

INDUSTRY



A&D - Interview

Sagar Bhosale,
Managing Director,
Schmersal India

(p. 16)



A&D - Interview

Michael Ambros,
Managing Director,
Schmersal Germany

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Batch Manufacturing P. 18

Predictive Maintenance P. 22

Safety & Integration P. 26

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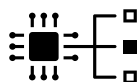
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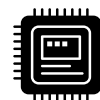
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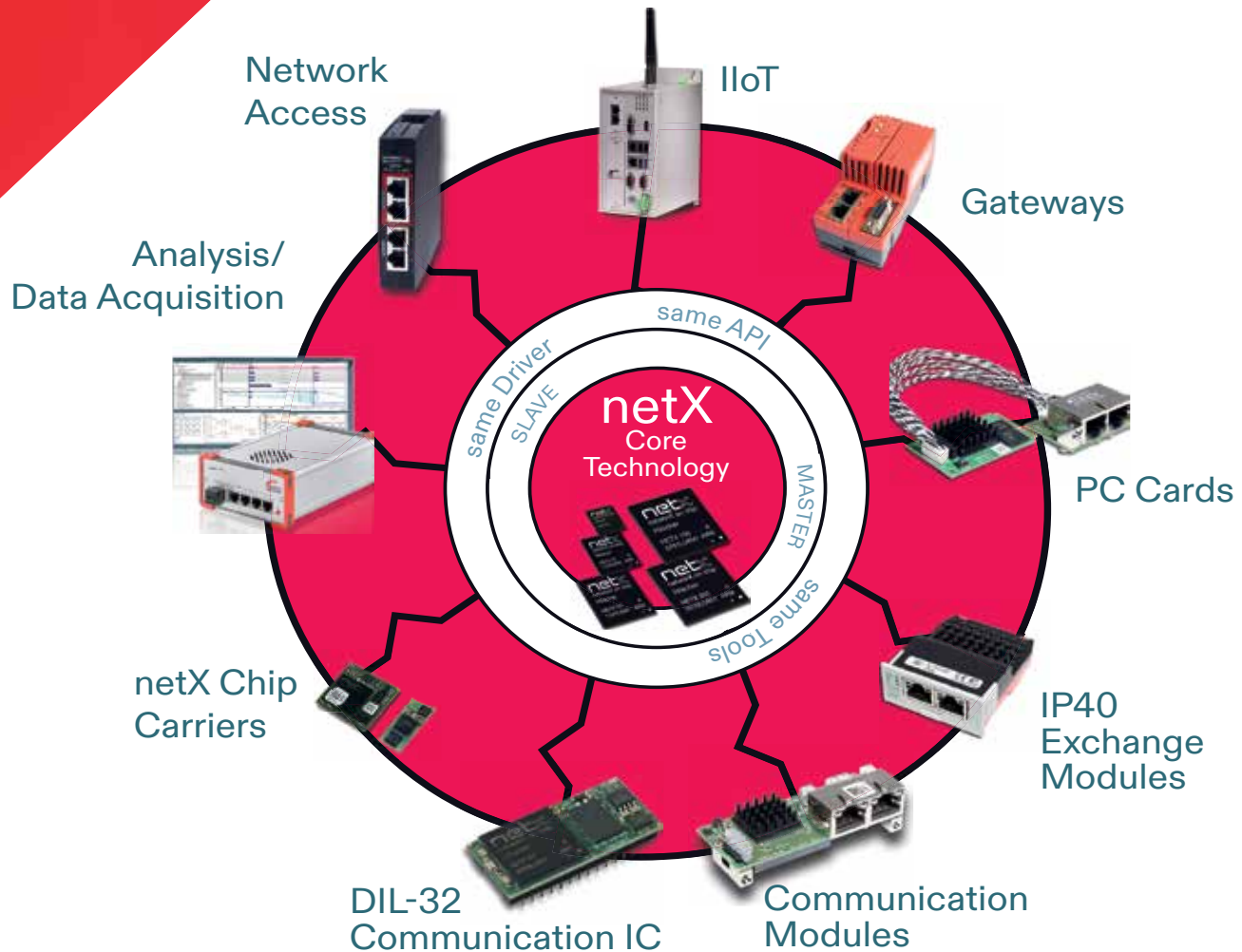
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*"India at the cusp
of new-age
technologies"*



Driving future momentum

Narendra Modi, Prime Minister, India once said, "Disruptive technologies will have a deep impact on the way we live and work." Reflecting the same, as we come to the end of 2022, we have witnessed how India has become the hotspot of digitalisation and automation practises across several sectors.

With the development of technological breakthroughs, the Indian industry has started using industrial automation that improves efficiency and quality of output while maintaining consistency throughout the micro and macro level processes across industries. This is also at par with companies' long-term transformations and changing digital business objectives. The very concept of 'Industry 5.0' proposes to resolve some serious issues that have been unintended outcomes of industrial development.

Today, India stands at the cusp of new-age technologies. On these lines, our Cover Story talks about the concept of 'Industry 5.0', which has come to the forefront of global discussions. It is an interesting time where we see how this new era of development can be made more socially sensitive and environmentally responsible.

As we wrap up 2022, we would like to thank all our customers and partners for their continued support and contributions. Together with you, we could decode the latest practises used in several industries today – from predictive maintenance to executing safety codes in factories, from condition monitoring to batch manufacturing in practice.

Considering such developments, A&D India will continue capturing and circulating the right information, facilitating manufacturing enterprises, identifying and applying new technology adoption strategies to move their businesses forward towards a brighter future.

Team A&D India

“ We are grateful and much obliged on the supportive feedback/suggestions our readers are pouring on us from last few months. We have been carefully and attentively going through each and every suggestion and have already started the ball rolling on some of the area's like

- Strengthening our editorial content
- Adding new columns
- Improved and customer friendly website which will be focussed on local Indian continent
- Dedicated space for Indian customer's on business promotion related activities
- Highly successful event IAMS in Dec 2022 for industry leader views on the industry

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Cover image courtesy: Shutterstock

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Honeywell Regreen excel deploys PlantCruise solutions

Honeywell has announced that Regreen Excel EPC India has deployed Honeywell's PlantCruise by Experion DCS solution, modular systems, and field instruments (FI) across its 40 plants in India. The installation will maximise production uptime, improve safety reliability and efficiency for its ethanol manufacturing distillery operations. PlantCruise Experion® Process Knowledge System (PKS) technology is designed to efficiently meet the control system needs of various industrial applications. The technology helps to maximise users' production uptime, improve safety, reliability, and efficiency, and reduce investments and operating costs. Explaining about the system, Ashish Gaikwad, VP & GM, Honeywell Process Solutions India, said, "Our partnership with Regreen and Ditap-v Automation is a testimony of our technology prowess, working hand-in-hand with local partners, and our commitment to drive sustainable solutions that will have a positive impact in decarbonising our customer's production process."

