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The official magazine of Indian Machine Tool Manufacturers' Association

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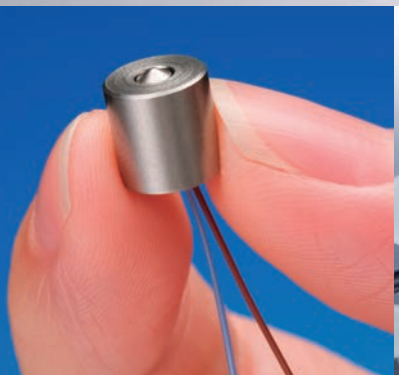

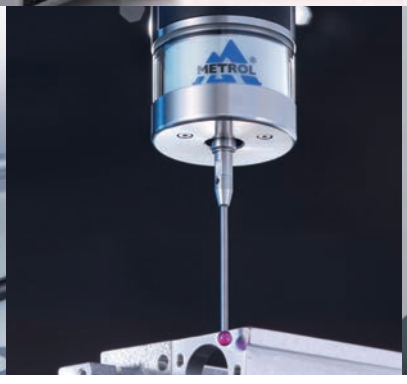

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L Krishnan
President, Indian Machine Tool Manufacturers' Association (IMTMA) and
Managing Director, TaeguTec India Pvt Ltd

Renewed Promises, Hopes…and New Resolutions

Wishing you all a very Happy New Year!

Someone rightly said "History repeats itself." This time it is clearly evident, as we are repeating the same calendar of 1947 – the year of both freedom and anniversary – when our beloved nation regained its independence and our dear association celebrated its first anniversary.

This year, I am even more joyful as 'Modern Manufacturing India' (MMI), our official magazine, is also celebrating its first anniversary. I extend my hearty congratulations to the dedicated team working for the magazine.

As we look back, we feel proud that the machine tool industry has come a long way. Since independence, the industry has been growing and has now become an important supporting base for the entire manufacturing sector. The machine tool industry has developed rapidly with the advancements in technologies and products in the recent years, and the growth has really been exponential.

Indian Machine Tool Manufacturers' Association has been working along and guiding the machine tool industry as it aspires to become globally competitive. With IMTEX Forming 2014 and The International Seminar on Forming Technology around the corner, the association has a lot on the cards for the industry.

To say a few words about MMI, it can be said that the magazine has taken a measured approach to the big picture: Rather than telling readers everything that happens on the technology front alone, it has gone beyond technology. This edition of MMI is dedicated to forming industry and its latest trends.

We have a busy 2014 ahead of us as there are bigger challenges and distant milestones to be achieved. We aim to accomplish our vision and mission to establish our industry at par with global standards and create a place among the top five machine tool manufacturing nations – "Together we can and we will achieve this goal."

Recent stabilization in Rupee levels and a steady picking up of orders in the machine tools segment add reasons to revitalize hope for the election year 2014. The industry will see its best days yet and your association stands resolute behind the industry.

I once again wish all the readers a prosperous New Year and invite you all to IMTEX Forming 2014 and ToolTech 2014.

Enjoy reading!

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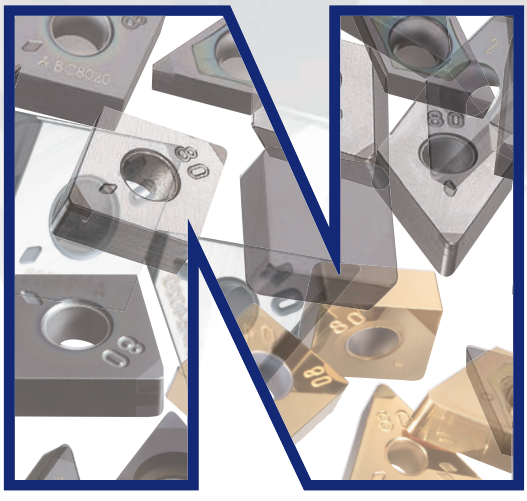

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Reflection…goals!

Sincere thanks to YOU: the reader, the contributor, the patron, the association, the government and everyone who contributes to the goals of this industry, the profession and yourself. We made it only with your support!

With the new year and the 1st anniversary of Modern Manufacturing India (MMI), all of us have hopes, aspirations in a market that is yet to be ideal. Having experienced this, we still have goals in the business context, which ironically are based on the reflection, of the time gone by.

Reflecting on the past year, MMI feels that we need to focus on segments that differ from traditional markets where we see potential, while we definitely cannot lose grip on the markets we have established locally.

With respect and having opinionated, we also clearly feel that we need to focus and strengthen the 'Made in India' brand if we have to succeed as an industry, nation and a company in this competitive global village. To help us achieve this common objective, we must share our successes, innovations with the user segments in India and globally and herein our goals completely fuse into each other.

While we can go on, please do look on us as 'your partner medium'.

The team from IMTMA and MMI is always available at your service and call! In your success rests ours!

Best wishes and regards to each one of YOU for a successful 2014!

PN

In confidence: Please feel free to share your successes and branding concepts with paresh.navani@vogel.de OR call me on +91 22 25644469.

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Soumi Mitra
Editor
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Action, the Key to Success

Today, while revisiting our year-long MMI journey, I find myself engulfed in a saying that strongly emphasizes on how without faith, nothing is possible. Yet, at the same time with it, nothing is impossible.

On this occasion of the first anniversary, I take the privilege to thank all of YOU our readers, patrons, office bearers, association members, colleagues, Indian Machine Tool Manufacturers' Association, our partners - Gardner Business Media Inc, ETMM, and many more. The list actually is endless. Thanks to your trust and contribution, MMI is an astounding success.

"Realizing that one's action is the only foundational key to success, we believe that focusing on appropriate actions makes a huge difference."

Realizing that one's action is the only foundational key to success, we believe that focusing on appropriate actions makes a huge difference. We also value all the enriching experience we have gathered through our interactions with you. Hence, as noted by respected industry members, with a conservative approach and your support, we strive to deliver better than before.

On this note, we present to YOU our 1st anniversary issue packed with the latest technology articles and application stories on varied areas of the industry. I am sure you will find this an interesting read.

As always we solicit your valuable feedback and comments.

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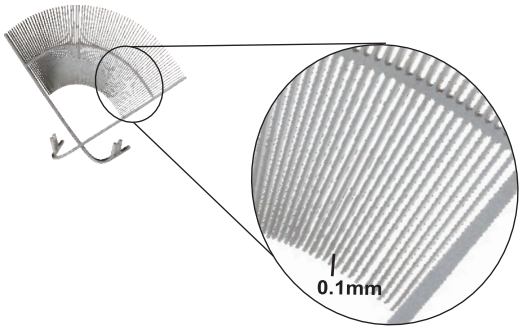

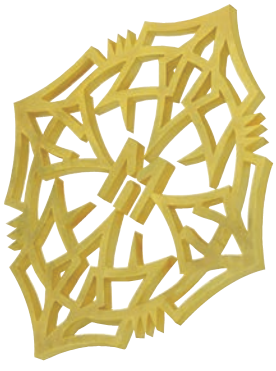

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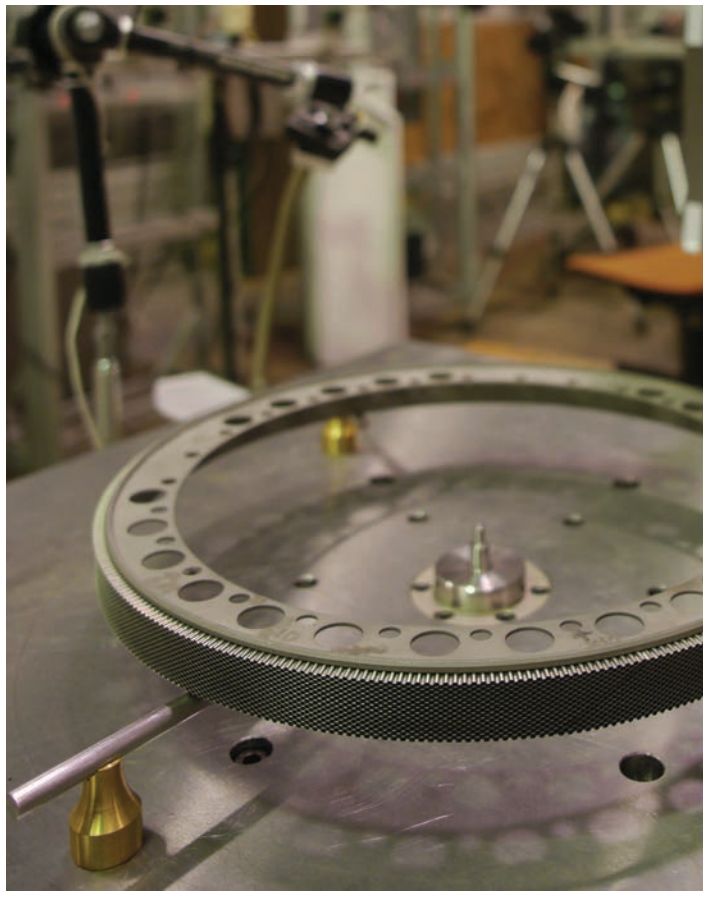

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Charting the Right Path!

"Successful companies, I believe, convert the vision into a working mission statement, which is a strategic tool that helps internal people focus on the objective at hand."

CEO, Micromatic Machine Tools Pvt Ltd, TK Ramesh

For any organization, it is important to have a vision of success that is understood across all parts of the business; inspires engagement and action. Any group effort requires all to be sure of their priorities, decisions and actions; if not, there is little chance of arriving at the destination. Understanding this need, many companies organize workshops wherein consultants are engaged to develop corporate vision and mission statements that state their ultimate goals.

The result is often long, flowery, well-written prose that sounds nice and has a feel good factor. Yet, few people outside the senior management really know the big picture or understand how their particular job or initiative affects the organisation's objective as a whole. A good portion of corporate vision and mission statements are feel good expressions developed for external consumption that adorn company walls. These statements do not help in directing employees across the enterprise.

Need for a working mission statement

Successful companies, I believe, convert the vision into a working mission statement, which is a strategic tool that helps internal people focus on the objective at hand. It defines what needs to be done in a single line that is simple, easy to remember and aids all the people to do their part on a daily basis.

It is essential that organizations have a working mission statement, i.e. a simple sentence along with a brief that is easy to memorize. This will firstly provide focus and define what the group is trying to achieve and how it is to be measured, and secondly, will reduce the number of dropped opportunities and bad decisions taken.

It is often seen that well-meaning individuals working on their own agendas, with only a vague idea of the company's larger goals, have greatly damaged both the morale of other employees and the company's overall ability to succeed. This is especially true of mid-sized organizations working across many locations where individuals or small groups have opportunities to carve out islands.

How does one go about creating a working mission statement and its brief?

There are three steps to building a working mission statement:

- List two or three ideas that you think sum up your job activities
- List a core principle for which you will stand
- List who you are working to help

For instance,

- If you are the branch manager of a machine tool sales service outlet, three ideas that sum up your job activities could be:
  - Have information on a wide range of machinery to meet SME needs
  - Provide quick and friendly customer service
  - Operate a clean and inviting office
- The core principle for which one can stand for could be excellence
- And who you are working to help could be the SME customers

Now putting it all together, the working mission of our branch is to have up to date and quality range of machines; provide quick and friendly customer service; and operate a clean, safe and inviting office, with excellent service for our customers.

Would it not make a difference if every member of the team could recite this working mission by memory and then perform his/her job in accordance with it on a daily basis?

Charter of operations

Linking departmental missions across an organization and making it the foundation of the organization's business plan is the charter of operations. This is another important document that must be in place in a simple, measureable and easy-to-relate form. This document needs to define the areas in which one operates, list tasks that will be accomplished, define how success is measured and give warnings about issues beyond control that could stop or slow progress etc, in specific terms.

Realizing the vision

Day-to-day operations in all companies can be realistically described as a state of controlled chaos. The sense of direction is often lost as personnel are often rushing to meet deadlines and have heavy workloads with time constraints. The working mission statement and the charter of operations work because they give the group a simple, yet big picture of what is at hand on an everyday scale. It may seem redundant, but having a view of the charter on a single page tacked over every person's desk as ready reference, does lead the company in the right direction. MMI

The views expressed by the author are personal and he can be contacted at rameshtkr@gmail.com

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MAKING THE RIGHT MOVE?

Choosing the right automation solution can be tricky. Following the crowd may actually bring about more challenges than results. In order to help make the right choice, Siemens along with Vogel Business Media India is hosting a forum wherein end-users are facilitated in taking apt decisions.

The volume of operations in my plant is medium. While robotic automation is a boon for high-volume production, can this technology work wonders for low-volume production?

Robotic automation is undoubtedly a boon for high-volume production sectors, especially the automotive industry. Robots are also used across industries for welding, handling and dispensing activities. There are various benefits like increased productivity, profitability and guaranteed sustainability of industrial production. Most importantly, manufacturers can eliminate the probability of hazardous, monotonous or filthy working conditions.

However, robots have proved beneficial for lean manufacturing processes as well as for large and small manufacturers. Lean manufacturing techniques implemented by robots are cost-effective when it comes to large production problems. Robotic applications can also prove beneficial for low-volume complicated tasks such as manufacturing and assembling of large components. This can be effectively done by robots in lesser time,v with more accuracy. For instance, machining of fuselage parts, an aircraft's main body section, can easily be done using robotic applications without employing huge machines that are expensive and non-flexible. The robot easily moves over the surface of the fuselage and gives flexibility to vary the fuselage dimension as per requirement. Such applications like machining or tape-laying of a fuselage generally requires six to eight weeks. With an automated robot, this task can be completed within a timeframe of one to two weeks.

Therefore, certain low-volume, yet complicated, production tasks can be carried out using robots, which in turn reduces time to the market of such complicated products. Thus, if implemented successfully, robots can be used to introduce lean manufacturing benefits in low-volume production activities as well.

Head of Plant, an automobile company, Pune

I currently have islands of automation in my packaging plant. I wish to opt for an integrated solution. Is there any check list that I need to consider when doing so?

From an end-user's perspective, here is a simple three-point check list that can be followed before automating any process:

- Whether the automation concept offered and technology used is well-proven
- Whether Fieldbus Network used in the scheme of the solution is Ethernet-based with appropriate key performance parameters like deterministic nature of communication, isochronous communication capabilities and real-time communication
- Whether all key components in the prescribed automation solution like PLC, safety functions if needed, HMI/SCADA and variable speed drives/ motion can be completely integrated through common engineering tools having a common database.

Sethuraman, Mysore

Being an SME, wouldn't deploying automation mean 'higher capital expenditure'?

This is one of the most commonly observed myths, especially in developing markets like India, where automation is not viewed as an investment. While it may seem as an expense in the initial stages, automation players need to convey the true value of the offered solution to customers. From a machine perspective, companies can use an automation system with Profinet that monitors status of the machine and switches off the machine in real-time when there is no production scheduled. Such measures can in turn enable even small manufacturers to benefit from increased productivity and reduced cost.

Kartik Chauhan, Jaipur

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"Emerging sectors bring new hope to the Indian metal forming Industry"

India has huge growth prospects in the machine tool forming sector. However, it needs to overcome certain challenges revolving around technology development to meet international standards. Against this backdrop, Indian Machine Tool Manufacturers' Association (IMTMA) organizes South and South East Asia's biggest machine tool exhibition IMTEX Forming 2014, and the International Seminar on Forming Technology to bring industry focus towards the opportunity areas in the Indian metal forming industry.

Indian metal forming sector contributes up to 15 per cent of the total machine tool production in the country. The country produced metal forming equipment worth $86.4 million of the global production of $25,658.6 million during 2011-12 (Gardner Research 2013). Though the overall scenario in the Indian machine tool industry looks sluggish currently, a flexible growth in consumer durables, electronics and auto industries, to which the metal forming industry serves as the core manufacturing machinery provider, is opening new doors of development. Emerging sectors like medical equipment, aerospace, pharmaceutical equipment, automation, white goods, shipbuilding, energy and power, process equipment and machinery, construction, railway and heavy transportation, communication and consumer electronics, etc have given a thrust to demand in the metal forming industry. Hence, Indian metal forming industry can expect to see considerable growth in the near future

Source: IMTMA

Initiatives by IMTMA to boost metal forming segment

IMTMA, the single-point contact and the face of the machine tool industry in India, has undertaken various initiatives like training programs, industry seminars and trade exhibitions with regard to the upgradation of the machine tool sector. The association has conducted programs like lead-time reduction in die & mold manufacturing, primary and advanced courses in sheet metal forming, cold roll forming technology and applications, hot forming process and applications, cold forging/cold extrusion technology etc, for the benefit of the metal forming industry.

The association has, over the years, deeply committed itself to supporting the industry for increasing competitiveness, technology, productivity and quality to ensure its overall development. In view of this, IMTMA is organizing the International Seminar on Forming Technology (ISFT) on January 22, 2014, and the industry popular trade exhibition IMTEX Forming 2014 from January 23-28, 2014, at Bangalore International Exhibition Centre (BIEC).

Concurrent event: Tooltech 2014

International Exhibition of Dies & Moulds, Forming Tools, Machine Accessories, Metrology and CAD / CAM

IMTEX FORMING 2014

International Forming Technology Exhibition

International Seminar on Forming Technology

The ISFT is an initiative, which is organized a day before the IMTEX Forming exhibition. The seminar brings together experts from renowned national and international companies and research institutes, who are invited to share their expertise and latest developments in the metal forming technology arena. Started in 1994, the seminar benefits the Indian forming industry with the knowledge of latest innovations and practices taking place in other parts of the world. ISFT 2014 will feature keynote sessions by Dr Ing. Andreas Sterzing and Peter Blau, Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz, Germany, on the latest developments in metal forming technologies. This will be followed by three concurrent sessions on processes, emerging technology, new materials tooling and design. Among

other attractions, a B2B Session will be organized for the participants to interact on a one-to-one basis with global leaders in the metal forming technology. This session will benefit the participants with an opportunity to discuss specific applications, technology aspects, joint ventures, collaborations, commercial issues, etc.

IMTEX Forming 2014

IMTEX Forming 2014 will focus on the exhaustive range of forming technologies in all engineering applications. It is a greatly expanded show that includes all forming technologies predominantly in metals, plastics, ceramics, composites and exotic materials. The event is organized with the objective of enabling manufacturing excellence through world-class productivity and cost-competitiveness. Noticing the need and importance of the forming industry, it was decided to organize the machine tool cutting and forming exhibitions separately in odd and even years.

Over the years, IMTEX Forming has featured close to 500 exhibitors and steady 20-24 countries in the segment of forming tools. Group participation from countries like China, Germany and Taiwan has been regular from past few years.

The exhibition holds tremendous significance for everybody in the manufacturing space including CEOs and entrepreneurs, middle level management, senior executives, corporate planners and strategists, R&D specialists, manufacturing managers and executives, shop floor engineers, supervisors and technicians, agents and dealers from the metal forming industry.

Apart from highlighting global industry development trends, the event will also act as a platform to discover sustainable manufacturing solutions and make Indian entities more competitive. It will also help build and strengthen business relationships and open doors to new business in the forming sector. Other major attractions of IMTEX Forming 2014 include the Pavilion for Academia/R&D initiatives, and JAGRUTI – IMTMA Youth Program, which is specially organized to provide the young generation a platform to showcase their R&D capabilities in metal working field and familiarize engineering students with the machine tool industry and the technological happenings in this industry segment.

Conclusion

The Indian metal forming industry faces tough challenges in meeting the increasing demand due to lack of adequate technology and focus of the Indian players towards the potential in the metal forming sector. The data for 2012-13 shows total demand for metal forming machines at ₹24,248 million whereas the production was only worth ₹5,647 million. This deficit was met by imports at ₹19,617 million.

It is also noted that forming technology elsewhere has advanced with facilities like inbuilt safety devices, full electronic control, quick change-over facilities, automatic parts transfer and other features designed to make them more productive. As India currently does not produce enough machines in these domains, the user-industries have to depend solely on imports.The Indian industry needs to overcome the barriers to growth – technology upgradation, lead time, high manufacturing costs, cheap imports, government policy executions, recessionary conditions, burden of taxes – to leverage on its true potential. MMI

Sumitomo Electric Signs Licensing Agreement with Kennametal

Japan – Kennametal and Sumitomo Electric have signed a licensing agreement under which the latter will provide and support Kennametal's new and advanced KM4X spindle connection solution to Sumitomo Electric customers globally. Sumitomo Electric, a leading global supplier of electric wire, optical fibers and cutting tool products, sees significant benefit for its manufacturing customers.

