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NEWSLETTER

(Technical Info. on Die, Moulds & Toolroom)

Volume: XXVI / No. 11 (Private Circulation for Members Only) July 2020

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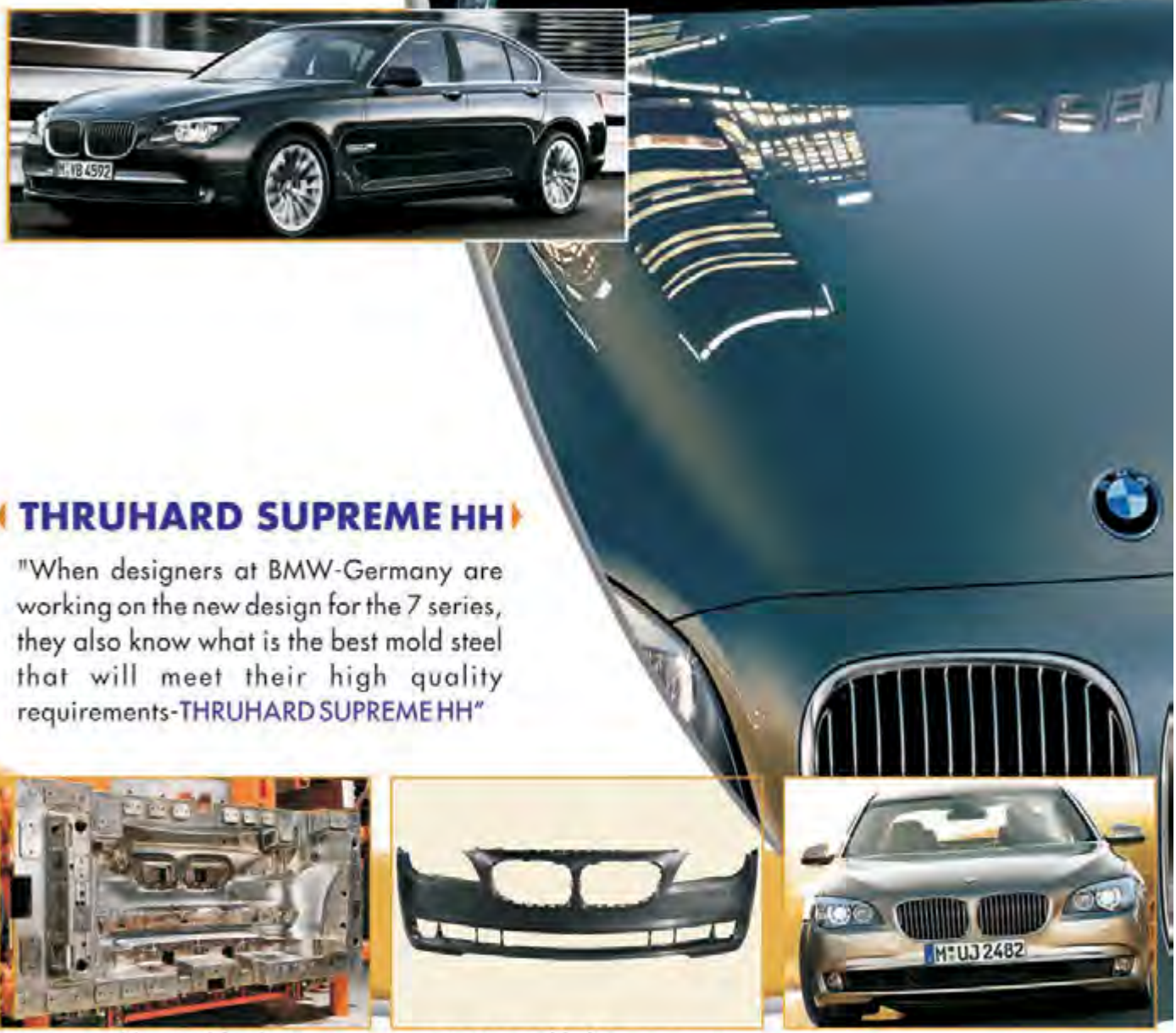

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EDITORIAL

Let's Learn

Swami Vivekanand rightly said, "Experience is the only source of knowledge."

Everything you learn and experience can often determine your success or failure in life. Effortful learning combined with Make it on-the-job experience could actually be a winning formula for success. Your choices and experiences sculpt you into the person you become and determine the culture at your organisation. This makes learning and development core requisites for a forward-looking organisation.

For this to happen, Indian tool makers and manufacturing SMEs have to nurture a culture of learning and development in the system. Individuals across domains and hierarchy should be encouraged to learn. Campaigns like 'Make in India' or establishing India as a global manufacturing hub is not possible without skilled manpower.

There is a need to encourage the industry-academia partnership. The industry must look for opportunities to impart practical knowledge to university students. While there's some progress on this front, there's still a long way to go. Current reforms in the Education Policy promote practical ways of learning from the early stages of school education. It is a good sign and will indeed help the nation in overall development. However, it will take time to witness the change.

The world is looking at India as not just a significant consumer hub, but also as a manufacturing destination. And India needs to stand up to this challenge by providing skilled manpower—right from operators to decision-makers.

In this issue of TAGMA Times, we highlight some of the hurdles, government initiatives, and the current scenario in terms of skill development involving the Indian SMEs. Has your organisation taken up any new learning related initiatives during this lockdown? Write to us and we will feature it in upcoming edition.

Let's learn and continue to inspire!

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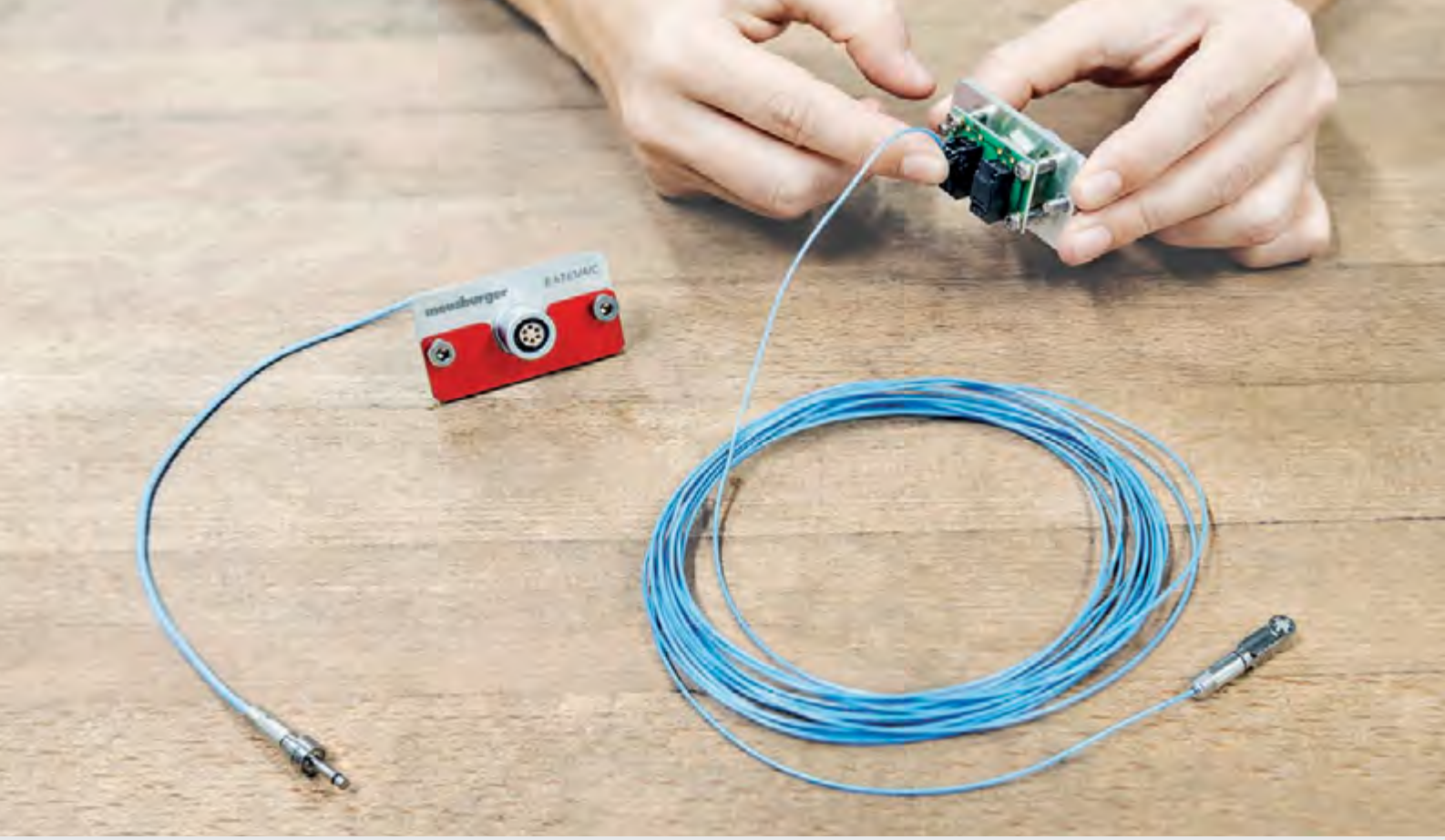

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ABB India opens a new robotics facility to support the digital transformation of manufacturing in India

THE new ABB Robotics solutions delivery facility is set to enable Indian customers to reap the benefits of Industry 4.0 including cutting-edge robotics and digitalization technologies, going at the heart of helping India become a resilient high-tech manufacturing economy in the world.

Spread over 3,600 sq.m at the ABB Nelamangala factory premises in Bengaluru, the new facility will enable ABB India to deliver robotic applications and digital solutions to a variety of Indian industries, including automotive, food & beverage, electronics and other upcoming sectors. The facility houses a state-of-the-art shop floor that can run proof of concepts and factory acceptance tests for 1000 ABB robots every year, which doubles the company's capacity. This enables rapid innovation, adaption, optimisation and agile delivery of made-to-order robotics applications for Indian customers.

"The new facility harnesses the powers of ABB's deep global expertise and knowledge of the Indian industrial landscape to support our customer base," said Sanjeev Sharma, Managing Director of ABB India. "Even with increased demand for automation, the penetration of robotics, especially in small and medium enterprises, is still low in India compared to the global average. With the help of the new and improved robotics facility, we will be able to share our knowledge and encourage Indian manufacturers to embrace our game changing technologies and become best-in-class manufacturers for local and global markets."

The facility includes a demonstration center where the latest technologies in robotic welding, gluing and material handling will be showcased and can be used to carry out joint prove-out sessions with customers. ABB will also integrate an ABB AbilityTM Connected Services team that can remotely monitor an installed base of ABB robots to conduct predictive maintenance and high uptime.

A new Customer Experience Center is being set up for customers to learn about the latest in robotics technology and applications, including ABB's dedicated robot simulation and programming software, RobotStudio. Additionally, the facility will host a paint lab where customers can run simulations of a broad range of industrial painting applications.

Bosch inaugurates fully automated production lines for protective face masks in India

IN the fight against coronavirus, Bosch has designed its own line of protective face masks. Bosch India recently inaugurated its fully-automated in-house production line at its Naganathapura location in Bengaluru. With this, the company aims to manufacture nearly 100,000 masks a day to protect its associates and contribute to the protection of the community at large in India. In doing so, Bosch is helping to relieve the burden on the market. The line was virtually inaugurated with active participation from both Central as well as State Government officials.

Globally, Bosch will produce over 500,000 (half a million) protective face masks per day across five fully

automated production lines at four Bosch locations, including the Naganathapura plant in India. These mask production lines have been designed by Bosch's special-purpose machinery unit and will be available for usage to the workforce at Bosch in India as well. About 3,000,000 of these surgical masks will be supplied free of cost to second level COVID -19 such as healthcare workers, police, municipal corporation workers, ASHA and aanganwadi workers as well as NGOs. The three-layered masks impede the spread of pathogens from the wearer's nose and throat with a bacterial filtration efficiency greater than 95 percent.

