VOL 5, ISSUE 3 - SEPTEMBER-OCTOBER 2021

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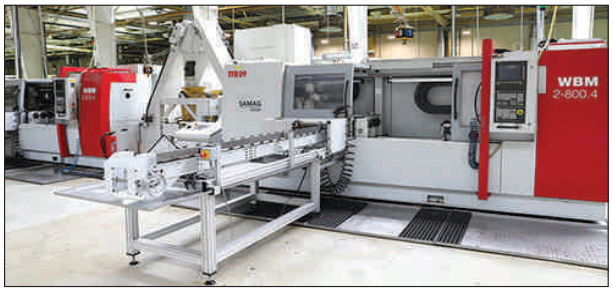

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IMTMA - 75 YEARS AND GOING STRONG

INDRADEV BABU
PRESIDENT
INDIAN MACHINE TOOL MANUFACTURERS' ASSOCIATION (IMTMA)

Dear Readers,

Perhaps this is the time for us to recall the challenges that we underwent when the COVID-19 pandemic hit the world last year and disrupted normal life. Things did not remain the same but, in hindsight, the pandemic taught us to be strong, resilient, and ever prepared for any eventualities that may arise.

The Government of India has been providing impetus to manufacturing through various schemes to help business activities pick up the pace and help industrial growth in the long term. The Reserve Bank of India's latest 'State of the Economy' report states that the manufacturing activity is gradually turning around.

The Machine Tool industry, while continuing its business with the Automobile and Auto Component industries, needs to engage more with Railways, as well as champion sectors such as Aerospace, Defence, Electronics, Medical Equipment, etc. As this happens, machine tool production and consumption will increase by several times.

I am happy to announce that Indian Machine Tool Manufacturers' Association (IMTMA), founded in 1946 by a group of 19 machine tool manufacturers, is completing 75 years. India as a nation is also celebrating 75 years of sovereignty in 2021. We are privileged to have outstanding and loyal membership who have always installed confidence in us to scale heights.

Today, as it always has been throughout its history, IMTMA continues to serve the needs of the Machine Tool and Manufacturing industries in India.

Remaining committed to its endeavor, IMTMA is organizing the fifth edition of 'Symposium on Automation & Robotics' on September 17 - 18, 2021, as a virtual event. The Symposium will have technology presentations as well as case studies. I urge the industry to take benefit from such events.

Remaining committed to its endeavor, IMTMA is organizing the fifth edition of 'Symposium on Automation & Robotics' on September 17 - 18, 2021, as a virtual event. The Symposium will have technology presentations as well as case studies.

With increased thrust to vaccination drive, things are expected to normalize. This will build confidence among the industry stakeholders to take part in in-person events and exhibitions in the coming days.

Have a happy year ahead!

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V ANBU
DIRECTOR GENERAL & CEO
INDIAN MACHINE TOOL MANUFACTURERS' ASSOCIATION

Dear MMI Readers,

India is gradually coming out of the uncertainties that engulfed it during the second wave of COVID-19. India's composite Purchasing Managers' Index (PMI) for July rose to a three-month high in July with the easing of lockdowns, according to IHS Markit Survey, corroborating an upswing in other parameters of the economy.

Economic recovery, to a large extent, depends on the country's progress in the vaccination drive. The Government is aiming to inoculate close to 90 percent of its adult population by March 2022, which will bode well for its progress on all fronts.

The Indian Machine Tool industry is adapting to the changed conditions through increased deployment of technology and digitalization and is working towards achieving the growth figures of pre-COVID years.

In the meantime, our Modern Manufacturing India (MMI) magazine is bringing up-to-date information to you from the Manufacturing sector including the Machine Tool industry to keep you well-versed with the developments. This month's edition focuses on the Automotive sector.

The Indian Machine Tool industry is adapting to the changed conditions through increased deployment of technology and digitalization and is working towards achieving the growth figures of pre-COVID years.

This year, Indian Machine Tool Manufacturers' Association (IMTMA) is completing 75 years. Founded in 1946 during the British era, IMTMA has, since then, been serving the Machine Tool and Manufacturing industries. We have captured a brief history and the journey of the Association since its inception in an article in this issue.

As we continue to share inspirational stories from across the world, we also reach out for your feedback which would be highly valuable in helping us understand your needs.

My heartfelt thanks to you, the readers of MMI, for your continued interest and support.

Readers can download previous issues of MMI from the IMTMA website.

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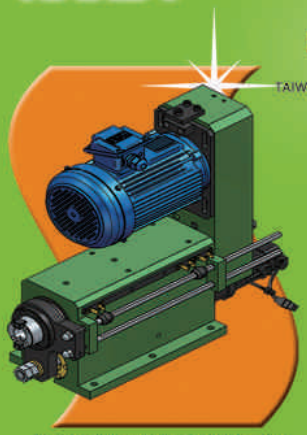
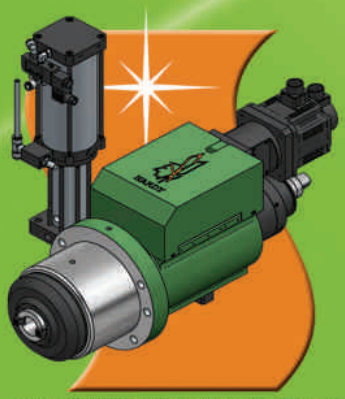
HARDY



TAIWAN EXCELLENCE 2017

Servo Type Drilling / Tapping Spindle Head Unit

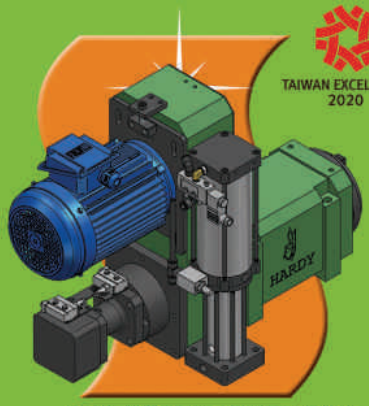
Built-in Motor Facing Head Unit - Flange Type



Built-in Motor Drilling/Tapping Spindle with ATC and Center Coolant

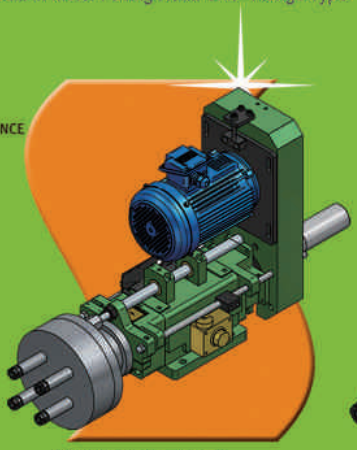
TAIWAN EXCELLENCE 2020

Built-in Motor Spindle Unit

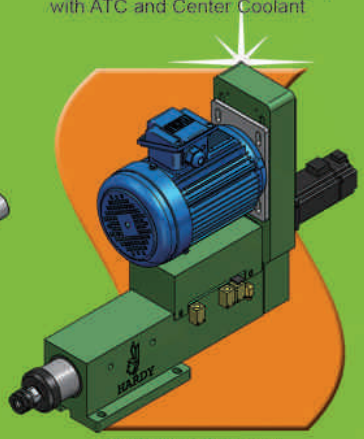


TAIWAN EXCELLENCE 2020

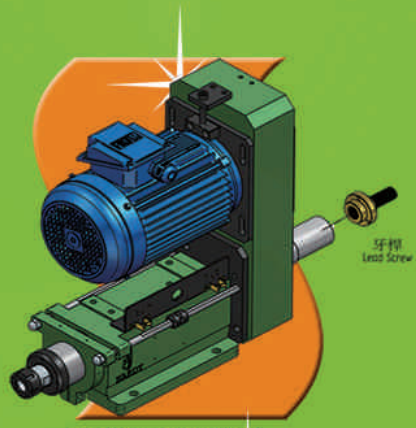
Boring/Milling Head Unit with ATC



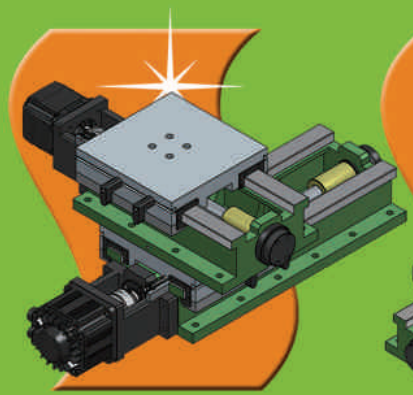
Multi-Spindle Head



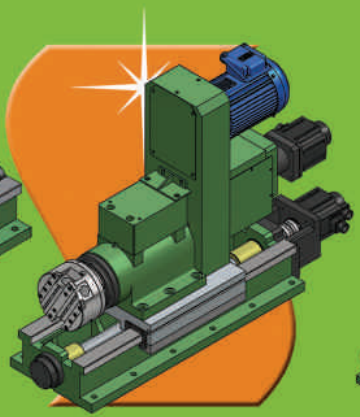
Servo Type Drilling / Tapping Spindle Head



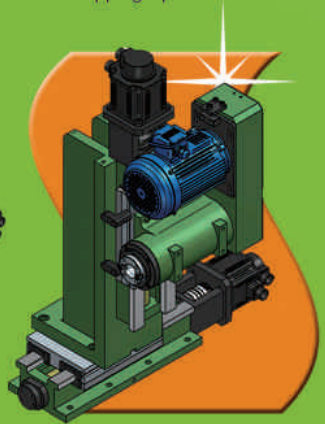
Tapping Spindle Head



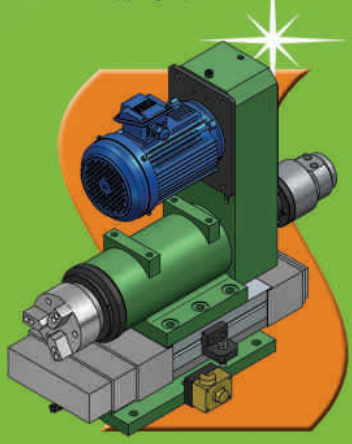
XY Servo Hardness Slide Unit



Servo Facing Head + Servo Ball Screw Slide Unit



XYZ Servo Slide Table + Milling Head



3-Jaw Chuck Spindle + Slide Unit

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ACCOMPLISHMENTS THAT WERE ONCE IMPOSSIBILITIES

India's spectacular victory in the Tokyo 2020 Olympics demonstrates that perseverance and commitment to one's goal are the most crucial qualities in reaching the top. The winners scripted India's Olympic history by winning seven medals - one gold, two silver, and four bronze.

Even in the best of circumstances, winning an Olympic medal necessitates a lifetime of effort. When India was dealing with the devastating first and second waves of the COVID-19 pandemic, the prospect of practicing for a sporting victory seemed a long way off. However, the Indian athletes stayed focused and overcame all obstacles – from physical ailments and despair to dealing with the toll COVID-19 imposed on the pursuit of their aim and brought home glory.

Following suit, India's indomitable para-athletes stormed the Tokyo Summer Paralympic Games, sweeping 19 medals in total, including five gold, eight silver, and six bronze bringing pride to the country. Defying all odds and stereotypes, they strove beyond their capabilities, underlining that nothing is impossible.

As India celebrates its 75th anniversary of independence, the phrase 'what was unthinkable yesterday is a reality today' rings true. In that spirit, nothing will be impossible tomorrow. Looking back over the bygone years, we have evolved from being a bystander to becoming a major player on the global stage.

> *"Start by doing what's necessary; then do what's possible; and suddenly you are doing the impossible."*
> *- Francis of Assisi*

At the independence, India's GDP was ₹2.7 lakh crore. Today, it is ₹135.13 lakh crore. Formerly referred to as a 'third world country', India now is one of the world's largest economies. We had the largest ever overall FDI inflow of US$81.72 billion for the fiscal year 2020-21, which is 10 percent more than the previous fiscal year 2019-20 (US$74.39 billion).

On this optimistic note, we, as ever, solicit your feedback on the current issue compiled on the strides the Indian Manufacturing sector has been making since the independence with the sole goal of making the seemingly impossible possible.

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IMTMA CELEBRATES DIAMOND JUBILEE

It is a matter of immense pride for IMTMA to have completed 75 glorious years in its endeavor to keep the machine tool manufacturers of the country close-knit. Shared are a few glimpses from its journey that was embarked upon with the sole aim of ensuring growth and progress of the industry...

Source: IMTMA

15th AGM of IMTMA, December 9, 1961

Indian Machine Tool Manufacturers' Association (IMTMA), one of India's oldest industry associations, is celebrating its 75th Anniversary in 2021. IMTMA's 75 years' commemoration is spanning throughout 2021 as the Association highlights key moments in its history. While very few companies in any industry have withstood the test of time to celebrate 75 years, IMTMA is looking back with some degree of satisfaction as one of the associations to claim this distinction.

The origin

The year 1946 was a watershed moment, not only in the history of the world but also for the Indian sub-continent. World War II had just ended. The political map of the world was redrawn with new super powers emerging while the British were on their last leg of their rule in India, which was soon to begin its new journey as a sovereign nation.

It's not an irony of chance that as India was set to embark its journey as a democratic country, a group of machine tool manufacturers in the then British India came together to form an association which in due course would become the apex body and single point of contact for the entire machine tool industry of India and also bring the country's manufacturing ecosystem under one roof.

On September 20, 1946, six prominent manufacturers of machine tools held a meeting in the Imperial Hotel, New Delhi, when the question of forming the Indian Machine Tool Manufacturers' Association was discussed and finalized. The late Sir Dhunjishaw Cooper of Cooper

IMTEX 1972

Source: IMTMA

Source: IMTMA

Engineering Ltd, Satara was appointed the President and MB Jambhekar of Mysore Kirloskar Ltd of Harihar (Mysore State), was appointed the Vice President. Important preliminaries for the formation of the Association like the various classes of Membership, Membership fees, the rights of Members and other incidental matters were discussed and tentative decisions were taken at this meeting.