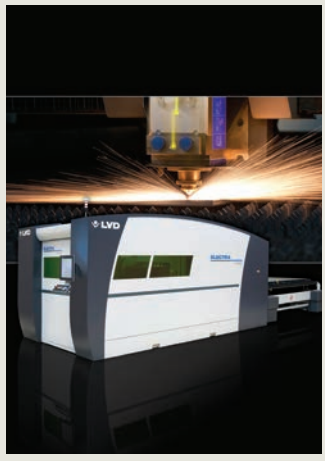
"The KM4X spindle connection is the most rigid system in the world today. This design enables manufacturing companies to maximize their capital investments. The spindle enables higher metal removal rates, which facilitates higher machine tool utilization and reduced cost per part, while increasing the manufacturer's available capacity," said Vice President and President of the Industrial Business Segment, Kennametal Inc, John R Tucker. "Having an innovative technology partner like Sumitomo Electric supplying the KM4X connection will create a powerful production advantage for manufacturing companies around the world."

Source: Kennametal India Limited

KM4X spindle connection solution from Kennametal

LVD Strippit India Opens Demonstration and Training Facility

Bengaluru – LVD Strippit India Pvt Ltd has announced that the official opening of its 800 sq mt demonstration and training facility will take place during the IMTEX Forming exhibition and will go on till February 2, 2014. During IMTEX, an executive shuttle service will run from the Bangalore International Exhibition Centre (BIEC) to LVD's new facility, which is only 25 minutes away, departing every hour from 10 am to 4 pm. A variety of machines will be on display that will include the Orion 3015 Plus—ideal as a first laser cutting machine and for cellular manufacturing, the Strippit S-1225 CNC turret punch press—offering flexible and efficient punching, a PPS 135/30—ideal for simple bending applications, and the new Dyna-Press—a super-compact press brake ideal for the bending of small parts.



Source: LVD Strippit India Pvt Ltd

Technologies that will be showcased at IMTEX Forming

Encouraging Youth to Take Up Engineering Courses

Frankfurt am Main, Germany – METAV 2014, an international event for showcasing the latest in manufacturing technology and automation, is organizing a special show for the youth. To be held from March 11–15, 2014, VDW-Nachwuchsstiftung (the VDW's Youth Training Foundation) is inviting more than 3,000 schoolchildren from North Rhine-Westphalia and about 1,000 vocational college teachers and trainers to the METAV in Düsseldorf. With the motto being 'Your opportunity in mechanical engineering', the aim of the event is to attract young people towards engineering and technical training courses, and inform teachers and trainers about the speed of technical innovation in the field of production technology.

The event will feature a broad array of information for young people via presentations aimed at teachers and trainers, all themed around CNC training. "The pedagogues are multipliers, and this means they are our most important allies," explained Director, VDW-Nachwuchsstiftung, Peter Bole.

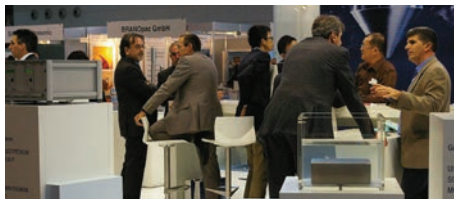
Source: Verein Deutscher Werkzeugmaschinenfabriken e.V.

Director, VDW-Nachwuchsstiftung, Peter Bole

parts2clean 2014 Already on Growth Path

Stuttgart, Germany – Following its record staging in 2013, parts2clean is headed for more growth in 2014. Demand for exhibition space appears to be even stronger due to the simultaneous staging of parts2clean alongside O&S and other related shows. By early December 2013, as many as 121 exhibitors had already reserved space for the 12th edition of the flagship trade fair for cleaning of industrial components and surfaces. The event slated to be held from June 24 to 26, 2014, at the Stuttgart Exhibition Center, already has two-thirds of the available exhibition space booked.

This year's event is also running alongside O&S—the flagship trade fair for surface treatments and coatings, LASYS— the flagship trade fair for laser materials processing and Automotive Expo—a combination of five trade shows aimed at the automotive sector. All these shows will have cross-industrial applications and hence visitors to any of the exhibitions will also be interested in visiting the other shows.



Source: Deutsche Messe

parts2clean 2013 was an ideal platform for purchasing and gaining technical know-how

Source: Frost & Sullivan

Director - Manufacturing & Process Consulting, Frost & Sullivan, Nitin Kalothia addressing the audience at Manufacturing Summit 2013

F&S Manufacturing Summit 2013, a Grand Success

Mumbai – Frost & Sullivan recently hosted a Manufacturing Summit at The Lalit, Mumbai on December 6, 2013. The 10th edition of this annual event provided an ideal platform for knowledge exchange, industry networking and fostered promotion of best practices in the industry.

In addition to high profile presentations made on aspects most relevant to the manufacturing fraternity, the forum presented a tour of identified best practices in select facilities that were visited during the site assessments for India Manufacturing Excellence Awards (IMEA) 2013.

Participants were given an excellent opportunity to learn from proven practices and hear industry experts speak on factors that contributed to the successful deployment of these practices.

Furthermore, the presentations focused on three areas:

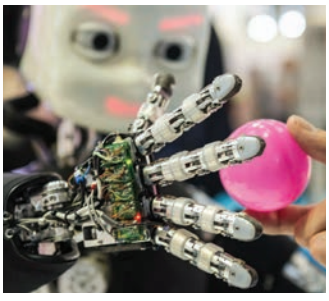
- Practices that have been successfully deployed in companies and that have yielded business benefit
- Practices that could be adopted by other industry participants (or across industries for that matter)
- Practices that are identified will be from a relevant initiative in a related function such as marketing, production, quality, asset care, innovation/NPD, technology adaptation for manufacturing, etc.

Additionally, industry stalwarts gave 4-6 presentations on new trends and future challenges for the manufacturing industry. All the presentations were followed by a Q&A round, wherein participants were able to interact directly with experts and speakers.

Professional Service Robotics at AUTOMATICA 2014

Munich, Germany – AUTOMATICA 2014, held from June 3–6, 2014, is presenting a 'Professional Service Robots' area wherein ready-to-use service robots and components will be showcased. These robots can be used in medicine and medical care, professional cleaning, logistics and agriculture. Representatives from research and industry will discuss the latest developments in panel discussions and presentations. The focal points of the supporting program range from human-robot cooperation to applications in medicine, agriculture and production and all the way to future perspectives and new technologies.

Professional service robots are equipped with new skills; they can detect and interpret their surroundings, are capable of learning and can even be instructed by laypersons for new tasks. EU Commissioner for Digital Agenda, Neelie Kroes emphasized, "We want to expand the industrial lead of the European Union in service robots and create new jobs through this success. The market for robots that can interact with people is going to expand, so I welcome the plan of AUTOMATICA to give saleable service robotics its own forum."



Source: VDMA Robotik + Automation

Professional service robots are equipped with new skills

DMG MORI Starts 2014 with Seven World Premieres

Pfronten, Germany – DMG MORI will present its new corporate design with CELOS, at its traditional open house event in the DECKEL MAHO factory in Pfronten. The open house will be held from February 18–22, 2014. The company plans to have seven launches of their latest range of products during the open house and a cumulative of 24 world launches during this year.

CELOS offers a common interface for all new high-tech machines from DMG MORI. CELOS apps provide the user with integrated and digitized management, documentation and visualization of order, process and machine data. International visitors attending the event can also experience the new corporate design on 19 machines: the new long life surfaces provide a higher scratch resistance and better protection against damages.

Source: DMG MORI

DMG MORI's DECKEL MAHO factory in Pfronten

Source: Frost & Sullivan

President, Automation Industry Association (AIA), K Nandakumar addresses the audience at the Discrete Automation event

Manufacturing Renaissance to be the Key Factor Shaping the Indian Economy

Mumbai – The Industrial Automation and Process Control Practice of Frost & Sullivan recently concluded its annual forum 'Enhancing Manufacturing Competitiveness: New Age Solutions Driving Change' on Discrete Automation and Process Automation. The two-day event held from November 27-28, 2013, at Courtyard By Marriot, Mumbai, focused on sharing best practices and ideas on how to leverage innovative technologies and best-in-class solutions as a resource to address evolving challenges and equip the manufacturing sector for the future.

With concerted efforts by the industry, end-users have gradually realized the advantages of automation solutions in order to be competitive in today's global economy. However, mass scale adoption has remained sluggish due to multiple factors, a key one being cost of ownership. Developing solutions for India, in India is as much the need of the hour, as is keeping pace with the rapid advancements in global manufacturing techniques to increase India's much needed manufacturing export contribution.

Director, Automation & Electronics Practice, Frost & Sullivan, Niju V said, "The key requirement is the need to shift from 'Value for Money' to 'Value for Many' business models. Indian end-users demand quality and relevant features customized to their needs and not a product with stripped down features at low cost. Several solution providers have recognized this requirement and are already focused on developing products for India in India."

The Discrete Automation event was followed by an awards banquet that witnessed industry's best-in-class companies being recognized with Frost & Sullivan's Excellence in Industrial Technologies Awards, India.

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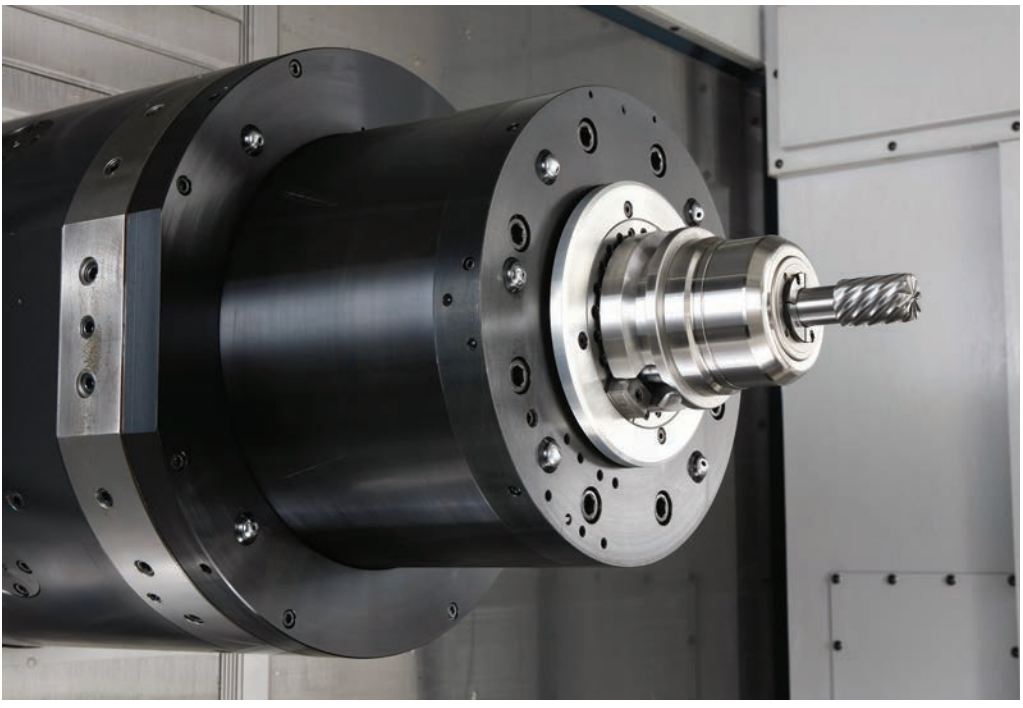
Titanium Alloy Machining Made Easy

Giving due importance to machining processes can work wonders when it comes to milling titanium alloys. Unfortunately, this potential is not fully exploited. Hence, simple process considerations that can increase productivity are imperative.

On a high-feed mill, the curve of the insert's cutting edge makes use of chip thinning to permit higher feed rate. The high-feed mill design seen here achieves five times the feed rate in high-temperature aerospace alloys when compared to milling tools with more conventional designs

Source: mmsonline.com



Source: mmsonline.com

Increasing the number of flutes compensates for the need for a low feed per tooth

Titanium alloys and aluminum alloys are alike in the following ways – both types of metals are used to make structural components for aircraft, and in both cases, the component could require 90 per cent of the material to be milled away before the part is complete. Plenty of shops probably wish that the metals had more in common than this. Aircraft-industry suppliers that are comfortable with machining aluminum are finding themselves machining much more titanium because new aircraft designs make increased use of the latter metal.

Global Aerospace Segment Manager, Stellram, John Palmer said, "Many of these shops actually have more titanium machining capacity than they realize. Many valuable techniques for machining titanium effectively are not difficult to employ, but few shops use all the techniques that are available for milling this metal productively. Titanium does not have to be difficult – it is just that the entire machining process has to be considered because any one element could impede the overall process effectiveness."

Stability is key, he added. When the tool touches the workpiece, it closes a circle. The tool, tool holder, spindle, column, table, fixturing and workpiece are all part of that circle, and part of the needed stability. Other important considerations include coolant pressure and volume as well as the method of coolant delivery and application. To realize the potential of those processes for machining titanium productively, Palmer recommends ten simple steps that are mentioned below.

Keep radial engagement low

One of the crucial challenges of titanium is heat dissipation. In this metal, relatively little amount of the heat generated during the machining operation is ejected with the chip. Compared to machining other metals, a larger percentage of the heat in a titanium machining process goes into the tool. Because of this effect, the choice of radial engagement dictates the choice of surface speed in this metal.

Full slotting – meaning 180° engagement – demands a relatively low surface speed. But bringing down the radial engagement reduces the time the cutting edge generates heat, and allows more time for the cutting edge to cool before entering the material during the next rotation. Thus, as radial engagement is reduced, the surface speed can be increased while maintaining the temperature at the cut point. For finishing, a milling process consisting of a very small arc of contact with a sharp, honed cutting edge, a high surface speed, and minimal feed per tooth can realize exceptional results.

Increase flute quantity

Commonly used endmills have four or six flutes. In titanium, this might be too few. The more effective number of flutes could be ten or more. Increasing the number of flutes compensates for the need of a low feed per tooth. The close flute spacing of a ten-flute tool is too tight for chip clearance in many applications. However, productive milling of titanium already favors a low radial depth. The small chip resulting from this provides the freedom to use a high-flute count endmill to increase productivity.

Make a thick-to-thin chip

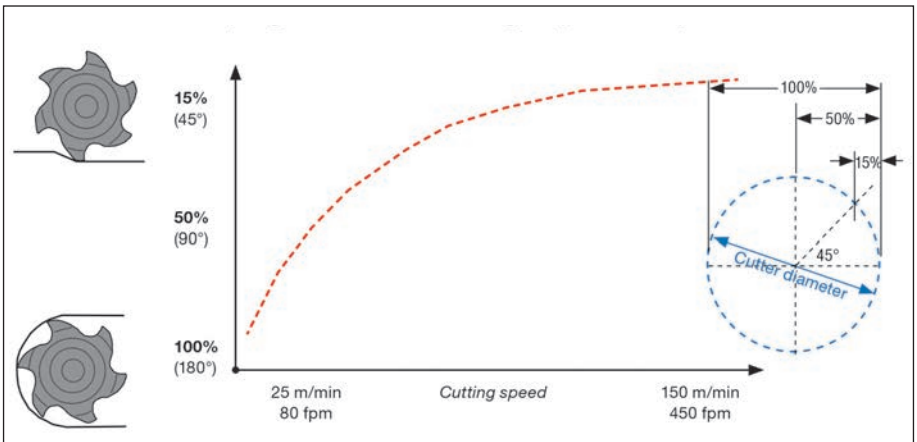
'Climb milling' is a familiar term for this idea. That is, do not feed the milling cutter so that the edge moves through the material in the same direction that the tool is feeding. Known as 'conventional milling,' this approach to machining causes the chip to start thin and become thicker. As the tool impacts the material, friction forces create heat before the material starts to shear away from the parent metal. A thin chip is unable to absorb and eject this generated heat, which instead goes into the cutting tool. Then, at the exit point where the chip is thick, increased cutting pressure makes chip adhesion a danger.

Climb milling – or thick-to-thin chip formation – starts with the cutting edge entering the excess material and exiting on the finished surface. On side milling, the tool tries to 'climb over' the material, creating a thick chip on entry for maximum heat absorption and a thin chip on exit to prevent chip adhesion.

Contour surface milling demands close examination of the tool path to ensure that the tool continues to enter on the excess material and exit on the finished surface in this way. Achieving this during intricate passes is not always as simple as merely

Peter Zelinski
Senior Editor
Modern Machine Shop

Source: mmsonline.com



Surface speed relative to arc of engagement (length of contact during chip creation)

keeping the material to the right.

Arc in

In case of titanium and other metals, tool life is lost in moments of jarring change in force. The worst of these moments often occur when the tool enters the material. Directly feeding into the stock (as almost any standard tool path would do) produces an effect similar to hitting the cutting edge with a hammer. It is essential to glide in softly instead. This can be done by creating a tool path that arcs the tool into the material instead of entering it in a straight line. In thick-to-thin milling, the arc of tool path entry should follow the same direction (clockwise or counter-clockwise) as the rotation of the tool. The arcing entry path allows for a gradual increase in cutting force, preventing snatching or tool instability. Heat generation and chip creation also increases gradually until the tool is fully engaged in the cut.

End on a chamfer

Jarring changes in force can occur at the tool exit as well. As useful as thick-to-thin cutting is, the problem with this method is that the thick-to-thin formation suddenly stops as the tool reaches the end of the pass and starts to clear the metal. The abrupt change produces a similar change in force, shocking the tool and perhaps marring the part surface. To prevent the transition from being so sudden, precaution needs to be taken by first milling a 45° chamfer at the end of the pass, so that the tool sees a gradual decline in its radial depth of cut.

Rely on secondary relief

A sharp cutting edge minimizes cutting forces in titanium, but the cutting edge also needs to be strong enough to resist cutting pressure. A secondary relief tool design, in which the first positive area of the cutting edge resists forces, after which the second area falls away to increase clearance, accomplishes both these objectives.

Secondary relief is common in tooling, but for titanium in particular, experimenting with tools having different secondary relief designs might reveal surprising changes in cutting performance or tool life.

Alter the axial depth

At the depth of cut, oxidation and chemical reaction can affect the tool. Early damage can occur at this one spot if the tool is repeatedly used at the same depth. When taking successive axial cuts, this damaged area of the tool can cause work hardening as well as lines on the part that are unacceptable for aerospace components, meaning this effect on the surface can necessitate an early tool change. To prevent this, it is necessary to safeguard the tool by changing the axial depth of cut for each pass, distributing the problem area to different points along the flute. In turning, a similar result can be achieved by taper turning the first pass and parallel turning the subsequent pass, preventing depth-of-cut notching.

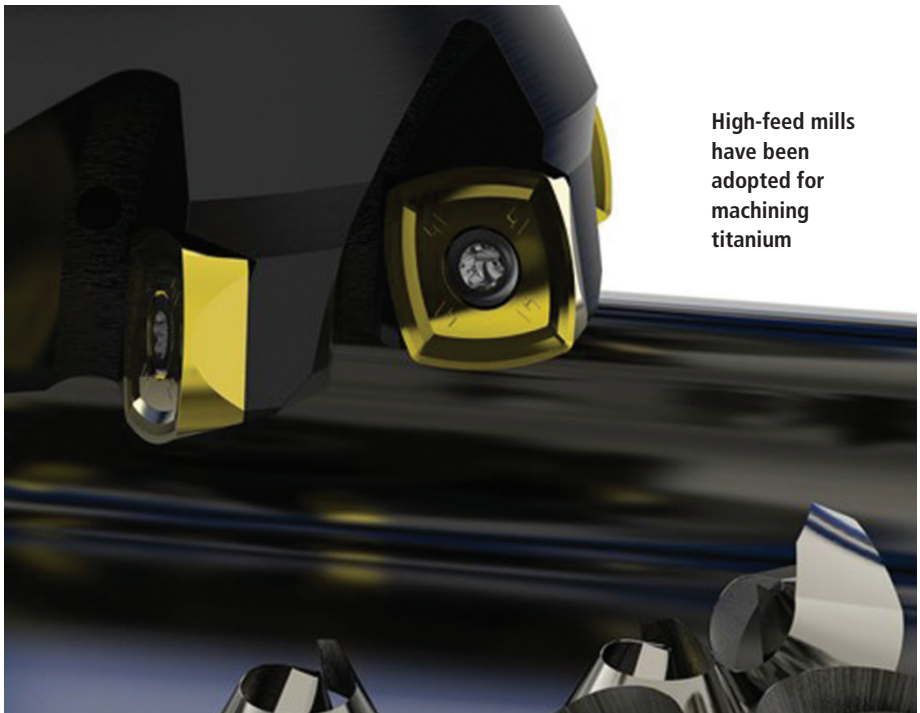
Limit the axial depth around slender features

The ratio 8:1 is useful to remember when milling thin walls and unsupported features in titanium. To avoid deflection of pocket walls, these walls should be milled in successive axial stages instead of milling to the entire wall depth with one pass of an endmill. Specifically, the axial depth of cut at each step-down should not be greater than eight times the thickness of the wall that will be left behind after these milling passes are performed. If the wall is 0.1 inch thick, for example, the axial depth of cut for a milling pass adjacent to it should be no more than 0.8 inch.