Avaali Solutions achieves ISO 27001:2013 security standard certification

Avaali Solutions recently announced that it has achieved certification against the ISO 27001:2013 standard for its Information Security Management System (ISMS). The certification underscores Avaali's commitment to safeguarding customer data by providing secure, compliant solutions. ISO 27001:2013 is an internationally recognised standard that specifies requirements for an information security management system (ISMS). The ISO 27001:2013 standard provides guidance on establishing an ISMS as well as on managing risk related to Information Security. It was developed by the International Organisation for Standardisation (ISO) and is based on best practises from around the world. Sharing her views on achieving certification, Srividya Kannan, CEO, Avaali Solutions, explained, "This certification underscores our dedication to providing world-class source-to-pay and shared service solutions that meet the highest standards in information security." The certification demonstrates the organisation's strong commitment to the ongoing maintenance and development of its Information Security Management System (ISMS), making information security and data protection an integral part of all its business processes and practices.

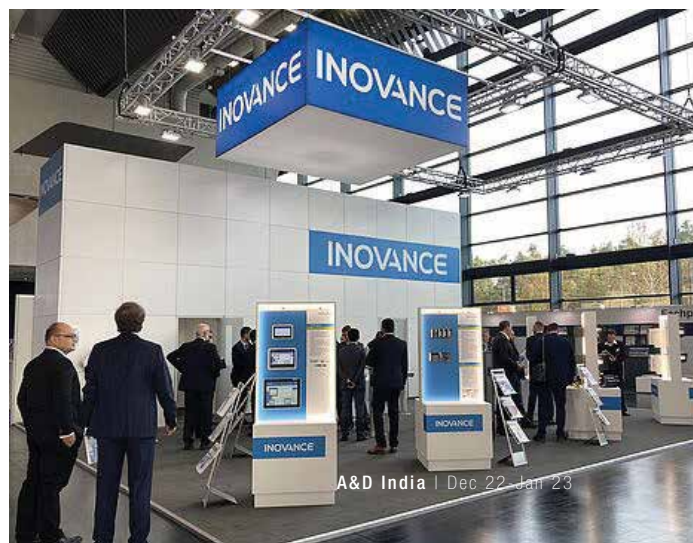


B&R showcased AI-enhanced machine vision camera

B&R Industrial Automation is enhancing its smart camera portfolio with deep learning functionality. The camera is a three-way collaboration with MVTec and Hailo. At the SPS trade show in Nuremberg, the companies celebrated the first function to come from their joint project. Machine vision algorithms based on deep learning are opening up exciting new ways to improve quality, boost productivity, and prevent waste while making manufacturing more flexible. During the trade show, Andreas Waldl, Machine Vision Expert, B&R Industrial Automation, mentioned, "Our collaboration with MVTec gives machine builders access to the best selection of the best performing vision functions around. They're an industry leader in both deep learning and classic rule-based algorithms – two complemented approaches that each play an essential role in machine automation." The first product to emerge from the project is a deep-learning-based optical character recognition (OCR) function. The Deep OCR achieves remarkably fast read rates, even on fonts that are other-wise difficult to recognise. Today's machine builders need not just computing speed but also power efficiency.

Inovance launches PLC & servo at Nuremberg's SPS show

Inovance Technology Europe recently launched four new products for the European market, which include the high performance Easy Series PLC, the GL20 I/O modules, the AC703 IPC motion controllers, and the SV670 servo series. The company also re-presented the MD800 compact AC drive, which has never before been seen at the SPS show, and gave an advanced preview of the SV680 servo drive. The launch was held at a press conference at SPS. At the event, the company also reported rapid growth, both globally and in Europe, revealing that global sales have hit \$3 billion. During the event, David Bedford Gaus, Strategic Marketing Manager, AC drives and servos, Inovance Technology Europe, said, "With the resources of a \$3 billion global corporation behind us, we are investing heavily in Europe for growth. In 2021, we invested 9.4% of revenues, and fully 20% of our global headcount, into R&D. Our product range includes: LV and MV AC drives, servos, motion control, PLCs, HMIs, CNCs, and 6 axes and SCARA robots."



OMRON to continue its strong focus towards Indian packaging machine makers

OMRON Automation aims to enable the manufacturers to prepare for and take maximum advantage of the rapid shift in automation that the packaging sector is witnessing over the last few years with the right technologies and capabilities. During the showcase of the company's integrated packaging solutions at PackMach Asia, held from December 7-9, 2022, in Mumbai, Sameer Gandhi, MD, OMRON Automation India, shared, "There is a rise in demand for better quality, hygienic, zero-touch, and eco-friendly packaging. India is emerging as a preferred global destination for packing machinery importers. All this makes machine manufacturers look up to global standards by aiming for high-end performance and completely integrated and scalable solutions. We aim to enhance our reach amongst vertical and horizontal form fill and seal (HFFS & VFFS) machine makers catering to food and commodity, pharmaceutical, and FMCG markets."



Infosys to digitise and automate processes at Envision AESC's

Infosys recently announced a strategic collaboration with Envision AESC. With this association, Infosys will develop a cloud-based platform to digitise and automate manual processes at Envision AESC's Electric Vehicle (EV) battery manufacturing plants. The cloud-based platform seeks to digitise key processes that require a high level of human intervention. In the long-term, the cloud-based platform aims to improve productivity, enhance end-to-end visibility, and simplify quality monitoring through data-driven reporting and analytics tools. This new cloud-based platform, co-developed by Infosys and Envision AESC, leverages AWS Cloud components of Infosys Cobalt, a set of services, solutions, and platforms for enterprises to accelerate their cloud journey. Speaking about the cloud-based platform, Jasmeet Singh, Executive VP & Global Head - Manufacturing, Infosys, said, "As e-mobility continues to transform the automotive landscape, building a strong digital core in the cloud is a business imperative. We are delighted that in collaboration with Infosys, Envision AESC will be taking a cloud-first approach to digitise operations in its EV battery manufacturing plants."

