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THE MACHINIST

ULTIMATE GUIDE TO PROFITABLE MANUFACTURING

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AN INTERVIEW WITH GRUNDFOS INDIA ON EFFICIENT WATER MANAGEMENT IN MANUFACTURING

DIGITAL SOLUTIONS
LENOVO ISG TAKES US THROUGH THE LATEST SOLUTIONS FOR THE INDUSTRY

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MACHINING FOR THE AEROSPACE INDUSTRY

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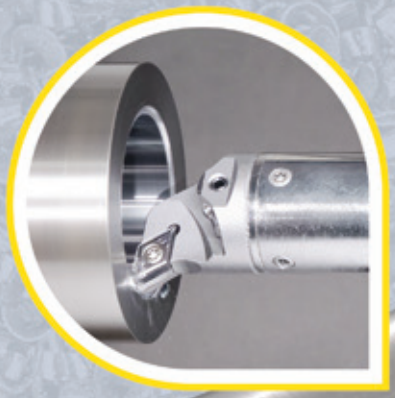

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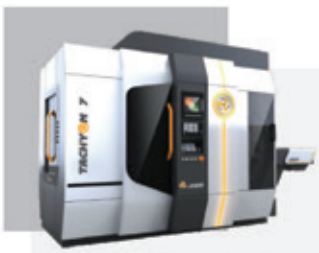

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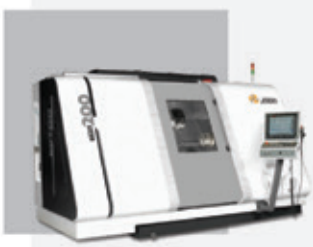
CNC High Speed Vertical Drill Tap Centre

ATM 160
CNC Inverted Vertical Spindle Turn Mill Centre



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MISSING LINKS

Ciao Readers!

The current regime has taken a lot of steps and has pushed the whole "Make in India" agenda, but there are some missing links and the government, whether it's State or Central, need to fill in those links to make India competitive, especially looking at the competitive geography we are in.

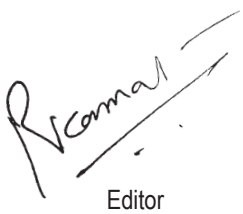
However, manufacturing competitiveness will grow in India if two or three fundamental objectives are understood. Firstly, I think we have to understand what competitiveness means?! I don't think, even that is fully understood. If you look at the cost of manufacturing in India which is higher compared with other nations, must be at least equal to, if not lower. In addition, the quality of what is manufactured, and quality means adherence to customer specifications without deviation. It does not mean gold plating everything, but it does mean that the manufacturers must adhere to customer specifications 100% of the time.

That said, the investments in the country must yield to the investors. Returns in terms of after-tax profits are comparable to the profits which the manufacturer can make by investing elsewhere or in some other activities. So manufacturing must yield a good return. Investments in manufacturing must be long-term. Here I am talking about profits, safety etc must be assured by the government for the long-term which means the stability of operating conditions, tax regime and policies all three must be in place. And, policymakers will have to understand that when you make policy for the manufacturing industry it cannot be made in a manner where the policy is heavily loaded in favour of one party. You have to create a policy framework that ensures a win-win for all the stakeholders. Any agreement or contract flourishes in the long-term, only if both parties have a level playing field.

Now it's a fact that these objectives are not being fulfilled because if they were being fulfilled, investments would have come to India and we would have become the manufacturing hub. So why investments are not coming? One of the reasons is, since the days of socialism, we have always thought that the industry is established by rich people who can afford to bear higher costs i.e. electricity costs, infrastructure costs, red-tapism, delay in decision making, policy paralysis which adds to the cost of setting up a manufacturing unit and we end up becoming a high-cost country.

We also need to look at all our other policies relating to compliances, regulations and standards. Of course, we should ensure the environment is fully safeguarded. But then we have to also see the manufacturing remains competitive and for that, the government must have a balanced approach towards manufacturing and the environment. And when it comes to manufacturing, the role of industry is far bigger than the role of the government – be it state or central, to become a competitive nation.

I hope you enjoy this reading this edition as much as enjoyed putting it together. Do share with us your opinions, comments and thoughts at *Rahul.kamat@wwm.co.in*



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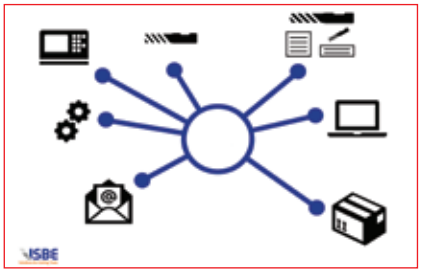

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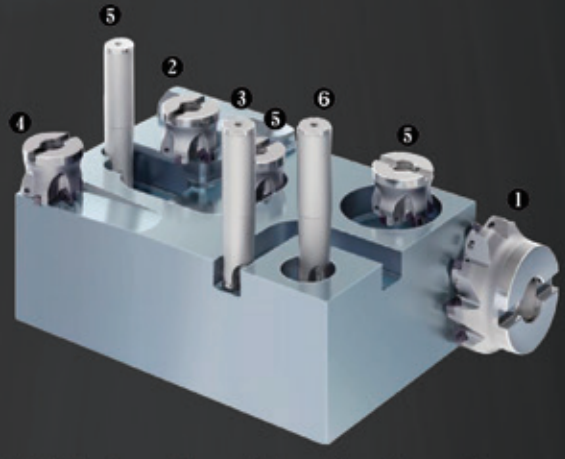

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YOUR GLOBAL CRAFTSMAN STUDIO

Cell Propulsion Selects Dassault Systèmes' 3DEXPERIENCE Platform

DASSAULT SYSTÈMES announced on World EV Day that Cell Propulsion, an electric mobility startup founded by former ISRO (Indian Space Research Organisation) engineers in electric mobility technology, has chosen the 3DEXPERIENCE platform on the cloud to enable collaboration across teams and bridge the gap between design and manufacturing in a seamless manner. The Bengaluru based company, Cell Propulsion builds and deploys high-power, high-payload electric light commercial vehicles (eLCVs) and electric heavy commercial vehicles (eHCVs) as part of their integrated solution, using SOLIDWORKS and ENOVIA applications powered by the 3DEXPERIENCE platform. It aims to develop an integrated ecosystem to accelerate the adoption of electric commercial vehicles by logistics and transportation companies in India.

"In order to meet growing demand for EVs in India, we are developing integrated solutions to make this transition seamless. We needed a safe, scalable solution to track product development, project progress and further our goal of enabling large-scale commercial vehicle fleet electrification using smart, electric mobility technology," said **Nakul Kukar, Co-Founder and Chief Executive, Cell Propulsion.** He added, "Dassault Systèmes' 3DEXPERIENCE platform is assisting us in turning our concepts into models using tools like SOLIDWORKS and ENOVIA, and also in planning out the project timetable and delivering the result in a much more professional and timely manner. Furthermore, the 3DEXPERIENCE community helps us connect with innovative global companies in EV space to understand, adopt and customise the best practices for EV development."

"Electric vehicles are ushering in a new era of mobility that is efficient, affordable, clean and sustainable. Bringing this new generation of vehicles onto the road requires new innovators, suppliers and the ecosystem to rethink the way they design, engineer, procure and manufacture. To meet the growing demand, this change needs to happen quickly," said **Deepak NG, Managing Director, India, Dassault Systèmes.** "On World EV Day, we are committed to our goal of shaping the future of sustainable mobility in India, with solutions that will connect multi-disciplinary project managers to engineers leveraging a data-driven approach that enables real-time collaboration, improves execution and accelerates innovation."

Danfoss Inaugurates Green Refrigerants Testing Centre

DANFOSS INDUSTRIES PVT. LTD has launched an all-new centre of excellence for green refrigerants at its state-of-the-art facility in Chennai, to encourage the sustainable development and use of low-GWP refrigerants. **Mr Dan Jørgensen, Minister for Climate, Energy and Utilities, Denmark** inaugurated the facility in the presence of **H. E. Freddy Svane, Ambassador of Denmark to India, Mr. Ravichandran Purushothaman, President - Danfoss India** and the business delegation accompanying the Minister.

Visiting Danfoss India campus along with distinguished business delegates, Danish minister Dan Jørgensen said, "Danfoss has established itself as a frontrunner in supporting the UN Sustainable Development Goals and fighting against global warming and climate change, globally. The launch of this new Green Refrigerant Centre by Danfoss will help accelerate India's transition towards green refrigeration. Danfoss journey in India is a bright example of how Danish technologies can help bring about more energy efficiency and sustainability in Indian industries."

The Minister's visit to India is part of the Green Strategic Partnership between Denmark and India, where both nations will exchange learnings, technology, and best practices to create a sustainable tomorrow.

"The Green strategic partnership between India & Denmark will enable Denmark to provide game-changing knowledge sharing partnership in India's sustainability journey, in line with the vision expressed by Prime Minister Narendra Modi and his Danish counterpart Mette Frederiksen. It will draw on our own rich experience of not just having an economic growth but also on how we can decouple growth from energy and scale up many of those sustainable solutions that have been successful in Denmark on a smaller scale. We are collaborating closely on strategic sectors of energy, water and environment, urbanization and IPR (intellectual property rights) with focus on an ambitious implementation of the Paris Agreement and the UN Sustainable Development Goals. In doing that, both Denmark and India will create green and sustainable employment, boost innovation, and investments, grow their economies, and help fight global climate change," said **H.E. Freddy Svane, Ambassador of Denmark to India.**

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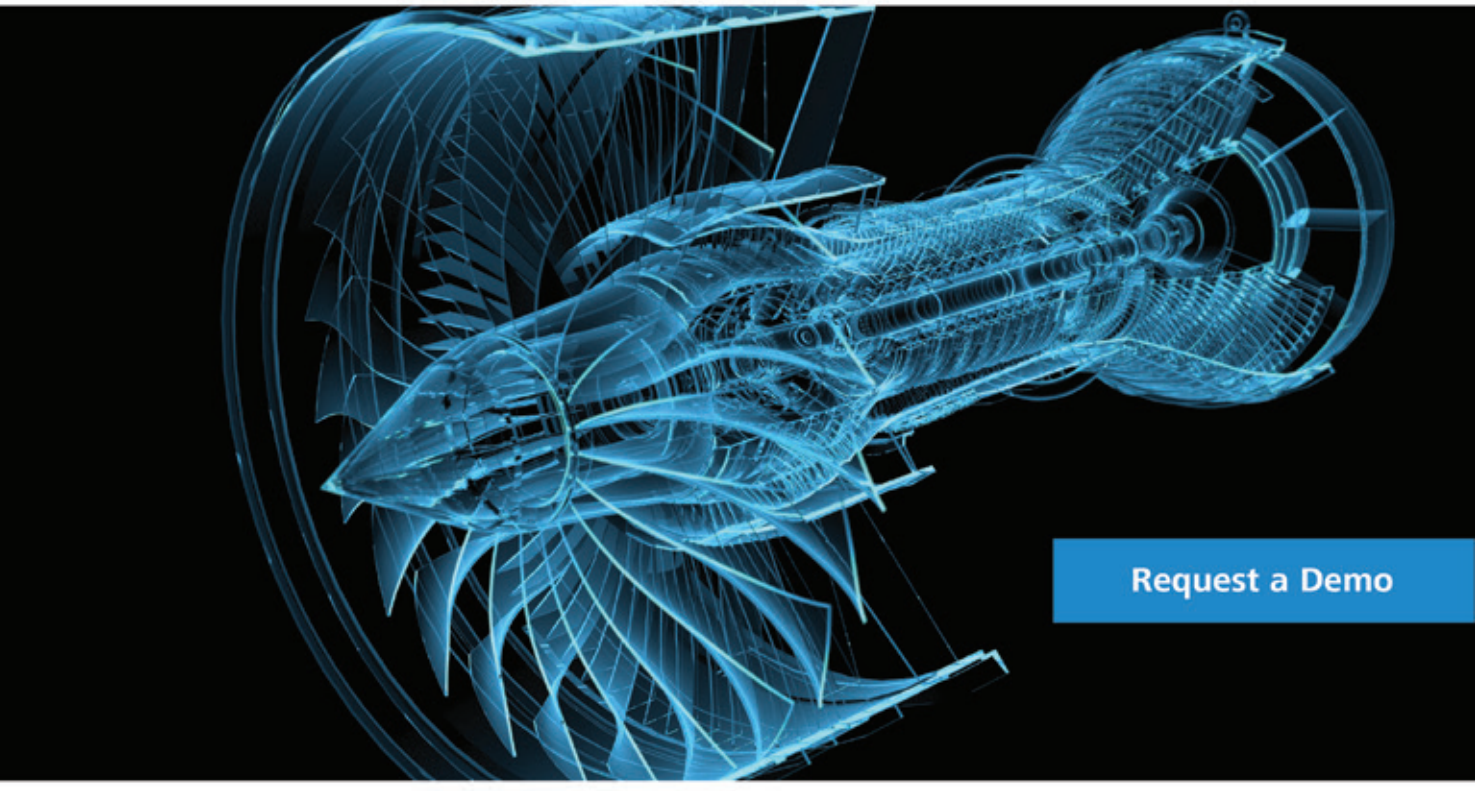

ZEISS India Ensures Aerospace Suppliers Stay Competitive

Due to increased pressure in the aerospace supply chain, the quality standards are maintained by inspecting raw materials, parts in process and finished products before they are sent to an OEM. Manufacturers are delivering products that will be part of avionics, aerostructure and propulsion systems across the world.