Despite the depth limit, it is possible to work this rule so that productive milling is still possible. To do this, thin walls need to be machined, so that an envelope of rough stock remains around the wall, making the feature three to four times thicker than the final feature.

Choose a tool much smaller than the pocket

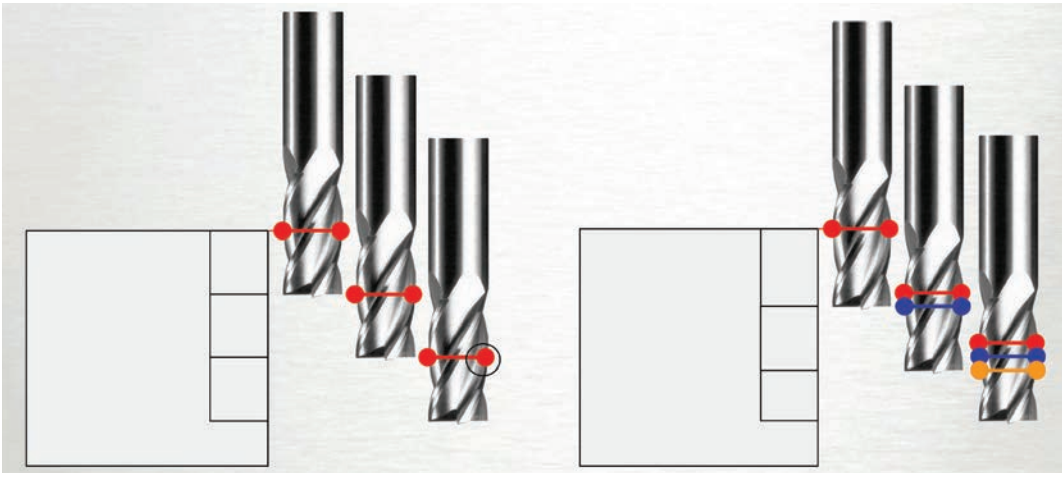
Because of the extent to which the tool absorbs heat in titanium, the tool needs clearance to allow for cooling. When milling a small pocket, the diameter of the tool should not be more than 70 per cent of the diameter (or comparable dimension) of the pocket. Less clearance than this risks essentially insulating the tool from coolant as well as trapping the chips that



High-feed mills have been adopted for machining titanium

Source: mmsonline.com

Source: mmsonline.com



It is necessary to safeguard the tool by changing the axial depth of cut for each pass

might otherwise carry at least some of the heat away. The 70 per cent rule can also be applied to a tool milling across the top of a surface. In this case, the width of the feature should be 70 per cent of the tool diameter. The tool is offset 10 per cent to encourage thick-to-thin chip creation.

Take cue from tool steel

High-feed mills – a tool concept developed for machining tool steels in the die/mold industry – have been adopted in recent years for machining titanium. A high-feed mill requires a light axial depth of cut, but when run at this light depth, the tool permits feed rates higher than milling cutters with more conventional designs.

The reason is chip thinning. The key to a high-feed mill is an insert with a large radius curve to its cutting edge. This radius spreads the chip formation across a large contact area on the edge. Because of the resulting thinning, a 0.040-inch axial depth of cut might produce a chip thickness of only about 0.008 inch. In titanium, this thin chip overcomes the low feed per tooth typically required in this metal. The thinning of the chip opens the way to a higher programmed feed rate than would otherwise be possible.

Milling titanium effectively

The challenges faced in milling titanium alloys can be overcome if the right measures are taken by manufacturers. And the simple tips suggested earlier will go a long way in extracting the maximum at the process level to machine titanium productively. **MMI**

"Investment in technology upgradation ensures long-term competitiveness"

Laying a roadmap for the sector, President, Automotive Component Manufacturers Association of India (ACMA) and Managing Director, Rane TRW Steering Systems, Harish Lakshman takes us through the various contributing factors that could change the present scene of the industry. Excerpts of the interview…

With the Indian auto component industry slated to grow at a compound annual growth rate (CAGR) of 14 per cent during 2013-21 period, how do you perceive the pace of growth in the domestic market?

Harish Lakshman: These are not the best of times for the automotive sector globally as well as in India; the industry is going through a tough phase. The turnover of the component industry in FY 12-13 was $39.7 billion, with S$9.7 billion in exports. The imports stood at $13.7 billion. Considering that the component industry grows in tandem with the vehicle industry, this year the component industry will close with either a marginally negative or at best a flat performance. However, we believe that this is a short-term phenomenon, and the growth aspirations of our young population will drive consumption, and the industry will be back on the growth path – sooner rather than later.

As the Indian auto component sector has largely transformed from being just a domestic supplier to a global supplier catering to the international automobile industry, what are the export prospects in the coming years?

Lakshman: Indeed, we are very proud of the fact that over the years, global OEMs and T1s have started to source auto components from India. Last fiscal, our exports were worth $9.7 billion and it is expected to grow three-fold by 2020 touching $30 billion. Currently, Europe accounts for 36 per cent of our exports followed by Asia and North America, each accounting for 25 per cent; although, on a country basis, the US is our largest market and will continue to remain so. The industry is also focusing on some of the emerging markets such as Russia, Brazil and South Africa, and we believe that these will account for a significant proportion of our exports in the future.

In the backdrop of challenges faced by the auto component industry, how can the concepts of volatility, uncertainty, complexity and ambiguity (VUCA) be addressed in terms of changing this adversity into opportunity?

Lakshman: Companies can best address VUCA on an individual basis as each organization is organically distinct from the other. Some of the companies have either diversified or are considering diversifying

Source: ACMA

"While most auto shows in India are focused on the vehicle industry, the ACMA – Automechanika is a sole B2B show focused on the aftermarket." – Harish Lakshman

into other geographies by setting their units in those markets or through exports; some companies are diversifying into adjacencies such as aerospace or defense. Most companies are utilizing this time to improve their internal efficiencies by investing in the upgradation of skills of their employees and/or investing in process improvement/ optimization so that they are ready for the next growth cycle.

Speaking of challenges, how can constant investment in technology upgradation and business development help overcome challenges that have led to significant de-growth in vehicle purchases across most sectors?

Lakshman: The auto component industry is ambitious to graduate to one that can create its own designs, products and technology to become truly world-class. It is only through creating products and IP that we can create a better bargaining position for the component sector. This however calls for the creation of an ecosystem replete with factors such as active interface with the academia, risk-sharing and handholding by the OEMs, appropriately enhancing skills of people etc. Investment in technology upgradation ensures long-term competitiveness and expands markets and geographies. However, there is no guarantee that it will help overcome sudden de-growth.

As the auto components industry caters to a huge clientele portfolio from the OEM segment, aftermarket to replacement market, what are the main factors that drive demand and govern the supply dynamics?

Lakshman: It is a fact that on one hand the vehicle consumption drives auto component demand, while on the other, the vibrant after-market also creates significant consumption of auto-components. Usually, it is observed that the aftermarket growth is significantly higher when there is a slump in vehicle consumption due to prolonged usage and delayed replacement of the vehicle. This downturn has however been unusual as the aftermarket growth also has been somewhat subdued. Perhaps, people are even postponing engine overhauls and other maintenance activities.

How do the auto component clusters contribute towards meeting the challenges of technological capabilities to pace up with global standards?

Lakshman: The ACMA Centre for Technology (ACT) over the last decade has helped to upgrade technology through process intervention in over 400 plants across the country, making them world-class. Today, we run several cluster programs such as the foundation, basic, advanced and engineering cluster programs, while a new product development cluster is on the anvil. We also run a special cluster program for the SMEs. Each cluster program has a distinct roadmap where best practices are imparted right from the shop floor to the top management. Our cluster development program has been so successful that its methodology has been adopted by UNIDO for intervention in the automotive industry in other parts of the world.

PERSONAL

"Over the years, global OEMs and T1s have started to source auto components from India. Last fiscal, our exports were worth $9.7 billion and it is expected to grow three-fold by 2020 touching $30 billion."

Harish Lakshman

What is the percentage of investments made by the sector in R&D, design, and engineering to meet global quality standards, given the fact that big foreign companies have also been investing in the domestic market through JVs and partnerships or setting up their own production plants?

Lakshman: It is a fact that investment by Indian industry in R&D and technology significantly lags behind that of its counterpart in other parts of the world, especially the developing countries. Some of the multinational auto component suppliers, such as Bosch, Continental, Valeo, etc have set up their engineering centers in India. I hope it will motivate others to likewise invest more in R&D, although it is much easier said than done. As pointed earlier, an ecosystem with necessary risk-mitigating and enabling factors is needed to evolve a culture of R&D and technology development in the industry. The current investment is in the range of 1-2 per cent.

While juggling between increasing price of raw materials and cut-throat competition for profit margin, how difficult is it to deal with FTA? What initiatives should the government take to address this pain area?

Lakshman: While ACMA supports FTAs for promotion of trade and commerce, it is essential to keep in mind that such agreements should benefit both the signatories. Unfortunately, FTAs till date have not benefitted India. Some of the trade agreements have also inadvertently led to an inverted tariff structure with basic raw materials at lower rate of customs duty as compared to the finished components, thus making the domestic industry unviable – omissions such as these must be avoided. Lastly, our government should consider signing FTAs with countries having tariff structures higher than those of ours such as South Africa and Brazil, so that it enables easy access of our products in these markets.

How does ACMA plan to leverage the best out of the ACMA – Automechanika scheduled to be held in New Delhi in 2015 for the industry peers?

Lakshman: While most auto shows in India are focused on the vehicle industry, the ACMA – Automechanika is a sole B2B show focused on the aftermarket. The last ACMA – Automechanika New Delhi was the first-of-its-kind for the Indian market and received a phenomenal response from the industry. Considering the aftermarket in the country, which is growing rapidly, the next show is expected to be significantly larger than the last one with higher international participation. MMI

The interview was conducted by:
Soumi Mitra, Editor, Vogel Business Media India
E-mail: soumi.mitra@vogel.de

Constant Evolution for a Better Future

Sahajanand Laser Technology Ltd, established in 1992, has been responsible for several revolutionary innovations in the laser arena for varied applications across various sectors. With cumulative manufacturing facilities measuring up to 40,000 sq mt, the company keeps developing ingenious solutions that are customer-centric and environment-friendly, thus, enhancing productivity and cost-effectiveness.

Sahajanand Laser Technology Ltd (SLTL) is not a new name in the industry. Being a pioneer in the world of lasers, it offers comprehensive solutions to diversified industrial applications. The organization has three other production facilities that manufacture laser systems for industrial, gems and jewelry, medical, research and defense purposes, apart from its headquarters in Gandhinagar, Gujarat.

Nedra Pereira
Senior Feature Writer
Vogel Business Media India
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Managing Director, Sahajanand Laser Technology Ltd, Arvind Patel avers, "We have dedicated, state-of-the-art production lines for laser diamond processing systems, laser micro-machining systems, laser material processing (cutting and welding systems) and automation systems, industrial high-power laser systems and a separate unit for radio frequency and microwave structures and components."

The manufacturing facility in Gandhinagar is the largest in India that manufactures laser equipment. The company also has a job shop in China and regional offices in the UK, US and Germany.

The operations of SLTL are executed by a workforce comprising 600 employees including laser experts, doctorates, management professionals and engineers.

Smart manufacturing and functioning

Patel states that the reason the company has been so successful with its offerings is that it provides solutions depending on the prevalent demand. "The fundamental driving factor for innovation in technology is focusing on the need and complexities existing in the market. Innovation that results in cost savings, reducing cycle time, and improving quality of work is the need of

Source: Sahajanand Laser Technology Ltd

Headquarters of Sahajanand Laser Technology Ltd at Gandhinagar, Gujarat

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the hour," he continues.

Being a global player, the company attributes its success to being able to provide cost-effective solutions. "We are now working on efficient systems, which offer international standard output, and are manufactured with lean techniques and methodologies," avows Patel.

Research and development

Patel believes that Research and Development (R&D) has now become inevitable for any manufacturing entity. Sustaining the growth of an organization is only possible, if it considers R&D as an ongoing continuous activity. The company has an extensive multidisciplinary R&D team comprising research scholars, software engineers, electronic – mechanical – instrumentation engineers, laser specialists, etc. He declares that many business units expect an immediate return on investment from the research activities they conduct. However, in the practical scenario, R&D activities yield fruitful results only after seven to ten years.

It is all about the customer

With the advent of various new technologies in metal processing, the organization proposes to introduce a new concept every year. The product offerings reflect the need for widespread laser application.

Patel reveals, "Process improvement and simplification are the two major benefits we strive to offer our customers. The day-to-day productivity of small- and medium-scale businesses can be increased with a multiplication effect using lasers." Speaking on the benefits that most of their end-users reap, he continued, "The cost of manufacturing is reduced as most of the materials processed with lasers do not require further processing. Furthermore, using lasers as a replacement to conventional cutting or engraving can result in up to 80 per cent reduction in processing time."

"Curbing power consumption helps companies achieve optimum production cost. Additionally, ergonomics and operator safety are highly important for our customers for hazard-free operations and increased productivity. Hence, our constant aim is to bring forth technology that can enable these factors, which are important to our customers. For instance, we manufacture a fiber laser system with the lowest connected load, which makes it a green machine."

Managing Director, Sahajanand Laser Technology Ltd, Arvind Patel

Another aspect the company looks at is making its products capable of energy saving with the incorporation of green manufacturing concepts. "Curbing power consumption helps companies achieve optimum production cost. Additionally, ergonomics and operator safety are highly important for our customers for hazard-free operations and increased productivity. Hence, our constant aim is to bring forth technology that can enable these factors, which are important to our customers. For instance, we manufacture a fiber laser system with the lowest connected load, which makes it a green machine,"asserts Patel.

More than off-the-shelf solutions

The company aims to continue to bring about customized CNC laser solutions for its customers, with international quality standards and at reduced cost of operations.

Being customer need-centric, the company is constantly looking to collaborate with partners to increase its share in the market. Patel affirms, "We are seeking partners as well as collaborators to further increase our reach and expand our business. We are also looking for service partners who understand our machines and will be able to better serve our global customers on time."

Future plans

The company's primary focus will always be on bringing out solutions that are critical for the industry. Providing custom-made solutions, this is one company that truly believes that the sky is the limit. "As a technology company, we are always keen to understand, develop and manufacture new innovative technological products to help the next generation," concludes Patel. **MMI**

Source: Sahajanand Laser Technology Ltd

A look at the internal plant at Sahajanand Laser Technology Ltd

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Moving Up the Global Manufacturing Value Chain

In a candid tête-à-tête, Chairman, EEPC India, Anupam Shah takes us through the year gone by, the future of engineering exports and the upcoming India Engineering Sourcing Show (IESS) 2014. An interesting read on the excerpts of the interview…

How do you perceive the current scenario of the engineering exports?

Anupam Shah: As compared to the last fiscal, the first four months of 2013-14 reflected negative growth in engineering exports. However, since July, exports started looking up after the Rupee devaluation. Taking this into account, the industry became more competitive and clocked a growth of 7.4 per cent in Apr-Dec 2013. We are very hopeful of reaching the target of 10 per cent that we have envisaged for 2013-14, before this fiscal year begins.

What initiatives does EEPC take to promote Indian exports in new geographies?

Shah: EEPC India organizes exclusive Indian Engineering Exhibitions (INDEE) in potential markets to showcase India's rapid progress in the engineering sector. Through INDEE, we have seen that exports have increased consistently. This has also proved to be productive and yielded good results for the Indian export community and foreign buyers. This year's edition will be held at Myanmar from March 13 – 15, 2014. This is in line with India's 'Look East Policy', which is a great starting point for us to build closer economic relations with Myanmar. The two countries can help form alliances with many other countries for trade. Furthermore, Myanmar serves as a connect between India and the Association of South East Asian Nations (ASEAN) and China to promote trade in the region.

Additionally, EEPC India also has Indian pavilions in specialized overseas trade fairs. For instance, India is the partner country and coordinating agency for Hannover Messe 2015. About 300 companies from India will be attending the event.

Source: Vogel Business Media India

"In order to move up the value chain, we need to make investments in manufacturing and capacity building." - Anupam Shah

How do you ensure the participation of international buyers in the domestic shows?

Shah: EEPC has been conducting its flagship event - India Engineering Sourcing Show (IESS). The event is a platform for showcasing the latest technologies and a meeting place for buyers and sellers from all over the world. This year's edition will run from January 22-24, at NSE, Goregaon, Mumbai. At this event, seven top MNCs have been invited to source from India. They are Cummins India, Danfoss, Kubota India, Pentair, ABB Group, Claas, and Inverto. Around 87 members from the Common Market for Eastern and Southern Africa (COMESA) are also attending the event, and have expressed their interest in establishing strong trade relations with India. The event is slated to provide a major platform not only for the Indian manufacturing exports but also the global

companies to explore possibilities of further integrating their value chain by tying up with vendors from across the world, including those from Africa, ASEAN, Latin America, and Gulf Cooperation Council.

Organized with support from the Union Commerce Ministry, IESS aims to encourage the Indian domestic manufacturing industry. As the engineering sector is among the top two contributors to the total Indian export basket with total shipments of $56 billion in the previous fiscal, this year's business orders at the event are expected to be worth ₹2,000 crore.

How can Indian manufacturing sector strengthen its market share through COMESA?

Shah: As Africa is considered the latest growth engine of the world, Indian engineering exporters are building strong networks with some of the influential organizations in the continent. COMESA, Africa's largest Economic Community, is fielding a strong sourcing team. Over 500 buyers from these countries have already confirmed their participation at IESS.

How is India perceived as a manufacturing destination?

Shah: India is delivering high-tech solutions to the world. With its capabilities to deliver mission critical engineering materials for applications, such as aircraft and spacecraft parts and even materials used in the nuclear parts, the country is moving up the global manufacturing value chain. What is impressive is the fact that engineering exports are still dominated by small and medium enterprises.

What initiative does EEPC to support the SMEs?

Shah: We are in constant talks with the Ministry of Commerce for a technology upgradation fund. This is to enable the SME sector, as 45-50 per cent of engineering goods are manufactured by it. SMEs need to be pushed to keep increasing their volume capacity in order to boost growth in the export market. But to scale up volumes from small-medium to large ones, the industry has to be equipped with technology upgradation.

What support does the government provide to the SMEs in terms of increasing their global footprint?

Shah: The government has two initiatives when it comes to SMEs, one is MDA - Market Developed Assistance and the other is Market Access Initiative. These initiatives are to support SMEs in getting global exposure as they cannot afford get it own their own. Comparing businesses of SMEs in India and Europe, we find that the size and capability of our medium businesses are equivalent to their small businesses. Hence, these initiatives are necessary to help the SMEs in India grow. But the government needs to revise limits and investments for the SMEs to encourage them to increase their market share by increasing the capability of manufacturing premises.

As India imports more than it exports, how will this trend affect the future of the manufacturing sector in the coming years?

Shah: India is a country wherein we have a consumer group that is very savvy with technology purchases. According to a study conducted, by 2020, India will be importing $100 billion worth of electronic components. As an industry we need to look at this in a holistic view. Indian consumers will continue to buy goods irrespective of whether the goods are manufactured domestically or imported. Hence, in order to move up the value chain, we need to make investments in manufacturing and capacity building. This may seem to be a mammoth task; however, it is only through some aggressive export strategy that we can put the industrial production, particularly of the manufacturing segments, back on the rails. MMI

PERSONAL

"With its capabilities to deliver mission critical engineering materials for applications, India is moving up the global manufacturing value chain."