The meeting marked the commencement of IMTMA which was granted recognition by the Government of India as a body representing machine tool manufacturers in India. IMTMA was constituted with 19 members: The Mysore Kirloskar Ltd; P.S.G. & Sons Charity Industrial Institute; U.M.S. Radio Factory; Cooper Engineering Ltd; The Indian Tool Manufacturers Ltd; G.G. Dandekar Machine Works Ltd; Investa Machine Tools & Engineering Company Ltd; The Hind Machines Ltd; The India Machinery Company Ltd; Paul's Engineering Company; Supercrafts Ltd; The General Engineering Works; The Batala Engineering Company Ltd; The Zamindar Foundry; Metropole Works; Fazal Mohammed & Sons; The Indian Sewing Machine Manufacturing Company Ltd; The Climax Engineering Company; and The Sind Engineering Works.

The First Annual General Meeting (AGM) of IMTMA was held on January 29, 1948 in the library room of Indian Merchant's Chamber at Lalji Naranji Memorial Building in Bombay. The first AGM, after adopting the statutory agenda, deliberated at length about difficulties and problems faced by the machine tool manufacturers in the country. Founder members discussed the ways and means for improving status of the Indian machine tool industry. Several members put forth progressive suggestions for increasing demand as well as supply of machine tools in the country. A meeting of the first-elected members of IMTMA's EC followed the first AGM. EC members, at the meeting, unanimously elected MB Jambhekar as the President of IMTMA, and DS Mulla as the first Vice President of the Association.

Settling down in business

IMTMA began its parallel journey with the newly formed young democratic India which was aspiring to emerge as an industrial nation through the establishment of various Public Sector Undertakings (PSUs) and research institutions. The formation of Hindustan Machine Tools (HMT) in 1953 gave a big fillip to the Machine Tool Industry and in the following year the Integral Coach Factory in Perambur, electronics factory in Bangalore and steel plant in Rourkela were set up giving birth to various ancillary industries in the Indian manufacturing landscape. The development work on new machine tools and accessories by Mysore Kirloskar, Cooper Engineering, Praga Tools Corporation, Batala Engineering, etc. laid the foundation of the next level of activities of the Association. During this period, IMTMA published the Directory of Machine Tools and the master catalogue – Guide to Indian Machine Tools (GIMT), which continues to be revised, updated and published annually.

The Association continued to make strategic connections with industry associations in various countries for close liaison for technology and industry updates. Members were encouraged to visit and participate in international industry trade fairs and seminars in India and abroad. IMTMA worked closely with the Government and the machine tool controller and development officer. Data was collected from sectors like Railways on the number, type and sizes of machine tools required and the possibilities of satisfying these requirements from domestic producers.

Exhibitions - the next big step

When all was said and done, there was still more to do. The next big step was to bring the In-

Today, with over 460 member companies, IMTMA represents 90 percent of the organized manufacturers of machine tools and related items / components as well as sub-systems and has brought the Indian Machine Tool industry to an important position in the world.

IMTEX 1975

IMTEX 1979

Source: IMTMA

Over the last two decades, IMTMA has worked very closely with the Ministry of Heavy Industries who has supported the Machine Tool industry through several of its initiatives such as Advanced Machine Tool Development Centre, Advanced Machine Tool Testing Facility, Tumakuru Machine Tool Park, etc.

dian manufacturers together to share competencies and utilize opportunities profitability. An all-India machine tool exhibition became highly relevant. India didn't have any at that time and in 1968 the idea was proposed and an organizing committee with Naval Godrej as Chairman was formed to make it happen. This gave birth to the first-ever IMTEX at Bombay in 1969. It took Naval Godrej less than a year to garner all available resources and present to the industry the first All India Machine Tool Exhibition in 1969. The journey had begun. It was indeed a bold step for a fledgling industry. The success of the exhibition gave the industry the much-needed confidence to march ahead with its activities in full steam. IMTMA never looked back.

IMTEX became IMTMA's ultimate tool to make the machine tool industry competitive. The exhibition was planned once every three years to match the product development cycle in the industry. Later it was scheduled once in two years and afterwards with the paradigm shifts in technology, it became an annual event. It evolved from a knowledge exchange tool to an industry empowering platform to address and influence government policies and a support system for IMTMA members to ride through economic upheavals.

New initiatives

The year 1991 was a benchmark one for Indian economy and businesses. This was the year when the Government finally broke the shackles of the license raj and ushered in liberalism. This led to the birth of several new generation entrepreneurs in machine tools and we began witnessing entrepreneurship driven machine tool companies starting from the mid-1990s to 2000s, bringing CNC technologies which revolutionized the industry, back then.

The Association began promoting the machine tool industry with more rigour as demand from Auto industry as well as some new industrial sectors picked up. Many more initiatives were added to IMTMA's portfolio as well. Meanwhile IMTEX continued to grow by several notches in Mumbai and Delhi, the cities where it used to be organized. During this journey we invented upon building our own exhibition infrastructure which gave birth to the Bangalore International Exhibition Centre (BIEC) in Bangalore with support from the Government of India and the Government of Karnataka.

BIEC has played a great supporting role in the development of the Machine Tool industry by being the venue for IMTEX. This infrastructure was developed to host large-scale engineering shows and with an objective to support the Manufacturing industry. BIEC is India's first LEED certified Green Exhibition and Conference Facility. Halls 4 and 5 have been conferred with 'Gold' rating by Indian Green Building Council (IGBC) and US Green Building Council (USGBC).

Over the last two decades, we have worked very closely with the Ministry of Heavy Industries who has supported our industry through several of its initiatives

Source: IMTMA

Source: IMTMA

Inside View of Hall 4 clicked at IMTEX 2017

such as Advanced Machine Tool Development Centre, Advanced Machine Tool Testing Facility, Tumakuru Machine Tool Park, etc. IMTMA, through its Technology Centres at Bengaluru, Pune and Gurugram, imparts training for fresh engineering graduates as well as industry professionals. During the year 2020 - 2021, IMTMA conducted a total of 335 programs, inclusive of 220 training programs and 89 webinars for students and industry professionals. While 3,556 delegates attended the online training programs, a record 12,042 delegates attended the webinars. Overall, IMTMA delivered 2,873 person-days of training during 2020 - 2021 through its training programs. All these initiatives are helping in advancing the Machine Tool industry to its next level.

Setting the tone for future

Today, with over 460 member companies, IMTMA represents 90 percent of the organized manufacturers of machine tools and related items / components as well as subsystems and has brought the Indian Machine Tool industry to an important position in the world. There are of course greater challenges with the pandemic outbreak, frequent lockdowns, etc. However, the industry will continue to remain resilient and endeavor to bring out new technologies and products which will reduce dependency on imports and enable 'Make in India' and 'Atmanirbhar Bharat' and continue to work towards garnering global recognition. Meanwhile, as the pandemic recedes, the Association will host new exhibitions and events besides conducting a series of online and off-line training programs to hone the skills of next-generation engineers and entrepreneurs. For more information on the Association's activities, please visit www.imtma.in

As the pandemic recedes, the Association will host new exhibitions and events besides conducting a series of online and off-line training programs to hone the skills of next-generation engineers and entrepreneurs.

BIEC Aerial View during IMTEX 2017

Source: IMTMA

TTIL Completes 20 Successful Years

A consistent 5S Excellence award winner, an AS9100 Rev D and ISO 9001:2015 accredited manufacturing entity and certified for Environmental Management System and OH&S system, TaeguTec India is proud of its latest milestone but not ready to rest on it yet.

Source: TaeguTec India

Centre: L Krishnan, MD, TaeguTec India lighting the lamp on the occasion of the company's 20th Anniversary.

Source: TaeguTec India

"It's a milestone made possible by teamwork. The people are key, and going forward too, we aim to work together to deliver better value proposition for our customers.**"**

L Krishnan
Managing Director
TaeguTec India Ltd

A leading supplier of modern machining solutions – both turnkey solutions and tailor-made – to a wide variety of industries including Automotive, Mold & Die, Aerospace, and Power Generation, TaeguTec is considered the most preferred tooling partner in the industry today.

TaeguTec India (TTIL) celebrated its 20th anniversary of successful manufacturing operations at its Bangalore factory cum office campus in August 2021. Now a leading cutting tools manufacturer with its enviably green and state-of-the-art campus in the industrial heartland of the Garden City, the TTIL factory journey from being an unknown brand on barren acreage is widely admired by both customers and competition.

A leading supplier of modern machining solutions – both turnkey solutions and tailor-made – to a wide variety of industries including Automotive, Mold & Die, Aerospace, and Power Generation, TaeguTec is considered the most preferred tooling partner in the industry today.

It calls for a celebration

Celebrating this momentous milestone at the factory with a sumptuous feast with the team, L Krishnan, Managing Director, TTIL, said, "It's a milestone made possible by teamwork. The people are key, and going forward too, we aim to work together to deliver better value proposition for our customers."

Helming the team for the last two decades, Krishnan has led and contributed to numerous related initiatives at the state, regional and national levels in matters of manufacturing process, policy advocacy, skill building etc. A consistent 5S Excellence award winner apart from being an AS9100 Rev D & ISO 9001:2015 accredited manufacturing entity, certified for Environmental Management System [as per ISO 14001: 2015 (EMS) and OH&S system per ISO 45001: 2018 (Health and Safety)], TaeguTec India is proud of its latest milestone but not ready to rest on it yet.

Source: TaeguTec India

Team TaeguTec India observing the company's 20th Anniversary.

UNLEARNING – THE ART OF LETTING GO

In the earlier issues, we have been talking about chasing goals, appraisals, reviews etc. all in the context of getting ahead and seeking to reach the level we covet. It is important, at this juncture, to understand and internalize the art of letting go. We can get to the next stage only when we let go of our present position.

We are living in changing times where VUCA world is a standard vocabulary. We are experiencing disruptions like never before, from the most unexpected sources, and terms like gig economy, skill economy, etc. keep making rounds and demand from us continuous learning of them. For which, unlearning takes the center stage. This just does not involve unlearning skills and knowledge that we have, but more importantly the frame works and attitudes that we work from. As Alvin Toffler implied that the illiterate of the coming times are not those who cannot read and write but those who don't learn, unlearn and relearn.

The situation and circumstances for our initial learnings could no more be valid in the changed present the same things look different in the new light. Unlearning is and should be pursued as an empowering process that helps change our paradigm. Unlearning is not something that can be achieved in a day but is a process that unfolds with time. Letting go of what we know and giving way to new ideas and ways demands persistent effort with the acceptance that our current knowledge is not enough.

We are comfortable with this reality in our physical journeys. If we need to get to Mumbai, we must move from Bangalore. However, in our personal, professional and organizational journeys, it is paradoxical that we want to reach somewhere but do not want to move.

An organization is an actual living entity made by individuals. How one impacts and shapes the other is complex to decipher, and it is in this context that the culture of the organization is critical and on which the success is built. Purpose, Vision, Mission and Values like fostering respect, encouraging diversity and creativity, embracing failure, evaluating risks, and adapting holistically and truly can be major differentiators. Hence, in these days of change and learning, organizations must wisely encourage choosing among alternative models or paradigms, and consciously help their human resources unlearn to learn.

"Unlearning is not something that can be achieved in a day but is a process that unfolds with time. Letting go of what we know and giving way to new ideas and ways demands persistent effort with the acceptance that our current knowledge is not enough."

TK Ramesh
Managing Director
Micromatic Machine Tools Pvt Ltd

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

CHANGING THE AUTO GAME

The increasing demand and favorable Government policies indicate that India could be achieving a substantially high penetration of electric vehicles in the near future. With charging stations and other requisites being put in place, let's look at the crucial role semiconductors play in helping boost the EV infrastructure...

Source: Magic Wand Media

HITESH BHARDWAJ
General Manager
Mitsubishi Electric India Pvt Ltd

The Automotive industry alone is a major industrial and economic force. Responsible for making over 60 million cars and trucks worldwide yearly, the industry, at present, is undergoing a paradigm shift, trying to make a quick switch towards alternative energy options. India is also running in the same league trying to invest in this electric mobility shift. This thought has gained momentum after keeping various factors in mind including the burden of oil imports, global climate change issues, rising pollution, and so on.

Growth of EV in India

To encourage electric mobility in India, the Government of India (GoI) has also proposed several changes in the Central Motor Vehicles Rules, 1989. Recently, the GoI has proposed to exempt Battery Operated Vehicles (BOVs) from the payment of fees for issue or renewal of Registration Certificate (RC) and assignment of the new registration mark.

It has also modified the FAME-II (Faster Adoption and Manufacturing of Electric vehicles – second phase) scheme to increase the subsidy for electric two-wheelers. The Government has also increased demand incentive by 50 percent for electric two-wheelers to ₹15,000 per kWh from the earlier uniform subsidy of ₹10,000 per KWh for all-electric vehicles (EVs) and hybrids, except buses.

There is also no doubt that the penetration of Battery Electric Vehicles (BEVs) has increased significantly in the last five years. With several automakers and start-ups working on respective products and tech-enabled gears, India aims to become a major global vehicle market.

EV infrastructure

The growth of the e-mobility sector in India also demands EV charging stations. The charging infrastructure is an important factor that determines the adoption trends of EVs in the country. The scarce battery technology in EVs needs charging from time to time depending upon the size and

Source: Magic Wand Media

capacity. Therefore, charging stations are essential for the sustainable operation of EVs.

The charging requirement depends on both the kind of vehicle and the utility purpose simultaneously. According to the NITI Aayog report, India could achieve high penetration of EVs by 2030. The GoI has set a target to electrify 70 percent of all commercial vehicles, 30 percent of private cars, 40 percent of buses, and 80 percent of two-wheelers and three-wheelers by 2030.

Not just the Indian Government but the industry giants too have been quite hopeful about the growth of EVs and the charging stations in India. Going by the developments in the overall EV charging ecosystem, India is gradually picking up the pace.