Speaking at the inauguration, Mr. Soumitra Bhattacharya, Managing Director, Bosch Limited & President, Bosch Group in India, said: "At Bosch, we have always kept safety and security of our asscociates at the forefront across all our operations. This initiative is one of our key steps towards honouring our INR 50 crore commitment to combat COVID-19 pandemic using our innovative technologies and high competence in manufacturing."

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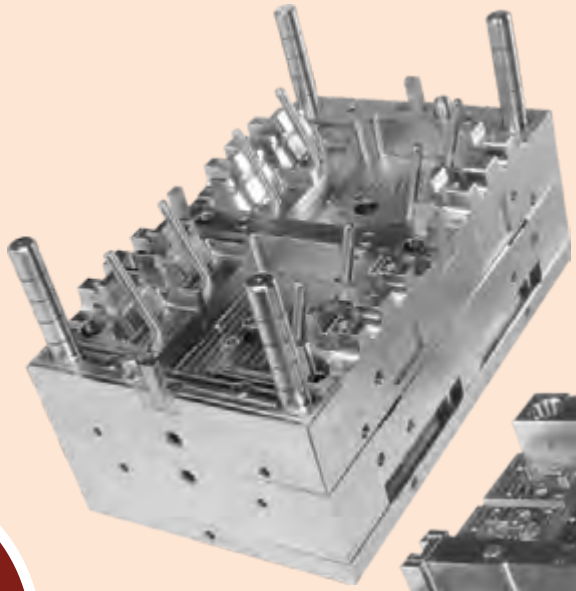

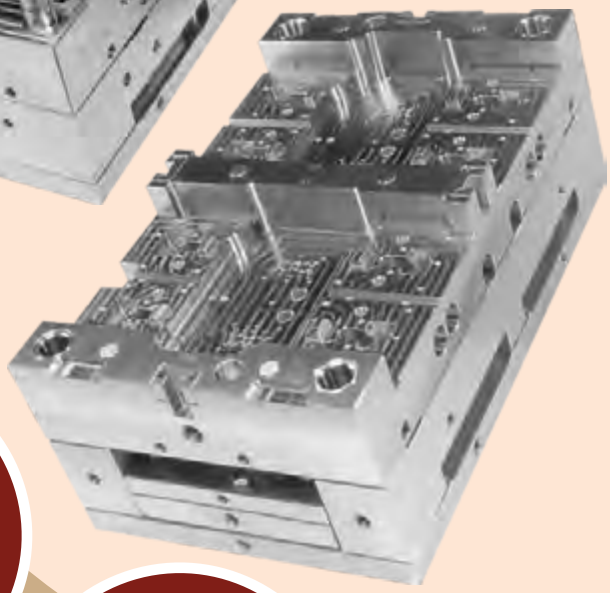

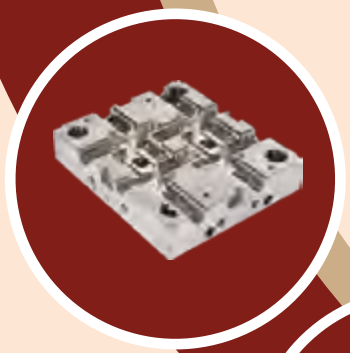

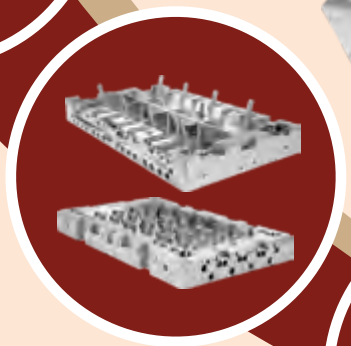

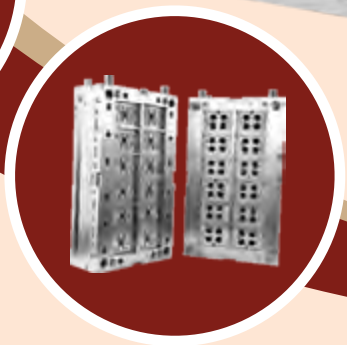

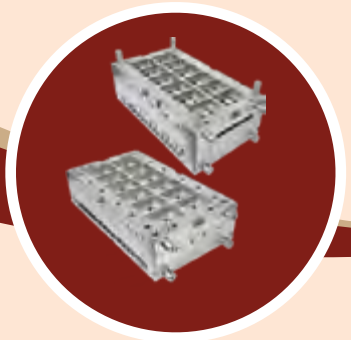

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Big opportunity for India to engage with the world and boost exports: CII

THE Confederation of Indian Industry (CII) outlined a ten-point agenda for increasing India's exports of goods and services in line with the Prime Minister's vision of an "Atmanirbhar Bharat". The CII report, entitled 'Re-orienting India's Export Endeavour in the Covid-19 World', states that India must aim to achieve 5% share in world merchandise exports and 7% in services exports by 2025.

"The pandemic situation has impacted world trade negatively. However, it also provides a big opportunity for India to better engage with the world and boost its export performance. This is an opportune time for India to strengthen its domestic manufacturing through a strong partnership between the Government and Industry", said Mr. Chandrajit Banerjee, Director General, CII. "As more and more countries are looking at realigning their trading strategies and diversifying their import sources post the Covid-19 outbreak, India must leverage the present situation to emerge as an alternative destination for sourcing cost-effective, quality products", stated Mr. Banerjee. "A key point in India's export strategy must be to strengthen its participation in Global Value Chains (GVC)", he added.

CII has outlined ten areas where action is required to boost exports. They are:
1) Open and facilitative import environment is required to attract global companies and ensure competitive access to intermediate goods. In general, higher duties on finished goods and lower duties on intermediates should be applied.

2) Foreign Trade Policy should be brought out at the earliest to establish a stable and predictable export policy regime.

3) Export finance must be expanded. The Interest Equalisation Scheme should be extended for another two years for all exporters, including non-MSME sector.

It called for fast-tracking GST refunds which hold up working capital. Cesses should be removed. The capacities of the Export Import Bank and the Export Credit Guarantee Corporation need to be strengthened to raise resources and lower risks.

4) Frade facilitation can be strengthened through digital tools for faster movement of goods at the border. It recommended reducing physical examination of goods, widening the Authorised Economy Operator program, and ensuring Direct Port Delivery system. Over the longer term, new risk analysis tools such as machine learning and AI should be used and all databases integrated. Port dwell time can be reduced through mechanisation of port infrastructure.

5) Trade Infrastructure for Export Scheme (TIES) must be extended and included under the National Infrastructure Pipeline. In the medium term, it is essential to draw up a comprehensive strategy for hinterland connectivity.

6) Ease of Doing Business reforms needs to be carried out by the state governments for enhancing competitiveness with monitoring at the Chief Secretary level. Time bound approvals and effective on-ground implementation of single window system across all states is required. Further, allowing industries to directly purchase land from farmers, rationalization of stamp duty, increasing threshold limits of certain labour laws, and setting up of a single labour authority in the state for all inspections, among others, are recommended. States should also strategize for exports based on their strengths and develop export clusters.

7) Adequate funding for meeting quality standards and providing certification facilities is necessary to strengthen enterprise competitiveness.

8) On the external front, India needs to leverage existing free trade agreements for exports and enter into FTAs with large market nations. India must also diversify its export basket to include more goods that are traded globally, such as electronics and machinery.

9) For strengthening India's participation in GVCs, the CII paper suggests openness to FDI for technology transfer. It also stresses on liberalization of the services sectors as services are embedded in manufactured goods. Gaps in standards and technical regulations must be bridged with more awareness and better facilities for exporters.

10) Marketing promotion in top markets is essential. CII suggests promoting 'Brand India' and setting up a dedicated marketing agency for key markets as well as expanding the Market Access Initiative and Market Development Schemes.
The CII report includes specific measures for 9 manufacturing sectors such as automotives, chemicals, electronics, steel and textiles etc. Education and healthcare are covered under services. In the agriculture and allied sector, CII has brought out recommendations for agri produce, fruits and vegetables, marine products and processed foods. India's goods exports declined to US$ 313 billion in 2019-20. Its share in global merchandise exports is 1.67%, with a low share in top globally traded items. In services, it enjoys 3.54% share.

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Coming up: Single window system for industrial clearances

"THE Government is genuinely working to create a true Single Window System which is completely digital and provides for unified and integrated business procedures. In addition, we will also encourage risk based self-regulation and third party Make it certifications," said Mr. Piyush Goyal, Hon'ble Minister of Commerce & Industry and Railways, speaking at the inaugural session of National Digital Conference on 'Easing Doing Business for Atmanirbhar Bharat' organized by CII in partnership with the Department for Promotion of Investment and Internal Trade (DPIIT) Where? When? He added that regulatory and policy stability is important for doing business and the Government is committed to it.

The Hon'ble Minister highlighted that the confluence of ease of doing business, digitization and Atmanirbhar Bharat can truly be the defining moment for India. He stressed that Atmanirbhar Bharat is not about closing doors but opening up and greater global engagement but from a position of strength and fair practices.

Alluding to the nascent signs of recovery being visible on the horizon currently, he highlighted that our services sector has been very resilient even in the face of the duress faced due to Covid-19. Any temporary restrictions placed in the face of Covid-19 have now been removed. Government stands shoulder to shoulder with the industry for supporting them in these times of crisis. Decriminalisation of laws, removing regulatory policy hurdles are some of the measures on the anvil.

Elaborating on the Government measures for implementing factors

of production reforms, Mr. Goyal remarked that the Government will be soon doing a soft launch of Land Bank Portal, with six states on board, for which 5 lakh hectares of land has already been identified. This will allow online viewing of land available for industry, from their distant offices, precluding the need for frequently visiting the offices of land-owning agencies. The Government is also looking for onboarding more states for helping them ease their labour laws and compliances, on the lines of what has been done in Uttar Pradesh, where industry has been exempt from select labour laws for 3 years, he further added.

"Production linked incentives are in pipeline for 12 major sectors like APIs and electronics. The Government plans to expand the horizon to as many as 20 sectors," underlined the Hon'ble Minister. He urged the industry to identify areas where policy stability is necessary for domestic industry and foreign investors. "Regulatory certainty and policy stability are very critical for businesses", he added. Responding to industry's suggestion for broadening the Business Reform Action Plan to include factors such as access to finance, Mr Goyal mentioned that improving the availability of long-term finance for the industry is one of the steps being taken by the Government to promote investments.

Earlier welcoming the Hon'ble Minister, Mr T V Narendran, President-Designate, Confederation of Indian Industry, among other things, highlighted the plight of MSMEs which need a special helping hand in the present situation. He suggested MSMEs to be exempted from approvals and inspections for 3 years under State laws while following all rules. "Self-certification route can be used for renewal and approvals for MSME with good track record," he added.

Mr. Chandrajit Banerjee, Director General, CII, commended the commitment of the government for establishing India as a global manufacturing hub through a slew of reforms and ensuring continuity in supply chains and smooth business operations, even as Government effectively combated the coronavirus pandemic.

Mr. Piruz Khambatta, Chairman, CII Task Force on Ease of Doing Business, in his closing remarks, stressed that instead of Tax Holidays, Paper-Work Holidays should be the norm for new entrepreneurs.

The one-day virtual conference saw an active participation from more than a thousand relevant stakeholders deliberating on issues pertaining to ease of doing business, including the areas where expedited action is required from the Government.