Renishaw expands its reach with new technology centre in India

Renishaw recently opened a new technology centre in Bengaluru, India. The new facility commenced on December 7, 2022, with the aim of providing its customers with access to demonstrations of Renishaw's solutions for metrology, and material analysis. After experiencing growing demand in the Indian markets, the company made the decision to move to a new 12,000 square foot facility that houses its technical, operations, sales, and marketing teams, warehouse, and technology centre. Those attending the inauguration included William Lee, CEO, Renishaw; Andy Buttrey, President, Renishaw APAC and Gallagher, VP & MD, Renishaw APAC. Other guests included P Ramadas, MD, Ace Manufacturing Systems, and Past President, Indian Machine Tool Manufacturer's Association, along with more than 30 CEOs, Managing Directors, and Vice Presidents from renowned manufacturing companies operating in India. On this occasion, Paul Weaver, Director of Sales & Marketing, Renishaw Metrology Systems, said, "Last year, India rose to number two in the Global Manufacturing Index, showing how the market is growing in the region."



Mitsubishi Electric India signs MoU with IIT Madras Research Park

Mitsubishi Electric India Power Semiconductors has entered into a Memorandum of Understanding (MoU) with IIT Madras Research Park to support the programmes conducted by the institute for the research and development of sustainable technologies. Addressing the occasion of the MoU signing, Hitesh Bhardwaj, GM, Semiconductor and Devices division, Mitsubishi Electric India, said, "Our power semiconductor technology holds a prominent position in the global market. We envision bringing technological development to India, which is achievable through this initiative of educating the youth and helping them get familiar with the new advancements." On this collaboration, Ashok Jhunjunwala, Institute Professor & President, IIT Madras Research Park and IITM Incubation Cell, stated, "Make in India requires design in India. Our partnership with Mitsubishi Electric India allows us to move towards this larger goal. Our products need to be developed through the best manufacturing process and have superior quality, while still being low cost."





“The world sees India as the next manufacturing hub”

...states, **Aditi Patil**, Partner & Director, AAPS Technosys. In a tete-a-tete with Neha Basudkar Ghate, she highlights that the Indian manufacturing and automation industry has already adopted the digital market and has an opportunity to become a global supplier. Excerpts...

How do you see level of adoption of advanced automation technologies in Indian industry?

Our manufacturing has shown tremendous Year over Year (YoY) growth, even though it caters to the domestic market. The world is looking for alternatives to Chinese manufacturing. Indian manufacturing has great potential to grab this opportunity to become a global supplier. With global exposure, top management has already initiated steps for smart manufacturing. About 25% of manufacturing has implemented plans for advanced automation technologies, and the rest is following up.

What is the role of digital transformation when it comes to smart manufacturing factories?

Digital transformation has different dimensions depending on the application. The Indian manufacturing industry is rapidly adopting highly automated shop floors. Factories have control systems for shop floors and ERP for business functions. Today's shop floors are complex and continually varying environments. The schedule needs to account for a level of variation that is typically beyond the scope of ERP. Shop floors have different challenges like machine breakdowns, worker absenteeism, cleaning, maintenance scheduling, availability of inventory, transport issues, changing set up times, alternative work plans, and quality problems. MES systems, for example, lay the groundwork for manufacturing digitisation. Currently, digitisation is limited to the shop floor, supply chain, and after-sales service. However, the future will see more digitisation of the customer experience during the purchasing process. Connectivity, data, sensors, a control system, a data management platform, and cloud storage will be at the core of digitisation.

Can you share a few success stories where tailor-made cost-effective automation solutions were implemented?

There are many. Few of them to mention here are production monitoring system for an electronic component manufacturer, Centralised Data Acquisition System (CDAS) with batch analytics and PLC HMI upgradation in line with 21CFR for a pharma customer, process automation for a chemical manufacturer, automated backup & disaster recovery for various automotive, paint and pharma customer, line traceability system, utility monitoring system, IT OT integration for MES & smart factory and robotics and pick & place systems for various automotive customers, STP ETP WTP plant automation for various clients, fuel farm automation for aviation industry, lube blending automation and asphalt drum plant automation for other industries.

When it comes to future expansion in the Indian market, what are your plans?

We are a customer centric company, and our approach is very flexible towards customers. We have always been upgrading our products and solutions portfolio to cater customer requirements. Our focus is to address customer pain area and give right sized solution based on various technologies. We now have all the solutions to cater advanced automation requirement of industry. We have expanded our expertise in robotics specifically cobots, Artificial Intelligence and Machine Learning (AIML), vision inspection systems and industrial cybersecurity. We have pan India customers and will continue to focus next two years this domestic market only.



“Addressing indigenisation of machine components”

Saurabh Chatterjee, Founder & CEO, Vashishtha Research in an interview with Neha Basudkar Ghate, talks about his startup that developed out of his experience with the limitations of depending on foreign technology in the Indian space industry at ISRO. Excerpts from the interview...

Looking back, how has your journey been with Vashishtha Research?

It has been a fantastic journey with many ups and downs. We learned about the entire landscape of India's machine development ecosystem, the aerospace, and composite manufacturing industries, startup activities such as pitching, fund-raising, and winning startup competitions, and business activities, such as getting contracts, making sales, and delivering products to customers.

How do you define 'Indigenous Manufacturing'? How does this contribute to the overall manufacturing landscape of the Indian industry?

The manufacturing industry in India suffers from a lack of quality, consistency, and an over-reliance on imported products, especially in the areas of machinery, instrumentation, and scientific/engineering software. Our reliance on foreign technologies causes issues in terms of spares and maintenance and limits our creativity as we are not able to modify the products made by other countries' companies. Indigenous manufacturing, in my opinion, is a manufacturing process that is not simply carried out on Indian soil but is based on manufacturing technology, machinery, and software developed by an industrial R&D base located primarily within India.

What has been the most memorable achievement for you in this venture so far?

The most memorable achievement for me was winning the DRDO Dare to Dream award for the first time and being recognised by the Defence Minister and other top officials. It was a signal that the country is ready for some serious R&D activity and that we aspire to be more than just a user of imported foreign products.

Can you share some insights on the company's development in composite manufacturing technologies across the aerospace and automotive industry?

The composites industry in India is very underdeveloped in comparison to advanced countries. Hence, the supporting inspection and manufacturing technologies in this field are also mostly imported. However, this is quickly changing, and more manufacturers are willing to move into composites to develop composite products that are more lightweight and corrosion-resistant. Carbon fibre, which was once associated only with exotic space-grade products, is now becoming more commonplace in our daily lives for making drones, sports goods, etc.