Global leaders in innovation and technology like Mitsubishi Electric are increasingly investing in charging station infrastructure development.

Mitsubishi Electric manufactures semiconductors and devices including power modules and high-power devices that handle the highly efficient control of power. These miniaturized Semiconductor Integrated Circuits (ICs) for system controls and power semiconductor devices play a key role in EV charging infrastructure.

An EV charging station (DC Type) has two stages of power conversions while transferring energy from a utility supply to an electric vehicle. In the first stage, alternating current (AC) is converted to direct current (DC) with power factor control to keep the stability of utility.

Meanwhile, in the second stage, DC is again converted into DC which controls charging voltage level as per vehicle requirement. In both stages, power semiconductors are used to convert and control the smooth flow of energy.

While converting AC into DC and controlling the charging voltage, power semiconductors lose some part of their energy in the form of heat. These energy losses decide the efficiency of DC chargers as well as the size of the cooling system, which, in turn, will decide the size of a DC charger.

So, for the best efficiency and a compact DC charger system, the performance of power semiconductors is one of the key factors. Nowadays, Silicon Carbide (SiC) is also used to improve the performance of power semiconductor devices. There is no denying that this technology will help in giving a boost to EV infrastructure.

Like Mitsubishi Electric, there's a long list of global leaders providing their support in one or another way in bringing e-mobility on the ground. They are also searching for alternative ways of sourcing power as there's a fear that EVs might run out of power between charging points.

Not to mention, the EV ecosystem is dependent on the Government policy intervention, participation of private sectors, and, of course, the technological innovations taking place on the EV-charging front. So, it's important to keep an eye on these developments too.

The EV charging stations are the backbone of the e-mobility sector and building it the right way will undoubtedly make EV adoption higher in India.

The Government of India has increased demand incentive by 50 percent for electric two-wheelers to ₹15,000 per kWh from the earlier uniform subsidy of ₹10,000 per KWh for all-electric vehicles (EVs) and hybrids, except buses.

UNLEASHING THE POWER OF POSSIBILITY

Source: Magic Wand Media

Simulation provides manufacturers the ability to analyze and test a new or revised product design and implement high-efficiency manufacturing lines to ensure products are created quickly, accurately, and at volume. Here's knowing one of the advanced technologies that has become imperative in high-quality manufacturing...

Every year, billions of products are made and sold across the world. Each of these products, regardless of volume, is made in facilities that follow certain steps to create, assemble, test, and ship. One misstep can cost time and money. The same is true for product design. One design flaw can lead to reliability issues – and lost customers. Anything left to chance opens the door to risk. When experienced manufacturing engineers model, simulate and analyze a product or system, they significantly shrink that risk.

And the manufacturing industry agrees. A recent survey showed that 75 percent of manufacturing executives believe simulation is critical for success. This shift is driving tremendous growth in the market, with simulation software expected to reach more than US$15 billion by 2026.

Simulation plays an important role when building new products or introducing changes to existing products. When building innovative or complex products, companies can speed time to market and identify potential issues by using simulation to visualize the end-to-end production process and product lifecycle.

This includes determining the most effective assembly line setup to prepare to meet demand or transitioning a line to a next-generation product. It can determine optimal line layouts, decrease bottlenecks, and improve every step of the manufacturing process. The simulation also provides insight into the steps taken in a product's lifecycle, including how it is made, how it works, and where it can be improved.

Adopting simulation in the product design process helps to reduce the number of physical prototypes and optimize the design for manufacturing. But what exactly is a simulation and how does it work?

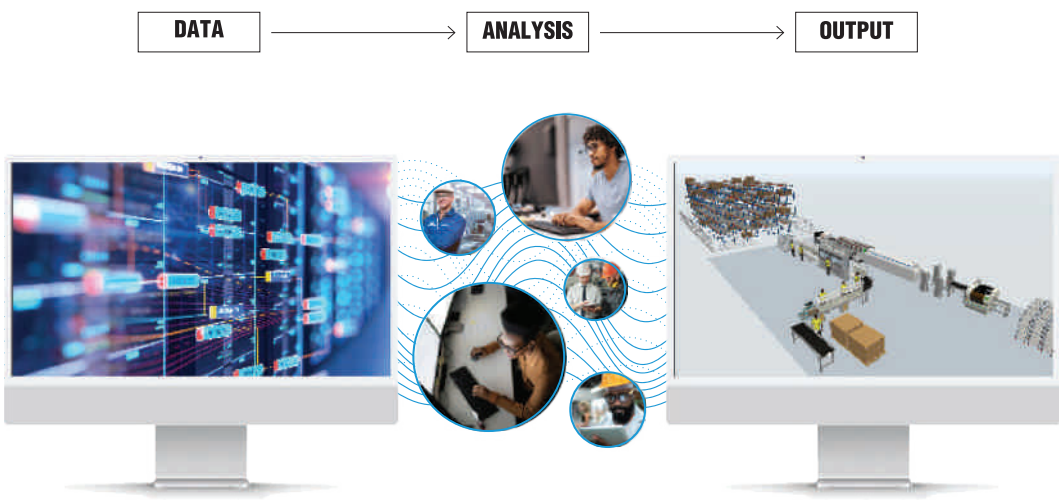
Simulation capabilities

Simulation is the process of modeling a real phenomenon through a set of computer-based mathematical formulas or algorithms. By taking this approach, engineers can observe a representation of operations on an

To maximize the value of simulation, organizations need to define the KPIs they want to improve and start simulation early. Examples include increased product yield, improved scheduling, and enhanced line flows.

Source: Flex Ltd

How manufacturing engineers extract the full value of simulation



Source: Flex Ltd

object or an environment. They then use this data to perform analysis to determine how to optimize complex products or systems. This simulation can occur ahead of any physical action such as the building of a prototype or the establishment of a manufacturing line.

It is an invaluable tool for analyzing and optimizing dynamic processes. This is especially true when mathematical optimization of complex systems is impossible using traditional methods – and when conducting experiments within real systems is too expensive, time consuming, or even dangerous.

Because it involves running an extensive range of scenarios, simulation provides engineers with a controlled and precise methodology in support of objective decision-making.

The most critical consideration for any simulation project is to ensure a clear understanding of the variables, constraints, and information needed. This is most often the longest part of a simulation initiative. Ultimately, the quality of the data input plus the engineers' expertise determines the quality of the results.

Simulation analysis yields the best results when performed by a dedicated team of engineers who specialize in simulation and have the deep critical thinking and problem-solving skills required to optimize the process or product design.

The result of well-applied simulation can include a range of benefits, including speeding time to market, creating better, more reliable products and more.

The three types of simulation that are used for design, manufacturing, or logistics simulation are Discrete Event Simulation, Design for Reliability, and Finite Element Analysis. Each type addresses different optimization challenges.

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Discrete Event Simulation

For any product, understanding the steps and interactions of multiple processes is key to optimizing production. When modeled, simulated, and analyzed, these steps offer important insight into the overall process. This practice in the Manufacturing industry is called Discrete Event Simulation (DES) and is probably the most frequently used type of simulation.

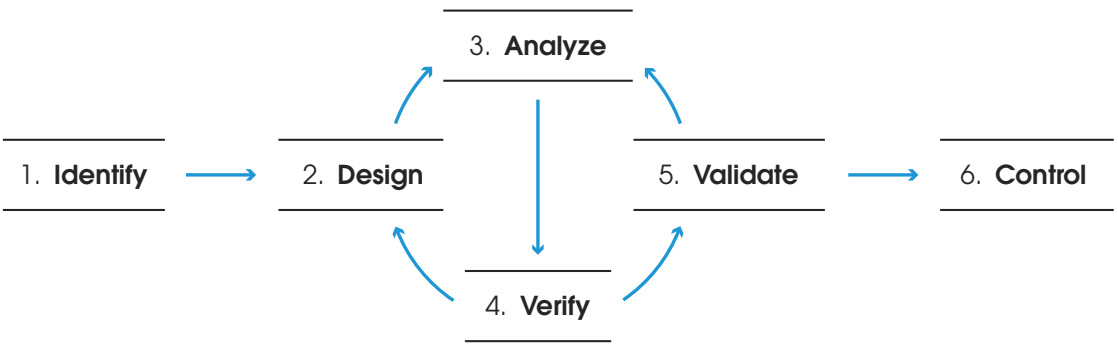
DES models real-world phenomena or a system of operation as a sequence of discrete events. Real-world phenomena with stochastic elements cannot always be mathematically modeled and evaluated, and it is even more difficult to represent them graphically or with objects.

Using DES, these high-complexity systems can be modeled and analyzed to help make business decisions and drive improvements in various ways. In some cases, and applications, DES is the only way to study a system and make improvements due to the fact that the system is so large and complex that any other method will take years to model, statistically study and then make needed changes (assuming the real-world system still exists and has stayed the same since the study started).

Since DES is a representation of a physical system, it allows the testing and experimentation of an existing or current system under various scenarios and provides insights based on those scenarios. This is a very powerful concept. In theory, a real-world model is being copied in a software-created environment, creating a 'digital twin.'

Using this digital twin, DES allows for the possibility of 'what-if' scenarios to be evaluated. Because the system is being represented by a model, it is easier to experiment and

DfR is a multi-step process that takes many approaches



Source: Flex Ltd

try various types of conditions without affecting the actual system or the process that is occurring – something of critical importance in time-constrained situations or when an actual production line cannot be modified.

It can also be used in the planning process long before a real system is installed. Extensive analysis tools, statistics, and charts let users evaluate different manufacturing scenarios and make fast, reliable decisions in the early stages of production planning.

DES ensures a product is fit for manufacturing and end-use. It does this by simulating factory environments such as production lines, automation solutions, logistic operations, or other manufacturing processes. Some of the parameters include yield, volumes, headcount, layouts, and more. This allows industrial engineers or process engineers to improve productivity, increase volumes, optimize layouts, reduce lead time, and reduce work in progress.

Finite Element Analysis

The second type of simulation, Finite Element Analysis (FEA), is a computational analysis used to predict how a product or component will react in a real-world environment. For example, FEA can predict if a product will break, wear out too soon or work as designed. Engineers rely on FEA simulation to reduce the number of physical prototypes, as well as run virtual experiments to optimize their designs.

The goal of FEA is to ensure a product can handle various types of stress. This data is then used to optimize the design of a part to improve an overall design, avoid possible failures, and validate the existing geometry for its application.

FEA makes predictions, based on many physical effects such as Electrostatics, Electrodynamics, Fatigue, Fluid flow, Heat transfer, Mechanical stress, Mechanical vibration, Motion, and Plastic injection molding. FEA is commonly used before parts are fabricated but can benefit existing products for design validation purposes.

The mathematical principles of FEA are also useful in other areas, such as computational fluid dynamics (CFD).

FEA focuses on mechanical structural assessment to find out the strength/deflection of a design, while CFD focuses on a fluid flow assessment to determine how a design interacts with air, water, and other elements.

Together, FEA and CFD algorithms built into modern software tools give engineers access to what are essentially mathematical superpowers.

To run an FEA simulation, mathematics is used to generate a mesh. This typically contains millions of small elements that make up a product's overall shape. It is a highly sophisticated way of translating a 3D object into a series of mathematical points that can then be analyzed.

Once the mesh is created, FEA analyzes each finite element, adding up all of the individual behaviors to predict the behavior of the actual object. Because the calculations are done on a mesh, rather than the entirety of a physical object, it means that some approximations need to occur between the points using different modes of accuracy. For instance, there is a square approximation, a polynomial approximation, and a discrete approximation. Each of these techniques increases in complexity while increasing the accuracy of results.

As a result, with FEA, product makers can improve product reliability, reduce the steps of physical testing and simulate 'what-if' scenarios.

Design for Reliability

The third type of simulation, Design for Reliability (DfR), is a process used to ensure products and systems perform a function within a given environment over the desired lifetime. It encompasses the use of an entire set of reliability engineering tools, along with the expertise to know when and how to use these tools.

Typically, engineers implement the DfR methodology in the beginning as an early concept, but it can also be applied all the way through to product obsolescence. Either way, the goal is to ensure customer expectations for reliability are met with low overall lifecycle costs.

Through DfR, which is often part of a Design for Excellence program, engineers identify high-risk areas and select tests for validating results. The next step is to reduce or eliminate, potential failure modes prior to production release.

DfR helps product makers meet reliability targets, mitigate risk from defects, optimize product design, reduce costs, and satisfy end customers.

At the core of DfR is the physics of failure, which includes testing to identify issues and statistical analysis to determine reliability prediction. This data can then be used to recalibrate as needed prior to physical prototyping.

Mean Time Between Failures (MTBF) is an important DfR tool, which predicts elapsed time between inherent failures of a mechanical or electronic system during normal system operation. MTBF is calculated as the arithmetic mean (average) time between

Through DfR, which is often part of a Design for Excellence program, engineers identify high-risk areas and select tests for validating results. The next step is to reduce or eliminate, potential failure modes prior to production release.

failures of a system. This analysis is used for repairable systems. Mean Time to Failure (MTTF) is the expected time to failure for non-repairable products or systems.

Using MTBF calculations, an engineer can improve a design by understanding points of failure. For example, an engineer wants to evaluate 144 components found in a bill of materials for planned usage in a printed circuit board. Using calculations under different operating temperatures, the engineer determines that 20 of the 144 parts are identified as high risk. The engineer then submits these parts for consideration to be replaced by parts that perform well at the higher operating temperature.

Another example is determining that 53 parts in a design will last ten years, while 11 will last for three years. This finding indicates a need to replace the 11 parts to be comparable with the longer-lasting parts.

DfR provides the simulation needed for:

- ***Cost control:*** On average, a considerable portion of a project's budget is typically allocated to design
- ***Preserving profits:*** Products get to market earlier, preventing erosion of sales and market share
- ***Product differentiation:*** As products reach maturity, there are fewer opportunities to set products apart from the competition through traditional metrics like price and performance
- ***Reliability assurance:*** Advanced circuitry, sophisticated power requirements, new components, new material technologies, and less robust parts make ensuring reliability increasingly difficult.