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- Quality standards as per AS 9100

Contact us for technical white papers or demo

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Tata Cleantech Capital Releases Report On Indian Renewables

TATA CLEANTECH CAPITAL LTD (TCCL), a joint venture between Tata Capital Limited and International Finance Corporation, Washington D.C. (World Bank Group) has released a report on Market Trend and State Comparatives of Indian Renewable Open Access Landscape. The report identifies key states which are expected to lead the growth in the Indian Renewable Open Access space over the next 1-2 years. The report also aims to provide a market landscape of the developers and debt financing in this segment.

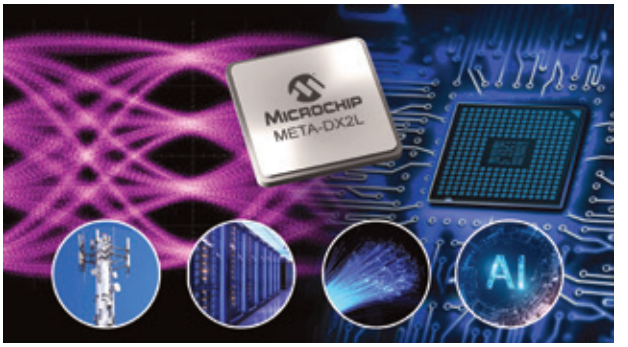
Go-Green initiatives led by corporates, coupled with increasing cost competitiveness, have accelerated the shift of Open Access projects towards renewable energy. The report focusses on business model evolution, connectivity arrangements and policies, regulations and Open Access charges across different states.

Regulatory certainty remains a key determinant to growth owing to the dynamic nature of the banking rules, cross subsidy and additional surcharges. The complexity gets further accentuated due to lack of uniformity in the policies witnessed in various states. Identification of key states is based on regulatory certainty, DISCOMs intent and financial health, certainty of exemptions, market size and other aspects. Given the complexity of the industry, it is highly likely that the bulk of the new capacity addition of renewable Open Access projects would be centred in Gujarat, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Chhattisgarh in the near term.

The report also highlights the emerging trend of dominance by renewable focused developers in the Open Access segment. The shift in trend is predominantly on account of long-term policies from key states such as Karnataka, Gujarat and Uttar Pradesh. Despite the shift, the risk perception for Open Access projects continues to be significantly higher. As a result, the debt financing in the segment is largely provided by private NBFCs due to in-depth understanding and agility to account for dynamic market situations.

Speaking on the report, **Manish Chourasia, Managing Director, Tata Cleantech Capital Ltd** said, "The development of Open Access market in India is still in its nascent stage and has immense potential to grow. Regulatory support and the proposed Electricity Rules, 2021 and Electricity Amendment Act can provide the much needed boost to the Open Access market in India. The sector could also benefit by adoption of wind-solar hybrid projects which has an added advantage as they can operate throughout the day, resulting in better utilisation of grid infrastructure and reduced dependency on banking facilities."

Microchip Unveils Industry's Most Compact 1.6T Ethernet PHY



ROUTERS, SWITCHES AND LINE CARDS need higher bandwidth, port density and up to 800 Gigabit Ethernet (GbE) connectivity to handle escalating data centre traffic driven by 5G, cloud services and Artificial Intelligence (AI) and Machine Learning (ML) applications. To deliver the higher bandwidth, these designs need to overcome the signal integrity challenges associated with the industry's transition to the 112G (gigabits per second) PAM4 Serialiser/Deserialiser (SerDes) connectivity that is needed to support the latest pluggable optics, system backplanes and packet processors. These challenges can now be overcome with the industry's most compact, 1.6T (terabits per second), low-power PHY (physical layer) solution from Microchip Technology Inc. with its PM6200 META-DX2L that reduces power per port by 35 percent compared to its 56G PAM4 predecessor, META-DX1, the industry's first terabit-scale PHY solution.

"The industry is transitioning to a 112G PAM4 ecosystem for high-density switching, packet processing, and optics," said **Bob Wheeler, principal analyst for networking at The Linley Group.** "Microchip's META-DX2L is optimised to address these demands by bridging line cards to switch fabrics and multi-rate optics for 100 GbE, 400 GbE and 800 GbE connectivity".

"For the 56G generation we introduced the industry's first terabit PHY, META-DX1, and now we have followed with an equally transformative 112G solution that delivers the capabilities system developers need to solve today's new challenges posed by cloud data centres, 5G networking, and AI/ML compute scale-out," said **Babak Samimi, vice president for Microchip's communications business unit.** "By delivering up to 1.6T of bandwidth within a low-power architecture and in the smallest footprint, the META-DX2L PHY doubles the bandwidth of previous solutions on the market while establishing a new level of power efficiency."

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Yamaha Launches Sporty RayZR 125 Fi Hybrid & Adventure Ready Street Rally 125 Fi Hybrid

IN AN EFFORT TO provide an enthralling riding experience to its customers under the brand direction 'The Call of the Blue', India Yamaha Motor (IYM) Pvt Ltd has launched the RayZR 125 Fi Hybrid, a scooter designed for the spirited riders, and the Street Rally 125 Fi Hybrid, which offers an adrenaline high for those who seek adventure.

The new Ray ZR 125 Fi Hybrid is targeted at unisex audience in the 18-40 years age group that are seeking a scooter that looks unique, is powerful and fuel-efficient. The Street Rally 125 Fi Hybrid is targeted towards unisex audience in 18-25 years age bracket, looking for a scooter that is high on adventure, with aggressive styling, and comes loaded with performance while being fuel-efficient.

The new Ray ZR 125 Fi Hybrid and Street Rally 125 Fi Hybrid is powered by air-cooled, fuel injected (Fi), 125 cc blue core engine that produces a power output of 8.2 PS @ 6500rpm and maximum torque of 10.3 Nm @ 5000rpm. Both scooters continue to weigh 99kgs (kerb).

As standard, the new RayZR 125 Fi & Street Rally 125 Fi Hybrid showcase a Smart Motor Generator (SMG) System that gets an added functionality of Hybrid System, wherein the SMG functions as an electric motor to give a power assist when you accelerate from a stop, reducing the insecurity caused by the wobble during start-outs in tandem riding or during uphill climbs. About three seconds after starting, or when the throttle is cut back or the engine rpm exceeds the prescribed level, the Power Assist function is cancelled. Also, an indicator light in the instrument cluster will inform the rider when the Power Assist (Hybrid System) is in operation.

The SMG also serves as a motor by reversing the direction of electricity release, providing benefits that include a quiet engine start system, automatic stop and start system.

During the launch, **Mr Motofumi Shitara, Chairman, Yamaha Motor India group** of companies said, "The launch of the Hybrid version of the new RayZR 125 FI and Street Rally 125 FI has allowed Yamaha to further expand its portfolio of Hybrid scooter offerings in India. After receiving immense response for the Fascino 125 Fi Hybrid, we are confident about further strengthening our position in the market, with these new offerings."

Bridgestone India's Carbon-Neutral Fuel Biomass Boiler Plant

BRIDGESTONE INDIA has commissioned a carbon neutral boiler plant at its Pune manufacturing facility. This initiative is part of the Bridgestone Group's worldwide commitment to reduce its absolute CO2 emissions by 50 per cent by 2030.

Built in collaboration with Thermax Onsite Energy Solutions Limited (TOESL) the plant uses carbon neutral Biomass briquettes made from agricultural waste. Estimated steam generation with this Boiler will be 123236 tons per year at full capacity and considering above steam generation, estimated CO2 reduction will be 19396 tons/year. The boiler plant caters to the current steam requirements at the Pune plant. Steam is utilised in tyre curing process to provide heat energy to stimulate chemical reaction between rubber compound and other materials in order to give tyres their final shape.

"We at Bridgestone are committed to help ensure a healthy environment for the future generations. This boiler plant is the third in Bridgestone's global operations and the first in Bridgestone's EMIA (Europe, Middle East, India and Africa) region and we are proud of this achievement. Reducing CO2 emissions is an essential step of our global sustainability strategy and with this plant we will save 0.157 Ton CO2 for every ton of steam produced. This will also result in annual savings of Rs. 6.9 million as compared to conventional energy usage. We are glad to have a reliable and expert partner such as Thermax Onsite Energy Solutions supporting us in this venture" said **Mr Parag Satpute, Managing Director, Bridgestone India.**

National Aerospace Laboratories Adopts Dassault Systèmes' Solutions

DASSAULT SYSTÈMES has announced that National Aerospace Laboratories (NAL), a constituent of Council of Scientific and Industrial Research (CSIR) has adopted the "Passenger Experience" industry solution experience based on the 3DEXPERIENCE platform to design civil aircraft in India, specifically the Saras Mk-2 program. NAL is also using DraftSight, a feature-rich 2D and 3D Computer Aided Design (CAD) solution for 2D design standardisation in the manufacturing of civil aircraft.

The "Passenger Experience" industry solution experience helps in reducing engineering costs in cabin completion by up to 40 per cent through engineering, manufacturing and certification processes automation. It also helps in increasing brand perception and reducing content creation by 40 per cent for all passenger touch points for sales and marketing. It also combines emotion and automation across engineering, manufacturing and certification processes to allow completion centres to deliver personalised cabin interiors profitably. The DraftSight solution unifies essential 2D drafting, advanced 2D CAD or all-in-one 2D and 3D design with full 3D capabilities for modelling, prototyping, manufacturing and laser cutting.

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Lightweight And Emission Reduction – Roof Frames Made With Ultradur® High Speed

THE TREND TO PANORAMIC ROOFS is ever increasing in the automotive industry. Car customers include panoramic roofs at the top of the list of extras when buying a new car. This trend coexists with the need to reduce the weight of all automotive components to minimize CO2 emissions. With the development of new Engineering Plastic parts for its interior applications, BASF and Grupo Antolin are complying with these challenges.

The newly developed panorama roof is integrated into the ceiling trim (called the headliner) of the car which is made from the very light Polyurethane Elastoflex® E 3943/134. The actual sunroof opening in the headliner is supported by a structural bracket. Traditionally this is made of heavy steel. With Ultradur® High Speed a metal replacement solution is now used. Besides a high dimensional stability, the engineering plastic convinces with excellent mechanical properties.

Partnership is the key to success. In close cooperation, both companies have successfully validated the Polybutylenterephthalate (PBT) Ultradur® High Speed in plastic frames for open panorama headliners. The novel and newly design of these parts allow a weight reduction up to 60 per cent compared to other traditional solutions. This special material allows the injection of large parts with unique performance such as excellent Page 2 P288/21e dimensional stability, low warpage at short cycle times, high stiffness, high temperature resistance and an outstanding flowability.

"One of the main advantages of the newly designed plastic parts is the change in the process. We attach the frame to the headliner. During the production process the panorama reinforcement frame is fixed to the interior trim part while at the same time the part is formed in the mould. That leads to the elimination of additional process steps and moreover it improves tolerances during assembly and the quality of the final part is increasing," explains **Enrique Fernandez from Grupo Antolin.**

"In addition, the new process does not involve the use of any solvents nor generate hazardous emissions." Global availability of Ultradur® High Speed "The new rheological modified Ultradur® High Speed has an outstanding flowability that is crucial to obtain large and slim interior trim parts. Moreover, considering its unprecedented processing advantages, we have been able to reduce weight without losing stiffness and dimensional stability at high temperatures," says **Dirk Salzmann, Key Account Manager in the Performance Materials division at BASF**. Following the predevelopment with a German customer, the first pilot project was launched for a best-seller vehicle with outstanding results. More opportunities with this solution have been identified for several OEMs at global scale.

Change in the Management Team of Continental's Autonomous Mobility

CONTINENTAL has appointed Hans-Jörg Feigel (62) as Head of Strategy and Future Solutions in the business area Autonomous Mobility and Safety (AMS), effective September 1, 2021. In his role, Feigel also becomes a member of the Management Board of AMS. Feigel, who holds a doctorate in mechanical engineering, succeeds Ralph Lauxmann (57), who took over the overall management lead for a customer project within Continental on August 1, 2021. Feigel has many years of international management experience in the automotive industry with extensive expertise in the field of braking and chassis systems. Most recently, he served as Managing Director Europe for an international automotive supplier. Prior to that, Feigel held various positions at Continental for close to 25 years.

"I am very pleased that with Hans-Jörg Feigel we have won back an experienced manager who will continue the successful work of his predecessor. Together with his team, he will further advance our innovation strategy and product and function roadmap. At the same time, I would like to thank Ralph Lauxmann very much for his future-looking achievements and contributions. I wish him all the best for leading a very important customer project for us, which requires top management attention," says **Frank Jourdan, member of the Executive Board of Continental AG and head of the Autonomous Mobility and Safety business area.**

In his new position, Feigel will act as the central contact for strategy and future technologies for all business units of Autonomous Mobility and Safety, from 2022 Safety and Motion, and will work closely with the CTO organization at Automotive Technologies.

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By Mr Sanjay Bhatia, President, Metal Container Manufacturers Association

A GROWTH DRIVEN MARKET

An insider view on the opportunities and challenges in the Indian metal packaging industry

The packaging industry is one of the fastest growing sectors in Country. The total size of the industry is $ 52.3 billion P.A. which is growing around 12 per cent per annum. The industry is coming up with some incredibly interesting and captivating packaging concepts, but the key component is sustainability and recyclability of the packaging material. Experts envisage a key role for metal packaging in the future as it is manufactured out of a sustainable material- that is tinplate/tin free steel and follows the principles of reduce-reuse-recycle.

Metal packaging industry is growing at around 5 to 6 per cent and is likely to reach around 770 to 800KT per annum by 2024. The growth in this sector is largely driven by pharma, food, beverages, paints, different types of closures etc.

The companies engaged in various sectors like processed food, personal care, paints, pharma etc., are making huge investments in these sectors which are generating opportunities for the growth of the packaging industry as well.