Filament winding comprises 10-15% of the composites manufacturing industry and is used for fuel tanks, pressure vessels, pipes, rollers, rocket motors, etc. It is a dual-use technology, that finds applications in the aerospace as well as commercial sectors.

What are your strategic plans for 2023?

Our strategic plans for 2023 are two-fold. First, we will be making good progress on the government research contracts that we already have. Secondly, we will be expanding our filament winding business in the government, private sector, and export markets. We have already received an export order from a research institute in Spain, and more are in the pipeline.

Unravelling Industry 5.0 for sustainable development

INDUSTRY



IMAGE COURTESY: shutterstock

As human civilisation moves faster towards every further milestone in development, the very concept of development also seems to change. While the wheel of economy essentially drives development and vice versa, the concept of Industry 5.0 has come to the forefront of the global discussion. Industry 5.0, the enhanced version, harnesses cobots and the bioeconomy to strike a fine balance between people, the planet, and profit. The Cover Story explains how this new era of development can be made more socially sensitive and environmentally responsible.



Dr Ravindra Utgikar,
Vice President- Corporate
Strategy & Marketing,
Praj Industries

Automation, electronics, and computer technology have played a vital role when it comes to Industrial Revolution



People, profit, and the planet are called the three pillars of development. Only a fine balance between all three can ensure consistent and sustainable development. Any imbalance could cause serious harm. Unfortunately, we have not been able to accomplish this, especially because of the enormous momentum of industrialisation. According to the report presented by the Inter-Governmental Panel on Climate Change (IPCC) in 2013-14, the average carbon emission in the pre-industrial era, that is, during 1750–1800, was 278 ppm. In 2021, it was 417 ppm, an increase of more than 50%!

Revisiting Industrial Revolution

The industrial era started with James Watt's invention of the steam engine in 1870 and the power loom, which later came to be known as Industry 1.0. What began as the famous Industrial Revolution, about a century later, in 1880, evolved into mass production and assembly lines where electricity replaced steam. This is referred to as the second wave of industrialisation Industry 2.0.

A century later, around the year 1969, the wave of electronics and computers emerged, and the use of Programmable Logic Control (PLC) further transformed the manufacturing sector. Automation, electronics, and computer technology took centre stage. This wave is referred to as Industry 3.0, another paradigm-shifting event.

While India had just about become comfortable with assimilating these, later around the years 2011–13, the next great transformational wave emerged. A wave that relied on each of the previous three and yet surpassed them entirely and ushered in the fourth dazzling epoch. This wave, now ubiquitously called Industry 4.0, has at its heart a Cyber-

Physical System (CPS), ie, a self-controlling autonomous framework that connects the cyber and physical worlds.

It is important to note that while Industry 1.0 to Industry 3.0 took about 100 years to evolve at each stage, Industry 4.0 emerged within just 40 years of Industry 3.0! It is also worth noting that the rate of proliferation of Industry 4.0 is exponential when compared to previous waves.

Society 5.0: Social Revolution

Interestingly, social development, just like industrial development, is said to be on the threshold of the 5.0 stage. The four earlier phases were, the Hunting Society (Society 1.0), The Agricultural Society (Society 2.0), The Industrial Society (Society 3.0), and the Information Society (Society 4.0). Society 5.0, also called the 'super-smart society', envisions a sustainable, inclusive socio-economic system, powered by digital technologies such as Big Data analytics, Artificial Intelligence (AI), the Internet of Things, and robotics. The CPS, in which cyberspace and physical space are tightly integrated, becomes a pervasive technological mode supporting Society 5.0. The 5th era is conceived as the 'smart' age.

Downside of Industrial Revolution

Undoubtedly, all these industry revolutions have immensely contributed to poverty eradication, mortality reduction, the progress of mankind's GDP growth, and so on. However, in hindsight, the incessant pursuit of growth and development has come at the expense of the environment. Uncontrolled carbon emissions from industry & transportation



Cobots are cost-effective, safe and offer several benefits

powered by fossil-based energy have been contributing to global warming and climate change. Massive deforestation for infrastructure and mining to extract fossil resources are wreaking havoc on planet Earth and its ecology.

Increasing automation is threatening to leave many individuals without jobs that pay a subsistence wage. Jobs involving more routine tasks, such as those in manufacturing, transportation, office administration, and food preparation, are the most vulnerable. If the situation assumes greater proportions, we may have civil unrest in the world, once again jeopardising social health. The widening chasm between the haves and have nots, or the rural and urban citizenry, for instance. The gap needs to be bridged.

To effectively address this scenario, measures like Universal Basic Income (UBI) and a robot tax are being envisioned. UBI will help all those who are left behind by this economic transformation avoid poverty. A robot tax is a legislative strategy to disincentivise the replacement of workers by machines and bolster the social safety net for those who are displaced.

Industry 5.0: Next frontier of Industry Evolution

The very concept of Industry 5.0 is mooted to resolve some of these serious issues that have been unintended outcomes of industrial development. This may be our best bet, as it is the only model that can accomplish industrial development and social development in tandem. It is important to note that this transformation from Industry 4.0 to Industry 5.0 has taken place within just 10 years! Two versions have emerged.

Industry 5.0 is expected to revolutionise the production process with higher autonomy for collaborative robots. It will also bring more creativity and innovation to the products by allowing robots to perform repetitive tasks. It is expected that humans optimally utilise their creative and intellectual capabilities. Thanks to fast progress in manufacturing techniques and production system digitisation, the sector today is moving from mass production to custom manufacturing.

Cobots

The first version (V1) of Industry 5.0 discusses human-robot co-working, also popularly known as cobots. The term itself implies congruence in society and technological development. In this version, humans will perform creative and transformational tasks, while robots will perform transactional and repetitive tasks. As a part of Industry 4.0, robots are functioning in the industrial environment for automation and in-service environment for domestic and professional use. Cobot applications contrast with traditional industrial robot applications, in which robots are isolated from human contact.

It all started with service robots known as cobots because they were designed to work alongside humans. However, recently, the concept has been extended to the industrial environment as well. Here, instead of the dreaded human-robot conflict, coexistence and cooperation are envisaged. In the coexistence mode, humans and robots work alongside each other without a fence, but with no shared workspace. Whereas in sequential, collaboration, humans and robots are



Bioeconomy is based on the core principle of sustainability

active in a shared workspace, but their motions are sequential, ie, they do not work on a part at the same time.