Anupam Shah

The interview was conducted by:
Soumi Mitra, Editor, Vogel Business Media India
E-mail: soumi.mitra@vogel.de

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Redefining Design Assumptions

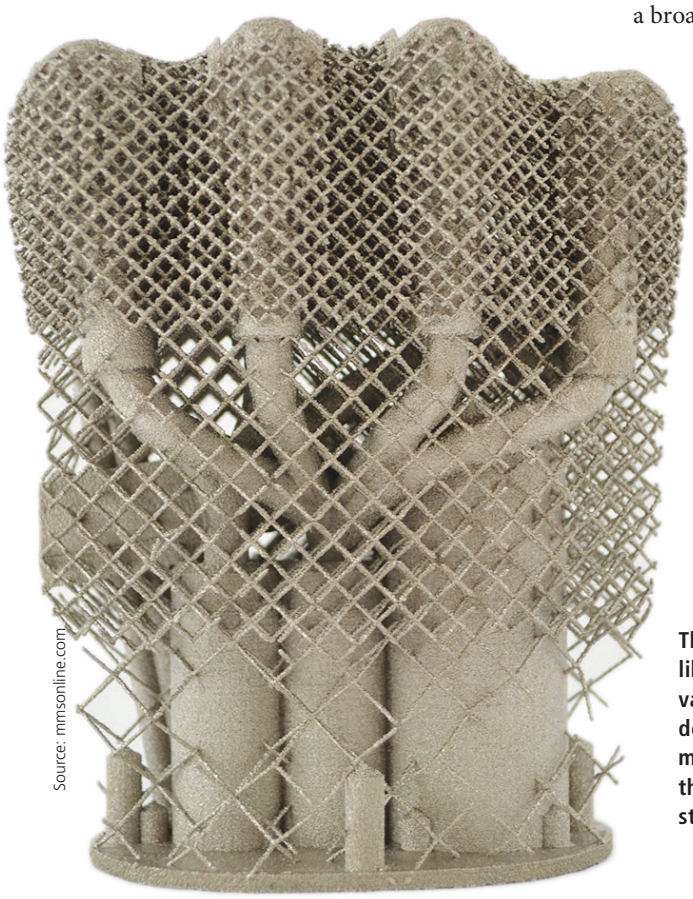
Additive manufacturing changes basic assumptions about the design of manufactured parts in both small and big ways. Oak Ridge National Laboratory is discovering as to what the new assumptions should be.

One of the most important sites in the US for advancing industry's understanding of additive manufacturing belongs to an institution once associated with the atomic bomb. In Oak Ridge, Tennessee, the Manufacturing Demonstration Facility (MDF) – part of Oak Ridge National Laboratory (ORNL) – is using resources as sophisticated as a $1.4-billion neutron source to examine the material structure of parts produced through direct metal laser sintering or through electron beam melting performed on the facility's own Arcam machines.

Source: Modern Machine Shop (MMS)

The resources, technology and scientists in the MDF are all available to help companies in the US to address manufacturing challenges. Indeed, this is the very mission and purpose of the facility. Additive manufacturing is one of the key research areas here. Within the MDF shop, additive manufacturing machines that build in metal and plastic are studied using thermal imaging to chart the processes' capabilities and performance. One of the goals of this imaging is the development of in-situ process controls. Meanwhile, by using ORNL resources located outside this shop parts produced additively are examined with tools as advanced as neutron tomography to understand their residual stresses. All such work is directed at improving the effectiveness of additive manufacturing, and ultimately, at realizing processes that are controlled and predictable enough for mature, ongoing production of a broad range of critical parts.

Along the way, the researchers involved with this work are expanding their understanding of how to apply additive manufacturing, and growing in their appreciation for what this technology will make possible. Ryan Dehoff, Ph.D, is one among them and focuses on additive manufacturing of metal components. When it comes to additive manufacturing, his message to established manufacturing professionals is essentially this – 'Forget what you know.' Or more precisely, recognize your assumptions and be prepared to question them.



Source: mmsonline.com

This component of a human-like robotic hand illustrates various features of a part designed for additive manufacturing. Instead of the part being solid, a mesh structure provides the form

Additive manufacturing is not a replacement for any existing manufacturing method, he explained. Instead, it is a design enabler that will allow engineers to solve problems by 'growing' or 'printing' components that would have been all but impossible to produce before. However, between today's engineers and the use of that enabler lies the need for a significant change in mindset.There are various aspects of this change – some small and some large. According to Dehoff, here are just a few of the areas in which conventional expectations about part design will need to give way.

Right is wrong

Take a quick glance at all the objects around you, and typically you can tell which ones are man-made because of the presence of one feature in particular: Right angles. The right angle is commonplace and it is characteristic of manufactured things. The foundation of most manufacturing is the machine tool, and the easiest form generated by a machine tool is a right angle. In addition, a right angle is among the easier forms to define on paper for measurement later. For these reasons, an engineer evaluating the manufacturability of a component design will almost invariably look for difficulty wherever the design departs from right angles.

But this filter is about to become less useful. Additive manufacturing produces organic or complex forms as easily as cubic ones. If anything, the process produces organic shapes even more easily than cubic ones. In recognizing this, one begins to see just how many of the right angles in the world around him/her are unnecessary. There are many square corners done simply because these are the most natural feature to

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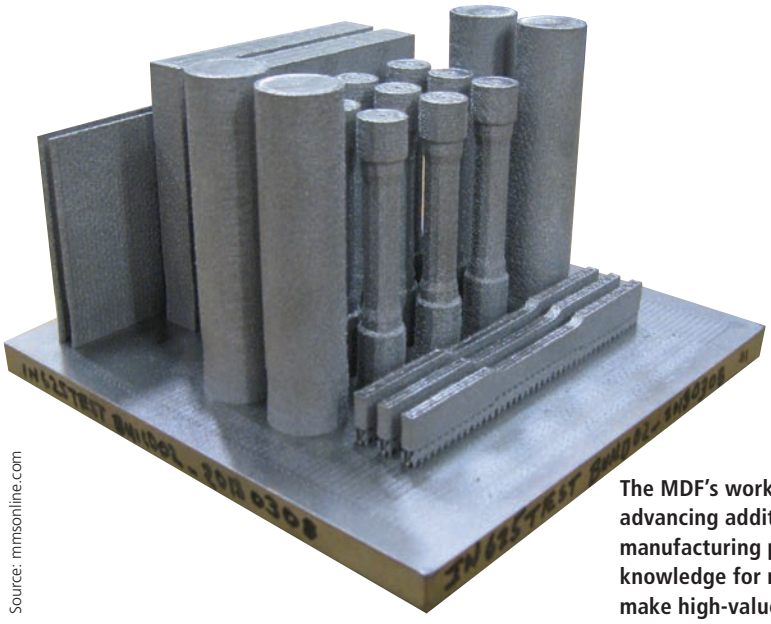
machine. When manufacturing is based on an additive process, many of those right angles are abandoned.

For the MDF team, a robotic hand designed to simulate a human hand served to emphasize this point. The hand was created on one of the facility's Arcam machines, which employs an additive process wherein an electron beam moves through a bed of powder to create each layer of the part. The powder that is not melted by the beam in this process remains in place to support the part as it grows. This support system is elegant not only because it conforms to the part and minimizes residual stress, but it also leaves powder packed all through the internal features when the part is finished. Without thinking about their choice, the robotic hand's engineers had arranged the hand's internal passages for cabling into a tidy and visually pleasing pattern of straight channels that met at right angles. Getting the powder out of the resulting internal corners proved to be impossible. This problem was solved in the next iteration, when the part was refashioned to give each of the internal channels a gently curving course like a river, removing the unnecessary angles from the design.



Source: mmsonline.com

The MDF's work includes advancing additive manufacturing process knowledge for metals used to make high-value components

Anything but round

Another basic assumption of manufacturability is that we expect holes to be round. This expectation is also natural because drilling and boring produce circular holes. In additive manufacturing, however, a circular cross-section can be a particularly challenging hole shape. Here is why: In an additive process, any feature has to potentially remain stable even while it is incomplete because features are built through gradual layering. For a circular hole, this is problematic if the part orientation means the hole has to be grown as it lies horizontally. Maintaining the circularity as the incomplete hole grows is likely to require extra support to be engineered into the design – a wasteful step if that circularity is not actually needed for the hole's function. Where the hole's purpose does not depend on the cross-section, a diamond-shaped or triangular hole is likely to be the more stable choice. Therefore, it is important to ask: Just what is the hole's purpose?

Indeed, what is the purpose of any feature? Dehoff explained, "This point about hole roundness relates to a larger issue in additive manufacturing – the importance of being aware of design intent. Designers and manufacturers have to be in close communication. Hole circularity is just one example of a detail unthinkingly applied that could result in unnecessary cost."

The new aluminum

When the choice of material does not matter for a part that is to be machined, the choice tends to be aluminum. The metal is easy to machine and cheap. Engineers frequently specify aluminum as their go-to material believing that they simplify manufacturing. But in the current state of additive manufacturing process knowledge, this choice is of little help.

As strange as it sounds, Dehoff believed that the go-to metal for many additive manufacturing applications should be titanium 6-4. From a machining perspective, of course, this choice is bizarre. Titanium 6-4 is relatively challenging to machine, not to mention expensive. But that is machining. The additive manufacturing perspective is different. Titanium 6-4 is not hard to work within an additive process largely because so much work has already gone into finetuning additive processes for this metal. Plus, additive manufacturing actually makes titanium cheap.

While the material is still more expensive than aluminum on an equivalent-weight basis, the strength of titanium enables the designer to use far less of the metal to attain the same structural performance. In place of a solid form, for example, a complex mesh structure could be grown within the additive machine so that the part uses only the amount of metal necessary to safely support its intended load. This freedom not only minimizes the weight of the titanium part, but also controls cost to the point of making the titanium component competitive. And in cases where the strength of titanium allows one additively produced titanium part to replace what used to be a complex assembly of multiple aluminum parts, that substitution can deliver significant cost reduction.

Function instead of form

According to Dehoff, of all the design engineering departures required to realize the potential of additive manufacturing, one final point is the most radical: Engineers should not directly create the designs. They should define needs and constraints instead. For better understanding, one can consider the previously cited idea of using a mesh structure to carry the part's intended load. Additive manufacturing makes such a structure easy to achieve. This structure could minimize both material cost and part weight compared to making the part solid.

Dehoff believes design engineers will model performance objectives instead of the actual manufactured forms in the future. Rather than directly constructing the model in CAD, the engineers will define load requirements and other performance factors in detail, and also define design objectives related to weight, cost and build time.

The real challenge of additive manufacturing comes from the fact that with its arrival, manufacturing technology has now outraced the tools and even the knowledge that design engineers have. It is now possible to produce what we are not yet ready to conceive. The manufacturing technology is that far ahead. For additive manufacturing to expand, our thinking about design engineering just needs to catch up. MMI

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Size Does Not Matter for EDM Automation

By integrating an OPS-Ingersoll EDM automation solution, a leading toolmaker from Germany, Coko Werk, successfully increased productivity and reduced electrode wear.

When investing in a new machine, one has to decide whether performance can be increased to achieve greater throughput. The tool construction team at Coko Werk, Bad-Salzuflen, Germany, faced this dilemma when two old EDM machines had to be replaced by a new one.

Replacement of EDM machines

When the company wanted to replace two EDM machines, it turned to OPS-Ingersoll for an automated solution. With workpieces of 1,270 mm x 1,770 mm and small pallet sizes of 320 mm x 320 mm, automating the new Gantry Eagle 1200 machine was hard to imagine. Moreover, pallets, software, job management systems and external measurement systems had to be incorporated.

Eric Culp
Editor-in-Chief – ETMM
Vogel Business Media
eric.culp@vogel.de

After weighing all the options, Manager, Tool Production, Coko Werk, Steffen Bierbach chose to take the risk. "We compared isolated applications and linear systems, and then decided on the OPS-Ingersoll solution with an integrated robot system. We were sure we could achieve our objectives with this system," he affirmed.

One of the initial goals was increased machine capacity to eliminate bottlenecks for the production of several identical large tools. Since the company wanted uninterrupted production, the machine was delivered and ready to go within the same week. In addition, the machine uptime, flexibility and efficiency were higher than initially expected. Although the number of EDM machines has been reduced from four to three, throughput times have improved.

According to Bierbach, in the past, spontaneous tasks required a large amount of organization. Modern automation, however, makes it possible to react fast. This is particularly important to Coko, as a large proportion of production involves plastics, and changes have to be made almost hourly.

Coko Werk

Challenge

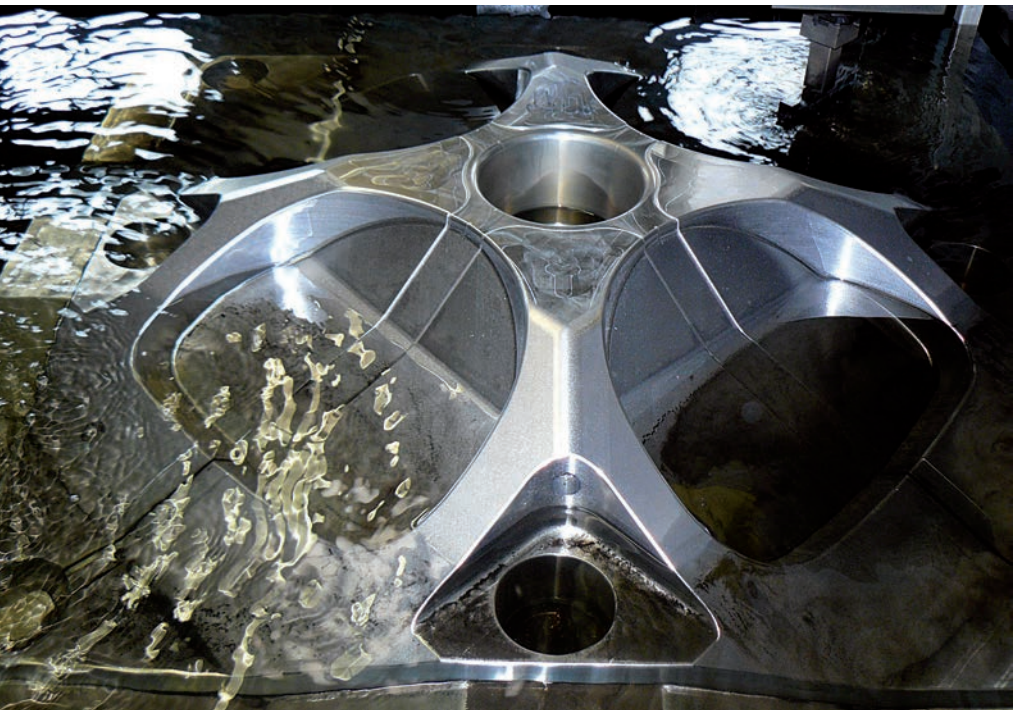
- Replacing two old EDM machines

Solution

- Integrating an OPS-Ingersoll EDM automation solution

Benefits

- Reduced electrode wear by 20-30 per cent as the monitoring and control system is more responsive
- Improved throughput rates
- Higher machine uptime, flexibility and efficiency



Source: OPS - Ingersoll Funkenerosion

Automating the EDM machine was hard to imagine when the toolmaker considered the extremely large workpiece dimensions

Cutting electrode wear

Group Leader, EDM, Oliver Prohl said, "I quickly realized that the automation concept would enable us to achieve our objectives without problem. The system has reduced electrode wear by 20-30 per cent as the monitoring and control system is more responsive."

At Coko Werk, automation does not mean less staff. To achieve a higher throughput rate, the electrode construction, production and programming departments were restructured and jobs shifted to the preparatory virtual field. "OPS-Ingersoll did a really good job. It is important that any company retains its employees when making such big changes. We managed this. We are now using the system efficiently, thanks to the interest and commitment of our employees," said Bierbach. MMI

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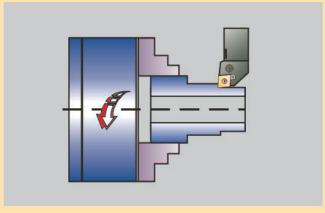
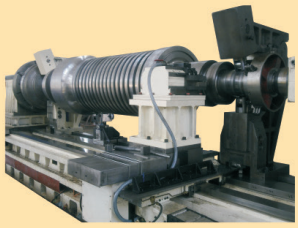


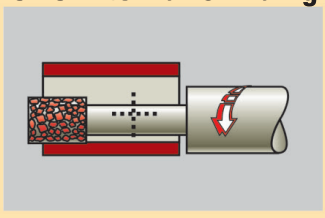
SC-8K
GANTRY LOADER

SC-14
PIPE TURNING



SC-25
CNC HEAVY DUTY LATHES

CNC Internal Grinding

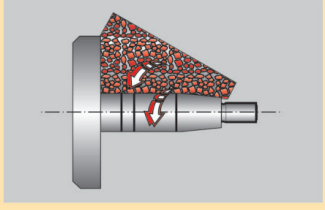


BRIG-450 CNC
BIG BORE GRINDER

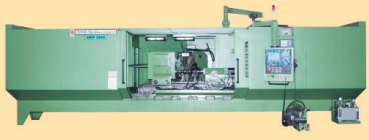
FIGT-300 CNC
FOUR STATION TURRET

FIGE-150 CNC
ID / OD GRINDER

CNC Cylindrical Grinding



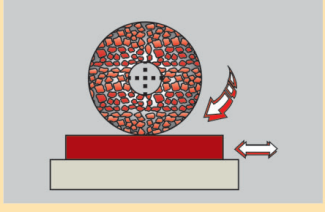
AWH-1500 CNC
LONG SHAFT GRINDER



AWH-2000 CNC
HEAVY DUTY GRINDER

SWH-400 CNC
AUTO LOADING

Surface Grinding

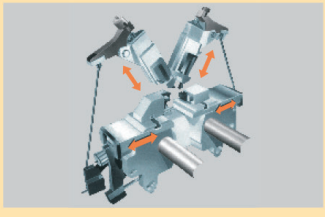


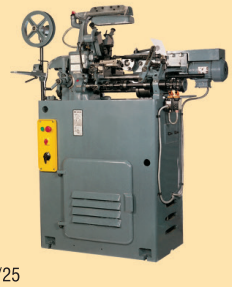
SG-106 CNC
CREEP FEED GRINDER

SGR-60
ROTARY GRINDER

SG-63
HYDRAULIC / PLC

Automats





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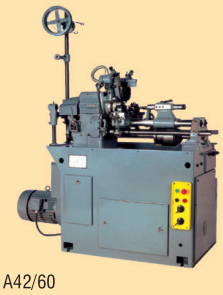

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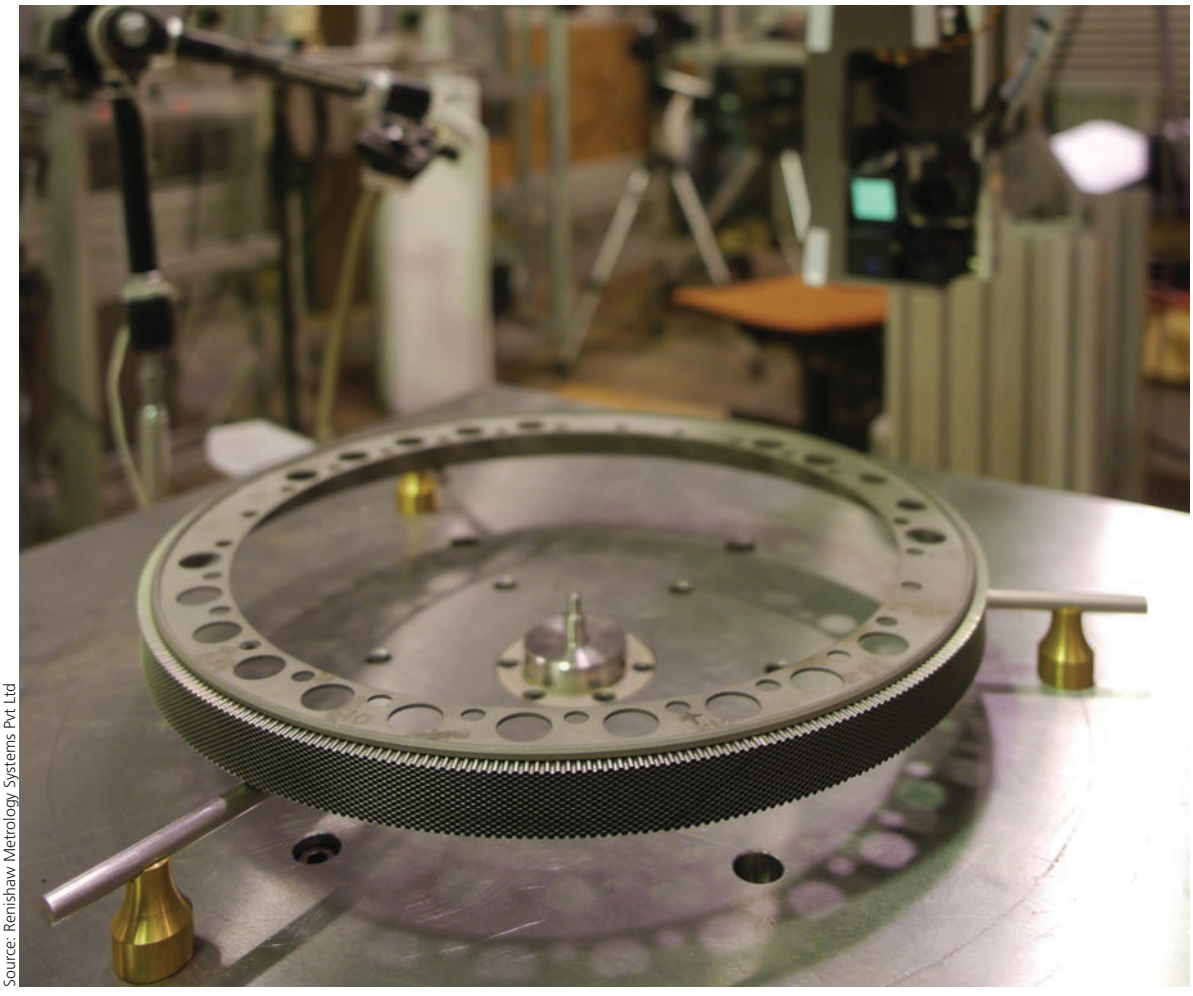


Source: Renishaw Metrology Systems Pvt Ltd

Honeycomb seal ring, an extensively used component, which has enabled to optimize the fuel efficiency of aero-engines

Incremental Encoders Help Optimize the Fuel Efficiency of Aero-engines

Making aircraft fuel efficient is a big challenge. Renishaw Metrology Systems Pvt Ltd has made this arduous task possible with its encoders. This is a perfect example of how small things can make a big difference.