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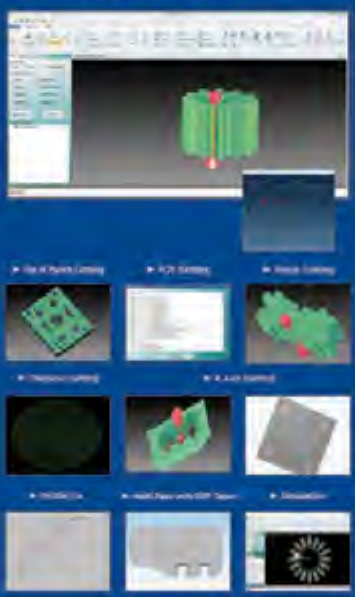

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Indian Auto Component Industry clocks turnover of ₹ 3.49 lakh crore (USD 49.2 billion), de-grows 11.7 per cent in FY 2019-20

- Sales to OEMs declined 17%, imports by 11.4% and exports by 3.2%
- Auto component Aftermarket at ₹ 69,381 crore (USD 9.8 billion) remained stable
- Industry cautiously optimistic as green shoots emerge

AUTOMOTIVE Component Manufacturers Association of India (ACMA), the apex body representing India's Auto Component manufacturing industry recently announced the findings of its Industry Performance Review for fiscal year 2019-20. The turnover of the automotive component industry stood at ₹ 3.49 lakh crore (USD 49.2 billion) for the period April 2019 to March 2020, registering a de-growth of 11.7 per cent over the previous year. Commenting on the performance of the auto component industry in India, Vinnie Mehta, Director General, ACMA, said, "The overall vehicle industry witnessed a severe downturn in 2019-20 that saw its sales slump by 18%. The component industry, in tandem, posted a subdued performance with de-growth of 11.7 per cent over the year, registering a turnover of ₹ 3.49 lakh crore (USD 49.2 billion). Auto Component Aftermarket at ₹ 69,381 crore (USD 9.8 billion) remained stable, while sales to OEMs in the domestic market at ₹ 2.87 lakh crore (USD 40.5 billion) declined 17 per cent. Both imports and exports declined by 11.4 per cent and 3.2 per cent, respectively; Imports stood at ₹ 1.09 lakh crore (USD 15.4 billion), while exports at ₹ 1.02 lakh crore (USD 14.5 billion)".

Sharing his insights on the performance of the auto component industry in the year gone by, Deepak Jain, President, ACMA said, "The automotive industry faced a prolonged slowdown in FY 2019-20 with vehicle sales in all segments plummeting significantly. Subdued vehicle demand, investments made for transition from BSIV to BSVI, liquidity crunch, lack of a clarity on policy for electrification of vehicles and slow-down in key export markets, among others, had an adverse impact on the performance of the components sector in India as also on its expansion plans".

Speaking about the current situation, Jain elaborated, "The auto component industry has displayed remarkable resilience in wake of the lockdown; the industry faced acute challenges on the front of working capital, production and dysfunctional logistics. However, with unlocking of economy, growth seems to be returning to the industry with uptick in vehicle consumption, especially in the two-wheelers, passenger vehicles and the tractor segments, although sales of commercial vehicles continue to be challenged. The component industry's performance is expected to return to pre-COVID levels by the festive season should the ramp-up be not stymied by lockdowns in manufacturing zones and lack of availability of manpower. Going forward, to allow for uninterrupted production in the automotive value chain, despite local lockdowns, ACMA has recommended to the Government to accord 'continuous production industry' status to the automotive industry."

The long-term prospects of the Indian auto component industry continue to be bright, especially with focus of the Government on 'Atma-nirbharta' and global competitiveness of the industry. The auto component industry and the vehicle industry are closely working together for 'deep-localisation' and import substitution, which will result in higher value-addition by the auto component manufacturers making the sector exports competitive," added Jain.

ACMA continues to support the vehicle industry in their request to the government for enhancing vehicle demand in the country through reduction in GST on all vehicle categories to 18 per cent and introduction of an incentive based scrappage policy.

For the components sector, ACMA continues to recommend a uniform 18 per cent GST rate across the auto component sector; currently 60 per cent of the auto components attract 18 per cent GST rate, while the rest 40 per cent, majority of which are two-wheelers and tractor components, attract 28 per cent. The latter high rate has led to flourishing grey operations in the aftermarket. A benign rate of 18 per cent will not only ensure better compliance but will also ensure a larger tax base.

Key findings of the ACMA Annual Industry Performance Review for 2019-20:

- **Exports:** Exports of auto components witnessed degrowth of 3.2 per cent to ₹1.02 lakh crore (USD 14.5 billion) in 2019-20 from ₹ 1.06 lakh crore (USD 15.2 billion) in 2018-19. Europe, accounting for 30 per cent of exports, saw a decline of 11 percent, while North America and Asia, accounting for 30 per cent and 27 per cent, respectively, remained stable.

  The key export items included drive transmission & steering, engine components, Body/Chasis, Suspension & Braking etc.
- **Imports:** Slowdown in the domestic market also reflected on imports of component into India. Component imports fell by 11.4 per cent to ₹1.09 lakh crore (USD 15.4 billion) in 2019-20 from ₹1.23 lakh crore (USD 17.7 billion) in 2018-19. Asia accounted for 65 per cent of imports followed by Europe and North America at 26 per cent and 8 per cent, respectively. Imports from Asia declined by 7 per cent, while those from Europe by 22 per cent and from North America by 17 per cent.
- **Aftermarket:** The aftermarket in FY 2019-20 remained stable despite a downturn in the vehicle industry. The turnover of the aftermarket stood at ₹ 69.381 crore (USD 9.8 billion) growing marginally by 2.8 per cent over the previous year.

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Sensitive toolholder to monitor machining processes

SCHUNK is entering a new era of toolholding: In September, delivery of the sensory hydraulic expansion toolholder iTENDO, the most sensitive toolholder on the market, will begin. For the first time, it will be possible to monitor machining processes at high resolution directly at the tool and to control cutting parameters in real time. The required acceleration sensor and electronics are integrated into the toolholder without affecting its interfering contour and other characteristics.

The iTENDO is capable of seamlessly recording the machining process, monitoring previously defined exact limits and, in the event of irregularities, enabling real-time adaptive control of the speed of rotation and feed rate, among other measures. Equipped with a sensor, battery, and transmitter unit, the smart toolholder records the data directly at the tool and transmits it wirelessly via Bluetooth to a receiver unit in the machine room, where it is forwarded by cable to a control and force sensor system controller. This

makes the system fundamentally different to other solutions for process monitoring. While monitoring the current input of the spindle only permits diffuse signals on vibration behavior, the intelligent tool mounting provides precise process data. In pilot applications, the intelligent fixture has proven performance for milling, drilling, countersinking and even deburring.

Starter set for simple start-up

In a first step, SCHUNK is standardizing the iTENDO for the common interface HSK-A 63 with clamping diameters from 6 mm to 32 mm and a length of 130 mm. The sensory toolholder is suitable for the use of coolant and is designed for speeds of up to 10,000 RPM. The commissioning and analysis of the data is carried out via a browser-based dashboard on standard PCs, tablet computers or smartphones. In the simplest configuration, which can be implemented completely without machine-side adjustments, the live data from the sensor can be displayed directly on the SCHUNK dashboard via a local connection. For this purpose, SCHUNK provides a special case system with integrated display, which makes it possible to put the toolholder into operation within two hours with minimal effort. In a second configuration, the real-time controller is ideally connected to the machine control system by a service technician via digital or analog I/O so that, for example, alarms can be triggered or processes can be controlled adaptively. The third and most sophisticated configuration enables additional information exchange with the machine (e.g. in the case of the latest Siemens control system via OPC UA). All variants can also be operated and centrally controlled via a cloud solution.

Hexagon enhances part loading efficiency with new large volume CMM

OPEN structure of DELTA OPERA offers unprecedented efficiency and confidence in loading very large workpieces.

Hexagon recently released DELTA OPERA, the large volume CMM that simplifies loading of very large parts in industrial environments. DELTA OPERA's unique open structure enables users to load workpieces from three sides of the CMM, making part loading quicker, more flexible, and protecting workpieces by avoiding collisions with the CMM structure.

Ideal for large aerospace and milling applications, DELTA OPERA allows for loading from the front, rear, and one side of the measuring volume. DELTA OPERA can also offer a smaller factory footprint than traditional gantry

machines, reducing temperature control costs.

"For manufacturers inspecting very large workpieces, loading parts can be challenging and time-consuming," says Marco Mussino, Product Manager and Project Management Leader, Manufacturing Intelligence, Hexagon. "With the innovative DELTA OPERA, part loading is made easier, driving more efficient inspection. With its open structure and outstanding performance, DELTA OPERA is the most significant evolution in large-volume CMMs for many years."

As well as delivering high performance, DELTA OPERA comes with a range of usability enhancements, including status and speed lighting indicators, and Hexagon's seamless probe head swapping system Manual Application Changer (MAC).

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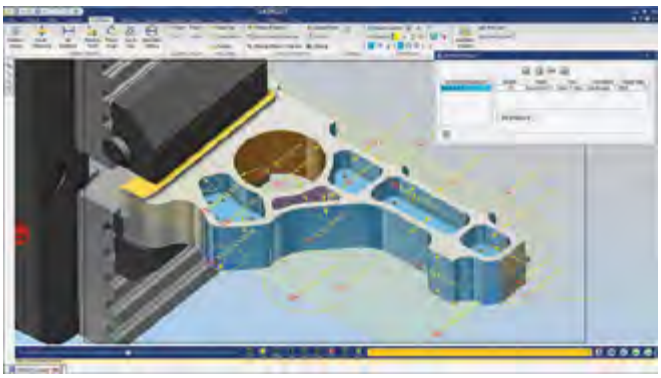
VERICUT Version 9.1 – Raising the Bar for Simulation

CGTECH is pleased to announce the latest release of VERICUT software, Version 9.1. VERICUT CNC machine simulation, verification, and optimization software simulates all types of CNC machining, additive, and hybrid manufacturing processes. The software operates independently, but can also be integrated with leading CAM systems.

VERICUT 9.1 raises the bar for CNC simulation once again with several new cutting-edge features that increase efficiency and empower users to do more in less time. New visibility options, plus enhancements to toolpath optimization, Additive Manufacturing, tooling & Multi-tool Stations, measuring & Inspection/ Reporting are just a few of the noteworthy features in this latest release. Hundreds of customer-driven improvements and software requests were also incorporated in this latest version.

"VERICUT 9.1 continues to enhance the User Experience through continued advancements with graphics and display controls, streamlined user controls, and more new capabilities and features than ever before", says VERICUT Product Manager, Gene Granata. "Version 9.1 also introduces a Learn mode for Force optimization – a form of Artificial Intelligence for faster/easier NC Program optimization. Using Learn mode, almost anyone can create highly optimized



NC programs from existing programs, without having to reprogram them."

Enhanced Visibility

New visibility features have been added to the Project Tree and VERICUT's right-click convenience menus for components and models, enabling users to toggle between visible and invisible states, or to enable/ disable 3-D objects for the simulation. Quickly see unobstructed views of the cutting process and gain better access to the part by removing enclosures, models of sheet metal or shrouding, and other "in-the-way" objects via "Invisible" or "Disable" actions.

New Visibility Options for AUTO-DIFF

Similar to the above, new features have been added to AUTO-DIFF giving users a higher degree of control over component visibility, such as when Fixture models should appear.

X-Caliper Annotated Images

Setup Plan has been renamed to Annotated Images. VERICUT Inspection is also now included with Annotated Images. Both Setup Plan and Inspection functionality is greatly enhanced with dimensions, notes and tolerances for checking parts at various stages of machining. Easily create professional looking and informative setup plans and inspection images stored with view layouts – ready to print as "shop aid" documents, or to appear in VERICUT's comprehensive Reports.