Cobots are cost-effective, safe and offer several benefits that include among other following:

1. **Compact:** Being small, compact robots, cobots can therefore be used almost anywhere in a production process without taking up too much space.
2. **Ease of installing and programming:** A cobot is easy to install by anyone and simple to program. With handy apps and software for smartphones and desktops, a cobot is operational in no time.
3. **Flexible:** A cobot can easily learn new operations and is, therefore, able to work in different places in the production process.
4. **Mobile:** Cobots are not heavy and easy to move around. Mounted on a mobile workbench, they can easily perform new tasks at different locations within a company.
5. **Consistent and precise:** Cobots always perform actions in the same way and with the same force. This ensures equal quality and accurately placed parts.
6. **Positive effect on employees:** Employees are spared monotonous or dangerous actions and are enabled to develop themselves by doing more creative work.
7. **Reduction of production costs:** Through the use of cobots, processes are streamlined and production goes up. Ultimately, this leads to a better bottom line.

Bioeconomy

The second version (V2) of Industry 5.0 elaborates on the

bioeconomy approach that smartly uses biological resources for industrial purposes and helps achieve a balance between ecology, industry, and the economy. It helps address important aspects of eco-friendly energy, sustainable materials, and industrial waste management, that were not even contemplated in the scheme of things hitherto.

Bioeconomy is based on the core principle of sustainability, what comes from the soil goes back into the soil in a classical 'Cradle-to-Grave' cycle. Carbohydrate-based goods and products are low-carbon and biodegradable; even agri-waste streams can be processed to produce organic manure. Biobased products have applications across diverse industry segments, eg, construction, packaging, chemicals, fertilisers, pharmaceuticals, etc. In fact, with rising awareness about - Environment, Society, and Governance (ESG) norms, more and more companies are actively exploring bio-based solutions for their needs.

Bioeconomy itself is a very vast topic, and if we take a closer look at industrial biotechnology, biomobility and bioprism have emerged as mainstays. The bedrock of industrial biotech remains well-oiled expertise in managing feedstock, technology, and products.

The transportation industry based on fossil fuel-based internal combustion engines is one of the fastest growing sectors worldwide, including India. Undoubtedly, it has a pivotal role in accelerating economic development by interlinking generation and consumption ends. At the same time, it is also identified, after industry, as the second largest consumer of energy and GHG emitter.

Sustainable decarbonisation of the ICE-based



Artificial Intelligence algorithms help to make smart decisions

transportation sector by reconfiguring mobility is a dire need of the hour. While the Bio-Mobility™ platform of technologies envisions the use of bio-based feedstock and organic waste to produce low-carbon renewable transportation fuels for all modes of mobility, including surface, air, and marine, sustainable development necessitates mitigation of the enormous carbon emissions, and the concept of bio-mobility aids that.

Expertise in processing diverse bio-based feedstock by developing and deploying advanced bio-chemical technology to produce biofuels and bio-chemicals & materials is the foundation of modern-day industrial biotechnology. Bio-based feedstock can be divided into four categories: sugary, starchy, lignocellulosic, and industrial waste. Using advanced biochemical technology, processes that undergo rigorous development and trials on 'Flask – Bench – Pilot – Demonstration' scale en route to commercialisation. As a result, we have low-carbon biofuels in liquid and gaseous form, as well as renewable chemicals and materials.

Bioeconomy has a positive social, economic and environmental impact on a nation's growth endeavors. It helps combat the evils of climate change through sustainable decarbonisation and carbon recycling, helping curb Green House Gases emissions. Bio-processing plants are typically located in the proximity of farms in rural areas, thereby, creating employment and entrepreneurship opportunities for youth in the farming community.

Industry 5.0 perspectives

Industry 5.0 enablers include Big Data and the Internet

of Things (IoT), as well as sensor-equipped machines, to secure a deep understanding of the subject. Artificial Intelligence algorithms allow for making smart decisions. Deploying cobots ensures quality, precision, and productivity with higher customisation. Industry 5.0 generates new kinds of job opportunities such as creative and innovative thinking, technology interface, managing cobots, creating artificial algorithms, and many more, while Industry 5.0 offers some distinct opportunities, it also comes with a set of challenges.

Opportunities of Industry 5.0

1. Highly automated manufacturing systems provide greater opportunities for customisation to customers.
2. Optimisation of human efficiency by unleashing greater opportunities for creative people to come and work.
3. Machines are versatile according to employee needs to create a high-level output.
4. Deeper operator engagement in the planning – enhanced efficiency.
5. Liberty of 'design to function' and allows more tailor-made and personal products.
6. Feeding real-time market data enables sharper and better manufacturing practices.
7. Increased safety at the workplace, cobots take up dangerous works.
8. Increased customer satisfaction and loyalty due to more personalised products and services.
9. Positively impacts profit and market share due to

The enhanced version of Industry 5.0 blends the unique benefits of advancements in digital technologies and the bioeconomy



- increased customer loyalty and new customer acquisition based on referral.
- 10. Increased human-machine interaction expands the platform for research & development.
- 11. Quality services can be provided at the remote locations.

- 8. Business strategies in industry 5.0 demands a higher level of dynamism to sustain competition due to differential customer preferences.

Challenges of Industry 5.0

1. Increased work polarisation; extremely trained and qualified; low-paid and unqualified employees. This may alleviate the skilled and unskilled divide in society.
2. Skill development is a massive undertaking that includes training the workforce, implementing advanced and cutting-edge technologies, and inducing behavioural change in interactions.
3. Smart manufacturing systems necessitate greater autonomy deviations from existing systems, such as integrated decision-making.
4. There is an increased cybersecurity threat due to its increased connectivity and use of standard communications protocols.
5. Demands a huge amount of investment to fully implement all its pillars, which is difficult for the industry and especially the SMEs and start-ups to adopt.
6. Due to the high amount of automation presence, challenging to fix accountability.
7. Due to mass personalisation, business strategy will be focusing more on customer-centric operations. Customer subjectivity changes over time and it is difficult to change business strategies and business models frequently.

Profits, planet and people

The enhanced version of Industry 5.0, builds on the merits of both versions of Industry 5.0 as well as Society 5.0 since it blends the unique benefits of advancements in digital technologies and the bioeconomy.

Industry 5.0 can bring about positive change in society, the economy, as well as environment. This development aims to make humanity smart and reliant on technology, while at the same time making conscious lifestyle choices that are in harmony with the environment. It is socio-centric as it has tremendous potential for employment generation in rural areas, as well as for rural enterprise and mitigating the damaging impact of pollution on health. It can bridge the gap between internal demand and supply, fuel the rural economy, and generate foreign exchange for the nation. Besides, it is intrinsically geared to alleviate climate change and accomplish the goals for sustainable development as stated by the UN.