How fuel efficient is a commercial airliner? A Boeing 747 burns approximately five gallons of fuel per mile or a total of 30,000 gallons (98 tons) on a flight between London and Hong Kong – a significant cost for an airline. The honeycomb seal ring is an extensively used component, which has played a crucial role in optimizing fuel efficiency of aero-engines, but the measurement of these seals present tough engineering challenges. Now, Hong Kong Aero Engine Services Ltd (HAESL) has been successful in solving this challenge by incorporating Renishaw's TONiC incremental linear and rotary (angle) encoders within its new optical Seal Ring Measurement System (SRMS).

Source: Renishaw Metrology Systems Pvt Ltd

Senior Engineer, HAESL, Eric Lau who has been working in the company for almost 20 years, and Engineer, HAESL, Raymond Siu explained, "SRMS is a joint development system by HAESL and The Hong Kong Polytechnic University (PolyU), which has transformed the way we inspect honeycomb. Before SRMS, we used vernier callipers to measure the rings manually, which is time consuming and relies heavily on the skill and experience of the operator. This new system has changed all of that. SRMS is not only faster, thereby increasing

work efficiency by 50 per cent, but also maintains the consistency of the results by eliminating human error."

Performance at its best

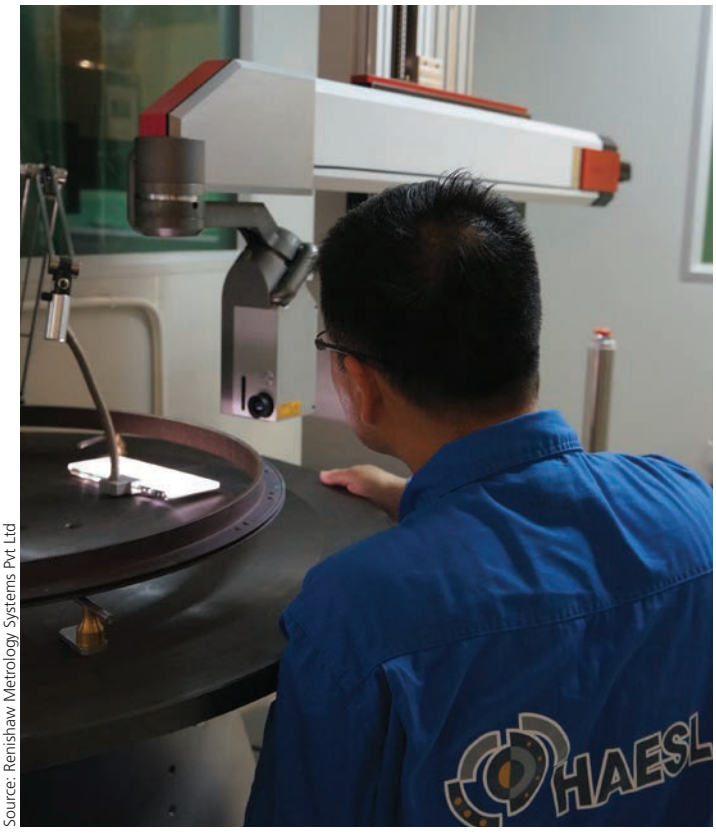
The chief designer of SRMS, Patrick Ng said, "The combination of an integrated optical measurement head, ball screw axes, servo-motors and encoded rotary table create an accurate, reliable and maintenance-free system. Unlike conventional probe systems, SRMS employs non-contact and optical inspection technologies to tackle the most typical seal ring measuring problems faced by the industry. The choice of Renishaw was straightforward. We had good experience of the company's encoders from other successful projects in the past, so we were assured of their quality and reliability. The company's TONiC series encoders offer excellent immunity to dirt; its compact size and ease of installation provided us with a great deal of flexibility in system design. Two TONiC encoders are fitted onto the linear axes of the X-Y stage on SRMS and their excellent performance is surpassed only by their exceptional support."

Ng added, "Loading the ring in the correct position on the rotary table is critical, with a direct effect on the measurement result. We compared different brands but Renishaw's has the best cost-performance ratio. To ensure a smooth and stable rotation, it is important that the cyclic error is low and TONiC can achieve this."

Renishaw's TONiC RESM angle encoder system offers ultra-low cyclic errors of typically ±30 nm and a resolution up to 86.4M CPR (counts per rev), which satisfies many of the most demanding requirements. The high accuracy ring scale is designed with low mass and low inertia, allowing better dynamic performance, while the readhead employs low noise (jitter) filtering optics to further improve positional stability and repeatability.

Ease of installation

All the ring scales feature a patented taper mount, which minimizes the installation errors and simplifies the integration. "The taper mount is one of the most attractive features of Renishaw's encoders. It saves our time and reduces the workload in correcting rotor eccentricity," asserted Ng. In addition, every readhead features an innovative integral set-up LED, which speeds up installation and removes the need for complex external set-up equipment or oscilloscopes.



Source: Renishaw Metrology Systems Pvt Ltd

Seal Ring Measurement System (SRMS) in operation

Avant-garde machine design

SRMS is a high precision optical measurement system, which is designed for measuring the roundness, flatness and Pitch Circle Diameter (PCD) of the holes on the seal rings by switching modes on its remote control pad. This system comprises three main modules: The rotary table, the integrated optical measurement head on the main console and the software console.

Ng explained, "Our SRMS' measurement head features a built-in, high-accuracy class 3R Laser Displacement Sensor (LDS) and an industrial camera, which moves horizontally (X) and vertically (Y) on the main console. The laser takes measurements for both internal and external roundness, while the camera takes images of the holes around the PCD and provides remote monitoring of the LDS laser spot position. This results in the improvement of measurement precision, which the probe system could not provide."

The seal ring for inspection is placed by the operator on the rotary table, providing a placement tolerance of ±2 mm through the built-in auto-centering function. The operator then selects the corresponding ring type from the library and starts the measurement. The measurement head remains static to capture and sends the data to the software console for processing. Every individual measurement reading from the head is coupled with the corresponding rotary table positional data from the encoder, and then on to compute a holistic geometric measurement of the sample, post processing.

Enhancement of machine tool reliability

Other than SRMS, HAESL also uses Renishaw's QC10 ballbar to assess its machine tool performance. "The ballbar allows us to track and identify problems earlier, thus enabling preventative maintenance. This minimizes production downtime and ensures the accuracy of parts produced. We are currently considering upgrading this to the latest QC20-W wireless ballbar system, which offers more advanced features such as bluetooth wireless connection, 'partial-arc' testing and single set-up for three-planes testing," said Lau.

HAESL also uses TP200 high accuracy touch trigger probe with the PH10 motorized probe head system on its co-ordinate measuring system (CMM) for part inspection. Siu concluded, "Inspection is a very important process in the aero-industry. Renishaw is the undisputed market leader in CMM probing technology and is undoubtedly our first choice." MMI

Enhancing Productivity by Switching to 3D Design Process

Having the right process for designing is essential. Otherwise, various problems such as repetitive drawing numbers, difficulties in tracking drawing versions, etc, occur. Siemens PLM's Solid Edge software helps to streamline processes in the design department, making it more efficient. Read to know more about it...

Forbes Marshall, a leading Indian manufacturer of steam accessories and control instrumentation, was ranked the fifth best place to work in India for the year 2013, based on a survey conducted across India by the Great Place to Work Institute and The Economic Times. This is the fifth time the company has received distinction in this category. Moreover, the company has won numerous awards for its products, including the India Design Council's award for good design; the Manufacturing Innovation Conclave award for manufacturing innovation and design; and the IDesign Award for best design in the capital goods category.

Like many other companies, Forbes Marshall has attained a number of tangible benefits as a result of migrating from a 2D drawing methodology to a 3D design process. The company achieved most of its notable gains using product lifecycle management (PLM) technology from Siemens PLM Software. The benefits include better visualization and communication, increased accuracy, faster time-to-market, improved quality, reduced costs and increased market penetration. These benefits were achieved using Siemens PLM Software's Solid Edge software.

Source: Siemens PLM

Source: Siemens PLM

Solid Edge was chosen to help the company reach several goals, including releasing error-free drawings more rapidly and efficiently without requiring additional manpower

Forbes Marshall

Challenges

- Release accurate drawings in a timely manner
- Keep track of design revisions
- Reduce component rejection rate
- Increase design efficiency

Solution

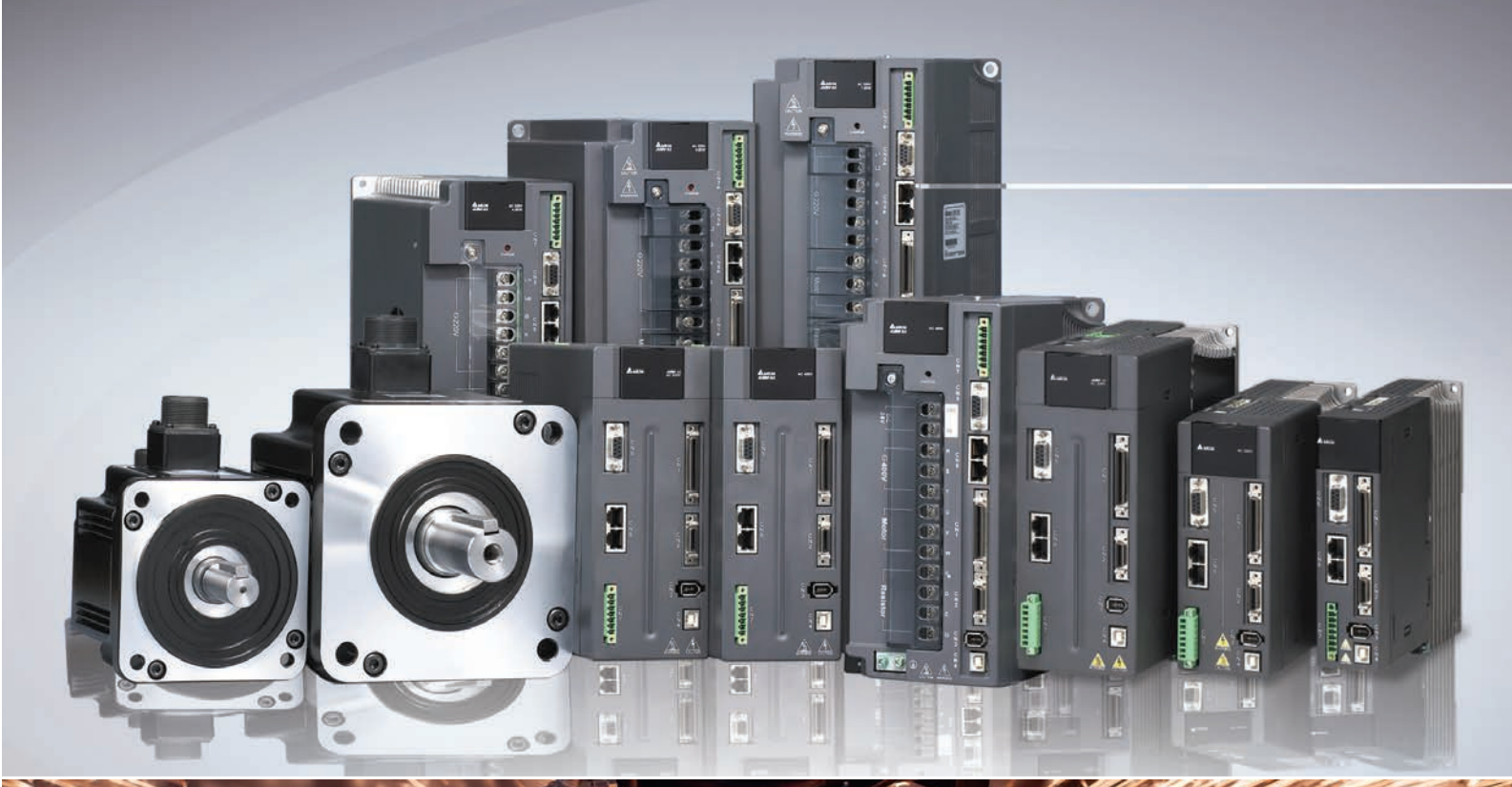
- Switch to 3D design process to increase accuracy

Benefits

- Substantially improved design-through-manufacturing process
- Increased design efficiency by 60-65 per cent
- Vendor mistakes due to drawing management issues eliminated

Offering an edge in design

Perhaps the linchpin to the company's success is best summed up in the word 'process.' In fact, process looms large for Forbes Marshall. It is a more efficient design process that resulted in the reduction of



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"The use of Solid Edge has enabled us to free up our technicians who, in the past, were consumed with tracking drawings and making changes. Now, our design engineers are working on new products and applying their creative abilities to bring about innovation."

Senior Development Engineer, R&D, Forbes Marshall, Yashwant Rajeshirke

substantial waste and rework. Better design data management and synchronous technology made this possible.

"Before using Solid Edge, we faced problems in releasing and keeping track of drawing revisions," said Senior Development Engineer, Research and Development (R&D), Forbes Marshall, Yashwant Rajeshirke. "It was a manual method. Various drawings were released with the same drawing numbers. Sometimes, different vendors were using different drawings for manufacturing the same components. It was difficult for our purchasing agents to accept finished goods, because often there were doubts as to whether the drawing used reflected the latest revision. So, we often received components with incorrect dimensions, which resulted in component rejection and rework. The delivery time for machined components was always a bottleneck in our production process," he added.

The company's 2D drawing system did not provide capabilities for managing basic data, such as drawing names and numbers. "It was a very difficult situation," opined Rajeshirke. "Our design engineers were keeping track of drawing revisions manually by using excel spreadsheets or handwritten forms. Someone had to be assigned to check each drawing. We used to spend huge amount of time checking and re-checking. If a mistake happened after manufacturing of the components or assembly, it was very difficult to identify at which stage or during which revision the mistake was made."

Right choice

Forbes Marshall engineers looked at a number of computer-aided design (CAD) solutions from various vendors. They preferred Solid Edge because of the software's built-in data management capabilities and the ability to make design changes 'on the fly' using synchronous technology.

Specifically, Solid Edge was chosen to help the company reach several goals, including releasing error-free drawings more rapidly and efficiently without requiring additional manpower, and to make products more appealing from an aesthetics standpoint. Moreover, reaching these goals would dramatically improve the quality of data exchange with suppliers and customers and, most importantly, enable the company to get new products to market faster and commensurately capture additional market share.

Impressive results

The use of the software has delivered impressive achievements. "With Solid Edge, we have increased the efficiency of our design engineers by 60-65 per cent," declared Rajeshirke. "Now, we precisely track revisions and drawings, and our design engineers can easily access each other's data. Concept designs are produced virtually and the designs vividly illustrate intent. We now have a common library of parts and product drawings. Our casting design process has been streamlined. Furthermore, our drawing release turnaround has been substantially reduced. In business terms, the software has enabled us to significantly improve our best practices and product quality, increase vendor and customer collaboration, and save time and money."

He further said, "We are realizing cost savings of ₹1,50,000 per month, because we no longer have to manually track and review drawings for accuracy. Mistakes by vendors have been virtually eliminated, because we now have accurate data. Plus, we are now releasing new innovative products more rapidly, which is proving quite beneficial in terms of market share. The use of Solid Edge has enabled the company to free up technicians who, in the past, were consumed with tracking drawings and making changes. Now, the design engineers are working on new products and applying their creative abilities to bring about innovation." MMI

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Correction is Better Than Rejection!

Turbo Energy Ltd is a well-reckoned name when it comes to turbochargers in India. Established in 1982, the company caters to both domestic and foreign markets. Constantly trying to improve its productivity and enhance processes, the company incorporated a customized solution from Metrol Corporation India that resulted in zero component rejection and cost efficiency. Here's an in-depth look at the solution provided.

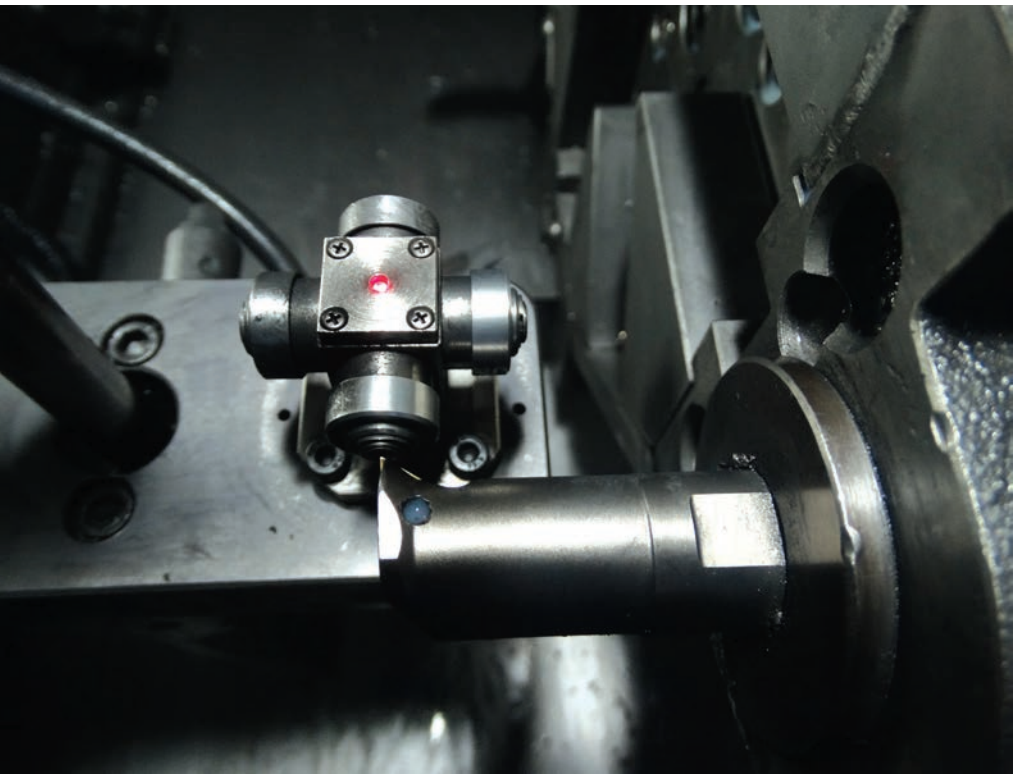
Turbo Energy Ltd (TEL) — formed as a joint venture between Brakes India Ltd, Sundaram Finance Ltd and BorgWarner Turbo Systems Worldwide Headquarters GmbH — is a supplier to all Original Equipment Manufacturers (OEMs) operating in India.

A leading manufacturer of turbochargers, the company primarily caters to the requirements of internal combustion engine industry for on and off road applications.