Shanks in Cutting Tool Assemblies

Defining shanks as separate objects from the holder and cutter enables programmers to see where these non-cutting portions of the cutter are – relative to the stock workpiece, and allows more discrete control over near miss and collision detection properties and tolerances. Tool holder models can also be used as "Shanks".

Streamlined Optimization with A.I.

The Optimize Control window has been streamlined to fit in a single window with no tabs. Relevant features become active in subsections depending on which Mode is selected. A new Force "Learn" Mode is available, providing Artificial Intelligence (A.I.) for optimization. In Learn mode, VERICUT learns from simulating cutting, then automatically configures & optimizes tools for increased cutting efficiency and reduced machining times.

Force Charts

New "Save All As" Optimization Settings option added to the right mouse menu when clicking on a Force Chart. New ability to 'Learn From Results' enables optimization settings for a tool or all tools that were analyzed.

Additive Manufacturing

VERICUT 9.1 has a new "Additive" Default Machining Type. This enables VERICUT to predict system resources that will be needed to additively build the as-designed part, including a starting stock build plate or model.

VERICUT can build multiple parts created by a "nested" build NC program, enabling additively built parts to be independently relocated or assembled for finish machining, or exported. This feature is especially helpful for Big Area Additive Manufacturing (BAAM) and Large Scale Additive Manufacturing (LSAM) parts.

DXF Import

The DXF Import feature has been enhanced with several new features. The DXF reader can now read the layers within a DXF file and automatically detect CUT/ NOCUT layers. Additional layers can be checked on to use as additional components.

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Skill up today for a better tomorrow

"Without sharpening your weapon; standing on the battlefield would not increase your chance of winning," says Ankit Sahay, an author. And, rightly so! Even though the Indian tooling industry has the determination to compete with its global counterparts, it currently lacks the required trained manpower to help it achieve its goals. Various initiatives and some digital strategies could come to the rescue and help bridge the skill development gap.

In Focus

Manufacturing has great potential to emerge as one of the high-growth sectors in India. It can provide large-scale job opportunities and enable a significant section of the population to find 'gainful employment'. The government has been making substantial efforts to create a conducive environment to promote this sector. However, for it to become globally competitive and a 'make-in export hub', it is very important to ensure that the necessary skills are available in the country.

In this day and age, skill development is no longer a matter of choice for any individual or organisation. It is key to survive and succeed in this competitive world. In order to gain an edge, it is critical that Indian tool makers and manufacturing SMEs invest in skill development.

Present scenario

According to the 'Micro Merchant Market Sizing and Profiling Report' released by MasterCard and the Confederation of All India Traders, SMEs' contribution to India's GDP stands at 45 per cent. This percentage is almost three times of what corporate India contributes. The report also states that the SME sector provides employment to around 46 crore people in the country and registers an annual growth of 11.5 per cent.

In spite of the tremendous potential it promises for India's socio-economic development, the nation's small and medium businesses are plagued by various challenges. Some of these include:

- Poor infrastructure, which hinders increase in production capacity
- Lack of adequate funds
- Little innovation
- Technology knowledge gaps
- Lack of training and skills
- Inability to attract tech-savvy talent

The concerns about infrastructure and finances require cost-intensive measures. The government and private sector companies are taking several steps to address these. The other challenges are closely linked with digitization. These can be addressed through Technology Knowledge Transfer—a process through which technology is disseminated from experts to concerned individuals or organizations to bridge the digital skill gap. The current policy initiatives, such as 'Digital India' and 'Skill India', are focused on helping SMEs become digitally literate and train their manpower to develop the necessary skills.

Government initiatives

While uncertain economic environment, inadequate infrastructure, competition from imports, delayed clearances, unfavourable market conditions and cost escalation are some of the major constraints for the Indian manufacturing sector, finding skilled labour has emerged as the biggest challenge confronting the sector's growth.

For instance, the tooling industry has been facing the challenge of finding skilled manpower. Students graduating from engineering institutes may possess the theoretical knowledge, but lack the practical knowledge that the industry requires. This has made it very taxing for owners of tool making units, as they have to spend time and money on training these young engineers.

Meanwhile, the government has been trying to redress this issue through 'Skill India' or the 'National Skill Development Mission' and other initiatives. And, the latest 'Atmanirbhar Bharat Abhiyan'/ 'Self-Reliant India Mission' has further proved that Indian policy makers are aggressively trying to tackle the issue.

Recently, the Ministry of Skill Development and Entrepreneurship (MSDE) launched 'Aatmanirbhar Skilled Employee Employer Mapping (ASEEM)' portal to help skilled people find sustainable livelihood opportunities. This platform aims to improve the information flow and bridge the demand-supply gap in the skilled workforce market. Apart from recruiting a skilled workforce that spurs business competitiveness and economic growth, the Artificial Intelligence-based platform has been envisioned to strengthen

A boost to skill development

Five years of the Skill India Mission and the World Youth Skills Day

A digital conclave was organized in the month of July to mark five years of the Skill India Mission and the World Youth Skills Day. In his message, the Prime Minister urged the youth to skill, reskill and upskill in order to remain relevant in the rapidly changing business environment and market conditions. He stated that the Skill India Mission launched five years back has led to creation of a vast infrastructure for skilling, reskilling, upskilling and enhancing opportunities to access employment both locally and globally.

Webinar on "Skilling and employment post-COVID-19: National Perspective"

FICCI organised a webinar on "Skilling and employment post-COVID-19: National Perspective" recently. The Webinar was part of the 'FICCI Thought Leadership Dialogue Series'. The COVID-19 pandemic has stalled economic activities across India and the globe which had an immediate impact on the global market and thereby affecting various sectors and regions.

UNESCO launches Global Skills Academy to boost employability of one million youth

UNESCO recently launched the Global Skills Academy which aims to equip one million youth with employability and resilience skills and help them find jobs during the upcoming period. The organisation unveiled the project, Skills for a Resilient Youth in the Era of COVID-19 and Beyond, on World Youth Skills Day, celebrated on July 15.

their career pathways by handholding them through their journeys to attain industry-relevant skills and explore emerging job opportunities, especially in the post COVID-19 era.

The other major initiatives by the government include:

- Pradhan Mantri Kaushal Vikas Yojana (PMKVY), the flagship scheme of the MSDE, enables a large number of Indian youth to take up industry-relevant skill training that can help them secure better livelihood.

- Skills Acquisition and Knowledge Awareness for Livelihood Promotion (SANKALP) is designed to operationalise the sub-missions under the National Mission. It aims to bring all skill training activities together, improve skill development programmes by building a pool of quality trainers and assessors, model curriculum and content, and establish a robust monitoring and evaluation system for skill training programmes, among others.

- Entrepreneurship Development Programme (EDP) under Prime Minister's Employment Generation Programme (PMEGP), is provided to PMEGP beneficiaries and focusses directly on developing skills required for entrepreneurship. This scheme aims to provide orientation and awareness pertaining to various managerial and operational functions.

- Skills Strengthening for Industrial Value Enhancement (STRIVE) is a World Bank-assisted Government of India project. It aims to improve the relevance and efficiency of skills training provided through Industrial Training Institutes (ITIs) and apprenticeships.

- Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY), initiated by the Ministry of Rural Development, is part of the National Rural Livelihood Mission. It works towards adding diversity to the incomes of rural poor families and catering to the career aspirations of rural youth. DDU-GKY has committed an investment of more than ₹ 5,600 crore to upskill India's rural youth since 2012.

TAGMA's contribution

Since its inception, TAGMA has been actively working towards helping the industry with skill development and training activities. It conducts educational seminars during the iconic 'Die Mould India International Exhibition' and even organises the 'International Tooling Summit' every year.

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What individual companies can do?

Encourage internships: Hiring interns studying in universities can translate into well-trained future workforce. By the time they graduate, they will already possess some amount of practical knowledge.

Organise training programmes: In this fast-changing world, technology upgradation is happening faster than before. It is imperative for the workforce to be updated with the latest technologies and market trends. For this, it's advisable to hire subject-matter experts.

Digital Methods: There are several courses available on the internet, such as on Udemy.com, Coursera.org, edX.org, among others. Encouraging employees to enrol in these courses could help them brush-up on their skills and even acquire new ones.

Attend various events: There are many relevant events, such as expos and seminars. Asking employees to attend such events will help them learn from their industry peers.

TAGMA has been proactive in getting experts from around the world to deliver notes about various subjects related to TAGMA. Apart from these, TAGMA also organises multi-city small gatherings for tool makers, where subject-matter experts update the industry about the developments in technology.

Apart from this, TAGMA recently started 'TAGMA Digital Initiative' during the lockdown to help companies and professionals with skill development activities. Under this initiative, TAGMA partnered with more than 25 companies, which conducted webinars on various subjects related to the tooling industry. The digital initiative was well received, as more than 10,000 professionals joined the webinars.

What SMEs should do?

As technological transformation sweeps across small and large organizations, it's creating a digital skill gap that several SMEs are struggling to fill. Yet, large organizations, confronted with similar issues, but equipped with substantial IT and training departments, realise that bridging their digital skill gap is a complex job.

SMEs usually find it challenging to adopt new technologies, digital media being one such challenge. However, they do not have to burn a hole in their pocket to start their digital media journey. As explained in the previous editions of TAGMA Times, digital media is a very cost-effective initiative. It only requires SMEs to develop the necessary skills.

In the wake of the COVID-19 pandemic, going digital is not an indulgence anymore, but a necessity. The first step to go digital is having a company website, where prospective clients can check and order products and services. Then, SMEs can promote their businesses online on search engines and social media platforms.

The way forward

As per the National Skill Development Corporation (NSDC), a public-private partnership set up by the Planning Commission with a mandate of providing funding and direction to private skill development programmes, the rising skill gap in India is estimated to be more than 250 million workers across various sectors by 2022.

There is an urgent need for skilling, re-skilling and up-skilling the working population. 'Make in India' and 'Skill India' have become the two pillars of the Indian manufacturing sector. While 'Make in India' is working to boost manufacturing activity and creating jobs, 'Skill India' is working to ensure a steady supply of a skilled workforce to the industry for enhanced productivity and assuring overall economic growth.

We believe, the way forward is to make training appealing to the youth. The government and industries should set standards for jobs, support ITIs and encourage the youth to join the sector. With these efforts by the government towards skill, and infrastructure building initiatives, India can emerge as the true world leader in the new era of manufacturing post COVID-19.

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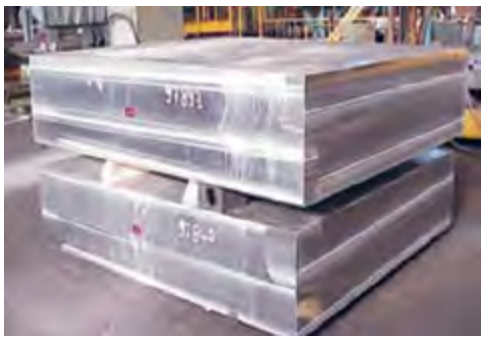

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'India has great potential to grow owing to its high domestic demand'

"Now, India has the chance to emerge as the new manufacturing destination as an alternative to China. In fact, we have a few global companies that have already invested in India and many more are in the process of doing so," says Ravindra Moolya, CEO, Speroni India Pvt. Ltd.

Q What are your views on COVID-19 and its impact on the manufacturing industry?

Well, we could either look at COVID-19 as a crisis or as an opportunity; it's all up to us. It is true that the pandemic has wreaked havoc across the globe—millions have died and many have lost their jobs—but we need to embrace this change and find a way to move forward.

According to me, every person in the world has a good or not-so-good COVID-19 story to tell. In India, the pandemic has totally changed the way industries function. Companies that have been relying on manpower to function are now incorporating automated solutions in all their business operations and looking for ways to adopt high-end technologies. This process would have taken decades had it not been for the pandemic.