Industry 5.0 enhanced version, thus, presents a delicate equilibrium between the proverbial “Profits, Planet, and People” trio, with a special emphasis on inclusiveness. The threat of climate change is real, and the time for sustainable climate action is NOW! Industry 5.0 is the enhanced version that positively impacts the environment, economy, and society. It is just the right recipe for ensuring sustainable development. □

“India as compared to other countries is ahead when it comes to digital transformation”

...states **Michael Ambros**, Managing Director, Schmersal Germany, and **Sagar Bhosale**, Managing Director, Schmersal India. In an interaction with Sanjay Jadhav, they throw light on various aspects of machine safety and solutions and highlight how the company has been evolving to meet the changing requirements. Excerpts...

What are the key parameters that differentiate Indian operations from Germany?

Michael: We believe in the potential of the Indian market. For us, it was clear that we do a lot of investments in India directly because India has great power in knowledge, education and in raw materials. Infrastructure is a challenge for all of us in our daily life in India but we believe in the market and its potential. The good thing is people want to be successful, they are proactive. We believe in the power of the people.

What do you think about the current pace of digital transformation in the Indian industry? What are your major developments in the digital domain for machine safety and appliances?

Michael: We see that the awareness of the Indian customers is ahead as compared to Europe. They are knocking on our door and

asking, ‘how can you help us’. In Europe, we sometimes have to knock on the customer’s door. India, as compared to other countries, is ahead when it comes to digital transformation. Secondly, we see that most of the customers are not really sure what they need and want. We give customers clear guidance on what they can do. The second step is what kind of technology they can use. But at the first level, it is more important to help the customer with what they can do and should do, so that they are content.

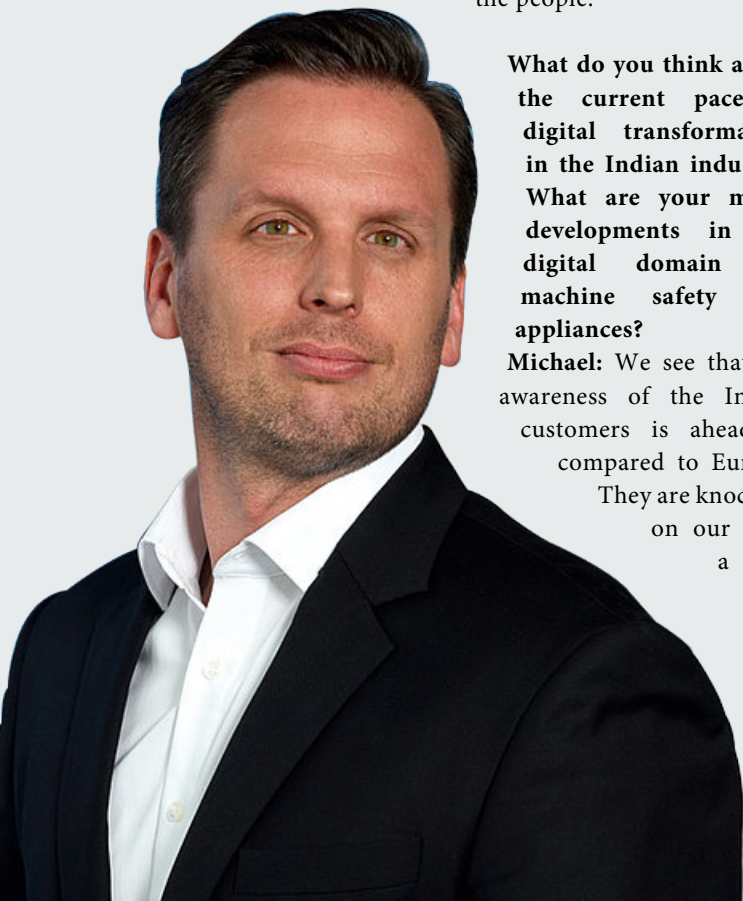
What are some of the best practises for businesses today in dealing with machine safety issues?

Michael: The best practise would be to start thinking about safety at the blueprint level. Most customers nowadays create a machine and then knock on our door and ask whether we can make it safe. We can do this, but it will take more time and be more expensive. For us, the customer should knock on our door at the blueprint level. This is the best tip or guidance we can give, and then of course we will find the customer’s application solution. If you reach us at the beginning, then we will help you design safety into the green field.

How would you advise other leaders in your industry to address potential mistakes?

Michael: Talk about it, have learning curves. Not everything is perfect. But we have learning sessions and recap sessions about projects. One needs to talk about it. Mistakes should not happen, but they can happen. One needs to share the experience with colleagues and customers.

What changes do you intend to implement in your





The Schmersal Group designated Michael Ambros as Managing Director of KA Schmersal GmbH & Co KG. In his role, which he took over on May 1, 2017, Ambros is responsible for the divisions of Administration and Sales & Marketing on a global basis. He spent many years in a senior position in the Corporate Finance division of a leading international management consultancy and has extensive management and professional experience in a wide range of industries inside and outside Europe, including the USA and Russia.



Sagar Bhosale has a total work experience of more than 25 years in the electrical and automation industry. As a founder member, he has been associated with Schmersal India for close to 15 years. Under his leadership, Schmersal India witnessed exponential double digit growth in sales, not only in products but also in the services division, which is now an established part of business.

organisation to ensure it adapts to the evolving business dynamics and meets the changing customer requirements in the future?

Sagar: We are talking about a complete safety solution. The most important change is to offer our customers a complete package from our side. For this, we have a team of certified safety consultants. Germany has certified them to conduct safety audits on customer machines. Our next plan is to enlarge this team to provide not only the services of the safety consultants but also to integrate these packages into the machine and make a complete solution for the machines and their processes.