Nedra Pereira
Senior Feature Writer
Vogel Business Media India
nedra.pereira@vogel.de

Manager – Manufacturing, Turbo Energy Ltd, V Palanivel explaining the working of a turbocharger said, "In exhaust gas turbo charging, part of the exhaust gas energy, which would normally be wasted is used to drive a turbine. The turbine shaft is connected to a compressor, which draws in combustion air, compresses it, and then supplies it to the engine. The increased air supply enables more fuel to be burnt; hence, the engine develops more power. Increased air availability improves combustion of fuel, thus leading to reduced fuel consumption and emissions."

Because the profile of the turbocharger housing has to be precise, the components manufactured have to be accurate in measurement and consistent in quality. The manufacturing facility was seeking to achieve zero rejection in the machining of a particular profile of the housing to increase their productivity. The company approached Metrol Corporation India, pioneers in inventing tool setters for turning centers, for their predicament.



Source: Turbo Energy Ltd

Automatic tool setters for CNC lathes reduce setting time and increase the accuracy of components

Turbo Energy Ltd

Challenges

- Variation in quality of components
- 22 per cent of rejected components were due to variation in bore diameter machining
- Requirement for skilled labor

Solution

- Incorporation of the H4A-series tool setter by Metrol Corporation India

Results

- Consistent quality
- Zero rejection and zero reworking
- 4 per cent saving in tooling cost owing to accurate tool wear updation
- 10 per cent increase in time saving due to lower tool setting time
- Improved Process Capability Index (C_{pk})

Ensuring a complete solution

After several discussions between both the companies, the problem was found to be due to the variation in the bore diameter machining, i.e. the bores were either under-sized or over-sized.

Country Head, Metrol Corporation India Branch Office, Suraj Giri averred, "Turbo Energy Ltd focuses on process improvements at every step and it expressed the need to eliminate rejection due to variation in the component profile caused by the tool wear. Hence, we wanted to aid the company by providing a solution for automatic tool wear

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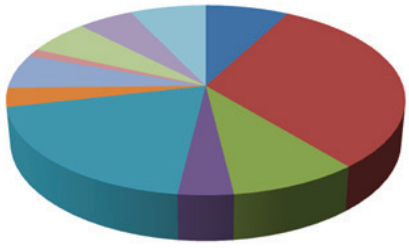

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"The industry is still shy when it comes to exploiting the benefits of using tool setters, but those who employ such tool setting devices affirm its effectiveness."

Country Head, Metrol Corporation India Branch Office, Suraj Giri

updation in their existing machine."

As the company wanted to use its current machine — the Takisawa TC-200, the machine required to be retrofitted with a tool sensor. This was done via careful study of the machine and the components produced. Giri asserted, "Once the feasibility was proved, the trials of mounting the sensor in the optimal location were undertaken."

The technical team from TEL made adjustments in the machine in order to accommodate the tool setter. Following successful mounting of the tool setter on to the TC-200, Metrol Corporation provided customized programming for the machine according to the given requirements and applications. Palanivel commented, "The tool setter automatically sends the required data directly to the control system, thereby automatically making the adjustments."

Speaking on the benefits of tools setters, Giri asserted, "By and large, the industry is still shy when it comes to exploiting the benefits of tool setters, but those who employ such tool setting devices affirm its effectiveness. The predominant method of manually setting the tools was preferred, until now, possibly due to good availability of skilled machine operators."

With tool setters, even semi-skilled to unskilled operators can run the machine. There is an increase in the accuracy in the workpiece, as the sensor ensures the precise measurement of the tool, compensating the thermal growth within the machine axis. Also the real-time wear of the tools are updated in the system automatically as opposed to approximate values entered by operators during manual tool setting. "In these changing times, companies see the reduction in manual errors and a remarkably lower tool setting time as very good incentives to install these sensors in their machines," continued Giri.

Improving processes

After the incorporation of the tool setter, the results have been phenomenal. Palanivel commented, "Our rejection rates have gone to zero. Before the incorporation of the tool setter, we required a skilled operator to do the initial setting, which took an average time of 2–5 minutes. However, now, an unskilled worker can do the same and that too within three minutes. In addition to this, our Process Capability Index (C_{pk}) value has improved." Through this, TEL has been able to continue to achieve customer satisfaction by being able to provide products and services of high quality at globally competitive prices.

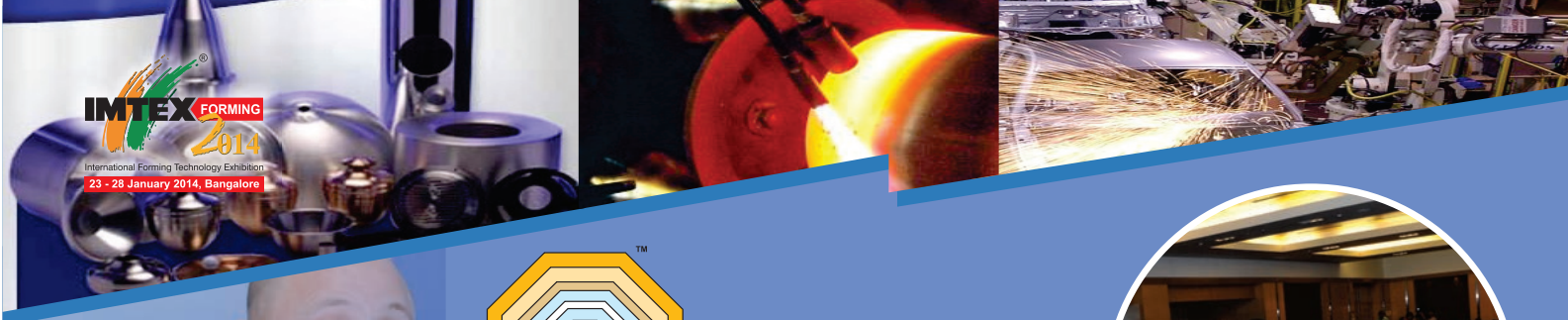
"As a result of incorporation of tool setters from Metrol, we now have zero rejection rates and have been able to increase productivity and reduce energy consumption; thereby, reducing costs. In addition, consistency in quality of the machined components has been maintained."

Manager – Manufacturing, Turbo Energy Ltd, V Palanivel

Speaking about the extra savings the company is making, Palanivel stated, "Additionally, there is no requirement for reworking the pieces and hence we are saving on energy consumption."

Satisfaction guaranteed

TEL is so impressed with the results obtained that they have already implemented tools setters in four of their systems and plan to incorporate 50 more such setters in their machines. This example is the best illustration of how sensors can not only help reduce rejection rates but also increase tool life and cost-effectiveness. MMI



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Modeling of the Deoxidization Process on Submerged Arc Weld Metals

Fixed welding tests were performed to investigate deoxidization during submerged arc welding and to develop a model for it. For all the chemical compositions of the fluxes used, the oxygen content of the weld metal decreased with increasing arcing time in the initial stage of welding. The oxygen content of the weld metal eventually became constant – a quasi-equilibrium state. Both the rate of reduction of the weld metal oxygen content and the oxygen content of the quasi-equilibrium condition depend on the chemical composition of flux.

In recent years, high-strength pipelines are increasingly being used to reduce the material cost of pipelines by making their walls thinner and to reduce the transportation costs of natural gas by transporting it at higher pressures. Since most pipelines are installed in cold regions, the weld metal requires low-temperature toughness. Reducing the oxygen content of weld metal improves its toughness because increasing the Charpy upper shelf energy reduces the volume of inclusions, which act as origination for ductile fracture. The oxygen content of submerged arc weld metal is conventionally predicted from the flux basicity. The study mentioned here investigates the deoxidization process during submerged arc welding and proposes a model for determining the weld metal oxygen content. It further demonstrates the correlation between the flux property of slag viscosity and weld metal oxygen content; and proposes a model for determining the weld metal oxygen content using thermodynamic and kinetic calculations.

Source: International Institute of Welding

In a nutshell

- Deoxidization of submerged arc weld metal is described by Eq.(1)
- Oxygen content of weld metal in quasi-equilibrium state [O]e is estimated thermodynamically
- Coefficient k is estimated from molten slag viscosity
- Oxygen content immediately after starting welding [O]i is determined by fixed welding

Oxygen content of submerged arc weld metal is conventionally predicted from flux basicity

Source: depositphotos.com / biletskiy_e

Fixed welding test

To investigate how the weld metal oxygen content varies with the arcing time, fixed welding (in which the welding torch is fixed) was conducted. Commercial carbon steel-base metal was worked to a thickness of 25 or 60 mm, a width of 150 mm, and a length of 150 mm. The welding wire was 4 mm in diameter. Table 1 lists the chemical compositions of the base metal and welding wire and Table 2 shows the flux used in the fixed welding tests.

Fixed welding was performed by fixing the location of the welding wire at the center of the base metal and surrounding the base metal with blocks to prevent molten slag leaking during welding. The following welding conditions were used: A current of 850 A, a voltage of 42 V and arcing times in the range of 2-400s. The height from the wire tip to the surface of the base metal was set to 35 mm up to an arcing time of 60s and to 50 mm after 60s to prevent the melting wire from contacting the molten metal. After welding,

the mass of slag and deposited metal was measured and the oxygen content of the weld metal was determined by chemical analysis.

Measurement of molten pool temperature

The temperature of the molten pool of fixed welding was measured using a tungsten–rhenium thermocouple. The thermocouple was set at a depth of 20 mm below the center of the base metal surface.

Effects of arcing time on weld metal oxygen content

For all three chemical compositions of the flux, the weld metal oxygen content decreases with increasing arcing time in the initial stage of welding. The weld metal oxygen content eventually became constant; this is assumed to be a quasi-equilibrium state. The oxygen content of weld metal in this quasi-equilibrium state, the oxygen content immediately after the commencement of welding, and the reduction rate of the oxygen content of the weld metal – all depend on the chemical composition of the flux.

Results of molten pool temperature measurements

The measured molten pool temperature fluctuated from 1,848 to 1,998 K, but its average temperature was 1,923 K.

Table 1: Chemical compositions of materials used (mass %)

	C	Si	Mn	P	S	Others
Base metal	0.21	0.22	0.72	0.013	0.010	Ni, Cr, Mo
Welding wire	0.06	0.21	1.95	0.007	0.006	

Table 2: Chemical compositions of flux (mass %)

Mark	SiO_2	MnO	CaO	Others	Flux basicity[1]	Viscosity at 1,773 K (Pa s)
A	40	18	22	20	0.93	0.122
B	21	20	20	39	1.19	0.106
H	35	20	20	25	1.21	0.065
I	32	17	17	34	1.24	0.026
J	25	20	20	35	1.97	0.031

Source: International Institute of Welding

Effect of arcing time on masses of slag and deposited metal

The measured masses of slag and deposited metal was determined by the consumption of welding wire for fixed welding with flux A as a function of arcing time; the measured masses of slag and deposited metal increases with increasing arcing time. In addition, the mass fraction of slag to deposited metal decreased with increasing arcing time. It became approximately constant at 1.0 when the arcing time exceeded 100s.

Estimate of weld metal oxygen content in quasi-equilibrium state

The oxygen content of the weld metal decreases with increasing arcing time in the initial stage of welding and then it eventually becomes constant in what is assumed to be a quasi-equilibrium state. This behavior

suggests that the deoxidization reaction reaches equilibrium in molten slag and molten metal. In addition, the weld metal oxygen content in the quasi-equilibrium condition depends on the chemical composition of the flux. Therefore, the oxygen content of the molten metal in the equilibrium condition between the molten slag and molten metal was estimated using thermodynamic calculation software (FactSage) and the estimated and experimental oxygen contents were compared. In the thermodynamic calculation, the temperature and mass fraction of the slag to the deposited metal were respectively taken to be 1,923 K and 1.0 based on experimental results. In addition, the chemical composition of the molten metal used in the equilibrium calculation was determined from a dilution ratio of the base metal in fixed welding.

When it comes to the relationship between experimental and estimated oxygen contents, the data point indicated by the arrow shows the flux for which the oxygen content of the weld metal had not reached the quasi-equilibrium condition in this experiment. If the oxygen content of the weld metal had reached the quasi-equilibrium state, the experimental oxygen content would have been lower. With the exception of the data point indicated by the arrow, the estimated oxygen content approximately corresponds to the experimental oxygen content. This demonstrates that the weld metal oxygen content in the quasi-equilibrium state can be estimated thermodynamically.

Modeling of deoxidization of weld metal

The rate of Si and Si-Mn deoxidization in TIG arc melting has been described by a linear reaction rate equation. In addition, the deoxidization reaction between acidic slag and high-oxygen content iron has been described by a linear reaction rate equation. These experimental results suggest that it may be possible to describe the deoxidization of a submerged arc weld metal by molten slag under arc welding by a linear reaction rate equation. Therefore, the deoxidization of weld metal during fixed welding is described by Eq. (1) mentioned below. When the flux for which the weld metal oxygen content has not reached a quasi-equilibrium state in this experiment, $[O]_e$ is determined by a thermodynamic calculation between the molten slag and molten metal. It is based on the result obtained in the previous section.

$$[O]=\exp[-k\cdot t+\ln([O]_i-[O]_e)]+[O]_e \qquad (1)$$

when

- $[O]_i$ - oxygen content immediately after welding starts (in parts per million)
- $[O]_e$ - oxygen content in quasi-equilibrium state (in parts per million)
- [O] - oxygen content at arcing time t (in parts per million)
- *k* - coefficient
- *t* - arcing time (in seconds)

The relationship between $\ln([[O]-[O]_e)/([O]_i-[O]_e)]$ was calculated using the experimental results and the arcing time. This relationship is linear. This confirms that deoxidization of submerged arc weld metal can be described by Eq. (1). In addition, it shows that coefficient k depends on the chemical composition of the flux. For all flux basicities, the relationship between the coefficient k and slag viscosity is linear and coefficient k decreases with increasing viscosity of the molten slag.

It is assumed that deoxidization of a submerged arc weld metal proceeds by a reaction at the interface between the molten slag and molten metal during stirring. Increasing the slag viscosity will reduce the stirring rate of the molten metal due to the increasing resistance at the interface between the molten slag and molten metal. Therefore, coefficient k (i.e. the deoxidization rate) is expected to reduce with decreasing stirring rate of the molten metal.

In the real moving heat source, such as during actual submerged arc welding, it may be considered that the arcing time is equal to the melting time of the weld metal. If the model is applied to real welding, it is necessary to change the arcing time to the melting time of the weld metal.

Conclusion

This study clarified that deoxidization occurs during submerged arc welding and proposed a model for determining the weld metal oxygen content. The conclusions are listed below.

- The weld metal oxygen content decreased with increasing arcing time, eventually becoming constant in what is assumed to be a quasi-equilibrium state
- The deoxidization process of submerged arc weld metal can be described by a linear reaction rate equation
- The weld metal oxygen content in the quasi-equilibrium state, which depends on the chemical composition of the flux, can be estimated thermodynamically
- For all flux basicities, the coefficient k decreased with increasing molten slag viscosity
- The oxygen content of submerged arc weld metal can be estimated by describing the deoxidization process by a linear reaction rate equation, estimating the weld metal oxygen content in the quasi-equilibrium state $[O]_e$ and the coefficient k, and determining the oxygen content of weld metal immediately after starting welding $[O]_i$.

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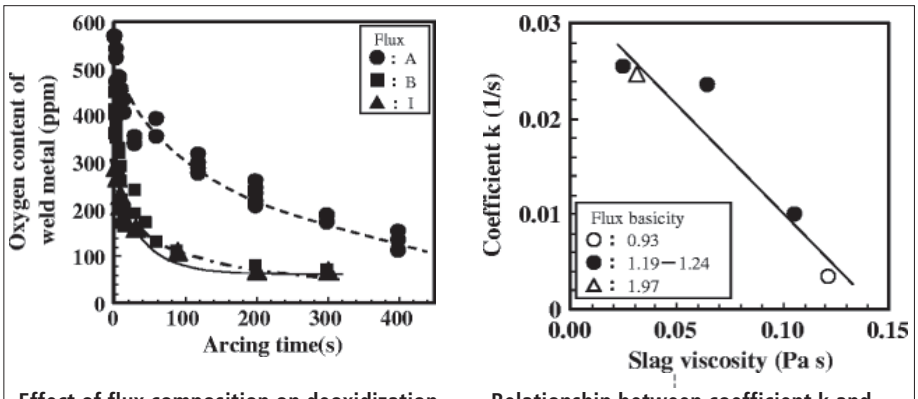
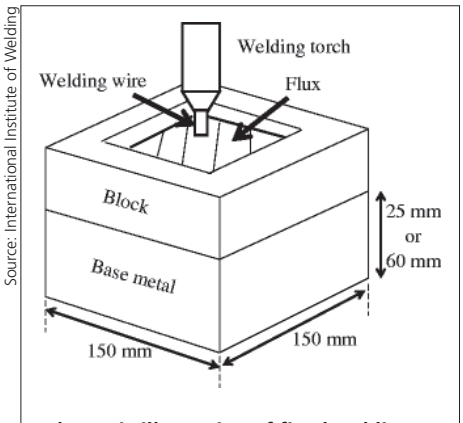


Source: International Institute of Welding

Effect of flux composition on deoxidization of weld metal during fixed welding

Relationship between coefficient k and slag viscosity



Source: International Institute of Welding

Schematic illustration of fixed welding

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POWERED BY
Indian Machine Tool Manufacturers' Association

Sharing Ideas, Spreading Knowledge

More often than not when given a plethora of options, it is hard to decide which one suits you the best. To overcome this indecisiveness, the Indian Machine Tool Manufacturers' Association (IMTMA) presented a unique platform that enabled solution providers and seekers to come together for effective networking and exchanging ideas.

The Indian Machine Tool Manufacturers' Association (IMTMA) has always been at the forefront of championing a productivity movement in the Indian metalworking sector by organizing the Productivity Summit. Ever since its inception in 2006, the event has showcased the finest productivity improvement projects in metalworking industries.

This time, the 7th Productivity Summit was conducted at The Orchid and Vits Hotel, Pune. The two-day event showcased the best productivity improvement projects in metalworking industries, which have excelled in achieving a superior performance through sustained productivity improvements.

The Summit ran parallel to the IMTMA-Siemens Productivity Championship Awards and the latest edition of the IMTMA Productivity Buzz. Emphasizing on the productivity factor, IMTMA organized the three concurrent mega-events wherein the old and new champions of productivity amalgamated with utmost seriousness amongst much cheering from participants from across the Indian cities.

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Knowledge sharing

Eminent speakers and veterans in the industry shared their experiences on the occasion. The dignitaries included Director, Tata Sons, R Gopalakrishnan, who spoke on 'India has blown it' and Vice Chairman, Toyota Kirloskar Motor, Shekar Viswanathan who propounded upon 'Productivity and Macro Variables.' On the other hand, Executive Director, LUCAS TVS Ltd, Dr N Ravichandran, won the audience with his theories on 'Next Generation Manufacturing through Lean Management'. On day two, keynote speeches were delivered by Chairman, TQM International, Janak Mehta and by the expert duo team of Head, Strategy RK Saxena, and Head, Production

Source: IMTMA

All winners of IMTMA-Siemens Productivity Championship Awards 2013

Control and Business Development, Hi Tech Gears, Akhilesh Agarwal.

Presentation of case studies

Apart from the keynote speeches, what grabbed the attention of participants was the presentation of various case studies. The entire range of cases studies dealt with various aspects of productivity from lean practices, redesigning, process optimization, automation, capacity enhancement and the introduction of flexible manufacturing, to name a few. Selected from over 300 submissions from across the spectrum of companies representing a myriad of productivity practices from across India, 'ten' final case studies were selected by the jury to be presented for final scrutiny.

Moreover, the outstanding case studies were rewarded with the IMTMA-Siemens Productivity Championship Awards 2013.

Source: IMTMA

1st Prize - TVS Motor Co Ltd
Case Study presented – Flexibility in manufacturing of Phoenix engine parts

Awards ceremony

The first prize was awarded to three winning teams Hero Motocorp, Rane (Madras) and TVS Motor Co; three second place awards were bestowed upon teams of Rane TRW, Godrej & Boyce Mfg Co Ltd and Bosch Ltd; while the third prize awardees were Mahindra & Mahindra Swaraj, Reliable Autotech and Laxmi Oil Pumps Pvt Ltd. The 'Vox Populi' was won by Rane (Madras).

Productivity Buzz

To highlight the need for exchanging ideas, the Summit was last year redesigned to have a separate platform named Productivity Buzz, which showcases productivity solutions. This one-of-its-kind event gives solution providers and seekers a platform wherein they can network with experts, exchange ideas and new concepts to resolve productivity challenges in metalworking.