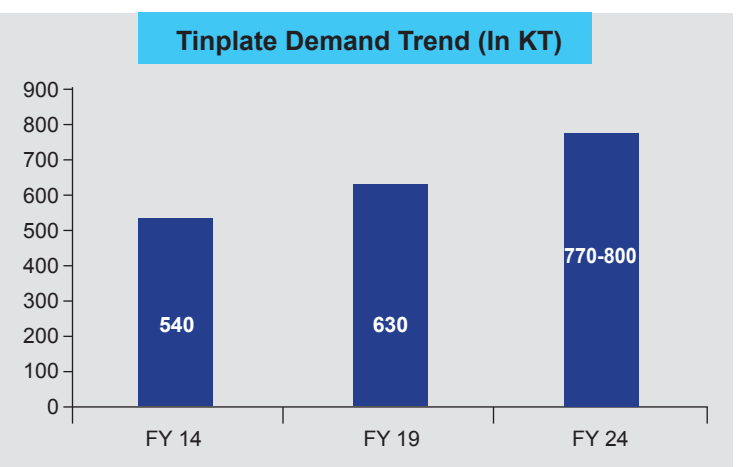
Looking at countries such as Germany, the material has consistently exceeded all required recycling rates for 10 years. As per 'Recycling Week' – June 2020 data in 2018 a whopping 90.4 per cent of the tinplate used as packaging material in Germany was recycled – in Europe the figure was 82.5 per cent.

CHALLENGES

Despite the immense opportunities the industry is going through one of the toughest times at the moment. The major issue that strikes in the face of the metal packaging industry is the mandatory imposition of the BIS standard vide steel and steel products QCO dated 17th July 2020, issued by the Ministry of Steel, Government of India.

The quality control order has mandated use of only BIS certified material like tinplate/tin free steel for tin cans and also imposed condition of use of BIS material for manufacture of various imported components/ steel products like easy open ends, peel off ends etc. which the industry imports from various countries in different sizes and specifications as they are virtually not manufactured in the country.

The resistance of the metal packaging industry against imposition of BIS is due to many reasons. The QCO has been issued at a time when the entire industry is already stressed to retune their business owing to the pandemic. Besides, it is practically impossible to force the international suppliers to go for BIS certifications as the process for getting BIS licence is quite cumbersome and costly. Moreover, for the few foreign tinplate producers who have applied for BIS licence in July 2020, no action has been taken by BIS Authorities since then due to current COVID restrictions.



Source: MCMA

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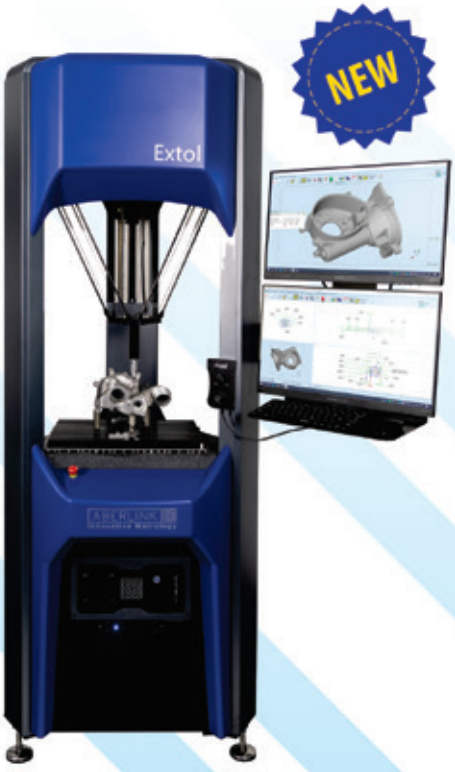

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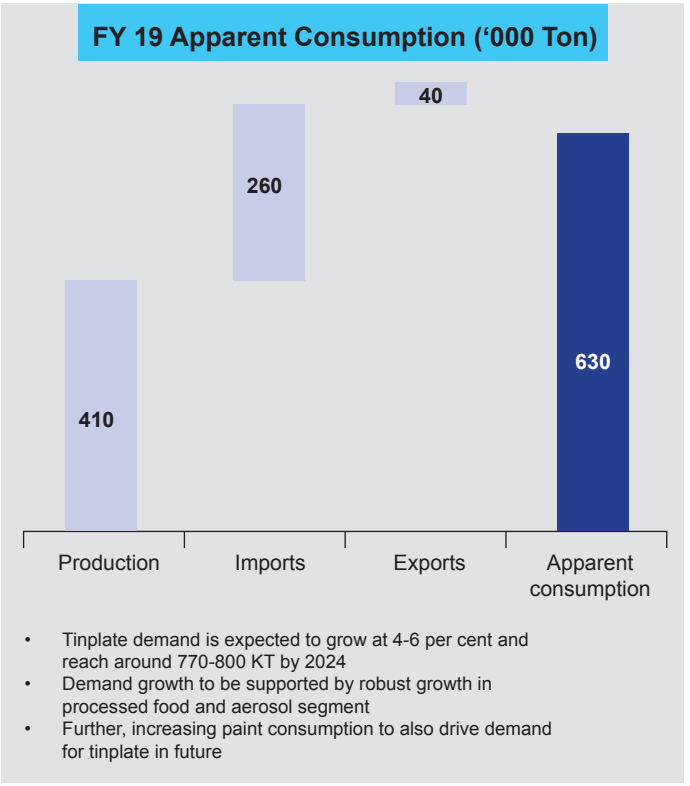

Source: MCMA

From the perspective of the international suppliers of tin Plates, India is a fairly small market, so they are not very keen to get into lengthy bureaucratic and cost intensive BIS certification procedures. As a result, the foreign suppliers have halted shipping tin plates to India, and this has led to acute shortage in the domestic market.

The Industry needs about 700 thousand M/T of tinplate/tin free steel while the domestic production is about 450 thousand tonnes. The Industry imports about 200 thousand to 250 thousand M/T of tinplate/tin free steel per annum from different countries. Due to the imposition of mandatory QCO the import of such material has substantially come down as the date of implementation of the QCO is being extended by only three months. Since the lead time for import of material is much longer, therefore, the imports have substantially reduced, virtually resulting in an acute shortage of tinplate/ tin free steel in the country. This has also led to a virtual monopoly of the two producers in the country and taking advantage of this shortage, the domestic prices of tinplate/ tin free steel has been increased already by almost 60 per cent since October 2020.

This exorbitant price increase in tinplate, consequently cans, may compel the existing customers to move away from metal packaging to other alternate packaging options especially in food, beverage and paint industry. The industry which is mainly concentrated in MSME will not be able to survive the hefty price increase of tinplate, loss of business to alternative packaging materials and an upsurge in working capital requirements.

Moreover, Industry imports both prime and non-prime materials for manufacture of tin containers/ various products for food and non-food segments. The industry is able to use non-prime material for manufacture of tin containers for non-edible products like paints, chemicals etc. and various other products like stationery items, lanterns etc. Non-prime material is an arising when the prime material is produced by the tinplate mills and is categorised as non-prime due to thickness variation, surface defect etc. These materials which are commercially cheaper can be conveniently used in India where availability of labour is comparatively cost efficient and the cans/ products are manufactured either manually or in a semi-automatic process. In case of imposition of BIS such non-prime material will not be available to the metal packaging units in MSME sectors. It means that they will have to depend on the prime material which is approximately 35 per cent more expensive than the non-prime material and which is already in short supply.

Considering the market is already favouring the industry in terms of the demand but now much is dependent on government policies as soon as it becomes favourable it will surely pin a promising future for the Indian metal packaging industry. By withdrawing the mandatory certification, the foreign suppliers will restart shipping tin plates to India as at present there is a huge shortage in the domestic market.

Furthermore, to make the environment more conducive and to promote localisation of steel products the government should set up a soft loan payable in more than 10 years for the packaging industry. Also, since metal packaging is 100 per cent recyclable, environment friendly and a sustainable packaging material, the government should take out a scheme to incentivize the user industry for encouraging use of such packaging material.

The Metal Container Manufacturers' Association(MCMA) represents the interests of companies involved in the production of metal containers, packaging and allied components. In particular, the Association represents members' views to government and other regulatory bodies. They also seek to influence the formulation of plans and legislation by communicating a well-researched and argued industry view. Member companies range from large international organisations to small independent specialist manufacturers throughout India.

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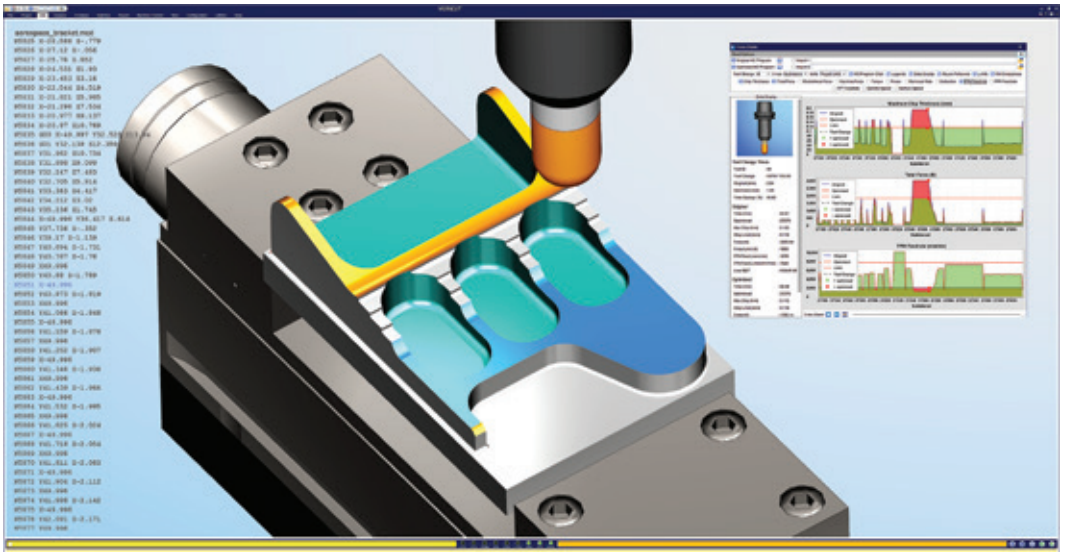
By Kruti Bharadva

IMPROVED PRODUCTIVITY AND TECHNICAL COMPETITIVENESS WITH VERICUT FORCE

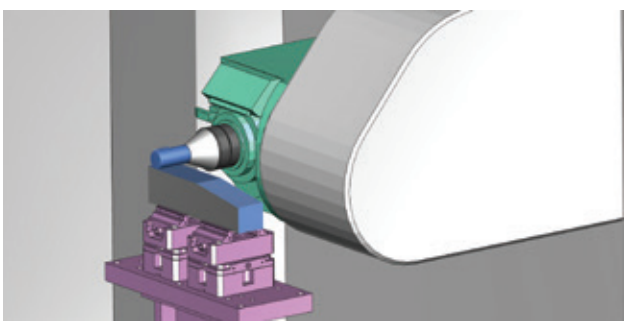


Full support for factory digitisation (smart factory) from the government offices at both federal and state-level still seems insufficient for many companies to overcome resistance to sudden changes and risks that could accompany those changes. KP AERO INDUSTRIES CO LTD (herein KP Aero) is an exception. A small but well-equipped with advanced technology in the Gyeongsang province of South Korea, KP Aero has successfully implemented the smart factory empowered by the corporate culture that conceives technological innovation as a natural task rather than burdensome. KP Aero's successful global market debut after 30 years of self-gained technology proves it well. KP Aero produces parts for A350, B737, B777, B787, and more. Korean Air, Korea Aerospace Industries, HANKUK FIBER are also important customers of KP Aero. In 2020 while the COVID19 significantly impacted the global aerospace industry, KP Aero was successful in securing a deal with a major Japanese aircraft manufacturer.

Aircraft manufacturers request lighter, more complicated, and precise parts. To meet these needs, which requires high-speed machining, a facility with machines that could operate at an average speed of 30,000 rpm was established.

KP Aero was already a user of the CNC simulation software and optimisation software VERICUT. However, when more need for precision machining was noted, and a need to improve the high-speed machines' productivity arose, the company made a call to test the optimisation module FORCE.

"VERICUT FORCE is a solution that is already highly accepted in the global aerospace industry. The fact that KP Aero using FORCE optimisation would give an extra boost to gain customer trust and strengthen the price competitiveness," said a representative.

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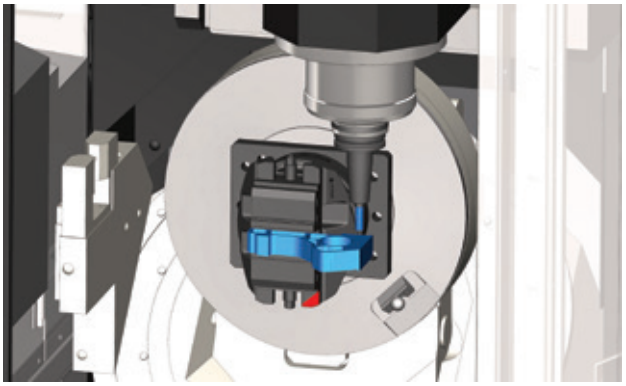
A Titanium (Ti-6Al-4V) part was machined using a 5-axis DMC-100U duoBLOCK to test the software. To machine a part faster and safer, FORCE cuts the NC code into small segments and applies the optimal feed rate for each segment, improving the efficiency of the toolpath and eliminate any risk due to overloads. After FORCE optimisation, KP Aero saved 25 per cent cutting time and eliminated tool breakage, which has been a problem while machining deep pocket corners and trims. Performance enhancement of the company is expected thanks to FORCE that can prevent overloads and tool breakage. FORCE also provides various easy and fast-to use analytic functions and charts.