The right simulation approach and expertise from goal setting to analysis and optimization will help ensure that products and systems will be their very best – now and in the future.

Simulation provides value across industries

Regardless of the industry, simulation offers many benefits, including higher reliability, faster time-to-market, and greater production line flexibility.

Automotive

What once was a simple engine, four-wheel and a chassis is now a connected smart computer that travels by road. The high-tech components, such as smart sensors, navigation systems, overhead consoles, and more, are important for safety and must be extremely reliable. When designing and assembling these 'brains' of the system, simulation plays a key role in predicting weak points related to hundreds of tiny parts.

When applied before physical prototyping, FEA simulation can indicate where component adjustments are needed ahead of fabrication. This helps improve reliability, shorten regulation cycles, and save automakers money by getting it right the first time. DES is also especially valuable as setting up a line can be quite time-consuming, particularly in the approval process phase of production parts.

Cloud

FEA and DfR simulation are ideal for the design and production of servers and other cloud infrastructure components to ensure the highest reliability in extreme situations, where temperature control is key. DES simulation can also play a role in determining how to rapidly bring high-demand products to market.

Healthcare

DES simulation can map necessary steps, determining the best process – even before a line or process is established. DfR can ensure the reliability of design, such as a glucose monitor or fluid delivery system, before engineers create a single physical prototype.

Industrial and communications

DfR simulation is highly valuable in the early design phase of industrial products. This is where makers have the opportunity to strengthen their designs for maximum value and operation. DES also plays an important role in setup and optimization, as these types of products require complex manufacturing lines.

Futuristic technology

The demand for simulation will continue to increase across manufacturing to meet the growing need for increasingly more complex products and systems. Simulation's vast capabilities enable companies to continuously push the edge on what is possible, creating more reliable, feature-rich products that help make the world a better place.

To realize maximum value from simulation, product companies have two options: Invest in simulation tools and develop their own in-house expertise, or Choose a manufacturing partner with deep expertise in simulation, optimized manufacturing models, and standard procedures and practices for every step along the way.

The right simulation approach and expertise from goal setting to analysis and optimization will help ensure that products and systems will be their very best – now and in the future. Simulation on the manufacturing floor and in design centers has become a best practice among leading manufacturers and will continue as companies look for better ways to design and build the next generation of innovative products.

FOCUSED ON GROWTH

Manish Bhatnagar, Managing Director, SKF India Ltd, in this insightful interview with MMI's Editor-in-Chief Soumi Mitra, talks on SKF India's unwavering growth strategy, the impact of the growing market of electric and connected vehicles on the company's auto business, its online store that offers automotive and industrial business products for retail and industrial buyers, and much more...

Source: SKF India Ltd

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The pandemic and its subsequent lockdowns created unprecedented havoc in the manufacturing industry, impacting workforce capacity, disrupting supply chains, and creating liquidity crunches. Now that things are slowly getting back on track how do you look at the manufacturing sector in the next quarter of the financial year? What are the strategies resorted by SKF India to get its pre-COVID-19 growth in the near future?

Manish Bhatnagar: While we entered 2021 with a robust balance sheet, deep customer relationships, a strong brand, and strategically positioned business, the country had been severely impacted with the second wave of the pandemic. With the Government focusing on mass vaccination drives and supporting small businesses, we expect spending and activity levels to gain momentum through the rest of the year as the macro environment improves. At SKF, the effects of the second wave of COVID-19 have not changed our strategy and we remain confident on the growth opportunities ahead. In line with our strategy, we will continue to focus on executing our strategies, sustaining operational efficiencies, maintaining customer centricity, and ensuring cost discipline leading to a strong financial performance and increased shareholder value.

Looking ahead, we see digitalization as an enabler to implement and deliver proactive solutions and position SKF strongly for the long-term growth. By designing unique solutions under

our rotating equipment performance (REP) model, we aim to enable growth and innovation and meet the changing needs of customers. Through REP, we leverage our product and engineering expertise with our deep understanding of rotating equipment to provide a solution to the customer to maximize their machine uptime and increase reliability.

Coming to the Auto industry, there has been a significant slowdown in Commercial Vehicles (CVs). How has that impacted SKF India and when do you see the segment's recovery happening? Which are the other segments that you cater to that can backfill the CV lag?

Currently for our Automotive business, which accounts for 55 percent of the SKF India's total business, we are focused on gaining share. This is because, for us, Automotive is not just one sector. So, the agriculture linked products, like tractors, are doing very well for the last two-three quarters. A lot of buying is happening in the two-wheelers. When it comes to passenger vehicles (PVs), new models are being launched, which did not happen in 2020. Passenger vehicles are a very special category where demand and sales are dependent mainly on new model launches and we are seeing that a lot of models are being launched and the buying has started. The slowdown in the commercial vehicles segment began long before COVID-19 and nothing has changed. In summary, agriculture is doing well, passenger vehicles should do well hereafter and two-wheelers will continue to do well.

The popularity of EVs is again picking up. How do you plan to cater to the segment?

The agriculture linked products, like tractors, are doing very well for the last two-three quarters. A lot of buying is happening in the two-wheelers. New models are being launched in passenger vehicles, which did not happen in 2020.

Source: SKF India Ltd

"One of the key learnings from COVID-19 is that to overcome such occurrences, industries must invest in digital factories and automation. The pandemic also exposed the Manufacturing sector's fragility brought in by over-dependence on select geographies for the supply chain."

Manish Bhatnagar
Managing Director
SKF India Ltd

Electrification is a strong trend in the Automotive industry driven by battery technology development and the multiple benefits that electric vehicles can bring to societies, for example, energy security, improved urban air quality, and noise mitigation. The growing market of electric and connected vehicles will positively impact our automotive business as the bearings play an important role in their applications. At SKF, we are investing in new technological developments and adapting or redesigning conventional bearings. Overall, we have a portfolio of innovative solutions that enable a robust and efficient E-powertrain drive. Many leading OEMs in Asia, Europe and North America alike are trusting SKF bearings and solutions as part of their electric drivetrain design.

SKF hybrid Deep Groove Ball Bearings (DGBB), for example, use ceramic rolling elements and steel rings. Bearings of this type offer improved high-speed performance and best-in-class electrical insulation characteristics, making them the premium choice for high performance EV powertrains. In addition, SKF is also developing application specific solutions to mitigate risk of current leakage at system level and to protect the entire EV transmission.

SKF India has come up with its Online Store, which understandably is in keeping with the current times. How has the response been so far since the practice of ordering automotive parts online is new in India?

As COVID-19 and the related changes in business and customer buying patterns have accelerated the need for digital transformation, we have launched emarketplace - an online store offering Automotive and Industrial business products for retail and industrial buyers.

The 24x7 online store aims to provide direct access to genuine SKF products ranging from Bearings and Bearing Units, Housing and Accessories, Greases, and other maintenance products, for both Industrial and Automotive segments. All the process industries, MSMEs, traders, retailers, automotive aftermarket retailers, mechanics and fleet owners will benefit from this wide range of products and solutions. Currently, we are enabling infrastructure - warehousing and last-mile delivery, to enable our customers, be it our channel partners or end users, to connect with us through the digital medium and order directly on the internet. So far, the demand has been fantastic. In total, we have over 1,000 product offer-

ings, delivering to 50 percent of total pin codes pan India.

The Manufacturing industry, having learned lessons from the first wave of the pandemic, was better equipped to deal with the crisis in the second wave. We are keen to know SKF India's learnings from it and the most important of all.

The Manufacturing sector is the backbone of any nation's GDP and over the years, the sector has created an endless number of opportunities for all stakeholders. However, the sector was hit hard by the outbreak and the unexpected lockdowns. One of the key learnings is that to overcome such occurrences, industries must invest in digital factories and automation. The pandemic also exposed the Manufacturing sector's fragility brought in by over-dependence on select geographies for the supply chain. It is imperative for industries to reconfigure their sourcing and manufacturing footprints and further capitalize on India's advantages in raw materials, skills, and entrepreneurship to build an ecosystem that supports a multi-tiered industry ready to take on global manufacturing.

Do you think that our Indian machine tool manufacturers have the bandwidth to match the efficiency of international machines?

The Indian Machine Tool industry is key to the Government's flagship 'Make in India' and 'Skill India' initiatives and is growing at a steady pace with its continuous support. As Industry 4.0 continues to impact the Manufacturing sector, it is imperative for the manufacturers to constantly transform themselves and reinvent business models to stay one step ahead. The industry, in general, needs to adopt digitalization and Industry 4.0 as well as focus on better resource allocation, redefined work processes, and strategic investment interventions, to meet increasing customer requirement for improved productivity, reduced cycle time and greater efficiency.

Source: SKF India Ltd

"The Indian Machine Tool industry, in general, needs to adopt digitalization and Industry 4.0 as well as focus on better resource allocation, redefined work processes, and strategic investment interventions, to meet increasing customer requirement for improved productivity, reduced cycle time and greater efficiency."

Manish Bhatnagar
Managing Director
SKF India Ltd

The COVID-19 pandemic has accelerated the longstanding trend toward manufacturing automation. Is the Machine Tool industry in India Industry 4.0 ready?

India's Machine Tools industry is a strategic pillar of the Manufacturing industry and is expected to play a key role in accelerating Industry 4.0 adoption. This will also help in achieving the ambitious target of making India a global hub for manufacturing, design, and innovation, and augmenting the share of manufacturing in the country's GDP.

Currently, India's Machine Tools industry is at a nascent stage of adopting manufacturing automation. As the demand for high-tech and efficient machines in the industry rises, the industry will have to make digitalization of the production process an indispensable part of business.

SKF has taken a lead in digital development, driving Industry 4.0 under the term 'smartifying industry'. The fastest-growing connectivity is in manufacturing, which represents almost one-third of the total value of Industry 4.0. SKF is smartifying the industry to utilize these opportunities. The gradual smartifying has brought an entirely new way of working that has a big effect on customer relations.

Currently, India's Machine Tools industry is at a nascent stage of adopting manufacturing automation. As the demand for high-tech and efficient machines in the industry rises, the industry will have to make digitalization of the production process an indispensable part of business.

Source: Blaser Swisslube

Blaser Swisslube Team in India

OFFERING THE RIGHT SOLUTIONS

A leading name in the field of metalworking fluids, Blaser Swisslube has had an exciting journey of over 20 years in India. The company owes its success to its customers who are spread across various segments, company sizes, and geographical locations in the country, and leverages this medium to thank them for helping it strengthen and expand its Liquid Tool approach.

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A 100 percent-owned subsidiary of Swiss-based Blaser Swisslube AG and replicating the same set of ethics, Blaser India has customer satisfaction as its top priority. "'Serving before deserving' was a key principle of Willy Blaser, Founder of the company, which is still valid even after 85 years of the company's establishment; we live it here in India too," shares Punit Gupta, Managing Director, Blaser Swisslube Solutions Pvt Ltd. "The comprehensive research and development efforts of Blaser Swisslube, along with its know-how and expertise, are our strong backbone in India, which will help us grow even further in the future," he adds.

Industries have been transforming by adopting technologies and hiring skilled employees and those with leadership qualities. Gupta is happy to see Blaser's contribution in the process, which has helped to drive the perception change among industry leaders who now look at the metalworking fluid as a 'smart investment with big results' instead of a 'necessary evil.' "The right fluid can have a positive effect on crucial performance indicators such as tool life, cycle-time, workpiece quality, and the machinist's satisfaction," he adds.

Wide range of solutions

Founded in 1936, the independent and family-owned Swiss company has grown from a small business into a technologically leading global player, having its presence in 60 countries worldwide. The company's business in India has been a success, shares Gupta. "Our solution-driven approach has been gaining wider acceptance,

which has helped us build long-lasting customer relationships here," he adds.

Sharing the company's comprehensive range of metalworking fluids that cater to myriad industries, he says that Blaser's goal is to offer coolant solutions for a wide range of materials and applications, "We are happy to offer water-miscible, neat oils as well as MQL (Minimal Quantity Lubrication) products and expertise to the Indian market. Our coolant products are built on different technologies like mineral oil-based, ester-based, or synthetic. Excellent human and environmental compatibility is highly important to us."

Blaser Swisslube Solutions follows GHS European standards. Its coolants are free of critical substances like boric acid. "There is also our unique Blasocut Bio-Concept. Water-miscible Blasocut emulsions stay biologically stable inherently without any need for bactericides. This is a concept that the company introduced 40 years ago," informs Gupta.

The company's neat oil solutions also offer high success in gear cutting, gear grinding, broaching, tool grinding, gun drilling applications, and more. "Many industry areas have a potential

Source: Blaser Swisslube Solutions Pvt Ltd

"Educating our customers on coolant handling and care, and investment in technology and partnership is a key aspect of our work. We, at Blaser Swisslube, have always worked on building businesses with strong fundamentals; this has helped us to increase resilience over time."

Punit Gupta
Managing Director
Blaser Swisslube Solutions Pvt Ltd

Blaser Swisslube has been continuously investing in strengthening the team, its know-how, and capabilities in India and globally. The recent investment in CCC – Country Competence Center – is an example of its future-oriented journey.

Source: Blaser Swisslube

Technology Center of Blaser Swisslube in Switzerland

Source: Blaser Swisslube

L-R: Punit Gupta, Managing Director, Blaser Swisslube Solutions Pvt Ltd and Gaurav Mittal, Sales Director, North and East India, analyzing customer parameters.

Sustainable development of business with long-term customers, partners, and employees has been a key aspect of Blaser Swisslube Solutions' growth.

to increase up to 20-40 percent in tool life and/or 8-15 percent in productivity as per various project records. We always analyze the process in the beginning and then make a proposal to the customer of what he can improve in the long run," he adds.