In the second edition of the Productivity Buzz, more than 40 solution providers displayed highly focused productivity solutions in the areas of machining, manufacturing, automation, workholding and fixturing, metal forming, die & mold, welding and IT-enabled solutions, amongst others. Some of the prominent names in the exhibitors' list included Ace Micromatic Group, Batliboi Ltd, Bharat Fritz Werner (BFW) Ltd, Bosch Ltd, Delcam Software, Festo Controls, GW Precision Tools India Pvt Ltd, Hexagon Metrology India Pvt Ltd and Jyoti CNC Automation Ltd.

IMTMA also had a category of awards for companies participating in the Productivity Buzz. The best display award went to Electropneumatics and Hydraulics (India) Pvt Ltd and a Certificate of Appreciation was awarded to Tata Steel Processing and Distribution Ltd.

Moving in the right direction

The whole purpose of the Productivity Summit and Buzz is to look into ways that will enhance productivity through sustainable manufacturing processes. With this objective, overall, this edition of the Summit was a great success in showcasing, spearheading and furthering the productivity cause in India. MMI

Source: IMTMA

Director, Tata Sons, R Gopalakrishnan addressing the audience.

Source: IMTMA

Jury at the Productivity Summit interacting with the participants

Forming Alliances to Grow

Indian Machine Tool Manufacturers' Association (IMTMA) is hosting IMTEX Forming 2014 and ToolTech 2014 at Bangalore International Exhibition Centre (BIEC). The entire metal forming fraternity will gather on a single platform to showcase its capabilities. This show will offer exhibitors and visitors an opportunity to share knowledge and know-how.

Trade fairs play an important role in the growth of any industry to which they cater to. This is especially true if they are held during difficult times. IMTEX Forming 2014, which is happening in the midst of challenging economic conditions, is expected to give a boost to the machine tool industry. Talking about it, President, Indian Machine Tool Manufacturers' Association (IMTMA) and Managing Director, TaeguTec India Pvt Ltd, L Krishnan said, "Certainly, manufacturing industry is going through difficult times. However, devaluation of Rupee can be an opportunity to the domestic suppliers as the local consumers are hesitant to pay the extra price for imported machinery. Hence, domestic manufacturers can come up with competitive solutions and make a mark in the market. This will help the Indian machine tool industry grow."

He further stated, "We have also observed the trend of increasing exports. Over the last five years, exports are growing at a Compound Annual Growth Rate (CAGR) of 18 per cent. Hence, we can say that gradually the Indian machine tool manufacturers are reaching out to the larger markets around the world. The bottom line is our exports are consistently growing."

In this condition, IMTEX Forming 2014 is offering a platform for Indian machine tool industry to showcase the best of its capabilities. This show focuses on the metal forming sector and caters to various industries. Elaborating about it, Director General, IMTMA, V Anbu said, "The show not only caters to the traditional industries such as automobile, defense, railways, etc, it is also useful to new segments such as aerospace, agriculture equipment, post-harvest processes and medical equipment."

Showcasing excellence

The giants in the industry such as Sahajanand Laser, Salvagnini Italia, Schuler,

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IMTEX 2013 was a showcase of value-added innovation and technological refinements

Source: IMTMA

"Over the last five years, exports are growing at a Compound Annual Growth Rate (CAGR) of 18 per cent. Hence, we can say that gradually the Indian machine tool manufacturers are reaching out to the larger markets around the world. The bottom line is our exports are consistently growing."

President, Indian Machine Tool Manufacturers' Association (IMTMA) and Managing Director, TaeguTec India Pvt Ltd, L Krishnan

"Though the production has not reached up to the global standards, the metal forming sector is growing with the rate of 29-30 per cent annually in the country. With such a fast growth, metal forming sector would grab a share of 20 per cent in the whole machine tool production."

Media Chairman, IMTMA, and Corporate Strategy Advisor, Management and Manufacturing Technology, Sheths', Shailesh Sheth

"The show not only caters to the traditional industries such as automobile, defense, railways, etc., but is also useful to new segments such as aerospace, agriculture equipment, post harvest processes and medical equipment"

Director General, IMTMA, V Anbu

Singhal Power Press, TRUMPF, Yamazaki Mazak, Fanuc, etc are expected to display best of its capabilities on fair ground. Live technologies will be displayed such as laser processing, robotics and automation, welding and joining, wire forming, hydraulics and many other allied technologies.

"The whole objective is to showcase manufacturing excellence. IMTEX Forming thus, adds lot of value to manufacturing sector by providing a platform to do this," said Media Chairman, IMTMA, and Corporate Strategy Advisor, Management and Manufacturing Technology, Sheths', Shailesh Sheth.

This exhibition also has a concurrent show, ToolTech 2014, which will help visitors find the complete solution including dies and molds at one place. The whole range of tooling systems, machine tool accessories, CAD/CAM, measuring equipment and software would be available under one roof.

"One would see lot of new innovations coming in especially in the area, which overlaps between metal cutting and metal forming. As we know, one can process many metal parts through a cutting as well as forming method such as welding or bending. In such a case, IMTEX Forming will give an opportunity to visitors to explore the options for their processes," added Sheth.

In the global scenario, 27 per cent of the production takes place through metal forming while metal cutting contributes towards 73 per cent. In India, on the contrary, metal forming method contributes towards only 15 per cent of production. "Though the production has not reached up to the global standard, the metal forming sector is growing at the rate of 29-30 per cent annually in the country. With such a fast growth, metal forming sector would grab a share of 20 per cent in the whole machine tool production," said Sheth.

Business delegation

The exhibition has already received tremendous response. High level domestic delegation is expected to come from various private and public entities. The delegation from Automotive Component Manufacturers Association (ACMA), Bharat Heavy Electricals, Bharat Electronics Ltd, Govt. Tool Room & Training Centre, DRDO, Indian Railways, ISRO, Naval Dockyard, Ordnance Factory Board, Society of Indian Automobile Manufacturers' (SIAM), Tool & Gauge Manufacturers' Association (TAGMA), etc is expected to visit the show. Also, delegations from major companies expected at the show from various entities such as Titan Industries, Toyota Kirloskar Motors, TVS Motors, Volvo India Pvt Ltd, Bajaj Motors, Force Motors, etc are expected to visit the event.

Concurrent events

Apart from the IMTEX Forming and ToolTech 2014 exhibitions, the IMTMA has also organized International Seminar on Forming Technology that focuses on sheet metal forming, forging & forming technologies and emerging trends in these fields. This one day seminar would take place on January 22, 2014. Speakers from renowned national and international companies and research institutes would highlight the latest trends, developments and research in forming technology.

Additionally, another concurrent event, 'JAGRUTI – IMTMA Youth Programme' an initiative of 'UDAAN' will help the young blood become tomorrow's successful CEOs. This program will expose the students to the new technology, which would give them industry insights and eventually help them become better leaders.

Moreover, IMTMA is also giving an opportunity to R&D institutes, to display its researches through Academia Pavilion. This helps bridging the gap between academia and industry.

Key takeaway

Overall, IMTEX is a complete package weaving industry, academia, government, students, etc together. The edition of IMTEX Forming is expected to have 45,000 visitors, which will help in boosting business transactions. Also, the platform will lead to serious business discussions, joint ventures and partnerships. In all, the event is expected to generate business revenue worth ₹400 crore. So be the part of it and make the most of it! MMI

Aluminum Bronze Alloys

Ampco Metal presents aluminum bronze alloys, material for tube bending. With these alloys, one gets to speed up tool manufacturing, improve sliding properties and increase product quality. For tube bending of stainless steel or other material exhaust pipes, Ampco 18, 21 and M4 are used with great benefits for product quality and long life of the production tooling. Nowadays, exhaust pipes for new automobiles are produced out of stainless steel tube in order to resist corrosion and provide the owners of vehicle many miles before changing exhaust pipe.

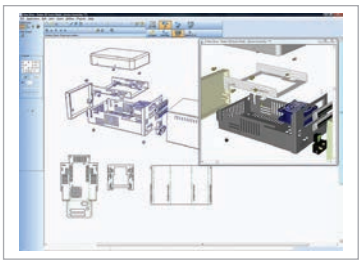
▸ **Ampco Metal**
Hall 3 / Stall D108
www.ampcometal.com

Professional Quality Inspection System

DuraMax offers one of the first systems in its class to master scanning process. It offers temperature stability from +18°C to +30°C. Other features of the scanner include VAST XXT sensor, CNC guided stylus, dust, moisture and thermal protection, flexible sensor and software configuration system and CALYPSO software. Its enclosed guideways protect it against contamination. Additionally, its massive design ensures solid footing. Moreover, it allows to measure a large number of points in one go.

▸ **Carl Zeiss India (Bangalore) Pvt Ltd**
Hall 2B / Stall A102
www.zeiss.co.in

3D Software



RADAN 3D is a high performance and versatile 3D modeling package designed to make sheet metal design and engineering assembly modeling simple. The software is specifically focused on rapid creation and modification of 3D sheet metal parts and assemblies. The system understands the attributes of sheet metal and utilizes user-definable parameters for precise automatic unfolding. Based on the ACIS solid modeling kernel and employing modern parametric techniques, it provides design flexibility, and a unique 2D to 3D method of creating 3D objects.

▸ **Radcam Technologies Pvt Ltd**
Hall 3 / Stall G102
www.radcamtechnologies.com

CNC Punching Machine

Boschert GmbH + Co KG is showcasing its Model CuProfi copper, aluminum and steel bar CNC punching machine allows punching, even on the edge of the part without bending it. Feeding system pulls the material through the punch head for complete processing with minimal waste and maintaining excellent accuracy. Two linear guides support the feeding unit. An AC servomotor guaranteeing a repeatability of +/- 0.05 mm drives the slides. Automatic part removal system is standard and consists of a full-length table that supports finished parts prior to separation and sorting.

▸ **Boschert GmbH + Co KG**
Hall 2A / Stall B111
www.boschert.de

Air Plasma System

Hypertherm intends to introduce Powermax125 to the Indian market during IMTEX Forming 2014. The latest addition, a 125-amp air plasma system features 100 per cent duty cycle for maximum work efficiency and productivity. The new system can be used for both handheld and mechanized cutting and gouging, and is capable of cutting 38mm-thick metals and piercing metals up to 25 mm-thick.

▸ **Hypertherm (India) Thermal Cutting Pvt Ltd**
Hall 3 / Stall C105
www.hypertherm.com

Stainless Steel Flat Bar Grinding Machine

Grind Master offers conveyorised belt grinding machine for descaling, finishing of SS flat bars, hex bars, square bars. The machine has unique floating type belt grinding heads to ensure uniform grinding quality. The machine is provided with sophisticated features like motorized head adjustment, digital read out for the head position, pneumatic belt tensioning, return conveyor system, inlet, outlet conveyors etc. The machine can be offered with one head up to 4 belt heads and for dry grinding or wet grinding.

▸ **Grind Master Machines Pvt Ltd**
Hall 1 / Stall H101
www.grindmaster.co.in

RTM Press

High-pressure Resin Transfer Molding (RTM) press not only enables shorter cycle times for complex parts with high requirements regarding geometry and rigidity, but also delivers consistently high part quality and surface. This virtually eliminates so-called voids, i.e. resin-free vacuum pores or gaps within the part or along its edges. In the high-pressure RTM process, resin is injected as quickly and smoothly as possible into the vacuum mold, which is opened by just a few tenths of a millimeter. This gap enables the resin injection process to spread over the mat with far less flow resistance and Malthus with low injection pressure. It then quickly infiltrates the mat before polymerization is started by heat induction.

► **Schuler India Pvt Ltd**
Hall 2B / Stall B101
www.schulergroup.com

Copper Cathodes

Kjellberg Finsterwalde offers HiFocus neo series of new long-living copper cathodes for cutting with oxygen. They can be used for a cutting current of up to 280 A. It proves to be a cost-saving solution due to the excellent price-performance ratio of the new cathodes. In tests, the new copper cathodes achieve 2,000 ignitions with a cutting current of 130 A and a cycle time of 20 seconds, 900 ignitions with 280 A.

► **Kjellberg Finsterwalde Plasma und Maschinen GmbH**
Hall 2A / Stall B106
www.kjellberg.de

Laser Cutting Machine

Laser Technologies Pvt Ltd is displaying its laser cutting machine at the IMTEX Forming 2014. The transmission system of the gantry metal CO_2 laser cutting machine delivers fast cutting speed, stable operation, good dynamic performance and long use life. Its cutting head gets direct contact with the plate material while keeping a constant focal length of the lens. This ensures a uniform cutting speed on the whole worktable. The machine tool is equipped with safety device, which ensures the operational security.

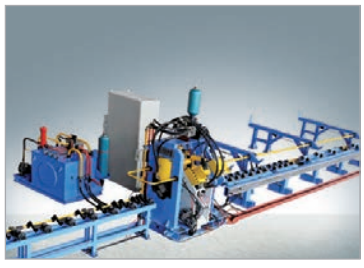
► **Laser Technologies Pvt Ltd**
Hall 2A / Stall D101
www.lasertechnologies.co.in

CNC Abrasive Waterjet Cutting Machines

MD Corporation is Exclusive distributors of OMAX in India, Sri Lanka, and Bangladesh. The company offers abrasive waterjets, which can be used to profitably machine virtually any material. JetMachining Center from the company is ideal for short-run part production, just-in-time manufacturing, tooling, and prototype part development. It requires no tool changes or complex fixturing, so one can reduce set-up times by at least 50 per cent.

► **M. D. Corporation**
Hall 3 / Stall L108
www.mdcorpindia.com

Angle Line



Jinan Tianchen Machine Group presents APC1010 angle line, an automatic professional machine for punching, making and shearing angle bars of electric power and telecommunication steel towers. The whole system consists of loading conveyor, in-feeding system, machine main body, finished angle bar out-feed syste, hydraulic station, pneumatic system and electrical control system.

► **Jinan Tianchen Machine Group**
Hall 2A / Stall A111
www.tcshukong.com

High Speed Press

Recently ISGEC developed 200T High Speed Press, which is equipped with coil line feeding aluminum strip 2 mm thick and 300 mm wide. Press is capable of running at 200 spm with a stroke length of 80 mm. It is equipped with dynamic balancing system supplemented by a stiff guiding system to take care of duty conditions. High rigidity and precision results in quality stamped parts, lower component rejection and improved die life.

► **Isgec Heavy Engineering Ltd**
Hall 1 / Stall B101
www.isgec.com

Surviving and Surmounting the Current

The recently held Manufacturing Summit 2013, the flagship event of the Confederation of Indian Industry (CII), was an eye-opener. The Summit was an ideal platform for the industry to come together and find ways to survive and thrive, given the current economic slump. Here's an overview of what conspired…

CII's 12th Manufacturing Summit 2013 saw industry stalwarts come together and discuss the actions that were the need of the hour for the manufacturing sector. Held at the Hyatt Regency, Mumbai, the event was themed as 'Manufacturing in India: Winning in the New Normal'.

The Summit was inaugurated in the presence of Chief Guest, Member Secretary, National Manufacturing Competitiveness Council (NMCC), Ajay Shankar; Immediate Past Chairman, CII (Western Region) and Director, Cummins Generator Technologies India Ltd, Pradeep Bhargava; Chairman, 12th Manufacturing Summit and Chairman & Managing Director, Godrej & Boyce Manufacturing Co Ltd, Jamshyd N Godrej, and Managing Director, The Boston Consulting Group India, Dr Arindam Bhattacharya, amongst others.

During the inaugural session, a report, 'Powering Past Headwinds – Indian Manufacturing: Winning in an Era of Shocks, Swings, and Shortages', was also released by CII and The Boston Consulting Group India. Commenting on the report, Bhattacharya said that the industry would have to learn and prepare to operate in a volatile environment, which could be caused by a depreciating Rupee or an earthquake in some part of the world.

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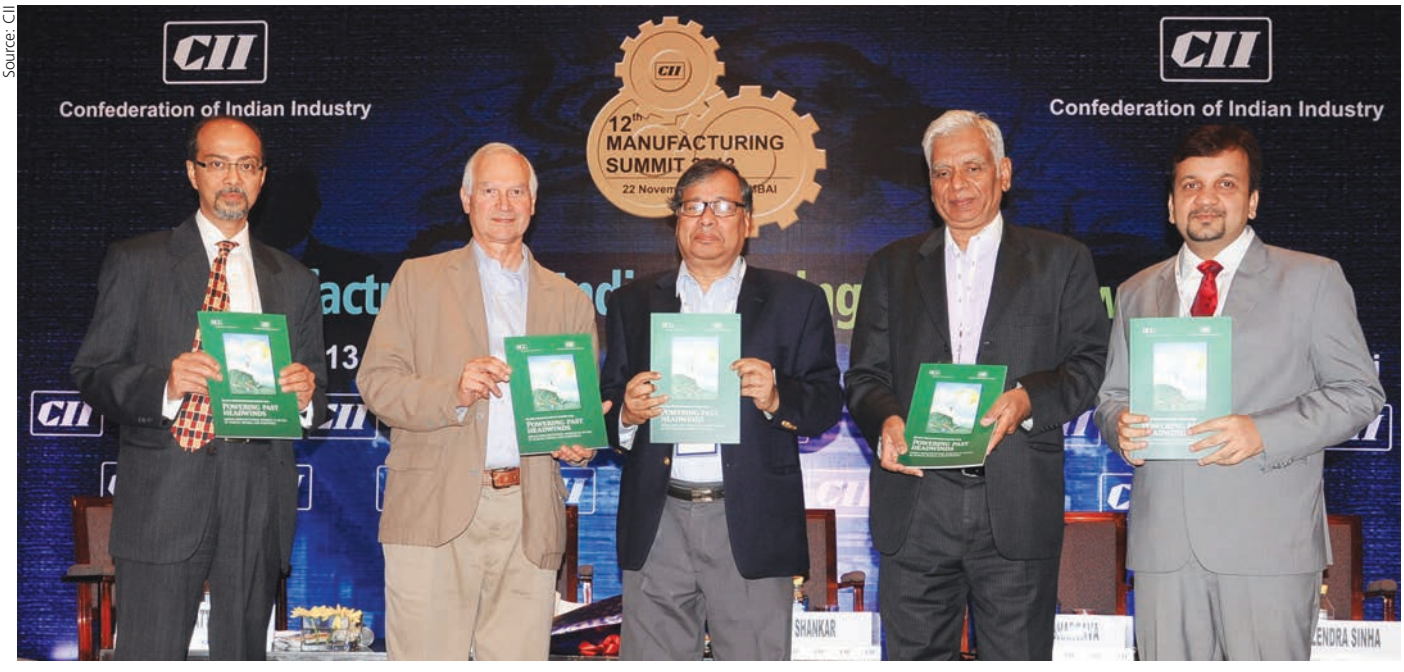
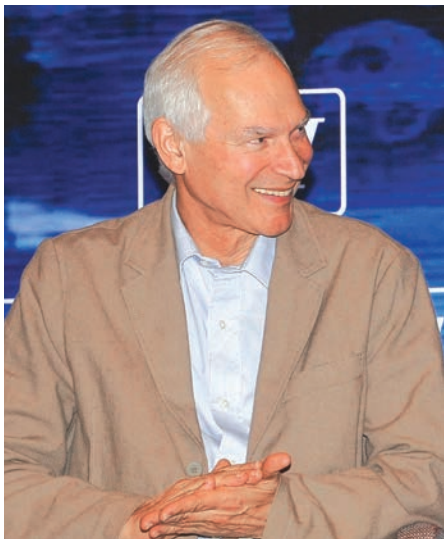
Current state of affairs

Addressing the Summit, Shankar averred, "The present depression has bottomed out and with economic revival on its way, the

Source: CII



(LtoR) Managing Director, The Boston Consulting Group India, Dr Arindam Bhattacharya; Chairman, 12th Manufacturing Summit and Chairman & Managing Director, Godrej & Boyce Mfg Co Ltd, Jamshyd N Godrej; Member Secretary, National Manufacturing Competitiveness Council (NMCC), Ajay Shankar; Immediate Past Chairman, CII (WR) and Director, Cummins Generator Technologies India Ltd, Pradeep Bhargava; Regional Director, CII (Western Region), Kaushlendra Sinha at the 12th Manufacturing Summit 2013



"The small and medium enterprises (SMEs) are critical to the manufacturing ecosystem. They contribute a lot and we need to look into the infrastructural and structural problems faced by them."