FORCE and other VERICUT modules seamlessly connect to already established facilities. KP Aero is implementing FORCE software as a part of their smart factory processes and planning to optimise other parts' toolpaths soon.

ABOUT VERICUT FORCE

Force Optimisation CGTech's VERICUT Force is a physics-based NC program optimisation software module that analyses and optimises cutting conditions throughout NC program operations.

VERICUT Force makes the most effective NC program for the given material, cutting tool, and machining conditions. The result is significant time savings, and improved cutting tool and machine life.



Analyse

VERICUT Force allows programmers to quickly and easily visualise what is happening cut-by-cut in the NC program as the tool contacts the material. With VERICUT Force you clearly see underutilised cutting conditions, excessive forces, metal removal rates, power, torque, and tool deflections.

A single click provides a review of the NC program and a visual analysis in the graphic review window. This analysis provides a view of the machining before running the NC program on the actual machine. VERICUT Force provides the user with a proactive analysis on NC programs, making them right the first time.

Optimise

VERICUT Force makes optimising an NC program fast and easy. Force calculates the contact between the tool and material, cut-by-cut. Force also takes the cutting tool edge and the material into account to adjust the feedrates to be optimal and constant.

Materials

VERICUT Force's material catalog is complete with ISO PMKNSH materials.

Benefits of Force

- Significant cycle time savings
- Charted cutting condition information for NC program analysis
- FAST analysis and iteration for testing various cutting scenarios
- Maximized and more consistent chip thickness throughout the machining process
- Cut-by-cut analysis of the interaction between the cutting tool edge and the material
- Improved cutting tool performance—utilize cutting tool technologies to their full potential
- Prevention of undesirable cutting conditions like excessive force, HP/Torque, and tool deflection

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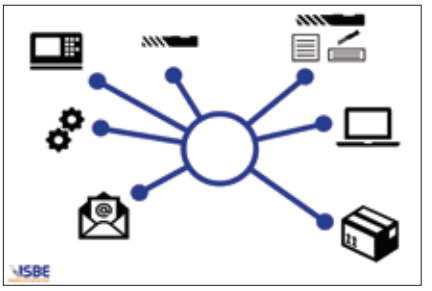
SUSTAINABILITY THROUGH DIGITALISATION

ISBE GmbH talks about how digitalisation can push forward sustainability in manufacturing, the need not only of the future, but of now

Many areas of life have come to a temporary standstill in the last two years due to the worldwide corona pandemic. What good fortune, that the industrial production managed to break free quickly from this trance-like state. In all this time, however, the growing idea of sustainability has never come to a standstill. How can we consciously use resources? This topic is becoming increasingly important in tool grinding companies and moving up the list of priorities to the same level as efficiency and digitalisation. But isn't it all connected somehow?



DIGITAL, SUSTAINABLE AND EFFICIENT

When we hear the term "sustainability," we think first and foremost of reducing material and energy use. By digitalising the internal processes of our company, we can take a few steps toward achieving this.

The more digitally we are set up, the more error-free we are able to work. This favours the increase in quality and saves resources, because we need fewer attempts to get to our final result. Material reject is reduced. An additional good side effect is that we manage our time and manpower more efficiently at the same time. After all, valuable resources include not only materials, but also working time and personnel. The most important thing is that the employees do not have to go through unnecessary steps and do not have to get their hands on things three times.

DATA CONSISTENCY INSTEAD OF ITERATION LOOPS

Let's assume tool manufacturers would work with a single available base on which everything is built. A data set from which the tool manufacturing team can feed all areas of operation. From the documentation of the customer's requirements, quotation, release drawing and the digital twins for production are generated.

DIGITAL ORDER PROCESSING

In detail, it could work like this: With a suitable software, the sales staff documents the description of the tool in a memo during the first meeting with the customer via a video chat program. Through screen transmission, the customer has direct insight, can follow the tool drawing and participate in it. If everything fits, he or she can approve it right away. Once the release drawing has been completed, the sales staff immediately generates the digital tool data for the collision check. With the final release, he or she can then provide the digital tool data for production from one and the same source via an export function.

The manufacturing department gets the order directly from the sales department and adds further production-relevant information to the digital twin using another program for tool modelling. From this, the manufacturing employee generates the 3D surface model and uses it directly for the FEM analysis. Grinding then already can begin, because the NC program can be generated and simulated on the basis of this data.

DIGITALISED DATA FLOW LEADS TO EFFICIENT WORKFLOWS

The tool data is available at any time and to anyone, immediately and on an up-to-date basis. The working sections use the tool data and add new information which they need for the further steps. Blanks can be derived for ordering from the supplier and at the same time grinding programs can be built up on the tool data. The reaction time from the sales inquiry to the production of the tool is reduced to a minimum. The result: a sustainable and efficient workflow is created.

Smart solutions which shorten and speed up manufacturing processes from the very beginning and at the same time increase quality are a matter to the heart of ISBE GmbH. The software developer and digitalisation expert specialise in the tool grinding industry, especially high-precision tools.

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By Kruti Bharadva

TRANSFORMING FOR THE FUTURE

Staying a step ahead and being future ready can be a gamechanger for any business. We spoke with **Rahul Kirloskar of Kirloskar Industries** on how the business is transforming itself for the future

In July 2021 Kirloskar Oil Engines, Kirloskar Chillers, Kirloskar Pneumatic, Kirloskar Ferrous Industries and Kirloskar Industries decided to refresh each of their business visions. The refreshed vision was aligned with the need to be future-ready in a constantly evolving world and stemmed from the desire to enhance the experience throughout the customer journey. We sat down virtually with Mr Rahul Kirloskar, Executive Chairman, Kirloskar Pneumatic and had a tête-à-tête with him – as he took us through the plans and vision of the group of companies.

Please tell us briefly about your group of companies, their product offerings and the sectors to which they cater as well as manufacturing capacities?

Kirloskar Oil Engines Ltd is a leader in the manufacturing of diesel engines, agricultural pump sets and generator sets with a sizable presence in international markets. Kirloskar Oil Engines Ltd has a strong distribution network throughout the Middle East and Africa with offices in Dubai, South Africa and Kenya and representatives in Nigeria. The company specialises in manufacturing air-cooled and water-cooled engines, diesel generator sets across a wide range of power outputs (2.1 kW to 5200 kVA), diesel engines, diesel and electric pump sets, power tillers, specialised engines for fishing, among others. The research and engineering Facility of Kirloskar Oil Engines Ltd ensures all engines and diesel generator sets are certified for stringent noise and exhaust emission norms. The company also offers engines that operate on alternative fuels such as bio-diesel, natural gas, biogas and straight vegetable oil. In the power generation segment, Kirloskar Oil Engines Ltd is one of the largest

selling Genset brands in the world whereas the newly-entered railways' power car business has already become the second-largest player fuelling the growth of Indian Railways.

Kirloskar Chillers Private Ltd has been at the forefront of HVAC technology in India since it commenced operations in 1996. For more than a decade after inception, it was the only company in India to manufacture centrifugal and screw chillers. Kirloskar Chillers Private Ltd.'s products are designed for a wide range of operating conditions and applications, from comfort air-conditioning to process cooling as well as low-temperature brine applications. In 2006, Kirloskar Chillers Private Ltd. was the first Indian chiller manufacturer to acquire AHRI certification for its products and the first to establish an AHRI-certified test facility in 2008. The company has been a pioneer in ozone-safe and low-GWP, eco-friendly technologies in India.

Kirloskar Pneumatic Company Ltd -Founded in 1958, Kirloskar Pneumatic Company Ltd. is the market leader in CNG systems and oil and gas refrigeration in India, enjoying a market share of over 60 per cent in both business segments. The company has a wide range of offerings that include air compressors, refrigeration compressors and systems, process gas systems, vapour absorption chillers and industrial gearboxes. It serves a range of sectors like oil and gas, steel, cement, cold chains, food and beverages, pharmaceuticals, railways, defence and marine. Kirloskar Pneumatic Company Ltd. has established technology partnerships with leading global companies. It is also steadily enhancing its leadership position in the gas compression segment while being the world's largest manufacturer of industrial gas compressors.

Kirloskar Ferrous Industries Ltd

Founded in 1991, Kirloskar Ferrous Industries Ltd. is India's largest castings and pig iron manufacturer. The company caters to various industry sectors, such as tractors, automobiles and diesel engines. The manufacturing facilities at Koppal, Hiriyur and Solapur have the unique capability of producing a range of products that include grey iron castings up to 300-kg pieces. The company also produces various grades of pig iron such as SG iron grade, basic steel grade and foundry grade. The company is also expanding its manufacturing capacities in pig iron and casting. The company has introduced a 3D printing facility, enabling fast development of new products and capability ramp-ups and has also started machining castings and added a coke manufacturing facility with waste-heat recovery power to be used in the foundry.

Kirloskar Industries Ltd

Kirloskar Industries Ltd is a public limited company trading on the Bombay Stock Exchange and the National Stock Exchange. The company was incorporated in 1978 and is engaged in wind power generation and has diversified into real estate development activities through its wholly-owned subsidiary, Avante Spaces. The company also invests in securities of group companies and has rented out commercial spaces.

Avante Spaces, the real estate business, a subsidiary of Kirloskar Industries, has embarked on its first project which is a mixed-development offering that includes retail and commercial space in smart buildings. It is exploring different models of real estate development keeping user-centric and future-forward principles in mind.

Arka Fincap, a non-deposit taking systemically important NBFC, is a wholly-owned subsidiary of Kirloskar Oil Engines Ltd. Arka Fincap is a professionally managed company focused on providing structured term financing solutions to corporates, real estate and loans to micro, small and medium-sized enterprise borrowers. The company was started three and half years ago.

Tell us about the large investments and growth strategies planned for all business lines in the coming years?

Among the new consumer-facing businesses, there will be significant investment in the realty business Avante Spaces and Arka Fincap, the non-banking finance company (NBFC). Avante Spaces is developing the first of its land parcels based on customer-centric and future-forward principles. The business is looking at a mixed-development offering that includes retail and commercial space in smart buildings.

Arka Fincap was established last year as a subsidiary of Kirloskar Oil Engines and began operations with a seed capital of Rs 1,000 crore. It is focusing on structured term financing solutions for corporations and loans to MSME borrowers and the real estate sector. In three years, Arka Fincap will expand into retail lending and consumer finance.

Avante Spaces is our first real estate project. The development potential of our first land parcel is about 2 million square feet and it will be ready by 2024. At Kirloskar Ferrous, we are setting up a phase-II coke oven and power plants to achieve self-sufficiency and cost reduction for the present facilities. At Arka Fincap, our NBFC setup, we had started with a commitment to invest Rs 1,000 crore as seed capital over four years. We have already infused about Rs 800 crore in it. We plan to invest the rest over the next 12 months or so.

Explain the infusion of industry 4.0 technologies such as digitisation and 3D printing into your business and how is this transforming the way you manufacture, the way you process, etc.?

We have adopted many new-age tech solutions. These include 3D printing, artificial intelligence (AI), Industry 4.0, IoT-powered gensets (over 50,000 already supplied), customer service, remote monitoring, digital transformation in after-sales service with the help of EFSR, among others. We leveraged technology to equip our employees with better tools, seamless and transparent flow of information, and learnings, along with AI-driven e-learning systems that can be accessed from anywhere in the world.

This, coupled with the right policies and processes, will allow our people to grow vertically and horizontally within companies, ensuring their learnings, as well as their potential to deliver, are limitless.

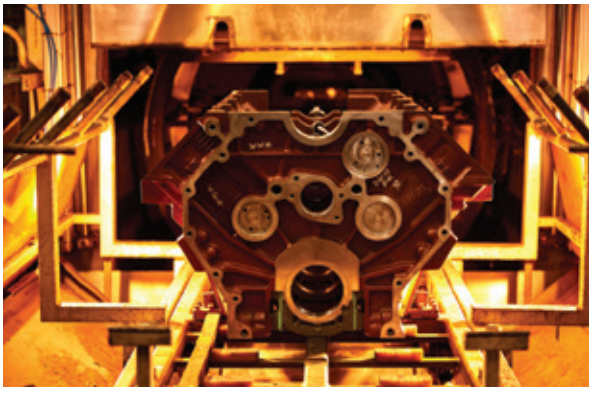
Kirloskar is on a transformation journey - with a vision now aligned to be being future-ready. Please explain this ethos and the need to transform. Especially keeping in mind, the current market scenario, wherein survival and adaption is the general norm?

Our businesses have always been agile and unafraid to transform in step with a transforming world. So, the refreshed vision is aligned with the need to be future-ready in a constantly evolving world and stems from the desire to enhance the experience throughout the customer journey.

The exercise involves not just a revitalisation of the businesses from robust, engineering-led firms to solution providers that lead today's transformed industrial landscape, but also being more customer-centric than ever before.

It is very much in line with our founder's vision of ensuring that all products are a step ahead of time, the companies will constantly innovate with an eye on the future. So, it wasn't tough once we decided to move ahead.

We were very clear about the values we would adhere to Innovative thinking, Empathy, Collaboration, Integrity, Excellence and Value-creation. These will be deeply entrenched in the operations going forward. In the past, we were more B2B. About four or five years ago, we started our journey towards being a digital company – we were probably one of the first companies to go digital. We took this decision because we were a 130-year-old group and we needed to move with the times.



Customer focus will form the core of your new mission. Kindly explain the shift?

The exercise involves not just a revitalisation of the businesses from robust, engineering-led firms to solution providers that lead today's transformed industrial landscape, but also being more customer-centric than ever before.