Helping customers win

Throwing light on the company's name change from Blaser Swisslube India to Blaser Swisslube Solutions, Gupta says that it was done with the sole intention to improve productivity, economic efficiency, and process stability for its customers. "The Liquid Tool Solution is our value proposition to our customers. All of us at Blaser India have a strong belief and we are convinced that it is the right way to move ahead together with our customers. Belief becomes stronger when we see more customers benefiting from it, and although we have added only a word, it makes a big difference to us," he shares.

He adds, "With our holistic approach and know-how, we can therefore offer solutions that help customers fully capitalize on the potential of their machines and tools, and turn their metalworking fluid into a key success factor – a Liquid Tool. We are continuously investing in strengthening the team, our know-how, and capabilities in India and globally. The recent investment in CCC – Country Competence Center – in India is an example of our future-oriented journey. Our team, together with our partners, are excited about the journey ahead and we are looking forward to more collaborative work with our customers, that can help them win."

Blaser Swisslube Solutions has been growing admirably for the last 20 years. Sustainable development of business with long-term customers, partners, and employees has been a key aspect of its growth. "The Indian market has been evolving from a traditional buying process to just price per unit to a more progressive approach of the total cost of ownership. This is an opportunity and challenge at the same time. However, we are happy that customers are following a partnership approach rather than a supplier approach," notes Gupta.

Riding over challenges

The pandemic has brought new learning and accelerated the changes in our surroundings and behaviors. People have started prioritizing their needs for investments in higher productivity, systems, and better care for humans and the environment. "Our Liquid Tool Solution approach fits in well here and we are confident that we can steer the next phase of growth with customers together. During the lockdown phases, we were able to serve and support our customers with the necessary information on coolant handling and care during longer production stops," shares Gupta.

The team has been constantly in touch digitally with all its customers, taking care of their requirements. This has resulted in further strengthening of mutual trust and the company's relationship with its customers. "We are able to play a vital role as a reliable partner during this difficult time," he sums up.

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A BEGINNER'S GUIDE TO SUPERFINISHING

Learn what superfinishing is, what applications it should be used for and why you should take care when specifying surface finish parameters.

Source: Nagel Precision Inc.

Different parts and materials that have been superfinished.

EMILY PROBST
Senior Editor
Modern Machine Shop

There is a constant pressure on manufacturers to both enhance the efficiency of manufacturing and enhance the performance of manufactured products, often by taking the weight out of components. For automotive manufacturers, this is coupled with pressure to reduce emissions. According to Sanjai Keshavan, Manager, ECO Hone and Microfinishing Systems Division, Nagel Precision Inc., all these pressures helped lead to the development of superfinishing — a finishing process first applied to production around the 1930s that is designed to enhance a component's surface finish while also improving its micro-contour accuracy through improved roundness, straightness, cylindricity and more. Despite its usefulness for automotive parts, the application potential for superfinishing is wide-reaching. From job shops to large original equipment manufacturers (OEMs), superfinishing has found roles in small medical parts such as hip and spine implants and aerospace parts such as turbine and landing gear components. According to Keshavan, superfinishing can conceivably be used in any OD application that requires the precise removal of small amounts of stock on the order of 0.002-0.005 mm from the diameter. While steel is the most common material to superfinish, he says, the process can also be applied to exotic alloys, titanium, aluminum and even glass and ceramic.

One of superfinishing's main benefits is that it is a cold material process, which means it eliminates the thermally damaged layer that is left by previous operations such as grinding. This has a key impact on extending component life. For example, Keshavan says that if the bearing surfaces of an engine crankshaft or camshaft were not superfinished, compo-

Source: Nagel Precision Inc.

Honing.

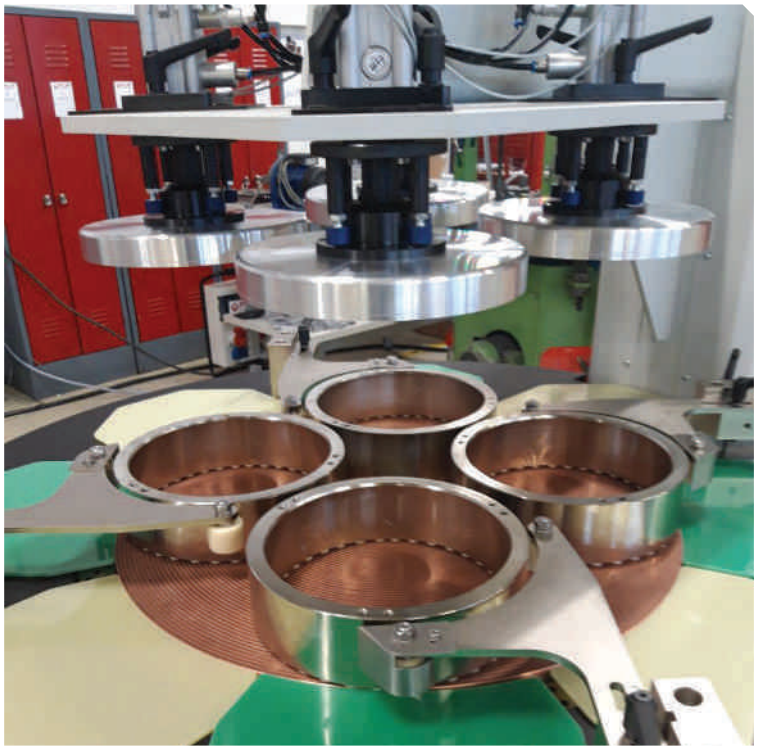
nent stress and wear could lead the engine to break down every 20,000-30,000 miles instead of the 200,000-300,000 miles as is common for today's engines.

So, how does superfinishing remove stock without the heat that is so typical of abrasive machining? The answer has to do with depths of cut. "When you turn or grind a part, the depths of cut could range from 50-100 microns or higher," Keshavan says. "Removing that amount of material in a short amount of time requires lot of energy, and the part heats up. Superfinishing removes 1-2 microns of stock on radius and requires less energy."

Choosing a finishing process

While manufacturers often use various finishing process terms interchangeably, Keshavan says each process has a subtle nuance that may make it better suited for a particular application. Here are some common finishing processes to compare:

Lapping – Finishing of flat faces with loose abrasives. Here, the improvement of surface finish is accompanied by improvement in flatness of the part.



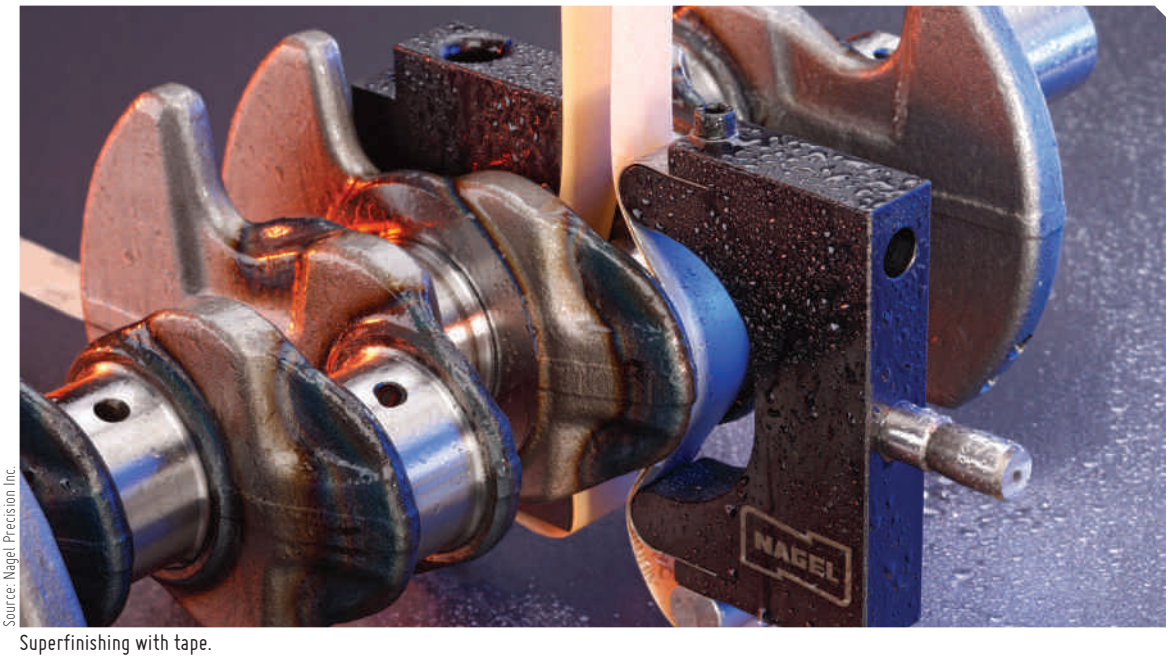
Source: Nagel Precision Inc.

Flat lapping.

Honing – Finishing of internal diameters with fixed abrasives. It is considered a cold process, as heat is not generated during this operation. Improvement of surface finish is accompanied by improvement of micro-contour accuracy.

Microfinishing / superfinishing – Finishing of external di-

Superfinishing has advanced beyond hard tooling. To add more flexibility to the superfinishing process, Nagel has developed 'D-flex' band technology that acts like a fixed abrasive but can flex to compensate for as much as a 15 mm change in diameter.



Source: Nagel Precision Inc.

Superfinishing with tape.

Source: Nagel Precision Inc.

Superfinishing with stone.

ameters and faces with fixed abrasives. It is considered a cold process, and it also improves the micro-contour accuracy.

Polishing – Finishing of outside features with loose abrasives. Both brushing and vibratory finishing are examples of a polishing process. This is not considered a cold process, and significant heat can be generated during the finishing operation. Improvement of surface finish is accompanied by loss of micro-contour accuracy.

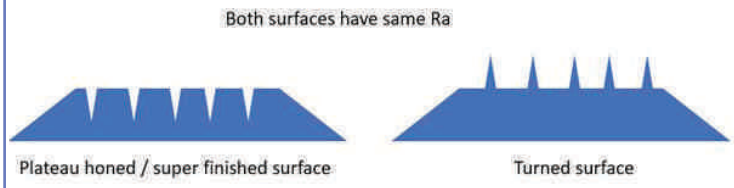
Both superfinishing and polishing are used to create a fine surface on outside diameters. Polishing is a more flexible process because a brush, a lapping compound or a vibratory process like tumbling can all be used.

Both superfinishing and polishing are used to create a fine surface on outside diameters. Polishing is a more flexible process because a brush, a lapping compound or a vibratory process like tumbling can all be used. Tumbling makes it possible to polish many parts at once. In contrast, superfinishing uses a fixed abrasive to impart the finish, and only one part is finished at a time. Keshavan says superfinishing has advanced beyond hard tooling. To add more flexibility to the superfinishing process, his own company, Nagel, has developed what it calls 'D-flex' band technology that acts like a fixed abrasive but can flex to compensate for as much as a 15 mm change in diameter.

Determining which finishing process to use depends on the end use of the part. Keshavan says, "Polishing is best suited for applications in which part geometry is not critical and aesthetics are the main concern; superfinishing is best suited for mission-critical parts."

Avoiding tolerance conflicts

The different ways we measure surface finish come with fine distinctions, says Keshavan. Roughness average (Ra) is a parameter commonly used to measure surface finish, but he argues that Ra does not provide a full picture. In particular, the parameter does not make a distinction between peak and valley parameters. For instance, a part with five distinct valleys of the same depth could have the same Ra as a part with five distinct peaks of the same height. Considering Ra alone, the finishes of these parts are the same. That is why, in certain applications, other parameters will be more appropriate to call out for the surface finish measurement.



Keshavan recommends referencing the ANSI/ASME B 46.1 national surface texture standard. It lists 100 or more parameters that can be used to measure finish, just a few of which are Ra, reduced peak height (Rpk), reduced valley height (Rvk), bearing area ratio (Tp), and the average distance between the five highest peaks and the five lowest valleys in a sampling length (Rz).

"If these parameters are judiciously selected and toleranced correctly," he says, "they permit manufacturing engineers to choose the most efficient way to process the parts and maintain the product's integrity."

He says problems arise when multiple parameters are specified without regard to their feasibility given the other specified parameters. Consider the following print callouts:

Ra: 0.2-0.3 µm
Rp ≤ 0.5 µm
Rz ≤ 1.0 µm

Empirically speaking, Keshavan says, Rz is equal to about 7 to 10 times Ra. To target 0.2 µm Ra, he says Rz would be at least 1.4 µm and out of print.

Another common problem he sees is applying a blanket process capability index (Cpk) without paying attention to tolerancing, particularly given upper and lower bounds on surface roughness. For example, consider another print specification:

Ra: 0.05-0.2 µm
Rz: 1.0 µm

"If a Cpk of 1.67 or better is demanded on all the parameters, we need to be at roughly 50% of the tolerance, so we shoot for 0.5 Rz," he says. "If we were to do that, Ra could be less than 0.05 µm, which is out of spec. If we were to target Ra to hit the Cpk, Rz would be pushed toward the higher end of the spec or out of spec altogether. Therefore, it is extremely important to tolerance this correctly."

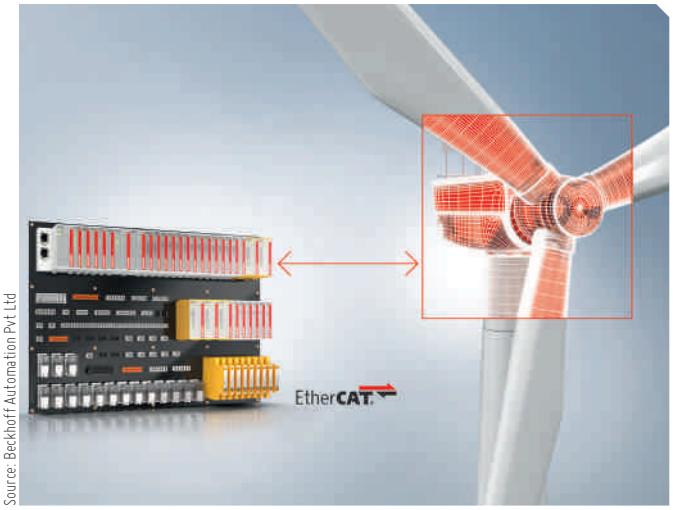
Source: Nagel Precision Inc.