Also, companies are spending a lot of time and resources on skill development, which is a very good sign. Overall, I feel that companies which accept change and act accordingly will be in a better position to tackle business challenges posed in the future.

Q What opportunities has COVID-19 created in the market?

India has great potential to grow owing to its high domestic demand, which in turn provides the opportunity to serve the export market. COVID-19 has disrupted the global supply chain and has changed the global sentiments towards China. Now, India has the chance to emerge as the new manufacturing destination as an alternative to China. In fact, we have a few global companies that have already invested in India and many more are in the process of doing so. So, if you see, we will have a huge demand coming our way. All we need to do is be prepared and work together to encash on this opportunity.

Q What are the challenges faced by the manufacturing industry?

Well, I can tell you the challenges faced by the metal cutting industry. Some of them include:

- Currently, our machines utilisation stands at about 30%, which increases our operations cost and makes us less competitive. But there is hope! We can actually improve our efficiency by as high as 70% with the existing setup.
- Today, 60% to 70% contributors comprise the small scale industries. They lack technical expertise and do not really have mentors to guide them. They learn from their mistakes and avoid taking huge risks.
- The cost of products are majorly dependent on the small scale industries, which are still human dependent, making them non-competitive in today's day and age. They need high-end infrastructure.
- They believe in working in isolation and have no plan for scalable manufacturing.

Q How could the Indian manufacturing sector improve?

We need to work collaboratively and become more competent. We need to focus on ways to reduce operational cost. We need to become informed buyers and invest in affordable good technology. It is important to ensure that every process is technology driven rather than solely depending on manpower. We

need to focus on the cost and ROI. Lastly, we must aim to create value, not only products.

Q How can companies collaborate and work together in this competitive environment?

For this, we need to change our orthodox mind set. We have to realise that there is enough business for everyone to thrive. I would like to share one example to explain this. During the lockdown, there was a shortage of standard cutting tools from China. Sensing this opportunity, some of the industry veterans based in Pune came together and developed cutting tools from scratch within record time. Right from the design to material selection and trials, it all took only 20 days. The multipurpose tool can be used for machining aluminium, cast iron and steel below 45 HRC. Last I heard, they have also received good orders from various companies and now, they are planning to develop high-end cutting tools.

Q Any words of advice for Indian manufacturers?

I strongly believe that this is the right time for every Indian manufacturer to present their grand vision for contributing towards building our nation. The domain experts should volunteer to train the younger generation and help companies make constructive changes; thereby, contributing towards building a strong manufacturing base.

TAGMA TIMES is the official organ of the association, over the years, since inception in 1993. It has evoked spontaneous support and appreciation from the members & advertisers continuously. It went thru a major revamp in November 2017 in terms of overall look, content and feel.

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'COVID-19 has taught me why it is important to value manpower'

"I believe when making a decision that could have a greater impact on everyone, it's very beneficial to take into consideration the collective viewpoints of a team," says SK Pasha, Managing Partner, Jupiter Tooling.

Q COVID-19 has affected several businesses across the globe. How is Jupiter Tooling trying to stay productive in the wake of this pandemic?

The global economy has been facing a challenge like none other. But I think it's very important not to lose hope. We need to find ways to make the most of this situation. For instance, I have been spending a lot of time brainstorming with my workforce. This has helped me bond with them and made me realise that each employee has a very noteworthy perspective about manufacturing. In fact, I have learned so much from my team.

During this lockdown, we organised a WhatsApp group quiz contest on different mould-making subjects. This proved to be an interesting experiment as it kept our team engaged and motivated. They were very enthusiastic to share their knowledge.

Periodically, we also conduct self-improvement sessions, wherein we discuss ways to improve our knowledge and manufacturing systems. We started working on efficiency reports, and performance indicators measures, among other aspects, to help us improve.

In short, it could be said that this lockdown has been an eye-opener for us, as it has helped us identify the redundant processes, hidden expenses and areas of improvement.

Q Are there any important lessons that the COVID-19 outbreak has taught you?

COVID-19 has taught me why it is important to value manpower. Each employee is a valuable asset. Their ideas and varied perspectives can inspire one to handle situations better. During one of our brainstorming sessions, we were discussing ways on how to reduce costs and enhance efficiency. Each of our employees made some very valid points on how we should go about it. Collectively, they emphasised on why discipline in financial management is very important. So, I believe when making a decision that could have a greater impact on everyone, it's very beneficial to take into consideration the collective viewpoints of a team.

Q After COVID-19, what do you think will be the new normal in manufacturing?

COVID-19 brought a lot of industries to a standstill. It affected businesses adversely and created hurdles in the supply chain logistics. Some companies shut operations, while others continued to operate using their limited resources. At a time like this, technology has come to the rescue by ensuring efficiency of operations. So, I believe that a lot of companies will begin to rely more on technology post COVID-19.

Apart from technology, I think MSMEs will now focus more on their employees' health and welfare. They would probably organise more health check-ups for their staff, which is something MSMEs haven't really done in the past.

Q Are there any policy changes you would like to suggest to help MSMEs bounce back?

Yes, definitely! The contribution of MSMEs to the economy has been undermined for long even though they are the backbone of the industrial landscape of our country. The government and financial institutions must help this sector prosper, as it will help the economy in the long run.

The government could help by placing the tool rooms business in a special category, as the investments are very high as compared to the returns in this industry.

The financial institutions need to subsidise loans at 6% to 7% interest to MSMEs. Additionally, the banks should go with the Bill discounting facility in domestic business, which will help in the rotation of funds.

Q Do you have any suggestions for tool makers or manufacturing SMEs?

Yes, tool makers need to wisely deal with their finances and manpower. They also need to focus on diversifying their products rather than only focussing on one. All this must be attained without compromising on the ethics of business.

Q What policies will India need to attract maximum investment to the country?

Firstly, as our Honourable Prime Minister has said, there's a need to become 'atmanirbhar' or self-reliant. In line with this vocal to local campaign, special incentives should be given to those buying 70% to 80% of local products. As an 'atmanirbhar' initiative, there should be a policy wherein tool rooms should be lent loans at 6% interest. This will help them tackle competition from Chinese manufacturers. As a policy, global companies are always on the lookout for genuine suppliers. To reign in this market, the government needs to create the required infrastructure that will help India attract global investments.

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'Tool rooms need to gear up. Setback ka jawab comeback se dena hai!'

"The Indian market is set to rebound and will be bigger than before. But is the Indian tooling industry ready? Each tool room has to plan for bigger and professional operations. The defence and aerospace sectors are garnering newer lucrative opportunities. Tool rooms should consider exploring such opportunities," says Sunil Desai, Director, Designcell CAD-CAM Solutions Pvt. Ltd., and Partner, SubAero Precision Machining.

Q How is India faring in the Covid-19 challenge?

These are indeed unprecedented times! We were never taught in business school to prepare for such a unique challenging scenario. We have faced the largest lockdown in the history of mankind and the largest migration of labour from urban to rural areas.

Currently, we are facing a unique situation—'Covid-19 behaviour fatigue'. People no longer want to be bound indoors; they have commitments to fulfil and are facing numerous challenges with regards to resuming work. While work from home seems to be the best solution for the time being, it's not a feasible option for the manufacturing industry. However, seeing the way the industry is finding ways to utilise their manpower and equipment, it seems like things are slowly limping back to normalcy.

As we are in the midst of a pandemic, it is difficult to gauge what will happen in the coming months. But it will definitely offer newer challenges with respect to new orders, pricing and working culture.

Sadly, Covid-19 is not the only challenge; India is fighting on multiple fronts. The country is dealing with ongoing geopolitical issues, and natural calamities, like torrential rains and floods, among others. Amidst all this chaos, India has witnessed the steepest fall in GDP.

Q With the current situation being so grim, is there any hope?

Of course! Even though conventional businesses are facing unsurmountable hardships, businesses, like pharma, health care, and those related to digital platforms, are witnessing tremendous growth. Some unique ventures like farm to table have seen considerable success.

I believe that once the pandemic ends, industrial growth will surpass pre-pandemic levels and anti-China sentiments will work in India's favour. The future markets will treat all sectors uniquely on the basis of the value they add to the ecosystem.

Besides, the current scenario has made the government rethink their approach towards healthcare and digitization of healthcare, thereby leading to effectiveness and transparency.

Q How did you ensure the productivity of your team during the lockdown?

Since the outbreak of this pandemic, we have gone through phases of denial, hope and acceptance. Our approach during each stage was different. Initially, we were only concerned about the survival of our staff in terms of ensuring that we are able to pay them their salaries to afford at least food and shelter. But when the pandemic struck, we faced the most difficult phase as most of our workers headed back to their hometowns. However, throughout

this challenging time we were always in touch with our manpower, checking their wellbeing and offered whatever support we could provide. We encouraged them to stay positive and spend time on learning and development. As months passed by, we resumed operations partially. We provided training to our existing users and focused on upskilling our CAD CAM engineers.

Q Do you foresee any trends that could emerge owing to this pandemic?

Yes, for businesses, it's always about survival and finding ways to flourish. With the labour crunch situation that the manufacturing industry is facing, I feel that most businesses will now opt to invest in automation solutions for their operations. They are more likely to choose automation through digitisation and cloud-based work cultures in every aspect of transacting business, such as banking, operations and logistics. For businesses, it will be less travel and personal interaction. They will prefer to function through a system-based ecosystem.

Q What lesson has this pandemic taught you?

There is not one, but many lessons. Going forward, it's important to postulate such situations to simulate business survival. We need to rethink about the quality of our work life and about adopting a healthy lifestyle to ensure sustainability of our businesses. Our tool rooms need to continually improve on every aspect—right from design and operations to data management. We need to wholeheartedly embrace our own Indian version of Industry 4.0. It's high time, Indian tool room owners, managers, engineers and workers eradicate the 'I' virus and migrate to the 'we' culture.

Q Do you have any words of wisdom for tool makers?

Post pandemic, the markets will provide growth opportunities to every sector. Tool makers are most likely to benefit from the anti-China sentiments and the Government's call for 'vocal for local'. We are blessed with huge domestic demand that provides enough opportunities for domestic players. We must gear up to grab those opportunities. However, Indian tool rooms have to improve their time to market and become globally competitive by adopting state-of-the-art technologies. Acquiring these high-end technologies may pose viability challenges to some businesses. But, in such cases, they can overcome it by exploring the cluster-based and shared-resources approach. TAGMA has an important role to play in this area.

Q So, you foresee a bright future for the tool making industry?

Of course! Bright, very bright! Before the pandemic, India was outsourcing die and molds from China and other countries because of factors like time to market, technology and, oftentimes, cost. But for now, the anti-China sentiments will help, not for long though.

The Indian market is set to rebound and will be bigger than before. But is the Indian tooling industry ready? Each tool room has to plan for bigger and professional operations. The defence and aerospace sectors are garnering newer lucrative opportunities. Tool rooms should consider exploring such opportunities. After all, the resources and mind set of tool rooms can easily adapt to the requirements of these sectors. Tool rooms need to gear up. 'Setback ka jawab comeback se dena hai!'

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'The ability to respond flexibly to the rapidly changing demand provides an opportunity for Indian manufacturers'

"By integrating digitalization and automation, manufacturers can now quickly turn around ideas and insights into reality, simulate and validate product performance, define and refine processes to produce goods within their predefined budgets, on time and as per the customer's requirements. This is key to competitiveness and Siemens Xcelerator portfolio is helping manufacturers in India achieve it," says Tony Hemmelgarn, President and Chief Executive Officer, Siemens Digital Industries Software.

Q Going digital is the way forward for all industries. How is Siemens Digital Industries Software gearing up to help companies achieve their digital goals?

Siemens Digital Industries Software is driving transformation to enable a digital enterprise, where engineering, manufacturing, and electronics design meet tomorrow. The Xcelerator portfolio can help companies of all sizes create and leverage digital twins to provide organizations with new insights, opportunities and levels of automation to drive innovation.