To ensure that all products are a step ahead of time, the companies will constantly innovate with an eye on the future. The expanded vision implies a promise to all customers that their dreams can now be truly limitless and will be fulfilled. We have always taken pride in ourselves for the fact that we probably have the best service networks across the country.

The customer is at the heart of everything we do, and we constantly evolve to exceed their expectations. We are now expanding our horizons and have made leaps from just products to solutions, to customer centricity and now to digital architecture. This change is reflective of our new philosophy to create better lives, better opportunities and a better tomorrow for our customers and society.

Kirloskar Industries reported a consolidated net profit of Rs 72.73 crore in the June 2021 quarter. Please tell us in detail how the numbers have been in the past financial year and your expectations of the coming quarter/year?

We cannot compare the results from last year because of the pandemic and our facilities being shut and we reported a loss of Rs 6-7 crore. We are hopeful to continue with the good performance of the company made in the first quarter.

How important is sustainability to your business ethos? What steps is the group taking towards incorporating sustainability into its products and services?

We are focused on creating maximum value for the customer through new businesses, new offerings and also through our strong, committed sustainability focus – green energy, new technology, community efforts. Our companies are responding to climate change. The Kagal plant, for example, is carbon-neutral. There is a waste heat recovery plant at KFIL and we have invested in solar energy with a total of approximately 20 MW of solar power across the group to reduce our dependence on grid power.

We believe business and environmental impact are correlated. So, we are imbibing renewable energy in our attempt to create a truly sustainable business with the use of solar power at our manufacturing facilities. We are moving towards a greener and energy-efficient technologies. This includes compliance with international standards in energy efficiency from Bharat Stage IV emissions to Euro VI and low GWP.

Tell us more about the new vision and how the company is planning to transform?

A refreshed brand identity and colours have been adopted as a part of this exercise. While the logo has elements of human-centricity and future-readiness, the colours allude to the legacy that the 130-year-old name carries, and the years put in to fulfil the dreams of those it has touched. The values of innovative thinking, empathy, collaboration, integrity, excellence and value-creation will be deeply entrenched in the operations going forward.

The refreshed logo symbolises our transformation and the journey towards a 'Limitless' future. The 'i' combines a human icon and a forward-looking arrow that shows the progression and growth of the people impacted. It also indicates that the companies are future-ready and will always strive to satisfy the needs of the customers. The inspiration was drawn from the colour copper that naturally evolves every day. Hence, the copper patina colour palette has been used – from shiny browns to darker browns, blues and finally greens. Teal is the final stage of this patina, that protects every element within it. This is the inspiration behind the colours of the identity you see today.

To strengthen their businesses, the companies are also expanding their leadership. Industry veterans that have joined in the recent past include ***Mahesh Chhabria at Kirloskar Industries, Vimal Bhandari at Arka Fincap, Vinesh Jairath for the real estate business and K Srinivasan at Kirloskar Pneumatic. Industry veterans RV Gumaste, Sanjeev Nimkar and Avinash Manjul continue to lead Kirloskar Ferrous Industries, Kirloskar Oil Engines and Kirloskar Chillers*** respectively.

By Kruti Bharadva

SUSTAINABILITY IS IN OUR DNA!

George Rajkumar, Country President, Grundfos India, talks about how efficient water and wastewater management is vital to the manufacturing sector and the role Grundfos plays in enabling this

Grundfos is a leading water solutions and technology company. Please describe for us the core business activities of Grundfos in India, including your production facilities

We started our operations in India in 1998. Currently Grundfos India has more than 450 employees and works with more than 250 distributors and dealers with 8 branch offices and many more home offices across India. We also have two manufacturing centers in Chennai and Ahmedabad. Furthermore, Grundfos India takes care of sales operations in Bangladesh, Bhutan, Nepal and Maldives.

Sustainability is in our DNA and is at the core of Grundfos' principles, dictating how we do business. We implement principles of sustainability into our products and solutions, aligning with the United Nation's Sustainable Development Goals (SDG) 6 which aims to improve sanitation and access to clean water and, SDG 13 on climate action

We have transformed globally to strengthen our position and responded to changing customer needs by reorganising our organisation for simplicity and speed, and by investing significantly into innovation and digital capabilities. We have organised our sales, marketing, technology and operations functions to serve four different customer segments: commercial building services, domestic building services, industry, and water utility. This creates a more customer centric structure, where the whole value chain is focused on meeting customers' unique needs.

Sustainability is the need of the hour. How is Grundfos actively working towards sustainable solutions through its products and services?

Sustainability is in our DNA and is at the core of Grundfos' principles, dictating how we do business. We implement principles of sustainability into our products and solutions, aligning with the United Nation's Sustainable Development Goals (SDG) 6 which aims to improve sanitation and access to clean water and, SDG 13 on climate action. Going by our purpose statement, we are committed towards creating solutions to address the world's water and climate challenges, thereby improving the quality of life for people across the globe.

We have a range of products and services that, while providing our clients top-of-the-line performance also ensures that they can run in a energy-efficient and sustainable and eco-friendly operations after installation. The pumps that we have sold throughout 2020 alone have helped our end-users reuse 1.5 billion m3 of water. We have set our sights on facilitating our end-users to save a total of 50 billion m3 of water by 2030.

At Grundfos, we have set our own goals of reducing water usage and CO2 emissions by 50 per cent within 2025 as compared to the year 2018. We also aim to be a climate positive organisation by the end of 2030. These are the main ambitions driving our sustainability initiatives. Even our Chennai facility in

smart plastics

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India is a LEED certified green building with a ZLD installations and a renewable energy setup through rooftop solar photovoltaics. Grundfos is also moving towards a circular economy, our products are designed to allow recycling and reuse. For example, most intelligent pumps use permanent magnets to run at high speed and are highly hazardous material to dispose. We have taken the initiative to collect our pumps from our customers after they reach their end of life period to ensure that it is recycled. We also provide consumers with the information to identify when a pump would reach its end-of-life period, so that the disposal can be done in a responsible manner.

Our current product highlights include iSOLUTIONS, a cloud-based application to monitor and optimise water networks, and Demand Driven Distribution (DDD) systems that control and measure water supply systems on a real-time basis to ensure water is only being utilised in required quantities. Our products utilise cutting edge predictive technology and high-end pumps to make sure water wastage is either minimised or nullified altogether.

"

Powered by our deep understanding of water, Grundfos iSOLUTIONS utilises intelligent pumps, cloud connectivity and digital services. Together they enable real-time monitoring, remote control, fault prediction and system optimisation to help you reach a new level of performance

To reduce water losses in one of its networks, an Italian utility installed the Grundfos Demand Driven Distribution controller to monitor and adjust the pressure continually all the way to the end of the line. The result was a 30 per cent reduction in water losses and 17 per cent energy savings .

What 'green' strategies have Grundfos adopted at its facilities? Please describe for us the accreditation your Chennai facility has received.

Grundfos India's Chennai production unit is a zero-liquid discharge plant with in-house sewage treatment and effluent treatment plants, making it India's first commercial gold-rated green building (LEED certification by USGBC in 2005). Grundfos India's factory has also received the gold certification in 2011 from the Indian Green Building Council (IGBC). In August 2013, our office building was further elevated to a LEED EB Platinum certification. In 2019, the entire Chennai facility is a LEED Platinum rated Green building along with its assembly/manufacturing area.

With sustainability as a core element of our ethos, our facilities are designed to minimise their impact on the environment through focus on recycling wastewater and usage of solar energy. Our underground water tanks with a capacity of 3,50,000 litres, collect 53 per cent of precipitation through rainwater harvesting. Solar collectors at our plants generate about 227 MWh from our roof top solar panels that is used within our plant contributing to a green cause.

The domestic wastewater generated in the facility is treated at our sewage treatment plant and the treated water is used for gardening and landscaping activities. The industrial wastewater is treated at our effluent treatment unit and is used back for processes at the plant.

Digitisation is key to manufacturing today. Please tell us about the iSOLUTIONS of Grundfos.

Grundfos iSOLUTIONS brings a new era of intelligence to pump systems and water technology with

solutions that look beyond individual components and optimise the entire system. Powered by our deep understanding of water, Grundfos iSOLUTIONS utilises intelligent pumps, cloud connectivity and digital services. Together they enable real-time monitoring, remote control, fault prediction and system optimisation to help you reach a new level of performance.

Grundfos offers iSOLUTIONS as an effective way to optimise water and wastewater networks. It is a cloud-based offering that augments operation and eases expansion or repair of water and wastewater networks. This can identify infiltration of water by monitoring actual flow in sewers and predict maintenance to save energy and labour before a breakdown occurs. Our optimisation module for wastewater collection systems improves knowledge of what is going on in the network, thereby saving valuable operation time and increasing efficiency.

iSOLUTIONS needs sensor-based smart pumps to gather data as well monitor the network and perform diagnostics. When used properly, it has the potential to save massively on wastewater loss and increase reuse to a great extent.

At the Pharmez SEZ in Ahmedabad, a common effluent treatment plant was setup to treat wastewater discharge by 12 pharmaceutical companies in the zone. Grundfos India provided the right energy efficient products for the setup of this plant from digital dosing pumps, dosing tank stations, hydro-pneumatic systems, high-pressure pumps, and solar surface pumps. All these connected through iSOLUTIONS helped achieve a significant reduction in power consumption and minimal maintenance and downtime.

How was the last fiscal for you in terms of business numbers and what were the key takeaways from the tough 2020?

The year 2020 was a challenging year for industries across sectors. After having been significantly impacted by COVID-19 during the first half of 2020, Grundfos returned to stronger sales traction in the second half of 2020. Return on sales reached 9.9 per cent and in a challenging year, Grundfos maintained a high customer satisfaction score and continued to deliver on its sustainability ambitions.

What are the key areas for efficient utilisation of recycled wastewater?

Reclaimed or recycled water can be used for many non-potable purposes in municipalities, commercial buildings and industries. A significant portion goes toward watering parks and landscaping alongside public roads, etc. Another avenue of reuse is in industries, which have the capability to use reclaimed wastewater such as power plants. A lot of water is needed to cool power-generation equipment. The water can also be used for concrete mixing, artificial lakes etc.

It can also be used in residential complexes for washing cars, flushing toilets, and maintaining landscapes. Both domestic and commercial/industrial water networks can run a dual piping system to keep the recycled water separate from the potable water. Deploying the right solution and technology can ensure that wastewater be recycled and used for drinking purposes as well. This would be particularly beneficial in water scarce areas to improve accessibility.

An example for the reuse of wastewater: The Grundfos plant in Suzhou was struggling to meet its water consumption targets in the last few years. As a result, the water being consumed at the site was monitored, which provided an opportunity to reuse grey water (water used in shower and production facilities) in the cooling towers and Deionized Water Systems. By utilising a Reverse Osmosis (RO) system and constructing grey water collection tanks, the site was able to biochemically cleanse the grey water of impurities and use the water for other production processes. It is estimated that water saved is over 10,000m3 (1,000,000 litres) per year.

What is the current scenario of wastewater management in factories?

Smart factories are leveraging new technologies to boost the efficiency of their manufacturing facilities. Wastewater treatment

has also been positively impacted by these technologies. Wastewater treatment in smart factories should be integrated with IoT and can be made more efficient when it is decentralised and modular in nature. This helps save energy and operational cost significantly by avoiding any major breakdowns, as parts that have been diagnosed to be malfunctioning by the software can be removed and replaced easily. It also provides real-time monitoring at remote locations, thereby reducing the need for direct human intervention.

A water treatment plant in Poland was proving to be inefficient in its process due to obsolete machinery present. Grundfos products such as pumps, dosing equipment and boosters, plus all the equipment for the bioreactors, including aeration grids, mixers and blowers were chosen by the plant to upgrade to help them become efficient in their process. The plant that previously could not maintain the low level of effluents in their treated water, now had become one of the only few treatment plants that could lower nitrogen in the water to 4-5 mg/l at the outflow and the phosphorus level to 0.4 mg/l. The plant helped reduce energy consumption by 50 per cent after the upgrade.

What are your views on having decentralised industrial wastewater treatment for a country like India?

With a country as big as ours, decentralised wastewater management systems should be the focus for effective treatment and management of wastewater in India. Decentralised plants are usually installed near the wastewater generation sites and aid in the most efficient treatment and use of wastewater helping reduce water pollution significantly. They are also seen as a popular alternative due to their flexibility as they can be changed as per the treatment need for the discharge. For the long run, they help in cutting costs and improve on the sustainability of the industry. Through proper decision making, industries will be able to set up, maintain and operate these plants with minimal capital spent.

Considering the relatively underdeveloped wastewater treatment sector in India and the increased scope for participation from private companies, there exists a gap in the market which can be filled with decentralised treatment solutions that can meet the country's complex water challenges. Decentralisation of wastewater includes utilisation of new technologies and cost-effective innovations that help democratize wastewater treatment solutions, allowing smaller local-level bodies to set up their own facilities and consequently leading to higher overall rates of wastewater treatment and processing. These systems could be a feasible alternative for areas which are not connected to sewer networks or those that are newly developed. However, these decentralised systems must be properly designed, maintained, and operated to provide optimum benefits.

Example using solutions like the Grundfos' Prefabricated Pumping Stations will help cut down cost and are easily customizable. They are supplied with piping, valves, auto-couplings, guide rails, pumps and level control. Ready to lower the pumps down to the auto-couplings, all these components are delivered by the same supplier as well as in the same unit, securing a cost-effective operation and ensuring that all parts fit perfectly. Moreover, concrete installations can crack over time, which creates leakages meaning that groundwater can enter the tank and while wastewater leaks out of it. Such leakages don't occur in prefabricated pumping stations.