EtherCAT I/O system

EtherCAT Plug-in Modules for Wind Industry

The EtherCAT plug-in modules from the EJ series minimize space requirements and wiring effort in wind turbines.

In the displayed control cabinet, the I/O level is realized with the EtherCAT plug-in modules and a highly compact, application-specific signal distribution board with a wiring level from stock and pre-assembled cables. The EtherCAT plug-in modules are based electronically on the well-known EtherCAT I/O Terminals and offer the same broad variety of signals. Their electromechanical design enables them to be plugged directly into an application-specific signal distribution board which distributes the signals and the power supply to individual application-specific connectors, in order to connect the controller to further system modules. Elaborate manual wiring of single wires is replaced by simply plugging in prefabricated cable harnesses. Many of the other components that would otherwise be installed separately in the control cabinet are housed as compact plug-in modules on the board, e.g. relays, fuses or surge voltage protection equipment. This means that the space requirement in the control cabinet is significantly reduced, particularly in series production with mid to high quantities, also lowering costs. Another crucial advantage is the minimized risk of incorrect wiring.



Source: Beckhoff Automation Pvt Ltd

The EtherCAT plug-in modules and the plug level for sensors and actuators can be placed flexibly on the signal distribution board. The development of a signal distribution board is carried out by the user or as a service by Beckhoff.

Beckhoff has a broad portfolio of PC-based control technology. Here its focus is on the ongoing integration of all plant and system functions: everything from operational management to pitch control; converter, gear unit, and brake control; wind farm networking; and hydrogen technology as a bridging technology to energy storage.

Beckhoff Automation Pvt Ltd
E: info@beckhoff.co.in
www.beckhoff.com/ethercat-plug-in-modules

ADVANCING BY LEAPS AND BOUNDS

Manufacturing technology in the automobile industry is directed to a place where there are a lot of experts in AI and machine learning. Digits are driving physics.

Source: MMS

Robots driven by information are given 'a better picture of reality'.

When you talk with Tim Shinbara, Vice President and Chief Technology Officer, AMT—The Association For Manufacturing Technology, you might think that the discussion is going to be focused on physical things like, well, machines. And were you to think that, you'd be wrong.

Because when he talks about the on-going advances in manufacturing technology they are largely predicated on digital tools. Machine learning algorithms, artificial intelligence, and the like.

And when the subject turns to more tangible things like machining center spindles, the point he makes is that advanced integral motor-type spindles are not only providing quick response times to G-codes but are providing 'a whole suite of different information streams to the controller'. Information about the environment. Vibrations. Stiffness data. Information streams that can be translated into what could be considered actionable intelligence.

Shinbara says that machine tool vendors and academic researchers alike are working on systems that will help 'tune' machines so that operations can be performed to meet requirements. There will be, he says, much greater consistency from part to part to part.

While there is a significant amount of existing sensors and instrumentation available on machines at present, Shinbara says this will be amplified in scope such that a comprehensive suite of inputs will be analysed and evaluated so that improvements and adjustments in machining are possible.

"It is important to normalize the data so that it can be used for analytics," he says. Given the number of inputs, this can be heavy lifting, data-wise.

Some of this work is being done in the cloud. But he says that several companies are performing the work off the machine but closer to the operation, such as at the work cell or factory floor level.

Although there are plenty of companies working on this tech—machine builders, control vendors and third-party software providers—and although Shinbara says that there is really a noticeable acceleration in the work that is being accomplished, it is still not off-the-shelf available. Yet.

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Be that as it may, Shinbara says, "The concept of 'one-and-done' is becoming more of a reality."

Robotic advances

One of the technology areas where Shinbara sees plenty of advances is in robots—again largely driven by information. He says that the deployment of improved vision systems and laser trackers are providing robots with 'a better picture of reality in the workcell'.

A factor that is important in this space is the discernment of 'a good data point from a bad one'. So, while training machines to be able to make those decisions is still a laborious task, Shinbara says that the learning curve is being shortened thanks to work that's even being done in other fields away from the factory floors, such as autonomous driving. (In that case the systems must learn what's a real vehicle or pedestrian and what's not, something not always accomplished, and which can have fatal consequences.)

Shinbara says that robot controls employing AI and accurate-yet-economical vision systems can be used to create robot systems that have the ability—both from the standpoints of timing and accuracy—to make 'intelligent movements', which can result in, say, fast, precise assembly operations.

Source: MMS

"Smarter, more economical robots could help industry augment the talent shortage problem by leveraging the capabilities of the fewer people that are available for the manufacturing operations; ultimately, he sees far more new job creation from robotics than not."

Tim Shinbara
Vice President and Chief Technology Officer
AMT—The Association For Manufacturing Technology

Robots, he says, are "moving from the mechanical engineering to the computer science world."

Another important development is that robots are becoming more plug-and-play. That is, you may have a robot from Company A but use it with a robot control from Company B. "A robot is looking more like a printer to a general network than it did in the past. This is being driven by standards harmonization, which is primarily occurring in the Industrial Internet of Things (IIoT) world with standards developers like MTConnect, ROS-Industrial, and OPC UA," he says.

The additive arena

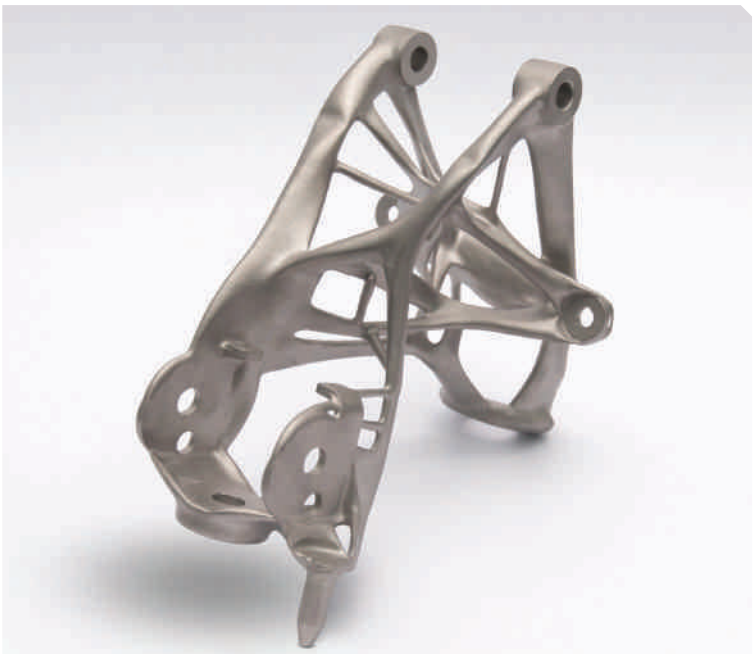
Shinbara segues from robots to advances in additive—and notes that one of the things that is happening in additive manufacturing is the use of robot-like structures to build products, given the ability of a robot arm to be manipulated through space. In other words, the robot isn't something that just paints and welds, but can become a parts-building device.

Overall, he says that there are plenty of advances being made in materials, both in types and particle sizes. He says that this is leading to more attention in how materials are being handled before, during and after builds.

Two other things he points out about the additive space: "Technology is outpacing adoption," which may be a result, in part, of the second thing, which is the variety of companies that have entered the capital equipment space, such as HP and Xerox.

And just as you'd only imagine hearing the names of companies like HP and Xerox as they might be used in office settings of manufacturing equipment vendors, a talk with Shinbara can lead to unexpected places.

The deployment of improved vision systems and laser trackers are providing robots with 'a better picture of reality in the workcell'.

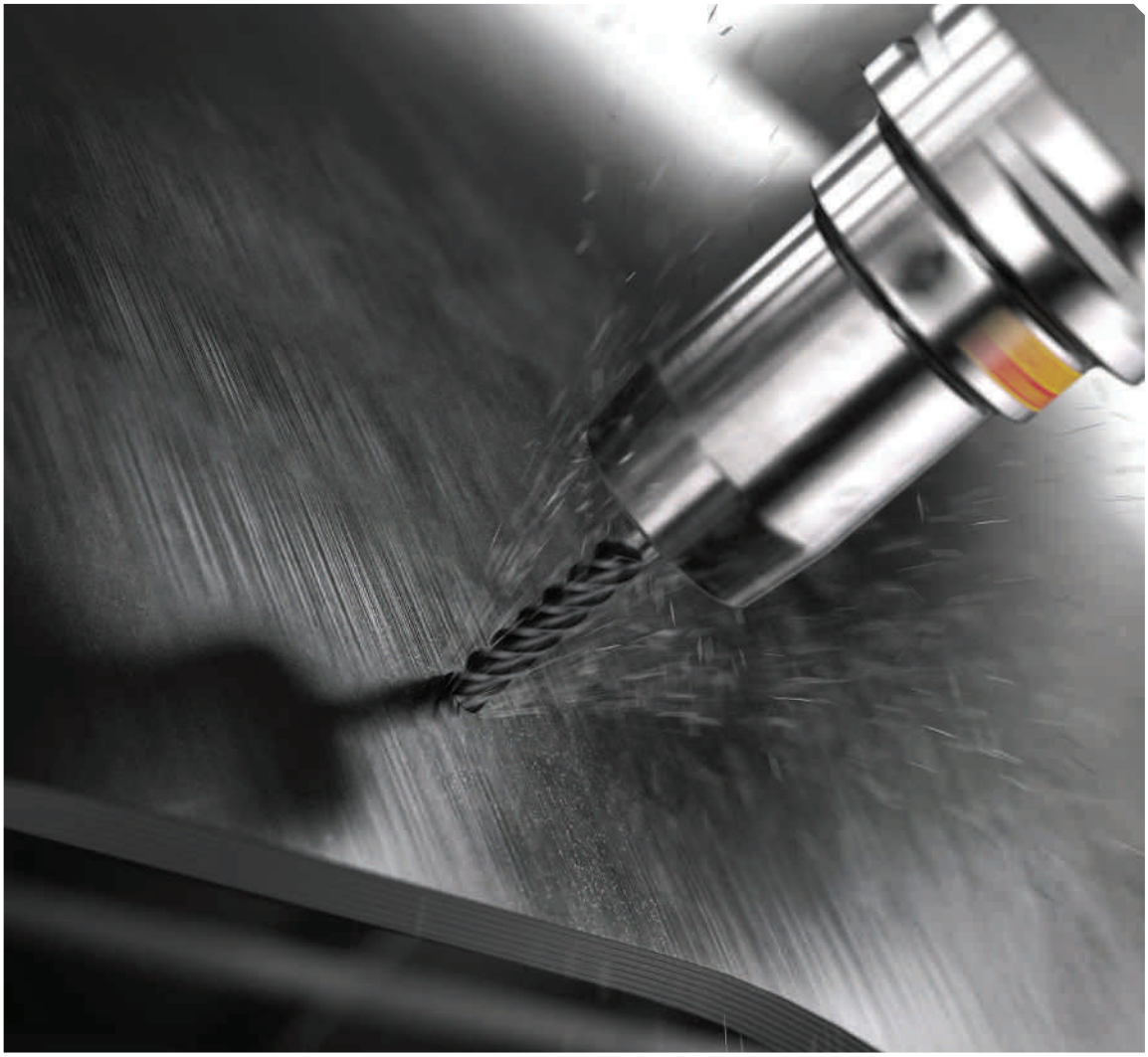


Source: MMS

This is a seat bracket design that GM developed with software provider Autodesk.

KNOWING THE DRILL

A recent survey confirms one-third of manufacturers' readiness to accelerate investments into automation tools. Sandvik Coromant's CoroDrill® 863-O cutting tool could help manufacturers rethink their approach to the difficult task of machining composites — thanks to chemical vapor deposition (CVD) technology.



Source: Sandvik Coromant

Holemaking is critical to the quality and performance of aerospace components, and arguably more important than ever in the era of COVID-19.

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When drilling holes in most aerospace components, manufacturers have three chances of getting the hole correct — after which, it will be impossible to rework the hole within the required design specifications. If just one hole misses those three chances, by diameter, surface finish or delamination, the entire component will need to be scrapped. Given the enormous value of aeroplane components, holemaking is a risky business. That applies especially when drilling composite materials, which place new demands on machining.

Holemaking has emerged as one of the most common machining processes when working with composites. Machining composite materials — that combine two or more materials with different physical and chemical properties — involves cutting, or fracturing, of the fiber part of the material.

If this is done incorrectly then layers of the composite material peel away from where they belong. This is known as delamination which, according to Sandvik Coromant's customers, is the most limiting factor in their production.

Delamination affects hole quality and repeatability, the quality and integrity of the final product and manufacturers' profits. Integrity tops it all because better hole quality is vital for preventing component failure and is very much determined by the manufacturing processes that are used for machining or finishing the holes.

The amount of heat generated during composite machining also becomes significant. The material's poor heat conduction and the absence of chips pose risk to the resin that holds the material's fibers together. In other words, the machining of composites illuminates weakness in the machining process that might otherwise be overlooked.

These weaknesses are emphasized by the growing range, and unpredictability, of composite materials available in the market. This makes competitive machining a challenge.

Why is this being mentioned now? Well, hole quality is now arguably more important than ever in the era of COVID-19. According to research by Euromonitor International, around 50 percent of companies plan to reshape their digital strategies. One-third of respondents in Euromonitor's Voice of the Industry survey 2020 said they will accelerate investments into automation tools — so, those holes need to be made correctly in unmanned lights-out scenarios.

Therefore, manufacturers need to keep rethinking how they go about drilling composites.

Predictable wear

It is established that hole surface integrity is a real concern for aerospace manufacturers. But, what role can tools play in addressing these concerns — and how can a better drill benefit an automation strategy?