Xcelerator brings together and integrates the entire Siemens Digital Industries Software portfolio with embedded tools and databases connecting current and future information technology, operational technology, and engineering technology environments.

By combining what was formerly known as the Siemens Digital Innovation Platform with MindSphere, Siemens Cloud Solutions, Mentor, and Mendix, Xcelerator allows companies to easily build, integrate and extend their existing data and network systems.

Q What about AI and machine learning? What role are they going to play in the future of manufacturing? How is Siemens encouraging the adoption of intelligent solutions?

AI will play a significant role. We are already seeing this with the Industrial Edge initiative we are working on within our Digital Industries division. Industrial Edge is trying to rethink the traditional industrial automation space and inject new ways of getting even higher levels of efficiency through, for example, running machine learning on the shop floor.

Q Recently, Siemens collaborated with IBM to deliver a new solution to optimize the Service Lifecycle Management of assets by connecting real-world maintenance activities and asset performance back to design decisions and field modifications. Could you elaborate on how this will benefit end-users?

Industrial companies often struggle to improve the performance and reliability of an asset over its operating life cycle. This is a result of several factors. But, the inefficient data sharing between engineering, operations, and maintenance processes, arguably tops the list.

The new solution from Siemens and IBM attempts to address this issue by creating a single source of information designed to help companies improve the development, maintenance, and operation of their assets. In other words, by leveraging elements of the Xcelerator portfolio and IBM Maximo, the solution establishes an end-to-end digital thread between equipment manufacturers and the owner/operators of that equipment. Through IIoT technologies, manufacturers will be

able to gain insights on wear and tear, operating conditions, parts failures, and other patterns that lead to design or manufacturing updates. This data can then be used to help companies lower their maintenance costs, reduce risks, and improve asset resiliency.

Q How do you view the currents trends in the Indian manufacturing industry with regard to the adoption of automated solutions?

The Indian manufacturing industry is dominated by a large number of emerging companies, which are rapidly expanding in both scale and complexity. Like the typically large industrial companies, they are facing the challenge of providing customers with the options of flexibility, choice and highest quality. And, offering these more efficiently and at scale has added to the complexity. Companies are increasingly looking at digitalization and automation to address the abovementioned challenges.

One of the significant advantages of digitalization for these emerging companies is that it does not require big capital investments, as compared to industrialization of the last century when traditional tooling was replaced by special purpose machines and automation equipment.

Now, SMEs can connect their existing shop-floor and machines with MindSphere cloud-based open IoT platform from Siemens. This will enable feedback loops that provide crucial insights, thereby helping in the continuous optimization of products and processes and resulting in sustainable, lean practices.

The ability to respond flexibly to the rapidly changing demand provides an opportunity for Indian manufacturers. By integrating digitalization and automation, manufacturers can now quickly turn around ideas and insights into reality, simulate and validate product performance, define and refine processes to produce goods within their predefined budgets, on time and as per the customer's requirements. This is key to competitiveness and Siemens Xcelerator portfolio is helping manufacturers in India achieve it.

Q How can manufacturers optimize on technology to carry out operations amid the COVID-19 outbreak?

Much before COVID-19, companies across the global manufacturing industry have been dealing with an increased amount of complexity. They have been exponentially trying to add electronics into a product, or have been thinking of challenges like electric vehicles and autonomous vehicles.

The pandemic has had an adverse impact on everything—right from supply chains to customer demand and the need for an entirely new product line. This has made the scenario overwhelming for industries.

Accelerating the adoption of smart manufacturing and digitalization and the use of the comprehensive digital twin could redress these issues. The idea of a comprehensive digital twin can make an excellent guide to a company's digital transformation focused on business value. By matching the predictive capability of the digital simulation world with the real-world impact results in the physical world, companies can learn, decide and act faster than their competitors. Or, in this case, adapt quickly to keep up with changing external factors, like a pandemic.

Q What trends and technological changes is the manufacturing industry likely to witness in future?

Various new trends are emerging, which we are either prepared for or are getting prepared for. For starters, delivering on the promise of Industry 4.0 with new levels of automation, autonomous system behavior and new levels of efficiency. New manufacturing techniques, such as additive manufacturing, which we are trying to address across many of our products, including new levels of integration between software and hardware. Lastly, new ways of solving manufacturing challenges with cloud, IoT and distributed edge systems.

Q What are Siemens' plans for the Indian market?

We have a large software development setup in India. The country is also home to some of our strategic customers. Today, Siemens is uniquely positioned with our Xcelerator portfolio, combined with our automation tools, to support Indian companies to gear up for Industry 4.0.

Steel Development for High-Pressure Die Casting Dies with Highest Surface Requirements

Due to technical but also aesthetic reasons the surface quality of cast products, and of the die casting dies accordingly, gains more and more importance. Surface quality is directly related to the appearance of thermal shock cracks which are transferred onto the castings during the casting process. This report describes the new premium hot-work tool steel CS1 which, due to its particular combination of properties like unusually high working hardness, tempering resistance, and simultaneously high toughness offers an exceptional resistance against formation and growth of thermal shock cracks.

Thermal shock cracks as main failure cause of die casting dies

The cyclic change of heating due to contact with the melt and cooling due to the sprayed lubricant causes thermal fatigue of the die steel during the lifetime of a die and thermal shock cracks in their typical network appearance on the surface of the die (Figure 1).

By propagating into the steel but also by transferring the crack network onto the surface of the castings thermal shock cracks not only reduce the lifetime of the dies but also the surface quality of the castings. Thermal shock cracks are among the most frequent failure causes of die casting dies. Reducing spray cooling to the necessary minimum is one approach

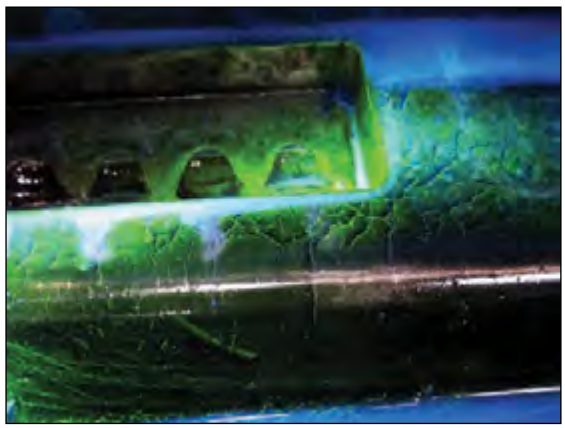


Figure 1: Thermal shock cracks on the surface of a die casting die, visualized in the magnetic particle test under UV-light

to delay the formation of such surface defects. The minimum quantity spray cooling technology is based on this idea but it requires a complete modification of the temperature control system, e.g. by installation of spot coolings directly below the working surface of the dies. These numerous drilled channels have to be considered as mechanical weakening of the die inserts. Furthermore they cannot completely avoid an increase of the general die temperature in the use of minimum spray cooling.

The resistance of a steel against thermal shock cracks mainly depends on its high-temperature strength

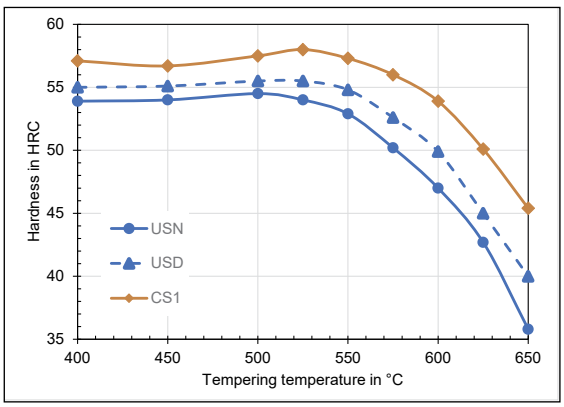
and toughness. High-temperature strength is directly related to the steel's hardness. This way an increase of hardness results in an improved high-temperature strength but simultaneously in a reduced toughness. However, more success can be expected from the development of a steel which simultaneously offers a very high high-temperature strength in combination with a high toughness.

The new premium hot-work tool steel CS1

As a Chromium-Molybdenum-Vanadium alloyed hot-work tool steel CS1 was especially developed for mechanically and thermally highly stressed tool components. The combination of a tailored alloy concept with production processes which guarantee highest cleanliness as well as an optimized heat treatment grant high hardness and at the same time a high toughness level to CS1. According to the high requirements on hot-work tool steels for die casting dies CS1 is exclusively produced by Electro-Slag-Remelting (ESR). This also corresponds to the established grades USN ESR and USD ESR which, in respect to their chemical composition, correspond to the internationally standardized hot-work tool steels 1.2343 (AISI H11) and 1.2344 (AISI H13) [1].

The presentation of the tempering behaviour (Figure 2) indicates that CS1 offers not only a significantly higher secondary hardness maximum but also a clearly improved tempering resistance compared to grades USN ESR and USD ESR. This way it offers a considerably improved protection of dies against undesired softening during operation.

Figure 2: Tempering behaviour of the steel grades



USN ESR, USD ESR, and CS1

Whereas the hardness of die casting dies made of steels like 1.2343 and 1.2344 usually ranges between 44 and 46 HRC the new grade CS1 allows working hardness up to 54 HRC, in some cases even up to 56 HRC. Also a clearly better long-time tempering resistance can be expected from CS1 which provides an improved protection against loss of hardness during the casting process. The chance to use CS1 with such a high hardness for die casting dies is derived from its high toughness potential. Figure 3 compares the toughness level of USN ESR and USD ESR with values of CS1 at the typical hardness level of die casting dies of 45 HRC. The improvement of the impact energy by 20 % is clearly visible.

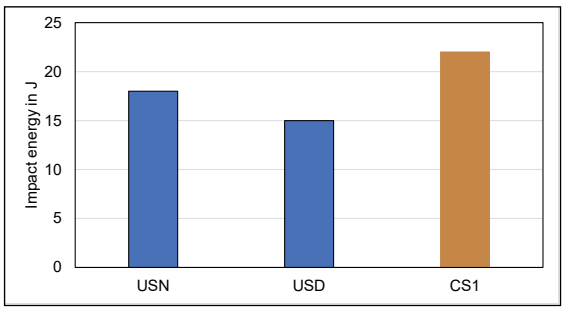
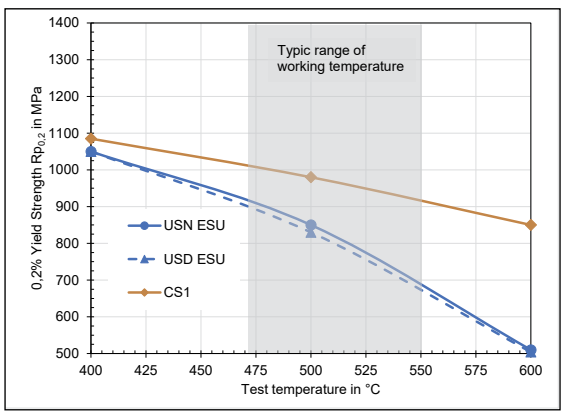


Figure 3: Comparison of toughness properties of the three grades USN ESR, USD ESR, and CS1, measured on ISO-V-notch samples taken in transverse orientation form the center of forged bars. Hardness: 45 HRC



High-temperature strength of the steel grades plays a great role in avoiding thermal shock cracks. Therefore Figure 4 compares the values of the 0,2%-Yield Strength Rp0,2 measured in tensile tests under increasing test temperature. All samples had been hardened and tempered to identical hardness of 45 HRC. While the yield strength of USN ESR and USD ESR drops in the same extent with increasing test temperature CS1 maintains a higher yield strength.