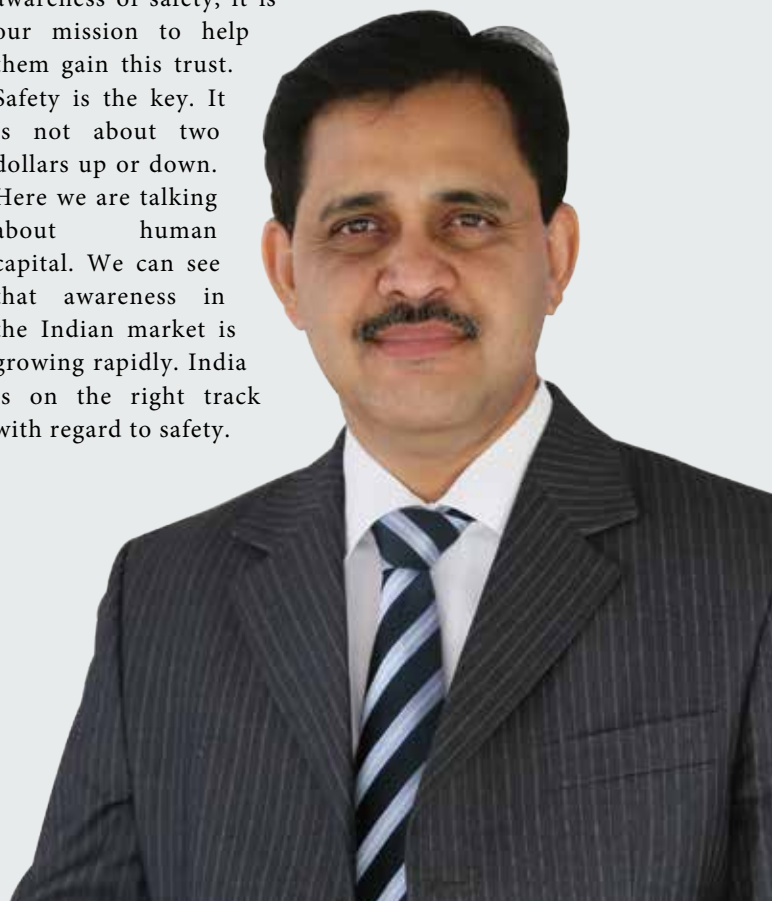
Educating & upgrading the workforce is an integral role of a leader. How do you look at it, and what are some of the initiatives from your company on this?

Sagar: Training is the most important part for us. There is no alternative that you can bypass training and put your salesforce on the job. We have a very rigorous method of training. So we conduct training for our team members. They have to qualify with some minimum percentage of marks, and then they are allowed to go and talk to the customers about different types of solutions. These pieces of training are also uploaded on our central portal so that they can cover important topics. We do this not only for our engineers but also for our channel partners. These modules are also offered to our customers.

In the coming years, the safety sensors and switches market is forecasted to reach \$34.3 million. What are the top three management practices important for this achievement?

Michael: For me, it is quite simple, listen to the needs of the

customer. Because we are not only selling components, we are also selling solution systems, and they are customised. Selling components is simple. One can do it at a cheaper price. But this is not our approach. Our customers need to have the benefit of buying our systems and solutions. It is our responsibility to show them the benefits. Sometimes it is not about increasing revenues but about helping existing customers. Selling safety is a trust-related business. And if a customer does not trust us or does not have an awareness of safety, it is our mission to help them gain this trust. Safety is the key. It is not about two dollars up or down. Here we are talking about human capital. We can see that awareness in the Indian market is growing rapidly. India is on the right track with regard to safety.



Batch it right!

The article explains how batch operations can improve machine utilisation, thereby, enabling optimal productivity and maximum output in a manufacturing plant.



Achal Saran Pande,
Partner,
Vector Consulting Group

In a manufacturing plant, flow characteristics can be profoundly influenced by issues in batching. If one were to understand the underlying principles behind these issues, one could avoid these issues and bring in considerable gains for the plant. Let us take the case of automotive operations. Here, almost all operations are associated with large batching operations. The commonly found large batching operations in automotive manufacturing units are listed below:

- Forging – Forging processes
- Casting – Core making and moulding machines
- Plastic components – Plastic moulding machines
- Sheet metal – Metal presses

Perils of conventional batching considerations

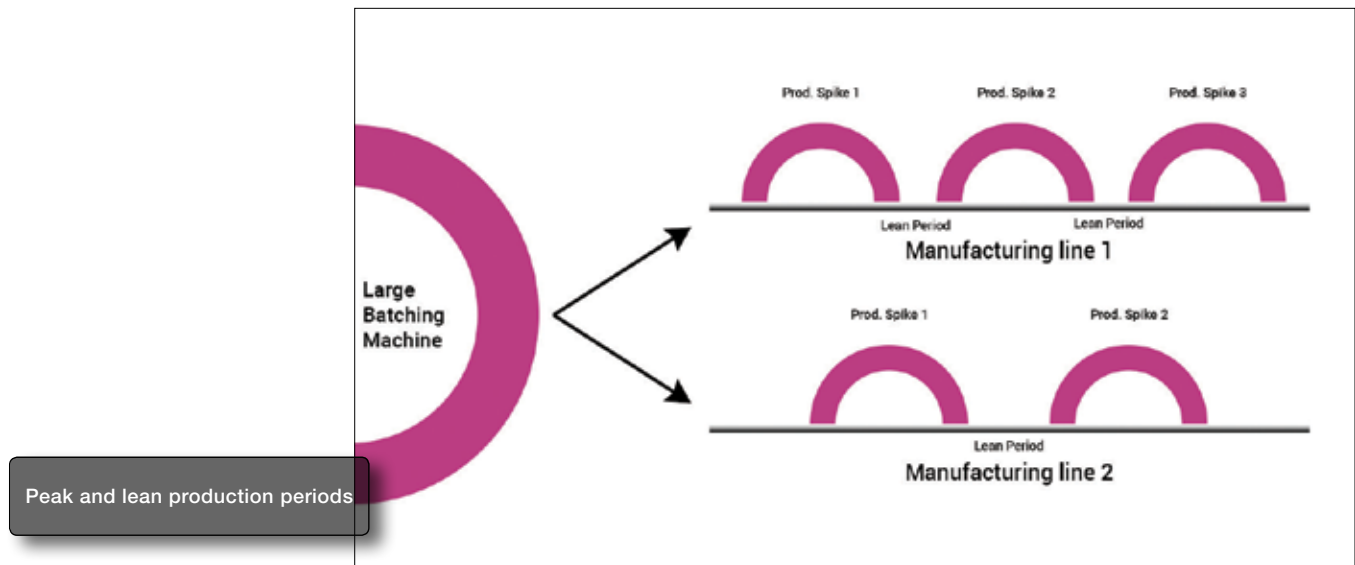
Conventional wisdom holds that in order to achieve maximum output and productivity, large batching operations should aim for very high machine utilisation. However, the problem with this line of thinking is that to maximise capacity utilisation large batches must be processed at a time.

And to ensure large batches in production, the company may end up sacrificing reliability – by increasing the overall production lead time. This will result in poor on-time delivery of the final product to the customers. If customers are unhappy, then even if the capacity utilisation goals have been met, it has no real meaning.