First, let's look at the ideal that manufacturers are striving for. They want holes that are of good quality, consistent and repeatable. Of course, any tool will wear out eventually, but this wear must be consistent and predictable from tool-to-tool.

The importance of predictable wear can't be emphasized enough. Usually, a CNC will be programmed to pull out the tool at the point of failure. So, if the lifecycle of the drill is not consistent then, in a terrible-but-realistic scenario, one could cut the tool life of most of the products they buy by 50 percent. When Sandvik Coromant supplies a drill to its customers, it must be able to guarantee that the drill will last for a predictable number of minutes, whatever the circumstances — every time!

Better by design

That's why Sandvik Coromant developed its CoroDrill® 863-O high-performance drill for composites, including carbon fiber reinforced (CFRP) and glass fiber reinforced (GFRP) materials. The drill has been designed with a focus on industries that make wide use of composite materials and demand more feet of material drilled per tool — like the Aerospace industry, which uses composite materials for manufacturing aircraft frames and other parts.

To develop the CD863-O tool, the O represents composite-only applications, the first thing we did was apply it to the material in aerospace that is most prone to delamination. Specifically, unidirectional laminate with no peel-ply or woven back, which is most commonly used in aerospace wings and fuselage. We digitally mapped the delamination to determine exactly how much delamination we experienced over the life of the tools.

The computer system was set with very tight tolerances, meaning the amount of delamination we'd accept in any given hole. From the resulting data, we could optimize essential aspects of the drill's design, like the angle of the helix — or the spiral groove around the drill. A higher helix benefits chip evacuation, so can help reduce delamination on the exit side. In contrast, too high a helix can separate layers in the composite material on the entry side. Either way, this can result in layers or fibers overhanging the hole.

Other key features of the CD863-O are its profile and grade. Composite materials are not ho-

Source: Sandvik Coromant

Tools like the CoroDrill® 863-O drill can help manufacturers fully automate their processes.

Machining composite materials — that combine two or more materials with different physical and chemical properties — involves cutting, or fracturing, of the fiber part of the material.

Source: Sandvik Coromant

The CoroDrill® 863-O has been designed with a focus on industries that make wide use of composite materials and demand more feet of material drilled per tool — like the Aerospace industry, which uses composite materials for manufacturing aircraft frames and other parts.

mogenous, and the appearance of any new material on a production run presents unique challenges; its own thickness, type of composition and so on. The CD863-O's superior features are designed to tackle any material.

Then there is the issue of grade. Carbide drills are well suited to machining aerospace components because carbide strengthens the tool through the cutting geometry and the shank. This optimizes the cutting action and maximizes clearance and material evacuation. However, because of the abrasive nature of composites, carbide also wears quickly. This is problematic, especially in automated production setups.

To overcome this, the CD863-O has Chemical Vapor Deposition (CVD) technology. CVD is a very hard tool material that is ideal for machining composites and stacked materials. Applying CVD layers across the entire cutting edge can give much longer tool life and, due to CVD's low coefficient of friction and high conductivity of heat, the tool's cutting edges are less susceptible to built-up edge (BUE). Since CVD remains sharp, this removes heat and has low friction and minimizes the tendency for problems in holes.

So, the CVD grade is preferable where hole count is high and higher productivity is required.

Well-equipped robots and field testing

The wider CoroDrill 863 family is already benefitting manufacturers' automated production setups — both in CNCs and robots on the production line. Because it's available in carbide, polycrystalline diamond (PCD) and CVD coated options, the drill can be left to machine all kinds of difficult material types — composites, aluminum, titanium, heat resistant super alloys and stainless steels — in unmanned or lights-out processes.

Once out of the laboratory, the performance of the CD863-O was put to the test by drilling holes into a carbon fiber workpiece. Carbon fiber is a popular choice of material in aerospace applications as engineers look to make lighter aircraft structures, thanks to the material's superior strength-to-weight ratio.

A component with an average thickness of 0.25 inches was subjected to two sets of drilling with a CD863-O geometry, which uses our own variant of CVD called O1AD for improved wear resistance in composite materials. First, the workpiece was machined with a 863-O drill with a cutting diameter (DC) of 6.37 mm (0.25 inch). Secondly, with a DC of 4.85 mm (0.191 inch).

In both sets and with all tools, the CD863-O showed excellent results. 400 holes were drilled in the carbon fiber at a DC of 6.37 mm (0.25 inch) and 560 holes at 4.85 mm (0.191 inch), even still at an early stage in their tool life the results matched laboratory testing remarkably well.

Using Sandvik Coromant's Capacity Data Management system, which is a system for predicting and forecasting tool life for our customers, we accurately estimated a safe tool life. Overall, this demonstrates the product's capabilities in providing excellent tool life, reduced tool changes, and repeatable and reliable performance in composite machining. Importantly, all of the holes had low levels of delamination upon entry, or exit, throughout both test runs.

So, it's clear that dedicated cutting tools are critical to achieving success in holemaking — especially in components made from composite or stacked materials. Tools like the CD863-O drill can also play a crucial role in helping companies fully automate their processes, even when machining tough composite materials.

ECOSYSTEM COLLABORATION MATTERS

Today's ecosystem of industrial automation is characterized by media disruptions during the processing and transfer of documentation. In this scenario, Eplan Project comes handy to resolve such issues via targeted collaboration among all stakeholders and systems.

Source: Eplan

Data created in the engineering process must be shared with everyone involved in the process. The ideal goal: machine builders and system integrators, control cabinet manufacturers, component manufacturers and also the machine or plant system operator all work networked together.

Operators of production facilities, machine builders and system integrators, control cabinet manufacturers and component manufacturers all have one thing in common: they all work together along the value chain, from the planning through to operating a finished machine or plant system – and continuously exchange information in the process.

Source: Eplan

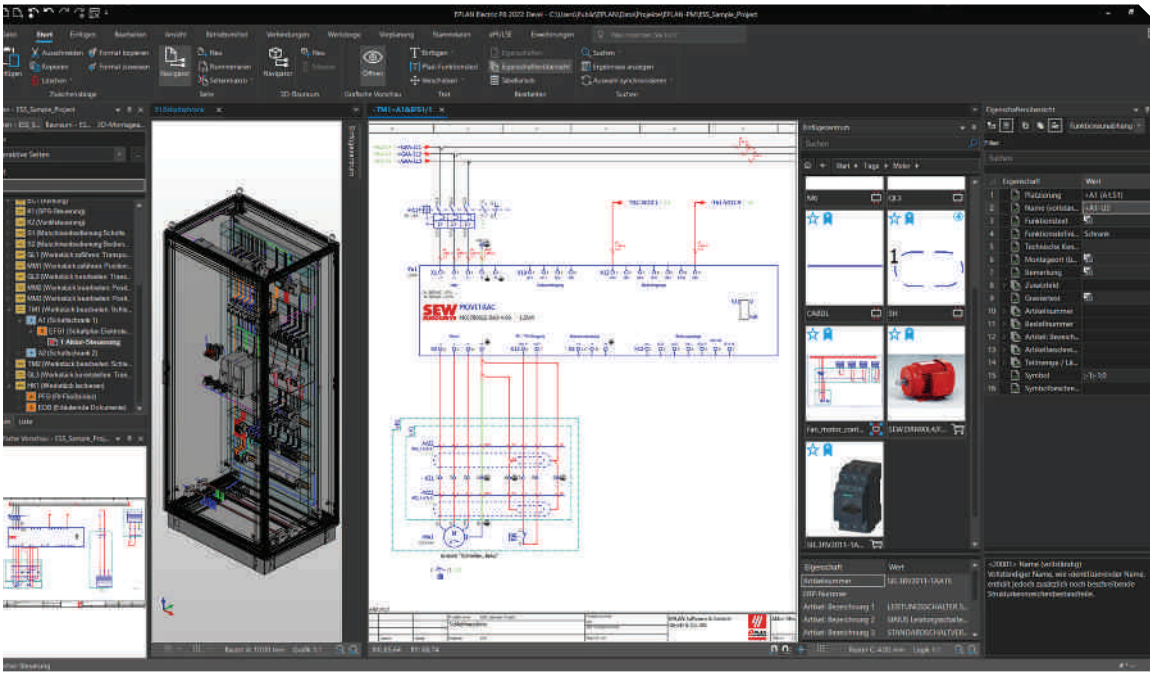
Ecosystem of industrial automation

What does this process – the collaboration among the various process participants – look like today? In the planning phase, the characteristics of the desired machine or plant system are described. If the company has particular supplier specifications, these are also detailed and then passed on to the operator, who takes the specifications into account when designing the machine or system. The planning phase is followed by the preplanning process.

Additional information such as devices, release lists from Excel, specifications in Word or preplanning tools such as Eplan Preplanning are taken into account and, in turn, are used by the basic engineering designers to prepare a quote, for instance. In the case of more complex production lines, this is traditionally taken care of by a system integrator, who is also responsible for the detailed engineering and for generating electrical and fluid-power schematics.

Data is enriched in the Eplan Project

The project created with the systems of the Eplan Platform – Eplan Electric P8 or Eplan Fluid, for example – is now transferred to the control cabinet manufacturer. This manufacturer creates the virtual prototype of the switchgear system



Source: Eplan

The new Eplan Platform 2022 with a completely redesigned user interface: the practical ribbon bars using modern technology flexibly adapt to the application.

The systems of the upcoming Eplan Platform 2022, in combination with the new Eplan eManage cloud service, network together machine builders and system integrators, control cabinet manufacturers, component manufacturers and the operators of machines or plant systems.

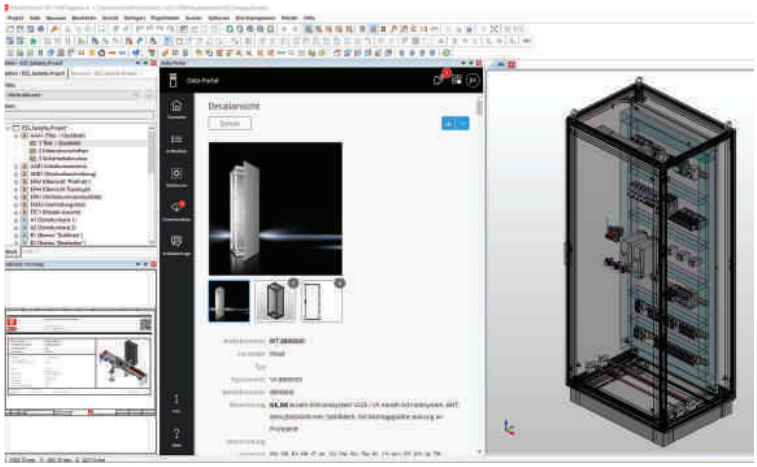
in the form of a 3D assembly of the control cabinet using Eplan Pro Panel. The control cabinet is then built, approved and commissioned by the operator. With the delivery of the switchgear system, the control cabinet manufacturer processes are complete.

The company hands over the Eplan Project, which has been enriched with data, back to the machine builder or system integrator, who then commissions the machine or plant system based on the final project data. The project is then made available to the operator, who can access the current documentation, for instance using Eplan eView, in the event that servicing or maintenance becomes necessary, and who can digitally document any changes using the redlining function as needed.

This process describes the daily work in this ecosystem of industrial automation. The challenge, however, is that all the data for an automation project is created and added at various stations along the value chain. Often, all the project participants are working with partially inconsistent data, which ends up making the process even more time consuming and error prone. For instance, the drive power of a motor is changed at some later point in a project, but this change isn't taken into account when the machine or plant system is commissioned. As a result, the documentation is not up to date.

A 'data container' as the central source of information

This is where Eplan comes in: the systems of the upcoming Eplan Platform 2022, in combination with the new Eplan eManage cloud service, network together machine builders and system integrators, control cabinet manufacturers, component manufacturers and the operators of machines or plant systems.



Source: Eplan

An important building block is device data, which is provided on the Eplan Data Portal. What matters here is the quality and depth of the data, something being intensively advanced with the Data Standard.

Source: Eplan

All changes in a project are centrally available in Eplan eView. The advantages are obvious: project documentation is always up to date — along the entire product life cycle and into operation and service scenarios.

Sebastian Seitz, CEO, Eplan, explains: "We connect companies with their clients and suppliers via the cloud, for easy and secure data sharing. The Eplan Project as the central, digital model of an automation solution supplies all processes with the necessary data. What we're talking about is a sort of 'data container' that is fed from the systems of the Eplan Platform. This generates added value in the digitized collaboration of all participants – through secure data transfer and central access to the Eplan Project."

A new feature includes the connection to the cloud via Eplan ePulse, which also significantly facilitates mobile working in design and engineering.

Cross-project collaboration via the cloud

Using the new Eplan eManage, projects can easily be uploaded to the cloud and managed and shared from there. More specifically, this brings together the worlds of on-premises software and the cloud. Clear access rights via role management ensure data security and provide flexibility for accessing projects. Users of Eplan Electric P8 and Eplan Pro Panel can conveniently upload their projects to the cloud and transfer them to the Eplan Platform for further processing. This is accomplished without the time-consuming sending of project data via email or using an FTP server. And the centralized, clear availability in the cloud also enables all project participants to search quickly for specific content.

With Eplan eView, all the changes in a project are centrally available. The advantages are obvious: project documentation is always up to date – along the entire product life cycle and into operation and service scenarios. An important component of this method of working is device data, which is provided on the Eplan Data Portal. Seitz says, "What matters here is the quality and depth of the data, something we are intensively advancing with the Data Standard."

Comprehensive, integrated and end-to-end digital data serves as a project accelerator. And don't forget, the data are consistent and the data transfer is secure.

Seitz continues: "With these optimized processes and increased efficiency, companies can optimize their machine and plant system design processes and sustainably increase the availability of their machines and plant systems. Collaboration among all participants ultimately increases the quality of the data and thus the added value."

High-quality digital device data is a key factor in:

- Processing orders in shop floor management and deriving production orders.
- Controlling automated machine fleets (Rittal Automation Systems).
- Providing information to partially automated workstations (for instance, simplifying wiring processes with Eplan Smart Wiring).