Thermal shock cracks are induced on those surfaces which are directly exposed to the melt. Marked in grey is the temperature range to which the surface of the die insert is exposed at least for a short time during each shot. Compared to the other two grades the clearly higher 0,2%-Yield Strength of CS1 contributes

significantly to avoiding thermal shock cracks. With a further increase of hardness the high-temperature strength can rise even more (figure 5).

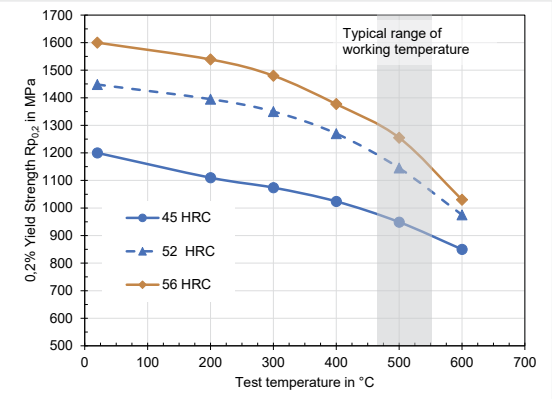


Figure 5: Influence of increasing hardness on the 0,2%-Yield Strength of CS1

Due to the high toughness potential (s. Figure 2) it is possible to harden and temper dies of CS1 to a hardness of up to 54 HRC. Of course also other geometric parameters of the die are responsible for the defined hardness. With the combination of these properties CS1 offers the precondition for die casting dies with highest resistance against thermal shock cracks as well as with highest geometric stability.

Hot-work tool steels receive their performance characteristics by hardening and tempering. Time-temperature-transformation (TTT) diagrams provide important information for appropriate hardening of tools. The comparison of corresponding diagrams of CS1 and USN highlight one great advantage of CS1 during hardening of larger dies (figure 6). Highest possible toughness of a die casting die requires a mainly martensitic transformation of the steel and consequently a fast quenching from hardening temperature. This is easy to adjust at the surface of a die. In the centre of the die the cooling rate is restricted by the thermal conductivity of the steel. Especially in the centre of large dies this leads to the risk of an at least partial bainitic transformation and a reduced toughness. In TTT-diagrams this is expressed by the position of the bainitic transformation with respect to the time axis. The direct comparison of the two diagrams demonstrates that the bainitic transformation of CS1 starts approximately 50 minutes later than of USN ESR. This allows an easy transformation of the core of a large die into martensite.

For an appropriate hardening of dies of CS1 a hardening temperature of 1030 °C and a soaking time of 60 minutes is recommended. Triple tempering is mandatory.

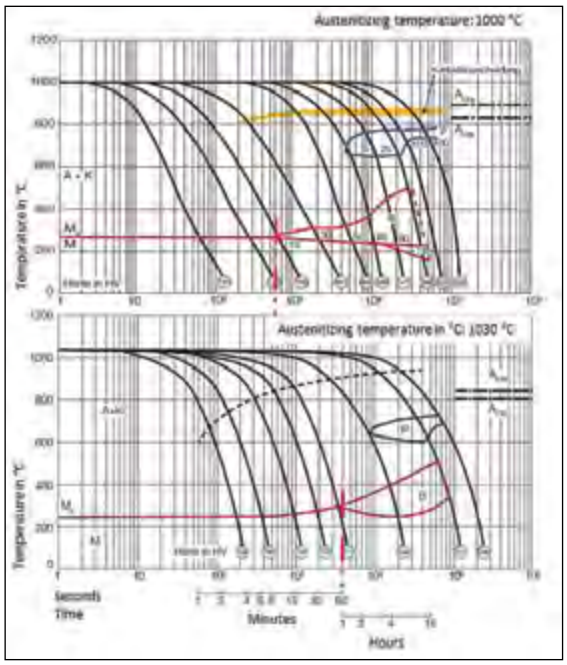


Figure 6: Comparison of TTT diagrams for hot-work tool steels USN ESR (top) and CS1 (bottom).

Note: the dotted red lines indicate the beginning of the bainitic transformation

Experience of industrial applications

The combination of the described properties is the basis of the operational performance of the steel grades in die casting operations. The following case studies describe the individual specific requirements and give an impression of the achieved casting performance.

Die cast tanks for brake fluid of motorcycles (Figure 7) are often a challenge for the dies in two aspects. On the one hand, such components are visible accessories whose aesthetic appearance is generally regarded as very important by drivers. Since even the smallest surface defects of the cast part become visible in painted or chrome-plated versions, the surface quality of the used dies must also meet the highest requirements. On the other hand, cracks in the dies in the sealing areas of such vessels very quickly endanger the functionality of the products. These high requirements were the reason why the caster had to reject the die inserts after a maximum of 3,500 shots. The use of a wide range of standard and special hot-work tool steels from various manufacturers was not able to achieve any significant increase in performance. By using CS1

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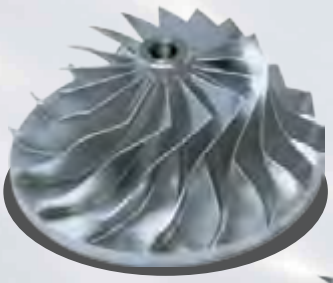

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with a hardness of 53 HRC, the caster was able to increase the output reproducibly to 13,000 shots.

Figure 7: Die cast tank for brake fluid of a motorcycle (example)

For functional reasons, very high demands are placed on the surfaces of die cast throttle bodies (figure 8). Through frequent reworking of the inserts, die inserts made of 1.2343 ESR achieved a maximum output of 90,000 shots. In the currently ongoing testing of die inserts made of CS1 with a hardness of 52 HRC, no reworking is required even after 80,000 shots.

Figure 8: Die cast throttle body (example)

To protect the electronic components installed in them, the assistance and safety systems installed in motor vehicles require housings of the highest surface quality. Corresponding demands are also made on sealing joints. Here, even the smallest surface cracks in the die endanger the functionality of the castings. The same applies to numerous telecommunications components. The housing of a storage unit shown as an example in Figure 9 must reliably meet the requirements described above. A further tightening of the quality requirements for the die steels results from cooling fins on the outside of the housing. Die inserts made of 1.2343 ESR for such a housing could not meet the strict specifications in the area of the sealing surfaces after only 5,000 shots. In the currently ongoing test with a die insert made of CS1 (hardness 53 HRC), no abnormalities were found after 7,100 shots.

Figure 9: Die cast housing of a storage unit (example)

Conclusion

The die casting industry is currently undergoing a noticeable change in its product portfolio. For technical and aesthetic reasons, the demands on the surface quality of the castings and thus also on the die inserts are becoming considerably more stringent. Further developments in process technology such as minimum quantity spraying are helping to reduce damage to the die surfaces. Such measures, however, are accompanied by a significant increase in die temperature. The newly developed premium hot-work tool steel CS1 can be used with a significantly higher working hardness. As a result, it achieves a significantly higher high-temperature strength in the range of typical working temperatures and thus improved resistance to thermal shock cracks. Since the special transformation behaviour of CS1 has a positive effect especially on the hardening of large die inserts, the use of CS1 is now also being tested for significantly larger inserts.

Author:

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References:

[1] ISO 4957:2018 Tool Steels, 2018

***Note:** Originally published in GIESSEREI 107, [2020], May/June 2020, pp. 49 - 53*

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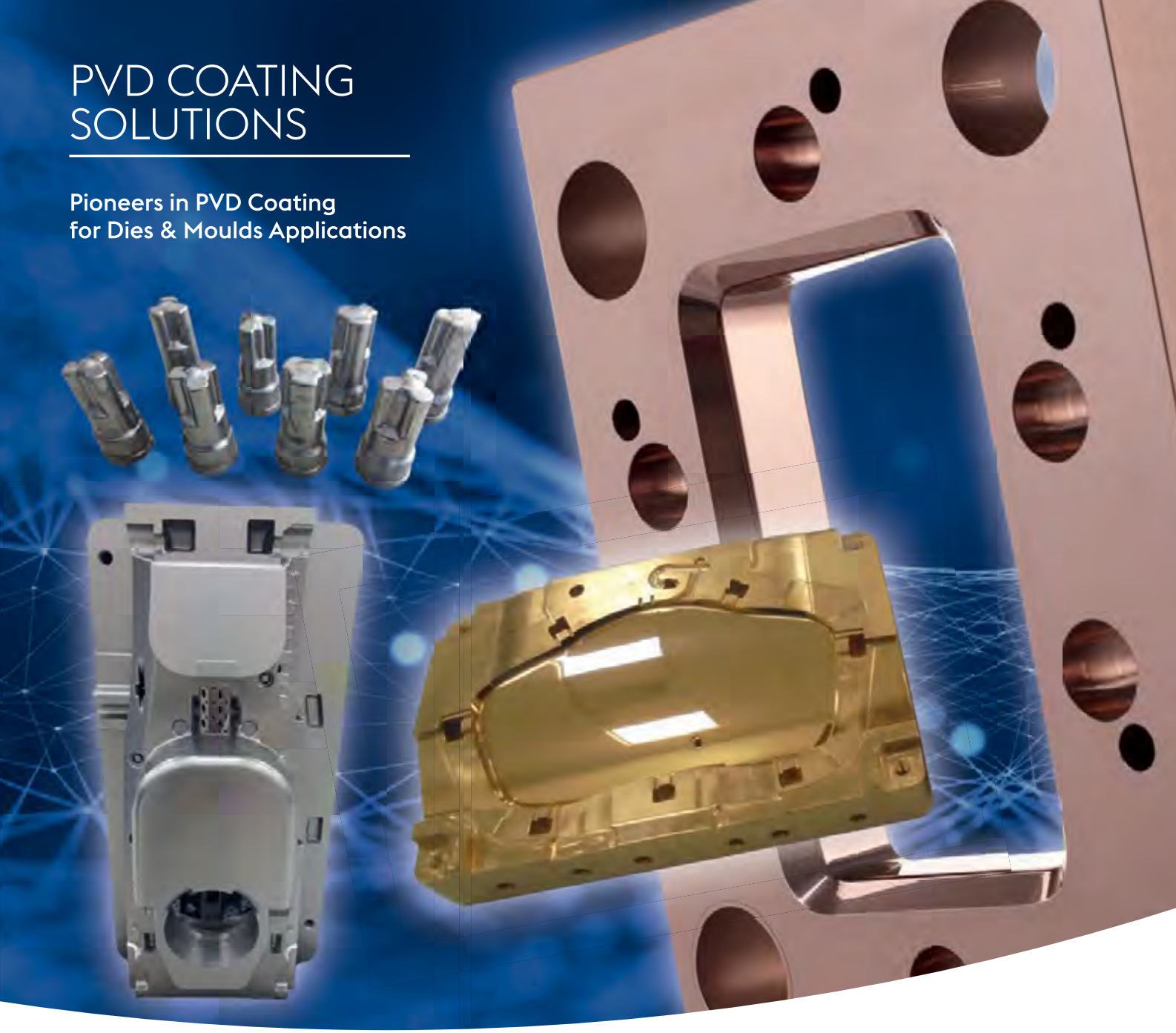

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From Die Design to Defect-Free Castings:

Shiva Tool Tech Achieves 80% Time Reduction with Altair Inspire Cast

Overview

Shiva Tool Tech is an automotive manufacturing focused, industrial powerhouse based in Pune, India. With over 25 years of experience in designing and manufacturing of gravity die casting (GDC), low-pressure die casting (LPDC), high-pressure die casting (HPDC) dies, the company supports customers at every stage—right from manufacturing process design to the production stage. Manufacturing processes include milling, drilling, hardening, grinding, Computer Numerical Control (CNC) machining, Electrical Discharge Machining (EDM), inspection and polishing to get the final assembly of the casting die.