With limited budgets, lack of private participation and capacity building - how can local authorities take advantage of 'smart-city' technology in an affordable and realistic way?

It is crucial for the authorities to consider the 'life cycle costs' of technologies they choose to invest in and solutions they plan to incorporate in smart cities and not just the initial capital investment required. This approach will ensure that they can source the ideal technology that is efficient and can help in long term sustainable infrastructure. They can also consider a PPP model and incorporate the most efficient solutions. It is critical to involve all key stakeholders, public and private to ensure that there is good collaboration and partnership all through the process – from planning to implementation and monitoring.

Within municipal water supply, water leakages are majorly caused due to excessive pressure. The combination of inefficient and older pumping units and process equipment, combined with outdated water management practices can result in higher operating costs and lower revenue, thereby negatively impacting the city's water management. Through the right technology and the technical know-how, a pumping system can not only save space, energy and human intervention, it can also cut down the costs and in turn manage the water efficiently without any losses.

For example, Grundfos DDD, offers water distribution with critical point measurement and advanced flow adoption. This DDD system can be designed in a city for an efficient water distribution network at the pumping station. In general, the controller in the distribution system should control the pumps based on the demand at the critical points. This can help reduce water leakages and conserve energy too. DDD can help reduce water leakages by 20 per cent and energy consumption by 25 per cent in a city.

By Kruti Bharadva

TOOL CRAFT FOR AIRCRAFT

A closer look at machining for the aerospace industry through the solutions provided by ISCAR

In machining aerospace components, the main challenges relate to component materials. Titanium, high-temperature superalloys (HTSA), and creep-resisting steel are difficult to cut and machining is a real bottleneck in the whole aircraft supply chain. Poor machinability of these materials results in low cutting speeds, which significantly reduces productivity and shortens tool life. Both these factors are directly connected with cutting tools.

When dealing with hard-to-machine typical aerospace materials, cutting tool functionality defines the existing level of productivity. The truth is, cutting tools in their development lag machine tools, and this development gap limits the capabilities of leading-edge machines in the manufacturing of aerospace components.

Modern aircraft, especially unmanned aerial vehicles (UAV), feature a considerably increased share of composite materials. Effective machining composites demand specific cutting tools, which is the focus of a technological leap in the aerospace industry.

Aircraft-grade aluminium continues to be a widely used material for fuselage elements. It may seem that machining aluminium is simple, however, selecting the right cutting tool is a necessary key to success in the high-efficiency machining of aluminium.

A complex part shape is a specific feature of the turbine engine technology. Most geometrically complicated parts of aero engines work in highly corrosive environments and are made from hard-to-cut materials, such as titanium and HTSA, to ensure the required life cycle. A combination of complex shape, low material machinability, and high accuracy requirements are the main difficulties in producing these parts. Leading multi-axis machining centres enable various chip removal strategies to provide complex profiles more effectively. But a cutting tool, which comes into direct contact with a part, has a strong impact on the success of machining. Intensive tool wear affects surface accuracy, while an unpredictable tool breakage may lead to the discarding of a whole part.

Advanced multitasking machines, Swiss-type lathes, and live tooling lathes have profoundly changed manufacturing small-size parts of various hydraulic and pneumatic systems, actuators, and accessories, which

Figure 1

are used in aircraft. Consequently, the aerospace industry requires more and more cutting tools that are designed specifically for such machines to achieve maximum machining efficiency.

A cutting tool – the smallest element of a manufacturing system – turns into a key pillar for substantially improved performance. Therefore, aerospace part manufacturers and machine tool builders are waiting for innovative solutions for a new level of chip removal processes from their cutting tool producers. The solution targets are evident: more productivity and more tool life. Machining complex shapes of specific aerospace parts and large-sized fuselage components demand a predictable tool life period for reliable process planning and a well-timed replacement of worn tools or their exchangeable cutting components.

The cutting tool manufacturer has a limited choice of sources for finding an ideal solution and may only have cutting tool materials, a cutting geometry, and an intelligent robust design as the main instruments to progress. However, despite these limited choices, the cutting tool manufacturer continues all efforts to provide a new generation of tools to meet the growing requirements of the aerospace industry. COVID 19 has seriously slowed down industry development, but this

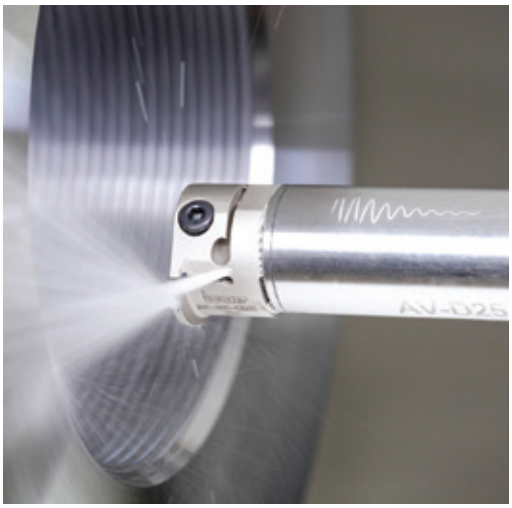


Figure 2

does not make the industry demands any less actual. The latest tool designs are good evidence of the cutting tool manufacturer's response to the demand for aerospace component production.

COOLANT JET

In machining titanium, HTSA and creep-resisting steel, high-pressure cooling (HPC) is an efficient tool for improving performance and increasing productivity. Pinpointed HPC significantly reduces the temperature at the cutting edge, ensures better chip formation and provides small, segmented chips. This contributes to higher cutting data and better tool life when compared with conventional cooling methods. More and more intensive applying HPC to machining difficult-to-cut materials is a clear trend in manufacturing aerospace components. Understandably, cutting tool manufacturers consider HPC tooling an important direction of development.

ISCAR, one of leaders in cutting tool manufacturing, has a vast product range for machining with HPC. In the last year, ISCAR has expanded its range by introducing new milling cutters carrying "classical" HELI200 and HELIMILL indexable inserts with 2 cutting edges (Fig. 1). This step brings an entire page of history to ISCAR's product line.

In the 1990's, ISCAR introduced the HELIMILL – a family of indexable milling tools, which carried inserts with a helical cutting edge. The new design provides constant rake and relief angles along a mill cutting edge and results in a smooth and light cut with a significant reduction in power consumption. The HELIMILL principle turned into a recognised concept in the design of the 90° indexable milling cutters.

The HELIMILL was modified and underwent changes which led to additional milling families and inserts with more cutting edges. The excellent performance and its close derivatives of the original tools ensured their phenomenal popularity in metalworking. Therefore, adding a modern HPC tool design to the proven HELIMILL family was a direct response to customer demand and the next logical tool line to develop.

In Turning, ISCAR considerably expanded its line of assembled modular tools comprising of bars and exchangeable heads with indexable inserts. With the use of a serrated connection, these tools fit a wide range of heads with a range of different insert geometries, including threading and standard ISO turning inserts for different applications for greater flexibility.

The bars have both traditional and anti-vibration designs and differ by their adaptation: cylindrical or polygonal taper shank. A common feature for the nodular tools is the delivery of internal coolant to be supplied directly to the required insert cutting edge (Fig. 2). Depending on the diameter of a cylindrical-shank tool, the maximum coolant pressure varies from 30 to 70 bars, while the tools with polygonal taper shank facilitate ultra HPC at a pressure of up to 300 bars. The efficient distribution of coolant increases the insert's tool life by reducing the temperature and improving chip control and chip evacuation; substantially increasing this application line in the aerospace industry.

DRILLING SOLUTIONS

Machining composite materials is filled with various traps and pitfalls. The high abrasiveness of composites intensifies wear rate which shortens tool life and affects the performance. Drilling is the most common cutting operation in machining composites, hence even a small improvement in the functionality of drilling tools is of key importance.

ISCAR developed a range of new drills that are in-

Figure 3

Figure 4

Figure 5

tended especially for composite materials. To increase abrasion resistance, these drills have a cutting part made from extra hard polycrystalline diamond (PCD) or diamond coating. Depending on the drill diameter, the PCD cutting part is known as a nib or a wafer; and in both cases is suitable for regrinding up to 5 times. The CVD diamond-coated solid carbide drills are attractive because of another specific design feature: the wavy shape of the main cutting edges. In machining composite materials, a tool produces more chattering than a cutting effect. The wavy shape of the cutting edge considerably reduces delamination and burrs, especially when drilling carbon fibre reinforced plastics (CFRP) and carbon laminates.

In addition to composites, the diamond-coated drills are suitable for machining other high-abrasive engineering materials. If necessary, these drills can be delivered with an optional tool through coolant holes.

Drilling deep, small-in-diameter holes is a common operation in manufacturing aerospace components. ISCAR's new solid carbide drills in the diameter range of 3-10 mm (0.125"-0.391") (Fig. 3) are intended specifically for such an operation. The combination of a split point geometry, a double-margin design, polished flutes, a multi-layer coating and coolant holes provides a noteworthy tool family for effective one-pass drilling holes with a depth of up to 50 hole diameters in difficult-to-cut austenitic and creep-resisting steels and Ferrum-based alloys.

FOR ANY COMPLEXITY

Airfoils of aero-engine turbines and compressors, impellers, and integrally bladed rotors (IBR) have a complex shape that is defined by aerodynamic requirements. New developments, which are directed at improving aero-engine efficiency, add to this complexity. The advancement of technology brought new methods for producing formed parts, in particular 3D printing, which significantly diminishes material stock for chip removal. However, machining remains the most common method for the final shaping method in manufacturing geometrically complex aerospace components. The progress in 5-axis machining and CAD/CAM systems has enriched the manufacturer's solution pool to overcome difficulties in component production.

Barrel-shaped milling cutters have good prospects in the 5-axis machining of aerospace components with complex surfaces. ISCAR has developed a series of barrel-shaped cutters of 8 - 16 mm (.312" - .500") in diameter in two designed configurations: solid carbide endmills and exchangeable heads with a Multi-Master threaded connection. The introduction of these tools into the machining processes is a major advantage of intensifying blade manufacturing.

PROMISING MULTITASKING

Recently, ISCAR introduced NEOCOLLET, a new tool holding family, which provides an alternative to clamping tools with spring collets. One of the typical tool holders in this family has a tapered shank that can be mounted in a collet chuck directly (Fig. 4), ensuring a rigid and reliable connection to improve tool performance. The new family includes the holders for ISCAR T-SLOT exchangeable slot and face milling heads from cemented carbide.

As mentioned, applying high-pressure cooling can substantially change machining results especially when dealing with titanium, HTSA and difficult-to-cut stainless steel – the main materials for aircraft hydraulic and pneumatic systems and light-sized accessories. The new turning tools with a square shank and a reliable screw clamping mechanism for 55° rhombic insert facilitate HPC in longitudinal, face and profile turning operations on small-diameter parts (Fig. 5).

By Kruti Bharadva

AT THE HEART OF INTELLIGENT TRANSFORMATION

The implied effects of the pandemic in the manufacturing sector has led to an exploration of how to use robotics, 3D printing, and AI to improve the R&D process and reduce uncertainty when launching production. **Vivek Sharma, MD – India, Lenovo ISG,** discusses in detail the potential of emerging technologies in the manufacturing sector and how 'Smart Factories' are beginning to make inroads across myriad industrial sectors

Please tell us a bit about Lenovo ISG and the sectors in India you cater to. What is the portfolio/solutions that you provide?

As an organisation that has an offering spanning pocket devices to data centers, we have a complete suite of solutions that address the technology needs of businesses across a range of industries including automotive, healthcare, manufacturing, government, retail, BFSI, etc.

Storage: Customers continue to face challenges implementing a cohesive data management system to analyse and process data more efficiently. Lenovo ISG's unique state-of-the-art data management architecture, in combination with the industry's most reliable ThinkSystem servers, enables customers to accelerate analytics and AI within a single platform.

The ThinkSystem DM series delivers a portfolio of enterprise-grade, multiprotocol storage systems that increases performance and capacity. Our second portfolio, the ThinkSystem DE series, is designed for mid-sized IT environments and supports block storage protocols.

Edge Computing/ IoT: Today, you need computing resources, and therefore servers, almost everywhere — not just in the data center, but also remotely. However, for performance reasons, remote data-generating devices must be close to computing and storage resources.

The Lenovo ThinkSystem SE350 Edge server's small footprint and power efficiency allow for reliable server-class performance at many Edge locations. The rugged SE350 can handle temperatures from 0° to 55°C, as well as tolerate locations with high-dust and vibration—such as construction site trailers and manufacturing floors.

HPC and AI: Our HPC and AI powered solutions look beyond breaking known barriers of performance and efficiency to solve humanity's greatest challenges. From cancer research to supercomputing that helps met departments predict the weather, we have an answer.

The data center market in Asia Pacific is forecasted to reach US$32 billion by 2023, and India stands as one of the fastest growing data center markets in the APAC region with a market size that is expected to cross US$4.5 billion by 2025

One such solution is GOAST. Traditionally, genome processing requires days (150 hrs) to complete, but with Lenovo's GOAST system, results can be delivered in under an hour (48 - 53 mins) using standard x86 hardware built on high-performance, high-reliability Lenovo ThinkSystem servers.

Lenovo is a global industry leader in supercomputing with 180+ systems across 20 markets, and the largest global provider of TOP500 installations. Seventeen out of twenty-five top research universities are powered by Lenovo.

We are unique in our ability to unify and offer a wide portfolio of cutting-edge solutions and continue to invest in key technologies such as IoT, Edge Computing, Cloud, 5G and AI, and will ride on their capabilities to lead the era of 'smart normal' after COVID-19.

How has the market for data center solutions evolved in India in recent times?