Chairman, 12th Manufacturing Summit and Chairman & Managing Director, Godrej & Boyce Manufacturing Co Ltd, Jamshyd N Godrej

"I urge the industry to come up with creative solutions for the problems bedeviling economic growth. Instead of complaining about the rigid labor laws which made it impossible to set up factories in India that can employ a million people, the industry needs to come up with solutions to the labor laws and advocate the same to the government so that such factories can come up."

Member Secretary, National Manufacturing Competitiveness Council (NMCC), Ajay Shankar

manufacturing sector will soon go back to the 14-16 per cent growth rate, which was the norm a decade ago."

The last decade has significantly altered the global landscape for manufacturing. While high-end manufacturing is slowly making its way back to the US, many low cost destinations continue to do well. Fundamentals that drive choice of manufacturing location have moved beyond mere low cost and proximity. Engineering and tooling capability, supply-chain risk and responsiveness and employment creation in home countries are all factors that have become more important currently.

The new normal

In India, demand has slowed down considerably across several sectors — the auto, home appliances and building material industries, for example, are even witnessing contraction in major categories. Infrastructural bottlenecks and factor constraints have become even more acute. In many ways therefore, the very context of running a manufacturing company now is different and a 'new normal' is being created – characterized by slowing demand, continued volatility in input costs, sustained infrastructural bottlenecks and forced local reliance.

Chairman and Managing Director, Bharat Forge, Baba Kalyani said Indian manufacturing was in the ICU. "Over the last seven to eight years, imports of manufactured items have gone up owing to the removal of imports duty and coinciding with a drop in industrial productivity in manufacturing. The fundamental problem is that there is nothing to manufacture because everything we need is imported," he continued.

Kalyani bemoaned the fact that manufacturing as a share of GDP had come down from 17 per cent a few years ago to 14.6 per cent at present, while the dream was to make manufacturing account for 25 per cent of GDP by 2025.

Yet, even in this situation, many companies have continued to do well. He added, "There is no country in the world that is more competitive than India in manufacturing. We have the skillset and the capability if channeled in the right direction."

Rural India is no longer a purely agrarian economy. With increasing urbanization, employment is shifting out of agriculture and moving to industrial sectors. About 75 per cent of new factories in the last decade have come up in rural areas.

Shankar pointed out that business cycles were part of economic life in all open economies and India would have to come to terms with such cycles. He stated that a major problem in India was that manufacturing in the country was not as strong as it should be, and urged the gathered corporate captains to evolve a consensus on pushing the case for manufacturing.

Making the most of the situation

It is important to survive and thrive across all times and tides. Managing Director and CEO, Larsen and Toubro, K Venkataraman spoke about how his company had bucked the economic downturn by increasing its exports and achieving excellence in its various verticals, and urged others to do the same. But he added that given the size of India, the domestic market would always remain the focus of the company. Venkataraman pointed out that India still had sectors that provided enormous opportunities to manufacturers such as nuclear power and defense industry, which were just opening up.

Adding to this, Godrej praised the small and medium enterprises (SMEs), which he said are critical to the manufacturing ecosystem. "SMEs contribute a lot and we need to look into the infrastructural and structural problems faced by them," he added.

Conclusion

The summit successfully held several table discussions that revolved around the changing context and the implications of these changes on companies. Discussing various sub-themes and sessions, the summit covered all aspects from defining the current scenario to the role the government should play in driving manufacturing excellence.

Member, Planning Commission, Arun Maira avowed, "India's people are its main resource in making manufacturing a success story in the country." He urged the manufacturing sector to recognize that employees were the assets that will help it succeed in a difficult economic environment.

Maira expressed that even in these difficult times, some companies were making huge profits as they have been treating themselves as internal learning institutions. Learning from experience is very essential for the progress and sustenance of industry. MMI

Powering the Future of Indian Electrical Industry

The 11th edition of ELECRAMA offered an ideal platform for electrical and electronic equipment manufacturers to exchange ideas. Be it exhibitors, visitors or students, everyone had something to take away from the show.

Bangalore International Exhibition Centre (BIEC) witnessed an electrifying show, the 11th edition of ELECRAMA-2014, which marked the presence of dignitaries and eminent personalities from electrical and electronics industry. The five-day event, held from January 8-12, 2014, was inaugurated by Chief Minister of Karnataka, K Siddaramaiah. Other dignitaries present at the inaugural session included Energy Minister of Karnataka, DK Shivakumar, and Additional Secretary, Ministry of Power, Government of India, Devendra Chaudhry. Speaking on the occasion, Siddaramaiah said, "India's electrical equipment industry is expected to play a vital role in improving the country's power infrastructure. Its potential to generate additional employment, both direct and indirect, is significant."

Compiled by:
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Source: IEEMA

Chief Minister of Karnataka, K Siddaramaiah lighting the lamp on the inauguration of ELECRAMA-2014 along with other dignitaries in the industry

In his address, Chairman, ELECRAMA-2014, and Managing Director, Yamuna Power & Infrastructure Ltd, Sanjeev Sardana said, "With the electricity sector being a sunrise sector across the entire developing world due to the rising aspirations of people, there exists significant potential for India to tap the export markets, as currently Indian exports are less than one per cent of global exports of electrical equipment."

ELECRAMA today has reached a momentum and dimension that it has become the single-largest showcase for all T&D equipment under the sun. "At IEEMA, we have recognized the need and relevance of a technology focusing on LV, intelligent electricity distributed generation and smart energy consumption space," stated President, IEEMA, and Managing Director, Easun Reyrolle Ltd, Raj H Eswaran.

With the theme of 'Go Global,' the exhibitors displayed the best of technologies. Talking about the theme and essentially exports, Vice-chairman, ELECRAMA-2014, Member, Executive Council Mentor, Transformer Division, IEEMA, and Jt Managing Director, IMP Powers Ltd, Aaditya Dhoot said, "The next ten years will be crucial for the Indian electrical equipment industry as it gears up to meet domestic demand and also establish its presence as a leading player in the global electrical equipment arena. The countries in the Middle East have been witnessing robust growth rates in recent years. The rapid urbanization and strong increase in investments in these countries have led to an increase in the demand for electricity. Thus, the Indian electrical equipment market has

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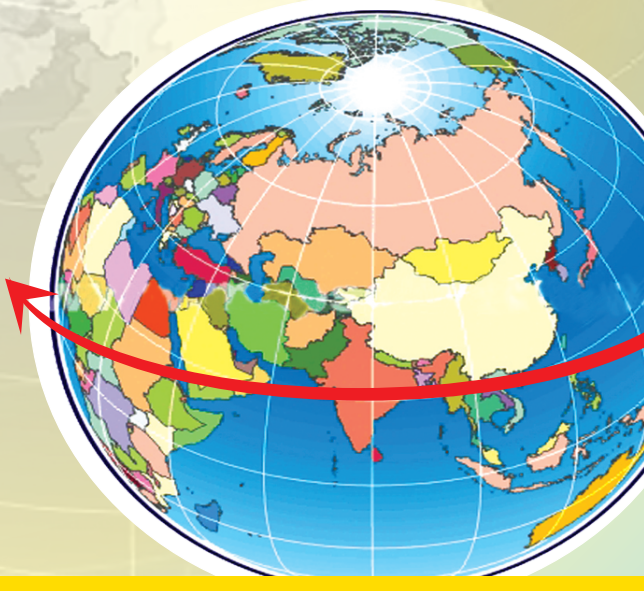

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"India's electrical equipment industry is expected to play a vital role in improving the country's power infrastructure. Its potential to generate additional employment, both direct and indirect, is significant."

Chief Minister of Karnataka, K Siddaramaiah

"This is the most innovative conference that I have ever attended. The young students have good ideas and they have potential. The government should help and support the youth implement and realize their ideas by creating a change in the education sector."

Member of Parliament, Rajya Sabha (Uttarkhand), Tarun Vijay

"Industry and research should go hand in hand. In order to increase innovation, young talent should be groomed as they have very good ideas and if they are encouraged, those ideas could be turned into fruitful actions and can be translated into business transactions."

Additional Secretary, Government of India, Anil Swarup

huge potential in these regions."

The event witnessed participation from over 950 exhibitors. It also received good response from international exhibitors. Total 165 international exhibitors from 25 countries participated in the show, while there were four country pavilions from Germany, China, Taiwan and Korea. Apart from the exhibition, IEEMA had also organized seven concurrent events, making the show a knowledge sharing platform.

Concurrent events

CEO Summit

The CEO Summit is among the most anticipated of the concurring events. This year, the summit focused on 'The power situation in Karnataka and the state's plan to support industry with power'. The subject was of particular significance considering the achievements of Karnataka in the industrial and power sectors and the fact that the state is hosting the show. Panelists for the event were the Minister for Energy, DK Shivakumar, and Chief Secretary, Karnataka, Kaushik Mukherjee. It concluded on a positive note and instilled confidence among all the participants that India, in general, and Karnataka, in particular, are heading for a bright, power'full' future.

CIGRE Tutorials

CIGRE Tutorials, organized by IEEMA and CIGRE India to share experts' views on power systems with international experts, saw tremendous response. Member, Organizing Committee ELECRAMA-2014, Indra Prem Menon welcomed the audience and gave an orientation about the activities and objectives of CIGRE Council. Director General, CPRI, N Murugesan marked his presence on the occasion. The tutorials encompassed knowledge sharing on high voltage equipment; overhead lines; sub-stations; HVDC and power electronics; and distribution systems and dispersed generation.

Technical papers were discussed by Terry Krieg (from Australia), Chairman, CIGRE Study Committee B3 on sub-stations; Hiroki Ito (from Japan), Chairman, CIGRE Study Committee A3 on High Voltage Equipment; Nikos Hatziargyriou (from Greece), Chairman, CIGRE Study Committee C6 on Distributed System and Dispersed Generation; Dr Bjarne R Andersen (from UK), Chairman, CIGRE Study Committee B4 on HVDC and Power Electronics; Herbert Lugschitz (from Austria), Secretary, CIGRE Study Committee B2 on Overhead Lines.

The organizers believe that the valuable contributions during the tutorials will enable the power sector to work out strategies for development of state-of-the-art electrical equipment in the country.

T&D Conclave

The International T&D Conclave, a half-day event, brought together heads of power utilities from different countries. These industry stakeholders shared imminent

Source: Vogel Business Media India

B2B meetings at the concurrent event — RBSM at ELECRAMA-2014

FROST & SULLIVAN

Manufacturing Summit 2013

Summit Concluded on:
6th December 2013

For More Details on Presentations Made at the Summit, Please Contact:

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Key Take-aways from the Summit

- The Human Resource (HR) function is clearly heading towards becoming a truly strategic partner in the future. Innovative ideas on self-management and realization of business enablers/results at the shop-floor, internal competence development, amongst others are definitely key factors that would differentiate the best companies from the rest.
- Management Commitment - An attitudinal change and true internalization by the workers/employees towards industrial safety and safe practices. Zero accidents, zero-work-related injuries - an Important KRA.

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INDUSTRY STALWARTS SPEAK

Mr. Sanjay Dabir,
Sr. Director, India Engineering, Diebold India Pvt. Ltd.
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President, IEEMA, and Managing Director, Easun Reyrolle Ltd, Raj H Eswaran

information on various aspects of the T&D sector including investment opportunities in the power sector in their respective countries. Present at the conclave were Executive Director, KEC International Ltd, Ajit Singh Chouhan; Director, Department of Sustainable Energy, The World Bank, Subramaniam V Iyer; Chairman, ELECRAMA-2014 and Managing Director, Yamuna Power & Infrastructure Ltd, Sanjeev Sardana; Managing Director, Maharashtra State Electricity Distribution Company Ltd (MSEDCL), Ajoy Mehta; President, IEEMA and Managing Director, Easun Reyrolle Ltd, Raj H Eswaran; Chairman, Presidential Task Force on Power, Government of Nigeria, Beks Dagogo-Jack; Member, Government's Department of Energy and Climate Change, UK, Derek Lickorish, and foreign dignitary Ghani H Mahmood.

The conclave witnessed a free exchange of ideas and concepts between the renowned technologists, global and Indian manufacturing companies with R&D operations, component suppliers and their customers. The event ended on a high note and sets the stage for revolutionizing product engineering.

ChangeXchange Reverse Buyer Seller Meet (RBSM)

Day two of ELECRAMA-2014 saw the inauguration of ChangeXchange Reverse Buyer Seller meet, which received an overwhelming response from both overseas buyers and ELECRAMA-2014 exhibitors. With over 6,000 meetings by foreign buyers spread over January 9 and 10, 2014, Indian sellers expressed a great deal of satisfaction over business conducted at the RBSM, resulting in an estimated business generation of over $150 million. Two back-to-back sessions of buyer-seller meets saw over 400 international buyers from 42 countries of Africa, ASEAN, Latin America, SAARC and Iran.

Some of the leading buyers included Central Electricity Board Mauritius, National Water & Electricity Ltd - Gambia, Bangladesh Electrical Regulatory Commission, Rural Electrification Board Bangladesh, SBEE Benin, Kenya Power Lighting Company, Rural Electrification Authority Kenya, Electricity of Mozambique, Transmission Company of Nigeria, Electricity Vietnam, ZESCO, etc.

Over 150 Indian companies had the opportunity to meet these buyers and about 1,500 meetings took place in packed business sessions. Both the international buyers and sellers found the opportunity to meet and explore business transactions.

TRAFOTECH-2014

TRAFOTECH-2014, the 9th in the series of a two-day International Conference on Transformers, started off on an inspiring note. The event provided transformer designers, manufacturers, users and consultants a common platform to review the latest advances and futuristic trends, share operational experiences and discuss the requirements of transformers for smart grid systems.

The aptly themed event 'Transformers for Smart Grid' was inaugurated in the presence of Chief Guest, Joint Secretary, Ministry of Power, BN Sharma, and Guest of Honor, Managing Director, KPTCL, G Kumar Naik. The event saw renowned experts present keynote addresses and technical papers over two days.

Sharma announced that the Indian government will launch a national smart grid mission and monitor the implementation of policies and programs envisioned in the smart grid roadmap for the power sector. He further stated, "This will help in finding solutions for some of the daunting challenges the Indian power sector is faced with."

Conductor Seminar

A seminar was organized by the Conductor Division of IEEMA during ELECRAMA-2014 to showcase the next-generation conductor technology to the users. The objective of the discussion was to create awareness and educate the industry about 'High Performance Conductors (HPC)'. Chairman, IEEMA Conductor Division, Chaitanya Desai stated that electricity has been traditionally delivered using bare over head conductors such as Aluminum Conductor Steel-reinforced (ACSR) cable and All Aluminum Alloy Conductor (AAAC) for over a hundred years. However, the industry today is in a flux of changes resulting in shifting to the next-generation conductor technology.

Source: IEEMA

Dignitaries and attendees at the thought provoking technical session at TRAFOTECH-2014

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"With the electricity sector being a sunrise sector across the entire developing world due to the rising aspirations of the people, there exists significant potential for India to tap the export markets, as currently Indian exports are less than one per cent of global exports of electrical equipment."

Chairman, ELECRAMA-2014, and Managing Director, Yamuna Power & Infrastructure Ltd, Sanjeev Sardana

Engineer Infinite 2014 and Innovation Day

Other than industrial and commercial technologies, IEEMA also offered a platform for the youth to make project presentations. In all, 74 projects were selected for the Engineering Infinite-2014 competition. Displaying innovative and technically advanced solutions for real world problems, the competition was a tough one.

Speaking on the occasion, Member of Parliament, Rajya Sabha (Uttarakhand), Tarun Vijay opined, "The young students have good ideas and they have potential. The government should support the youth implement and realize their ideas by creating a change in the education sector, wherein students are provided with the infrastructure to implement their ideas."

Additional Secretary, Government of India, Anil Swarup mentioned, "In order to increase innovation, this talent pool should be caught young as they have good and original ideas, and if they are encouraged, those ideas could be turned into fruitful actions and can be translated into business transactions."

"The next 10 years will be crucial for the Indian electrical equipment industry as it gears up to meet domestic demand and also establish its presence as a leading player in the global electrical equipment arena."

Vice-chairman, ELECRAMA-2014, Member, Executive Council Mentor, Transformer Division, IEEMA, and Jt Managing Director, IMP Powers Ltd, Aaditya Dhoot

Awards conferred

The informative seminar gave in-depth insights to the participants about the types of HPC, their benefits, stringing techniques, types of hardware used, etc. The event comprised interactive sessions throughout the day with over 100 participants from various utilities across India.

These conferences and seminars provided an opportunity to participants to exchange know-how. For all, it was a good platform to learn more about the technology. Along with creating the knowledge sharing platform, IEEMA also acknowledged spread of awareness through display of innovations. The awards for the Best Stall and Best Product categories created a buzz on the fairground. About 75 entries were received for the Best Product category and the assessment was made based on parameters like innovation, usability of product in the long run, energy saving criteria, etc. On the other hand, the Best Stall contest had a separate jury under each category that included eminent architects and planners, corporate communication consultants, industry counselors, etc. The assessment was made taking into consideration various parameters, which included overall appeal, optimum use of space, branding and brand projection, use of green materials/ technologies, innovation in products, behavior of stand staff towards visitors etc.

Source: IEEMA

The first prize was awarded to team members Asif Mahideen, J Shiju and Jomson Jose of Ponjesly College of Engineering for their project on 'Design and Implementation of an Environmental Cleaner Robot'.

Conclusion

With the participation from industry, students, government, etc, and the right mix of display of technologies and knowledge sharing, the ELECRAMA-2014 had lot to give away. It bridges the various gaps from buyers-sellers, industry-academia, etc. In a nutshell, the event helped the industry bring new enthusiasm in market, which would pump in more business in the long run. MMI

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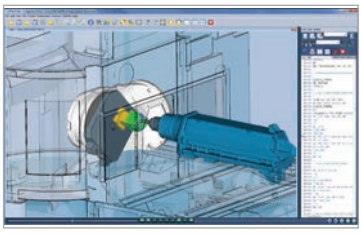
Software Update



CGTech India has introduced version 7.3 of VERICUT CNC machine simulation and optimization software. The new version of the software features many enhancements that significantly improve performance, thereby simplifying manufacturing engineers' ability to simulate the CNC programming and machining process. The new version also offers improved interface, which is customizable according to the requirements of users. In the version 7.3, the first thing a user will notice is the all-new icons, available in multiple sizes. There are also several user-selectable color themes, and every window and icon can be optionally displayed or hidden.

▸ **CGTech India Software Solutions Pvt Ltd**

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Grooving Tool

VARGUS Ltd has expanded its line of grooving solutions from GROOVEX. The new Groovical line provides an impressive range of high-performance and cost-effective solutions for general applications in a variety of different profiles such as square, round and specials. Suitable for internal and external grooving and parting off applications, the new range includes two distinct tooling systems designed for different groove widths and depths. GV26 is made for groove widths from 0.5 to 2 mm and groove depths up to 5 mm while GV29 is designed for groove widths from 2 to 6 mm and groove depths up to 6.5 mm.

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With a response time of 1 ms, the OPR-063-M collision and protection device from Schunk is ideal for robotic applications. The lightweight device consists of a housing, which is made of hard-anodized aluminum alloy, weighs 290 g, and has been particularly designed for applications on small robots. Here the monitoring is carried out by an exchangeable magnetic switch from the outside. After a collision, the unit only has to be returned to its original position, disassembly is no longer necessary. This makes operation simpler, minimizes malfunctions and reduces the need for spare parts.

▸ **Schunk Intec India Pvt Ltd**

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Turn & Mill Machine

The new CTX beta 800 TC from DMG stands for maximum flexibility in the area of turn & mill. It is capable of undertaking complete machining of workpieces up to 500 mm in diameter and 850 mm turning length. A key element of the machine is the Direct Drive B-axis with a swivel range of 110°. It is equipped with the new highly compact turn/mill spindle. The spindle's compact design with integrated ejecting cylinder for the tool clamping provides 120 Nm of torque with a length of just 350 mm.

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Updated Portal

With the updates in the Data Portal, EPLAN now provides over 350,000 component data from 56 manufacturers. New additions include General Electric (GE) in the field of high-voltage current switchgear, Numatics with fluid power components, Murrelektronik, for example with field distributors, Omron and cable manufacturers Schweiger, Sigmatec, Stego and TKD Kabel. Expanded and updated equipment data in the EPLAN Data Portal help accelerate project planning.

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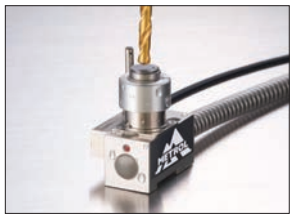

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