Obtaining a Defect-free Die Design – Efficiency in the Process

At Shiva Tool Tech, casting dies are designed and manufactured for automotive and non-automotive components like brackets, crankcase, housing, cylinder heads, compressor housings, manifolds, alloy wheels, etc. with a lead time from 3 weeks to 8 weeks, depending upon the complexity of the project.

The casting die designs are developed based on years of experience for components received form their customers in the form of the computer-aided design (CAD) and or engineering drafts. Once the die for the casting is designed, it is manufactured and assembled at their facility. The die is then sent to the customer for carrying out the physical casting trial. The cast part manufactured from the new dies is sent back to Shiva Tool Tech with an inspection report and defects identified. The die design is

then modified to eliminate the defects. This entire process takes about 3-4 physical iterations to get a defect-free die design.

Realizing the value of simulation software in optimizing this design and manufacturing process to save time and money. Shiva Tool Tech began outsourcing casting simulation when needed. However, outsourcing the simulations were expensive and time consuming. In addition to paying for every iteration, the turnaround times for simulation from the service providers were long. This led them to explore options of bringing the expertise in house by investing in simulation software.

"We are happy that we invested in Altair Inspire Cast. The support provided by engineers from Altair and their partner DesignTech is excellent. We look forward to the new features and capabilities to be added to Altair Inspire Cast in future versions of the software."

Shivaji Pawar,
Managing Director, Shiva Tool Tech

They chose Altair's casting simulation software Inspire Cast. It met their requirements for ease of use, accuracy of results, speed of computational analysis, and rich visualization of results while remaining within budget considerations.

Inspire Cast in the Casting Simulation Process:

The updated process at Shiva Tool Tech now involves Inspire Cast in two phases:

- On receiving the CAD of the casting part **(Fig. 1)**, the model is taken to Inspire Cast for running simulations with a virtual gating system on the part. Once the gating location is fixed based on the desired simulation results, the shot model for the component is designed in CAD.

- The shot model is then taken to Inspire Cast for carrying out the detailed casting simulation to understand the occurring defects. The methodology is modified to reduce or eliminate defects by changing the gate size, shape and with additions of risers and chillers.

Project Details

For a recent project for the design and manufacture of casting dies for an automotive pump, the housing was to be cast with Aluminum AlSi7Mg by Tilt Pouring process with Steel HDS-H13 as the mold material. Engineers imported the pump housing model in Inspire Cast to evaluate an appropriate gating location. Using the Inspire Cast tilt pouring template, the process parameters were fed in to run the simulations.

From the solidification results obtained, bulk porosity was observed at the top and minor porosities were observed near the bottom **(Fig. 2)**. The bulk porosity at the top could be eliminated by using an appropriate runner for the gating system. Accordingly, the shot model **(Fig. 3)** was prepared in CAD, and it was again taken to Inspire Cast for carrying out a detailed simulation. The bulk porosity

Fig. 1: Pump housing CAD model – gating at top

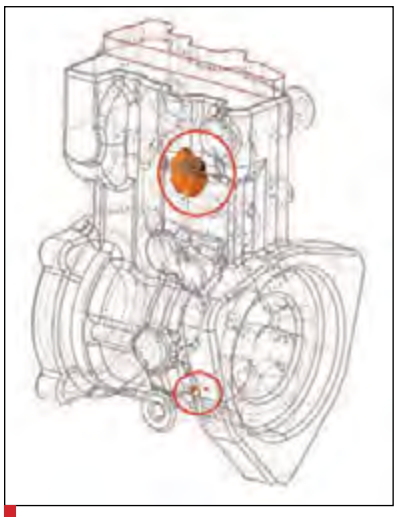

Fig. 2: Macro Porosity Marked

Fig. 3: Shot model with ingate

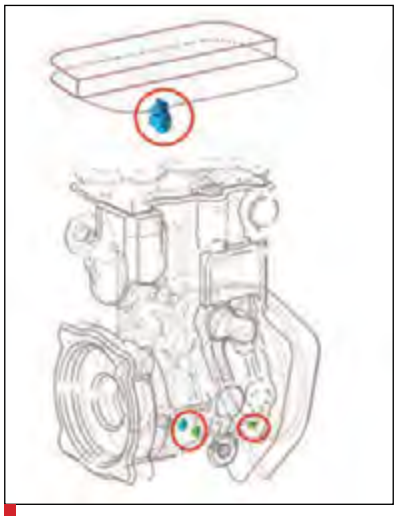
Fig. 4: Macro porosity


Fig. 5: Liquid fraction


Fig. 6: Shot model including chillers

observed earlier shifted to the runner, but the porosity near the bolting location still remained **(Fig. 4)**.

Based on filling results, the liquid fraction animation in Inspire Cast showed the last regions to solidify. It was observed that the bottom bolting location had a slower solidification rate due to the intricate mold cavity geometry. This reflected the reasons for the porosity, obtained after complete solidification of the part **(Fig. 5)**.

It was decided that a second iteration be carried out by adding chillers near the affected bottom bolting location to speed up solidification, keeping the same process parameters. An external chill was placed near the bolting location **(Fig. 6)**.

The liquid fraction plot demonstrated that the solidification occurred evenly at the bolting location **(Fig. 7)**, and the porosities were completely eliminated from the casting component during this phase **(Fig. 8)**. The design of the die was finalized and sent for manufacturing.

The complete die assembly after manufacturing was sent to the customer for carrying out the casting of the pump housing. The prototype of the component **(Fig. 9)** was sent back to Shiva Tool Tech for performing the inspection and the part was found to be defect-free.


Fig. 7: Liquid fraction

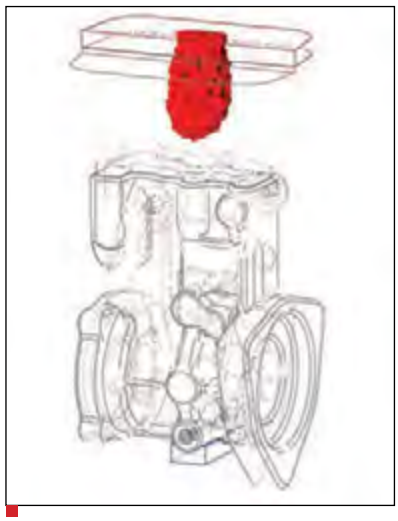
Fig. 8: Macro porosity


Fig. 9: Prototype component

Summary

- 3 iterations were carried on Inspire Cast to finalize the methodology of the pump housing
- It took 2 days altogether to finalize the methodology
- It took about 45 minutes per iteration to get the simulation results in Inspire Cast
- Time saved was 80% over traditional physical trails.

Product Update

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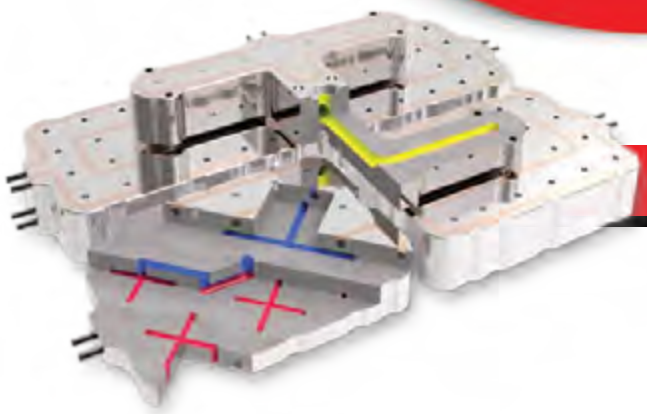

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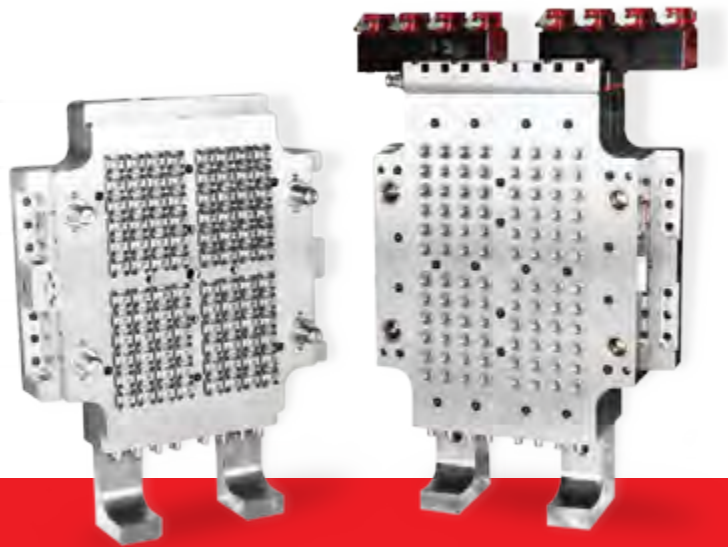

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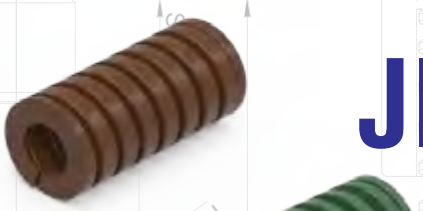

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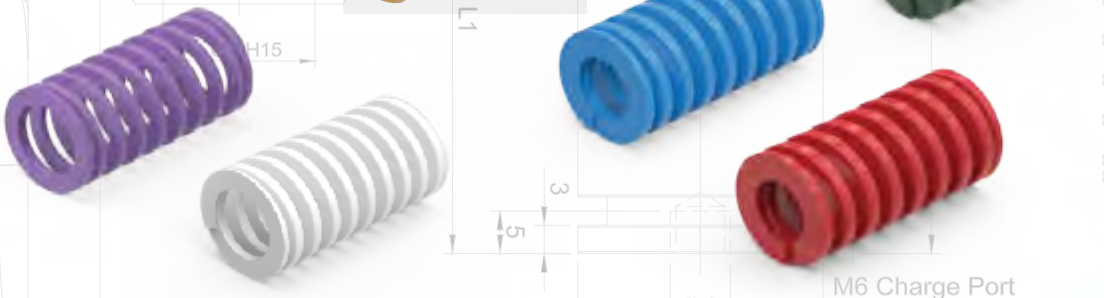

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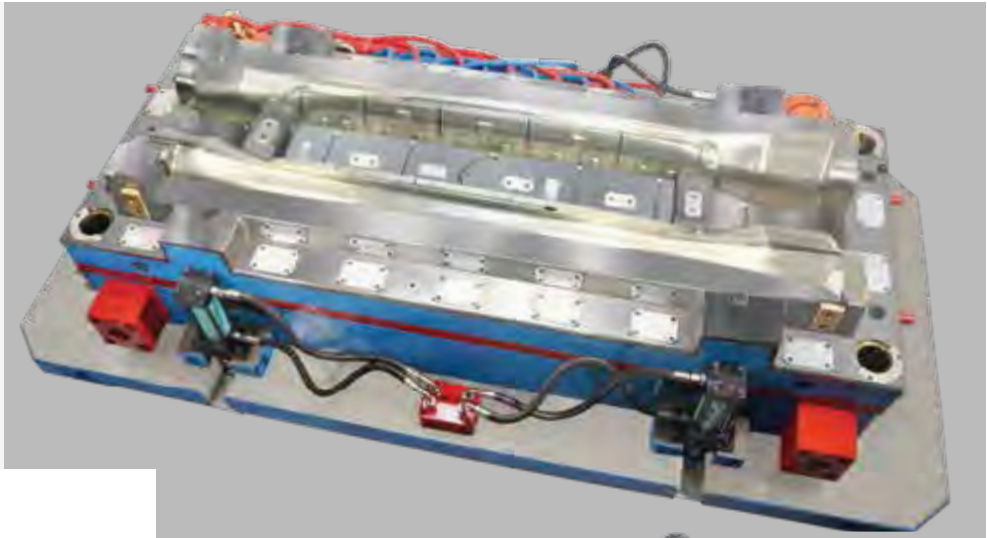

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