Users of Eplan Electric P8 and Eplan Pro Panel can conveniently upload their projects to the cloud and transfer them to the Eplan Platform for further processing.

QUALITY IS THE FOCUS

India's pioneer in developing and manufacturing self-lubricating guide elements, Avi Oilless Die Components, has been relentlessly invested in R&D and technology innovations. It has maintained its supremacy in the industry by consistently providing high-quality products and services to its customers.

Source: Avi Oilless Die Components India

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Avi Oilless Die Components India Pvt Ltd is known in the industry as the first-ever company in India to develop and manufacture self-lubricating guide elements. Founded in 1993 as Avi Enterprises as a small workshop, the company has grown to include a diverse range of products such as oilless guide elements and press dies and molds.

Prashant Moreshwar Hendre, Director, Avi Oilless Die Components India, shares how, 25 years ago, he identified the gap in the market that prompted him to take this course of business and transform the company set up by his father. While doing some job work for the machining of components for Bajaj Auto Ltd's Pune plant, he visited a Bajaj store for the delivery of materials and came across a wear plate/sliding plate of bronze with black round spots on it. On enquiry, he found out it was imported from Germany and was being used as a guide element in press tools.

Following some more interactions, the Bajaj team asked him whether he could develop such a part and handed over a sample for study. This prompted Hendre to conduct extensive research into the specifics of MOC. "It took me a year to make this part after some struggle. After successful trials at Bajaj over the next two years in press tools, I was confident in manufacturing it indigenously," he adds.

The company inked deals first with Mahindra & Mahindra and later with Tata Motors for supplying self-lubricating parts for press tool dies, which set it on the journey to becoming what it is today.

Increased recognition among customers

The next major breakthrough

came in 2004 when Avi Enterprises formed a private limited entity named Avi Oilless Die Components India Pvt Ltd and increased its infrastructure with the state-of-the-art machines for precision machining of components. Currently, the company has a complete in-house foundry facility to make special alloys (base material) for self-lubricating bearings. It uses centrifugal and continuous casting processes to make raw materials. It has an in-house testing facility for conducting chemical and mechanical tests, and develops self-lubricating bearings for different applications in various sectors such as automobiles, press tools and plastic moulds, welding fixtures and SPMs, plastic moulding, extrusion machines, and so on.

The self-lubricating bearings are also used in the Steel sector (rolling mill equipment, continuous cast plant, blast furnace, wire rod mill equipment, and various accessories used in steel plants), Cement plants (klins/ furnace door application), the Power sector, Hydro-Power and Thermal Power plants (turbine applications, dam gate applications), Infra-Projects and Heavy Machinery sector, Material Handling Equipment, Defence sector, Nuclear Power plants, and many more.

Avi Oilless Die Components India received the prestigious Industrial Leadership Award for industrial development from the All India Achievers Association – New Delhi in 2013. The company was also appreciated by Bharat Heavy Electricals Ltd with a Star Innovation Award for the year 2016-17 as recognition for the development of import substitute self-lubricating bearings for its critical applications.

Source: Avi Oilless Die Components India

"Customer satisfaction is our topmost priority. We have successfully given our solutions and created a benchmark across various industries with our cost-effective and superior quality products for different applications."

Prashant Hendre
Director
Avi Oilless Die Components India Pvt Ltd

Wide range of products

Avi Oilless Die Components India manufactures a range of products that it sells to many companies across several industry sectors. It manufactures standard components for press tool dies and plastic molds for hydro-power applications, and self-lubricating bearing products for plastic molding machine manufacturers (bushes for toggle assembly, sliding shoe, moving platen and crosshead bush, thrust washers, etc.). The company also manufactures for rubber processing machinery manufacturers (bushings for gear case, guide rolls, gland rings, piston rod bushes, and screw nuts), material handling equipment manufacturers, steel plant equipment manufacturers (blast furnace clay gun piston rings, torpedo ladle car center plate, and self-lubricant bushes for billet lifting device), nuclear power plant manufacturers (camshaft bearings, sliding pads), and defence sector equipment manufacturers (special copper base alloy bars, bushes, etc.).

Overcoming sectorial challenges

Speaking about the challenges faced by the SME sector in manufacturing, Hendre says, "Due to substantial growth in the SME sector, it is always a challenge to retain employees. Getting skilled labor is another challenge. We have maintained a strong family relationship with all our employees and always support their personal growth and provide timely financial help during crises."

The Government of India's initiatives such as 'Aatma Nirbhar Bharat' and 'Make in India' have helped Indian private enterprises to sell their products to many Government institutions and public sector undertakings through the GEM portal. Gaining access to new organizations has become easy now.

"We certainly possess the potential to turn India into a manufacturing powerhouse in the near future, as perceived by the Government. The widened MSME credit guarantee scheme and the new definition of MSME have helped us to use its benefits to a large extent," he adds.

Avi Oilless Die Components India is a recipient of the prestigious Industrial Leadership Award for industrial development from the All India Achievers Association and the Star Innovation Award by Bharat Heavy Electricals Ltd as recognition for the development of import substitute self-lubricating bearings for its critical applications.

Source: Avi Oilless Die Components India

Array of Press Tool Components

Source: Avi Oilless Die Components India

Products on display

SUPPORTING EACH OTHER TO WIN

Vellore Institute of Technology (VIT) Chennai and SEDAXIS Advanced Materials Pvt Ltd have joined hands by signing a Memorandum of Understanding to establish a Centre of Excellence for Additive Manufacturing.

Source: SEDAXIS Advanced Materials Pvt Ltd

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Collaboration between industry and academia is highly critical for innovation and growth. It has now become imperative for academic institutions to partner with industry to obtain industry data, help with their research ideas, and most importantly, make their graduates industry-ready.

Working towards this goal, Vellore Institute of Technology (VIT) Chennai and SEDAXIS Advanced Materials Pvt Ltd have joined hands by signing a Memorandum of Understanding (MoU) to establish a Centre of Excellence (CoE) for Additive Manufacturing (AM).

The VIT-SEDAXIS AM CoE would be located inside the VIT Chennai campus and would help drive the adoption of 3D printing within the multitude of SMEs (Small and Medium Enterprises) and MNCs in the region by offering affordable access to multiple 3DP technologies under a single roof. The target sectors include Automotive, Aerospace, Consumer Goods, Manufacturing, Engineering Services, and others.

Tackling issues

The high cost of machines combined with high material costs translates into higher per-part costs for end-users, thus slowing down the pace of mass adoption of this important technology. The CoE is determined to tackle this head-on with the right mix of machines and materials backed by an 'open philosophy'.

The Centre will plan to have a research arm as well, equipped with a range of 3D printers in a phase-wise manner for R&D applications, including continuous composite fiber 3D printing and other open material/open parameter capable 3D printers. This would enable researchers from all domains to engage in advanced research on new materials and new product development.

The CoE will also complement as a Knowledge Hub by hosting relevant workshops and webinars for both industry and academia to better understand the benefits and use-cases of 3D printing. It is envisioned that by doing so, the Centre will fulfill its key objective of democratizing AM amongst a diverse set of stakeholders, with a strong focus on the underserved SME sector.

Stronger together

Commenting on this new collaboration, Dr Kanchana Bhaaskaran, Pro Vice-Chancellor, VIT Chennai, said, "VIT has always been the frontrunner in closely collaborating with industry as a way of creating industry-ready graduates and excelling in the research and product development activities. Today, we are excited

to welcome onboard SEDAXIS Advanced Materials, the industry partner, in our journey of fruitful collaboration in the domain of additive manufacturing. Besides providing solutions to social and industrial problems, we are also looking forward to witnessing many remarkable outcomes as part of this association in terms of supporting academic research and projects."

She also emphasized that industries, across all the domains situated in and around Chennai, can utilize the VIT faculty expertise and the 3D printing facilities at the Centre for their manufacturing needs such as design, prototyping, tooling, and small-batch manufacturing of the components.

On the need for such facilities in India, Vishwanath Godavarty, Business Head - 3D Printing, SEDAXIS Advanced Materials, added, "It's encouraging to see that one of the largest private universities in India has recognized the need to make 3D Printing more accessible to both industry and R&D/academia and has joined forces with SEDAXIS to fulfill our joint vision to democratize 3D Printing and help make it more accessible to the underserved SMEs across the region. Through this CoE, we would be able to generate greater awareness of continuous composite fiber, affordable industrial SLS (Selective Laser Sintering), and R&D-specific solutions in 3D Printing. Also, many SMEs struggle to translate the excitement they feel about 3D Printing into meaningful business opportunities. The CoE will support such use-cases as well with objective solutions that take the guess-work out and negate the need for expensive third-party consultants."

Following the MoU sign-off ceremony, the members of both the VIT Chennai and SEDAXIS teams took a tour of the upcoming CoE facility and VIT's campus to review its advanced infrastructure and facilities.

Source: SEDAXIS Advanced Materials Pvt Ltd

"Industries across all the domains situated in and around Chennai can utilize the VIT faculty expertise and the 3D printing facilities at the Centre for their manufacturing needs such as design, prototyping, tooling and small-batch manufacturing of the components."

Dr Kanchana Bhaaskaran
Pro Vice-Chancellor
VIT Chennai

Source: SEDAXIS Advanced Materials Pvt Ltd

"It's encouraging to see that one of the largest private universities in India has joined forces with SEDAXIS to fulfil our joint vision to democratize 3D Printing and help make it more accessible to the underserved SMEs across the region."

Vishwanath Godavarty
Business Head - 3D Printing
SEDAXIS Advanced Materials Pvt Ltd

The CoE will also complement as a Knowledge Hub by hosting relevant workshops and webinars for both industry and academia to better understand the benefits and use-cases of 3D printing.

Source: SEDAXIS Advanced Materials Pvt Ltd

HELPING INDUSTRY HARNESS TECHNOLOGY

With the aim to help Additive Manufacturing achieve maturity and facilitate its incorporation in Mechanical & Plant Engineering, VDMA India organized the 'Additive Manufacturing Symposium – The Game Changer of Manufacturing' for the second time at Taj, Bengaluru on August 20, 2021. Highlights...

Source: VDMA India

Additive Manufacturing (AM), also known as 3D Printing, is a transformative approach to industrial production that enables the creation of lighter, stronger parts and systems. It is yet another technological advancement made possible by the transition from analogue to digital processes. In recent decades, communications, imaging, architecture, and engineering have all undergone their own digital revolutions. It has revolutionized the way we think and has ushered in flexibility and efficiency to manufacturing processes. While additive manufacturing seems new to many, it has been around for several decades and is rapidly picking up pace. In the right applications, AM delivers a perfect trifecta of improved performance, complex geometries, and simplified fabrication.

AM gaining momentum

New avenues of AM adoption are emerging with more industries and applications adopting it. Currently, Automotive and Electronics industries lead both in terms of overall market share as well as growth of AM adoption and are trailed by Medical, Industrial and Architectural sectors.

The technology is projected to touch a market of $36 billion by 2027 and is predicted that the impact of the AM industry could accelerate to attain a potential of $300 billion by 2027. The Indian Additive Manufacturing market alone is estimated to hit $79 million in products and services by the end of 2021 with a CAGR (Compounded Annual Growth Rate) of around 18 percent in the past 5 years. While increased domestic production, low manufacturing costs and an increased utilization across industries and application will power this growth, the partnership of key AM players with the Government's 'Make in India' initiative will further boost its expanding footprint.

Initiative towards industry progress

The event covered various leitmotifs ranging from simulation, machinery, processes, imaging products and materials. More

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than 80 delegates comprising industry representatives, academia and media participated at the symposium. The event was conducted in collaboration with VDMA's partner companies – B&R Industrial Automation Pvt Ltd, Beckhoff Automation Pvt Ltd, Festo India Pvt Ltd and ZEISS India and its knowledge partner – BTG Legal.

The event was graced by the Chief Guest Seenivasan Balasubramanian, CEO, International Aerospace Manufacturing Pvt Ltd (IAMPL); the Guest of Honor Friedrich Birgelen, Deputy Consul General, German Consulate Bangalore; Rajesh Nath, Managing Director, VDMA India; and other speakers and dignitaries.

Source: VDMA India

Experts' take

While Nath outlined the impact, benefits, and the market analysis of Additive Manufacturing both in India and globally, Birgelen spoke on the impact and management of the COVID-19 pandemic in Germany and some similarities in India.

In the technical presentation 'Adapting Additive Manufacturing in the Aerospace Industry', Balasubramanian introduced the transformative process of AM, highlighted its benefits, and shared some of its applications in the Aerospace industry.

The symposium's knowledge partner BTG Legal released a paper about 'Root cause analysis of disputes in engineering contracts and how to avoid them'. It was released by Balasubramanian, Birgelen and Nath, and presented by Parveen Arora and Prashant Mara, Partners at BTG Legal.

The technical session, moderated by Manohar S, Regional Head, VDMA India, comprised four speakers. Rayeshwar Shanbhag, Area Sales Manager, Beckhoff Automation, made an interesting presentation on 'PC Based Control for Additive Manufacturing'. He was joined by his colleague Pavan Sadarjoshi, Application Manager, Beckhoff Automation.

KS Manoj, Head of Business Development IQS, ZEISS Industrial Metrology, spoke on 'Holistic Quality Assurance process in Additive manufacturing – from Powder to Part Performance'. Raghavendra Borelli, Branch Head – Bangalore, B&R Industrial Automation, chose 'Driving industrialization with Additive Manufacturing Automation' as his point of discussion.

Ramesh Ramachandar, Senior Industry Segment Manager, Festo, concluded the session with 'Adding Consistency & Efficiency to Automation in Additive Manufacturing'.

The Indian Additive Manufacturing market alone is estimated to hit $79 million in products and services by the end of 2021 with a CAGR of around 18 percent in the past 5 years.


Source: VDMA India

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