The data center space has witnessed explosive growth over the last few years. More so, growth reached a new high once the pandemic hit, as businesses and people across the world headed online for work, entertainment, and education. The data center market in Asia Pacific is forecasted to reach US$32 billion by 2023, and India stands as one of the fastest growing data center markets in the APAC region with a market size that is expected to cross US$4.5 billion by 2025.

As we inch closer to a post-COVID world, we are seeing verticals like education, BFSI, retail and even hospitality increasingly adopt technologies like AI, IoT and edge computing, to support business growth. Increasing digitisation across sectors is creating growth opportunities for hybrid cloud solutions as organisations look to mitigate the impact of COVID-19 and focus on business continuity while ensuring data privacy and security.

The two most powerful trends in our industry are the advent of cloud computing and the desire to digitise entire businesses to make them more agile – how does ISG fit into this trend?

At Lenovo, Intelligent Transformation is at the heart of everything we do. Extending this belief as a value proposition to our customers and partners, we focus on three key building blocks for enabling Intelligent Transformation: **data, computing power and algorithms:**

- ***Data*** fuels all possibilities and smart devices play an important role in generating and connecting this data
- ***Computing power*** is the engine that turns this fuel into power
- ***Advanced algorithms*** combined with Big Data and industry know-how produce valuable insights that create value for every industry

Technology will underpin the transition to remote working with greater demand for both IT services and devices. Cloud and Software-Defined Infrastructure (SDI) will be a huge focus, with everyone having moved quickly to the public cloud in the wake of the pandemic, but now looking at SDI to build longer-term solutions. For example, when it comes to remote working, Virtual Desktop Infrastructure (VDI) solutions are already resonating as it offers a good balance between security and accessibility, without burning through capital expenditure.

We have always worked with a 3S strategy – Smart IoT, Smart Infrastructure and Smart Vertical. Smart IoT becomes the essential tissue for the connected world. With Smart Infrastructure, Lenovo ISG comes in providing computing, storage, networking, software power to support this intelligence. Lastly, Smart Verticals are those that can be customised with Smart IoT and powered with Smart infrastructure. This takes us towards an intelligent transformation where devices and data center infrastructure work together to create a holistic solution.

All of this, offered with Lenovo's TruScale subscription-based offering provides flexibility to scale up and down as needed and can help address CapEx/OpEx concerns amidst this uncertain market environment so that businesses, especially SMEs with smaller budgets can better prioritise their spends and get on the digital transformation bandwagon.

What is the difference between Industry 4.0 and 5.0?

Innovations in the last one decade are proof that we have progressed in many ways and leveraged technology to its full potential. Industry 4.0 combines IoT, AI, cyber-physical systems, Cloud, and cognitive computing. It has brought automation to the manufacturing industry, enabling businesses to adopt smart technologies for advanced capabilities. It has always been a one-sided approach - we relied on technology and process automation was a priority.

Industry 5.0 has taken this to the next step. Now, we are leveraging smart technology and our intelligence

to make accurate decisions. Instead of terming industry 5.0 as different from 4.0, we can say that it is a progressive way to drive transformation in production and customer experience.

Industry 4.0 technology allows production processes to be more flexible, and robots are already a standard in the industry. Industry 5.0 combines the speed, productivity, and consistency of robotics with human innovation and skill. It improves personalisation and creativity, and emergence of sustainable policies are driving greener technology at optimised costs.

We have been talking about industry 4.0 for some years and continue to do so, in terms of being 4.0 ready in India – is the country ready for the next level? Please answer this in terms of infrastructure, readiness, and willingness to adapt, technology available, training, etc.

As we head into industry 5.0, the pandemic has impacted India in different ways, such as potential delays to 5G rollout in India to more long-lasting changes in the economy.

Things will never be the way they were before - and we strongly believe that companies in India will no longer work in the same capacity with regards to their workforce distribution. In industry 5.0, the smart normal asks businesses of all sizes to rethink where their employees need to be to deliver value, which will impact the relationship between companies and traditional office space.

My advice to businesses is to ask where they see themselves in the scale of 0-100 per cent economy? Instead of just being reactive to the situation around us, companies need to ask themselves where they want to be - whether it's 60, 70 or 90. Accept the changes and use them to your advantage - your workforce will be virtual so why not capitalise on your new options for increasing talent diversity?

In addition, the tech that powers industry 5.0 will be different. Lenovo sees the data center evolving from the "core-centric" data center of today, to the "edge-to-core" data center in the near future. This has two parts:

- ***Distributed Edge IT*** – Where the 'local' work happens - where the worlds will meet most of the time – innovation will be focused on the enabling infrastructure (5G), and new data center designs customised for any environment (ruggedized, unique shapes and sizes, etc.)
- ***Core IT*** – Where the majority of business operations work happens - not just limited to the data center, it also encompasses how an IT organisation leverages private, multi-and hybrid cloud

Lenovo believes eventually everything will become software-defined – including both in the edge and in the cloud.

Why is data important to the manufacturing sector in India, and how does Lenovo ISG help channelize its importance?

Data is the new currency and IT decision-makers are the new bankers – making it important for organisations to manage their data to not just survive but thrive. Our strategy in India and worldwide focuses on enabling the 'Data-Centered': businesses and people who leverage data to better cater to their customer bases.

An EY survey revealed that big data and predictive analytics ranked as the top investment priority in technology by 66 per cent manufacturing firms in India. This clearly indicates that manufacturers are in a better position to leverage data and gain maximum benefit of digital manufacturing to monitor and visualize key performance indicators (KPIs). This can be seen across automotive, textiles, pharmaceutical, electrical, etc. industries.

Please tell us about industrial 5G and its integration into existing technologies.

As 5G becomes more widely available, it will be the key driver of IoT and other intelligent automation applications. Edge Computing, IoT, AI, blockchain, etc. will all benefit from 5G's lightning-fast connection and low-latency.

5G can help shape the future of IoT by allowing billions of smart devices to communicate and share data autonomously. Especially in the auto sector, manufacturers are racing to perfect the technology that will power self-driving vehicles. Smart automobiles consume a lot of bandwidth, demand faster network responses, and require constant network connectivity. Smart Cars can operate more efficiently with 5G's increased bandwidth and lower latencies.

5G and IoT play a significant role in the manufacturing sector by advancing technologies like robotics, warehouse automation, smart factories, and flexible manufacturing that improve efficiency and reduce costs. It will enable manufacturers to develop smart facilities and fully utilise technologies like automation, AI, AR, etc. for troubleshooting.

5G will transform the way industries' function, businesses operate and how a consumer reacts to the changing environments.

Please share with us actual case studies, wherein a manufacturing company has applied your solutions successfully.

In a data-driven market, the most effective method to increase efficiency, quality, and production is to turn data into actionable insights. Manufacturers are using Internet of Things (IoT) and the generated streaming data to better industrial operations.

For example, Hero MotoCorp, the world's largest two-wheeler manufacturer, manufactures over 9 million bikes and scooters a year. Demand continues to grow, and they rely on an automated system operating 24/7 to control the hundreds of robotic crane arms that handle more than 12000 spare parts every day. However, their previous legacy server infrastructure kept crashing — wiping out the cranes' instructions every time and halting operations. Lenovo ISG was engaged to design and deploy a high-availability technology solution which comprised the Lenovo ThinkSystem SR650. In addition to being built on robust, highly reliable Lenovo systems, the active configuration means that the memory content of the robotic arms is protected even in the unlikely event of unplanned downtime.

> "At Lenovo, Intelligent Transformation is at the heart of everything we do. Extending this belief as a value proposition to our customers and partners, we focus on three key building blocks for enabling Intelligent Transformation: data, computing power and algorithms

Any innovations/ new launches coming up in the near future?

We see ourselves as a service-oriented partner to organisations and not a hardware supplier, recently introducing a range of new and updated hyperconverged infrastructure (HCI) solutions and cloud-based services to enable customers to keep pace with evolving business needs in the new 'Smart Normal'.

- The Lenovo ThinkSystem DM Series Storage Manager OS allows customers of all sizes to harness data more securely and efficiently, from edge to core to cloud, with a single set of tools and capabilities for a smarter way forward
- In collaboration with Microsoft, our new Lenovo ThinkAgile MX Azure Stack HCI Edge and Data Center Solutions enables customers to rapidly deploy a hybrid cloud infrastructure
- The Lenovo ThinkAgile VX HCI Solutions improve agility and reliability for SAP HANA database deployments, launched in collaboration with VMware

Additionally, our Desktop-as-a-service solution provides a more secure remote work solution, with cloud-like simplicity and on-premise performance, with the convenience of a single monthly payment and single point of contact for support. We are also continuing to invest in key technologies such as IoT, Edge Computing, Cloud, 5G and AI, and will ride on their capabilities to lead the era of 'new normal' after COVID-19.

How has the pandemic changed the way manufacturing sectors function and how has Lenovo ISG facilitated this change?

As virtual, decentralised and smart workplaces become the norm, this transformation to a data-driven environment will mean bigger workloads need to be processed in shorter timeframes at the edge and in the cloud. The manufacturing sector will benefit from data analytics, driving higher productivity through integrated planning, and superior product quality. From analytics to collaboration and communications, manufacturers require cutting-edge computing devices, from the plant floor to the corner office, to enable digital transformation. Key technologies such as IoT, Edge Computing, Cloud, 5G and AI, will be critical to ensure the manufacturing sector continues to lead the smart normal era.

Lenovo ISG's strategy focuses on enabling the 'Data-Centered' - businesses and people who leverage data to better equip themselves to cater to their customer bases. Recognising their cost concerns, as well as data security fears in a remote work environment, we have been advising a more strategic and long-term approach.

With consumption-based models like TruScale, customers never take capital ownership of the hardware or other IT assets and only pay for what they use each month. As thought partners, our emphasis is on developing solutions that solve problems and create impact. We are optimistic that the future of manufacturing lies in automation, innovation, and smart technology adoption to increase productivity, performance, and profitability.

By R. Jayaraman - Head of Capstone Projects at Bhavan's SPJIMR

EVOLVING SCM IN A POST-PANDEMIC ERA

R Jayaraman talks about the evolution of supply chain management in a Covid and post-Covid era

In an article in the New York Times, 1 June 2021, Goodman and Chokshi argue that many of the concepts that drove supply chain transactions pre-Covid have outlived their usefulness. Or, even, proving counterproductive, and, worse still, may have directly resulted in the slow restart many industries are experiencing after Covid. These pre-Covid practices have crippled the supply chains to the extent that these are now holding back the recovery. They cite the instance of the auto industry, the 'inventor' of these pre-Covid practices, such as, lean, JIT, cost cutting, holding low inventories, where the supply chain 'vacuum' has forced many auto companies to cut down on production drastically. Why? Because of the shortage of availability in 'electronic chips' which are now required in all automobiles to serve the needs of the computer-controlled systems. They link this 'shortage' directly to the JIT practices. And they postulate that lean has led to cost cutting, which has, in turn, put the screws on inventory holding. This 'lowest cost' mentality has hurt the industry, by emptying out the inventory pipelines, which are the saviours, whenever there is a surge in demand. The situation is not very different, each industry has a 'shortage of chips' story to tell.

Toyota introduced the concept of the 'Toyota Production System', or TPS, which is a combination of JIT, lean, waste reduction, etc. The TPS is not lean, but western thinkers, when explaining to their domestic business audiences, used the terminology lean to mean three things – JIT, waste reduction and cost reduction.

The TPS was, in reality, a graded, evolving response from Toyota to the increasingly competitive markets, and was primarily developed as a tool to align and integrate the 'back-end supply chain' with the 'front-end supply chain' by creating linkages, through information generation and sharing

The TPS was, in reality, a graded, evolving response from Toyota to the increasingly competitive markets, and was primarily developed as a tool to align and integrate the 'back-end supply chain' with the 'front-end supply chain' by creating linkages, through information generation and sharing.

In many ways, TPS is a well compounded mixture of activities which allow for internal adjustments of speed and quality, of changes large and small, which operated under the overall 'Four Principles' (or 4P) framework. These principles are philosophy, process, people/ partners and problem solving. These include many things, apart from lean, JIT, etc., such as, Quality Function Deployment (QFD), Plan-Do-Check-Act (PDCA), Customer Relationship Management (CRM) and so on. The US interpreters, led by Womack and Jones at MIT, and Jeffrey Liker, at Michigan Universi-

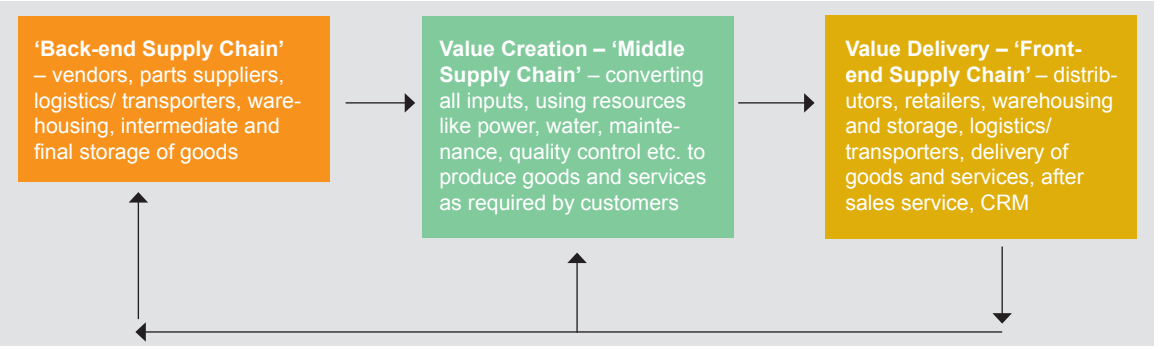


Figure 1: The Universal Value Chain diagram of manufacturing industry (the Manufacturing Chain)

ty, tried to sell lean in the way the US industry would understand easily – overall cost reduction through improved manufacturing practices. Cost reduction was emphasised as it would improve profit. JIT, low inventories, were all options.

