending speeds of 25 mm/s, producing more parts per hour at a lower cost per part. The coupling of the ram and servomotors is realized through two heavy-duty ball screws to distribute force and tonnage evenly across the working length. The electric ram offers smooth transition from approach to working speed and minimizes power consumption through the use of an optimal power to inertia motor ratio.

More bending force & flexibility: In addition to the fast acting ram and higher bending force, the newest Dyna-Press provides impressive production capabilities with extremely consistent repeatability and accuracy, as well as the flexibility to handle a broader range of parts through a precision four-axis back gauge.

Fast setup with touch control: LVD's TOUCH-B 15-inch touch screen control makes setup fast and efficient. The CNC control minimizes operator input and makes part programming easy and intuitive. With minimal input, the operator can create 2D and simulate in 3D on the 15-inch touch screen. The LVD TOUCH-B control also offers network connection with LVD's CADMAN®-B programming software for added flexibility.

Designed for ergonomics: The Dyna-Press 40/15 Plus is ergonomically designed, an adjustable work height gives the operator the option to work in a seated or standing position. A self-levelling base and adjustable-height foot pedal adds to the machine's ergonomic design.

A versatile choice: LVD's new Dyna-Press 40/15 Plus joins the Dyna-Press 12/8, 24/12 and 24/12 Plus models. All Dyna-Press press brakes offer the flexibility of tooling choice. An extensive range of upper and lower tools are available: for punches, Universal, W style or US style; for dies, Universal, LVD style or US style.

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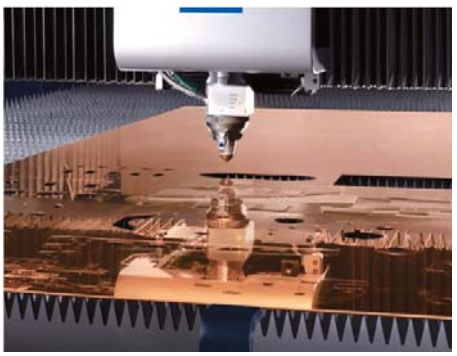
Software for profiling



With over 39 years of experience, Radan successfully drives thousands of profiling machine tools worldwide. Designed to seamlessly integrate with Radpunch, the Radan punch/profile solution delivers optimisation for punch, profile and combination machine tools. This formidable combination will expand with a customer to program all their future punch, laser, plasma, router and combination machine tool investments from one system. Radnest extends Radprofile functionality to provide true shaped nests which produce high utilisation, manufacturable nests from sheets, off-cuts and remnants, delivering substantial savings in material.

Radan3D is a high performance 3D modelling package designed to make sheet metal design accurate and simple, with the manufacturing process in mind. Typical issues such as bend allowance and corner relief are all taken into account with Radan3D. 3D parts are automatically developed for onward processing into Radpunch, Radprofile or Radbend, ensuring a smooth and efficient workflow from design to manufacture. Radan3D works the same way sheet metal engineers think, providing an easy to use 3D modelling system for your current and future 3D requirements.

Radraft provides users with a comprehensive draughting solution for drawing preparation and all 2D geometry manipulation. With many advanced features and an easy-to-use graphical interface, Radraft is flexible and cost effective. Radtube is a multi-axis laser system for rotary and multi-axis cutting machines developed specifically for tube cutting and manipulation industry.

Radm-ax is an industry leading 5 axis laser system developed specifically for the sheet metal engineering, automotive and aerospace industries.

All profiling solutions are machine independent and support all major manufacturers.

3D ScanArm for reverse engineering and CAD-based design applications

FARO Technologies has launched the FARO Design ScanArm, a portable 3D scanning solution tailored for 3D modeling, reverse engineering, and CAD-based design applications across the product lifecycle management (PLM) process.

As a limited-time promotional offer, the FARO Design ScanArm will be bundled with 3D System's®Geomagic® software at a reduced launch price. The available software options have capabilities that range from an automatic meshing software that delivers ready-to-use files without any post-processing to a full-featured reverse engineering software that combines history-based CAD with 3D scan data to create feature-based, editable solid models compatible with all major CAD platforms.

"The FARO Design ScanArm was purposefully-engineered to meet the needs of the Product Design market," stated Dr. Simon Raab, President and CEO, FARO Technologies. "By combining FARO's best-in-class 3D scanning technology with 3D System's Geomagic software offerings, the Design ScanArm provides a turnkey solution that allows users to quickly digitize any part or object, easily design or modify reverse engineered models, create manufacturing-ready CAD models, and verify design intent of prototype products."

The FARO Design ScanArm features optically-superior blue laser technology with fast scanning speed to deliver high-resolution point cloud data and the ability to seamlessly scan challenging materials without the need for spray or targets. The device is lightweight and maneuverable for convenient desktop mounting in the design studio or engineering lab. The Design ScanArm features a simplified user interface that makes it easy to operate regardless of skill level or 3D scanning experience.

Dr. Raab added, "Through a deep understanding of our customers' workflows we can ensure that FARO's solutions are optimised for application-specific demands and, as such, our customers are not forced to pay for features that do not add value to their processes. It is this engineering philosophy that allows the Design ScanArm to be aggressively priced for rapid return on investment without sacrificing any required technical capability." The FARO Design ScanArm is the ideal 3D scanning solution for any organization that may have the need to manufacture parts without existing CAD models, develop aftermarket products that need to fit tightly with existing products, reverse engineer legacy parts for design changes or replacement, create digital libraries to decrease inventory and warehouse costs, design aesthetically pleasing, freeform surfaces, or leverage the power of rapid prototyping.

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