Industries in Europe started the practice of the 'Lean Bundle' (lean bundle is a mix of lean management, JIT, QFD, low inventories, waste reduction, process orientation) in early 1990's, as did the US. However, they emphasised the 'hard' concepts in preference to the 'soft' ones, such as, philosophy, people/ partners. This led to a partial implementation of TPS, and this was the dominant practice prior to Covid. The manufacturing industry in the west, led by the auto makers, garments, leather goods, and many others went on a cost cutting binge, by relocating the 'back-end supply chain' to China, India, and other low-cost countries like Vietnam, Thailand, Bangladesh and Philippines. As a result, the manufacturing industry underwent a huge transformation.

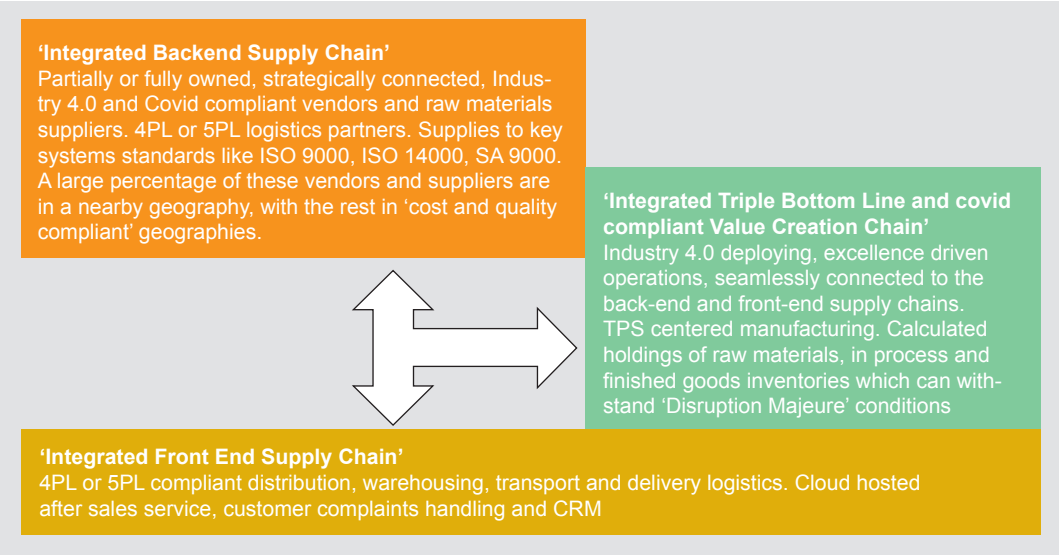
> "The manufacturing industry in the west, led by the auto makers, garments, leather goods, and many others went on a cost cutting binge, by relocating the 'back-end supply chain' to China, India, and other low-cost countries like Vietnam, Thailand, Bangladesh and Philippines

The clustering that has taken place has created oceans of 'back-end suppliers' and 'value creators', with the whole world being the 'front-end supply chain'. There are some 'holistic clusters', like China, India and the US, which have large chunks of all the three clusters. The driver for this development is clearly cost reduction, and not lean or JIT. For example, many US companies closed down their 'lower value adding' activities in their 'back-end chains' to low-cost centres like China, India and others. This download has created its own problems, especially when dealing with large 'back-end supply chains', with a big clout to create major disturbances in the back-end supply chain – value creation universe.

In the pre Covid scenario, many companies enlarged/ created 'back-end supply chain' tails which were completely antithetic to the TPS thinking. Whereas the TPS philosophy sought to keep suppliers and vendors close to the value creator, including through equity holdings and manpower participation (this is typical of Toyota), US and European companies created huge 'back-end supply chains' but without either the equity participation, or adequate control over operations to ensure the benefits envisaged from such arrangements. Off-shoring is but one example of this. Such manufacturing chains could withstand Force Majeure conditions of limited impact, in terms of time and magnitude. But they were not designed to withstand the Covid disaster, for which a new term has to be invented, because Covid is not a force majeure condition, it is something much more than that, both in terms of magnitude and time. The new term is 'Disruption Majeure', this needs to enter the legal lexicon and businesses need to figure out how to deal with this in the future. Both, Force Majeure and Disruption Majeure, need to be separated and treated differently. We will show a pathway which companies can consider, post Covid.

MANUFACTURING CHAINS – POST COVID:

We have thus established that the major reasons for the disastrous situation many companies in the west found themselves in were: discontinuous back-end supply chains characterised by inadequate operational or equity/ management control, long distances between the value creation and back-end activities, years of cost cutting and cost management leading to short term gains but starved inventories, dry inventory pipelines and capacity build downs. The question then is how to go about building a new model of the manufacturing chain which will work well beyond Covid.



Beyond Covid, the main changes likely are impact of Industry 4.0 (with greater integrated manufacturing using IOT, AI, ML, Cloud Computing, etc.), long periods of interruptions due to 'Disruption Majeure' conditions, increased rate of demands to compensate for the very low consumption during the Covid driven disruption periods. At the end of every disruption, there is likely to be a surge in demand for many consumables due to the pent up, unsatisfied needs. This will not only put pressure on the front-end chain but also on the value creation chain as well. Which, in turn, will make sudden and unpredictable demands on the back-end chain. Companies will have to not only fight battles for meeting the demand for their products but do so in a way that prevents Covid promoting conditions from developing. If Covid were to again affect the world in the same way as in the last two years, then we will once again witness the 'Disruption Majeure' state, with disastrous consequences.

The primary objectives of companies post Covid will be 'safe business operations', 'uninterrupted business operations' and 'integrated manufacturing operations.' These three pillars of post Covid businesses will lead companies to take up multiple actions to redesign the manufacturing value chain in its entirety.

TPS will have to be practiced not as a cost cutting effort, but as a company managing effort. This will mean full or partial ownership of back-end chains, wasteless, flexible and customer driven (and lean imputed) value creation chains, and a Theory of Constraints (TOC) centric front-end chain which will not only sense demand surges but also adjust itself to deliver customer value. Industry 4.0 practices will facilitate lean manufacturing like never before and enable production of 'zero defect' goods and services, which will not only improve the quality of the output, but also result in speedy deliveries. End to end delivery cycle times are bound to be reduced by more than 30 per cent.

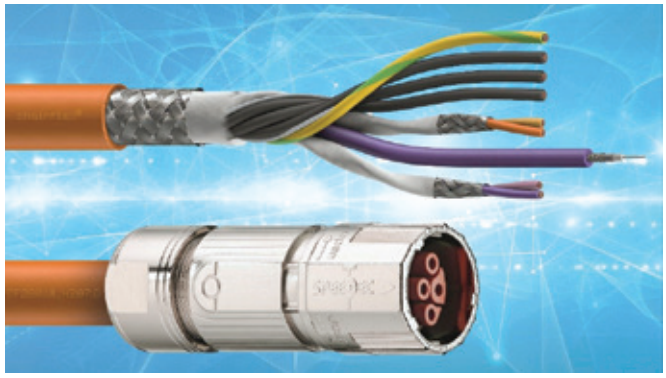
How to safeguard against 'Disruption Majeure'? That will be done through the redesigned manufacturing chain configuration which will allow for the carrying of acceptable inventories across the full value chain, with the help of Industry 4.0 practices under TPS.

The effect of post Covid operations on companies are at two levels. One, at the value chain design level and at the macro, physical level, there are bound to be some key changes. Companies are going to get their back-end chains closer to them, geographically. However, in order to still keep cost and supply advantages, some parts of the back-end chain will continue to remain in low-cost but efficient geographies. Thus, there will be broadly two back-end chains, one, which guarantees supplies during the 'Disruption Majeure' conditions, and, the second, holds the cost during the normal, day to day business dealings. This would lead to new types of clusters.

The clusters are now 'integrated clusters', signifying that much of the back-end supplies are in close proximity. Inter cluster transactions, to augment supplies will continue, but at a lower intensity than pre-Covid, and with the new applicable conditions regarding Industry 4.0 compliance etc. Thus, the new world manufacturing order is likely to be more resilient due to the practice of TPS, 'integrated cluster' formation and the usage of the new 'Disruption Majeure' compliant manufacturing value chain.

ENERGY AND DATA COMBINED IN NEW IGUS HYBRID CABLE FOR SEW MOTORS

Small, compact and fast: these are the demands on the new generations of motors. To this end, more and more drive manufacturers are turning to hybrid technology to save space. Therefore, igus has now expanded its range of hybrid cables with a new cable especially for SEW motors with the MOVILINK DDI interface. Users in the material handling industry, for example, can rely on a durable cable specifically developed for e-chain applications.



Hybrid cables for drive technology are characterised by their ability to combine energy and data transmission in one cable. The result: the number of cables required is halved. In the case of the new SEW motors with MOVILINK DDI interface, the drive manufacturer relies on a coaxial element for the data transmission of motor information. In order to be able to safely supply the compact motors with energy and data while they are in motion, igus has now developed a new hybrid cable. "The challenge with cables with coaxial elements is that they quickly become susceptible to faults at high dynamics. That is why we have made it our task to develop a durable and flexible cable that also functions reliably in motion", says **Andreas Muckes, Head of Product Management chainflex cables at igus GmbH**. To this end, the motion cable specialist can draw on its more than 20 years of expertise in the field of coaxial cables for highly dynamic applications. For the new hybrid cable CF280.UL.H207.D, four energy cores have now been combined with one coaxial core and two control pairs. By merging two cables into one, users can save 40 per cent space in the energy chain. At the same time, the weight that has to be driven by the system is reduced, which means that less energy is consumed. The new cable with PUR outer jacket can be used for applications with a bending factor of up to 15xd and is therefore suitable for a wide range of industries: from machine tools and material handling to the automotive industry.

28 cables for hybrid technology

With 28 different cable types for motors from Siemens, Beckhoff, SEW and Bosch Rexroth, igus already has the largest portfolio of hybrid cables for the energy chain from stock. With the expansion of the CF280 series, igus is following the ongoing trend of hybrid technology. The cable specialist also offers its CF280 cable series with a PVC outer jacket as CF220. In this way, additional costs can be reduced in the hybrid cable segment. The chainflex cables can be purchased harnessed or by the metre. As with all its cables, igus also provides a guarantee of up to 36 months on the new SEW hybrid cable.

SABIC'S NEW NORYL GTX™ RESIN

SABIC's NORYL GTX 9500 resin retains a better balance of mechanical properties when exposed to heat and humidity typical of automotive under-hood environments, than polyamide (PA) resins (PA66 and PA6), as well as comparable high flow and high-temperature performance. Its dimensional stability and mechanical property retention under a wider range of temperatures and humidity – together with high flow performance – can open opportunities for thin-wall designs that reduce weight. Target applications for NORYL GTX 9500 resins include vehicle junction boxes, connectors and other applications requiring dimensional stability. These materials also demonstrate a potential for use as the base resin in carbon fibre-reinforced thermoplastic composites used in structural and body components, and for applications in the industrial, aerospace and marine markets.

"Our global development teams excel in formulating thermoplastics with targeted properties that resolve long-standing customer challenges such as the propensity of nylon to soften under exposure to moisture," said **Darpan Parikh, global product management Leader, Resins & Compounds, SABIC's Specialties business.**

The strong tendency of PA resins to absorb moisture and water, which is exacerbated by elevated temperatures, may cause softening, loss of stiffness and warpage. NORYL GTX 9500 resin offers significantly lower water and moisture uptake than PA, even under high heat conditions, up to 150 degrees Celsius. In fact, SABIC testing demonstrated that NORYL GTX 9500 resin absorbed 21 per cent less moisture at equilibrium than PA66, and 58 per cent less than PA6.

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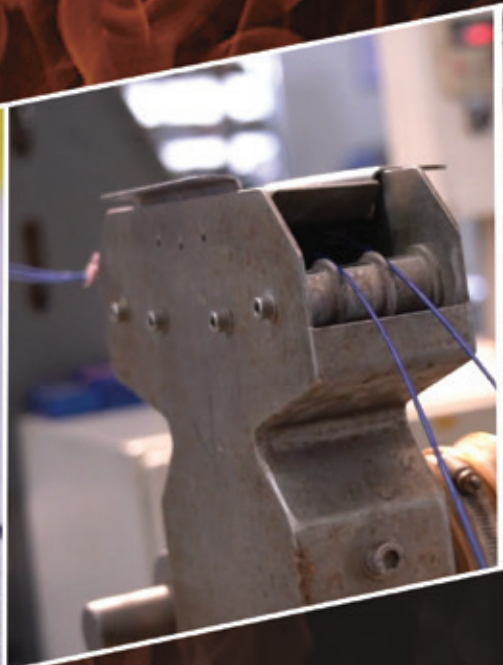

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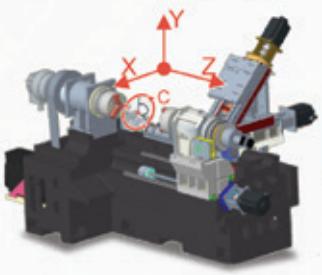

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Tooling offered

VDI — or — BMT

Radially Placed Tools
for forward & backward machining

12 Station tool disc — STANDARD

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SPECIFICATION

Swing over bed	610 mm	Max. spindle speed	4000 rpm
Swing over carriage	400 mm	Spindle power (30 min rating)	11 kW
Max. turning dia	386 mm	Spindle power (continuous)	9 kW
Max. turning length	570 mm	Rotary tool power	2.2 kW
Spindle nose	A2-6	Rotary tool max. speed	5000 rpm

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