The question is, why do large batches jeopardise reliability?

Problem 1: Capacity stealing

When you execute a large batch, you will end up with a phenomenon called ‘Capacity Stealing’. Capacity stealing happens when any available capacity is utilised for producing items that are not on the critical path, ie, items that are not needed by customers in the immediate future. And what is more, one might even be producing non-essential items at the expense of items that are required immediately or those that are required for confirmed orders.



Problem 2: Capacity waves

Another issue arising because of large batches at batching machines is that they create 'Capacity Waves' at downstream operations.

This situation occurs when the batching machine feeds many specialised manufacturing lines downstream. When this happens, it creates 'Lean' and 'Peak' production periods across lines. Lean periods are those when there is a near starvation of some downstream processes, resulting in idle time for labour, while peak periods result in downstream flooding processes, necessitating overtime payments for labour.

It is no wonder that large batching machines often appear to be constraining machines and become the focus of attention for planners. So, the entire production is planned, assuming that these machines are the real constraints on the flow. The experience, however, is quite contrary to this. These large batching machines are the true internal constraints of the manufacturing setup. Moreover, these machines generally have excess capacity.

The sheer abundance of inventory that can usually be seen lying just beyond these machines proves this point. One downstream operation is likely to prove to be the real constraint. For example, the constraint is often found in the welding and finishing operations when it comes to sheet metal operations, while it is found in the fettling and finishing operations in castings.

Problem 3: High WIP

The third issue with large batch sizes is that they, by design, increase work-in-process inventory levels, whether the constraint is in the batching operations or not.

Based on these disadvantages of large batches, it is ideal for reducing batch sizes. However, the disadvantage with smaller batches is that they tend to increase the number of set-ups that would be required, thereby making even a non-constraint machine into a constraint machine. Productivity would drop, and lead time would again go up. Small batches can also lead to poor on-time delivery performance.

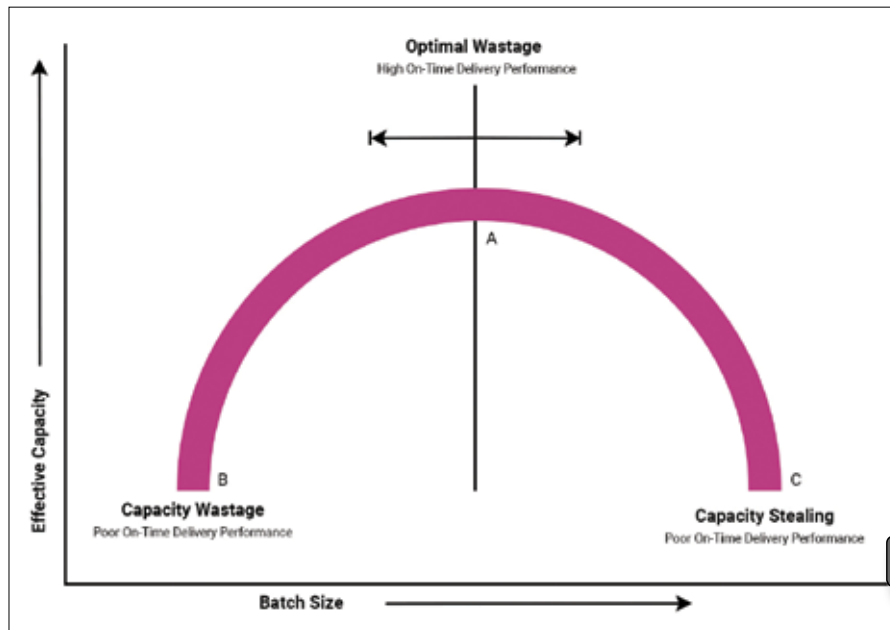
Back to square one!

Addressing challenges

Step 1: Reduce batch size to more optimal levels

Clearly, the extremes in batch size (too large or too small) must be avoided. So, the way to improve machine utilisation without hindering on-time delivery performance is to identify an optimal point for different machines with different capacities through an iterative process. It may be difficult to imagine why reducing batch sizes to more optimal levels can reduce manufacturing lead time. After all, whether there are one or a thousand parts, each process takes the same amount of time.

But as you can see from the U-curve given below, while both extremes are non-optimal and should be avoided to



prevent poor OTIF, the optimal point occurs somewhere in the middle.

Step 2: Decouple batching machines

What is very important to note is that the batching machine must be decoupled from downstream operations. This is vital because only by decoupling this machine can you give it the flexibility to be out of sync with remaining downstream operations, entertain batching considerations and still not disrupt the flow. The decoupling is operationalised with a buffer immediately after the batching machine.

Step 3: Pull based replenishment to buffers

This buffer, located immediately after the batching machine, will provide several benefits. Firstly, by linking the manufacturing trigger for the batching machines to consumption from the buffer, the batching machines will be able to accommodate larger batches without impacting the reliability of the system.

Secondly, since the downstream processes consume from the buffer, one can avoid the cycles of starvation and flooding, that were noted above. Finally, the downstream

activities can act as independent systems, with their WIP being controlled by a consumption trigger from the finished goods inventory. This will ensure on-time delivery to the consumer. Without any expediting requests being escalated to the plant, the plant can manufacture as per plan without any unplanned set-ups. So, the cherry on top is that capacity utilisation will increase!

The way forward

Implementing these steps is not always easy since this solution is counterintuitive. Understanding local optima is easier, while grasping global optima requires systems thinking. Moreover, the performance incentives linked to capacity utilisation and local optima figures can be a hurdle. So even if the team logically agrees on the solution, until they consistently experience that even without large batches, their capacity utilisation incentives are not threatened, there will always be a fear about the new way of working.

But once a hitherto hidden capacity reveals itself, and they realise that they can have higher output (~30%) and a very high OTIF (>95%) by subordinating to improvements in flow, old bad habits will be abandoned. □

Does the situation look complex?



Here's a problem solver.

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Finding the right Machine Learning techniques for Predictive Maintenance

This feature talks about predictive modelling and the areas of its application while listing out the most-used learning algorithms for Machine Learning models. The first part of the article explains the predictive model in detail.



Pallab Mitra,
Global Director of Sales & Marketing,
Trangile Services

When we talk about Predictive Maintenance, we are talking about the ability to predict the basis of current archival data in a business process. An organisation typically looks at predictive maintenance for the following:

Real-time asset condition and performance monitoring has been observed in ATM maintenance around the world.

- Analysis of work order data used in the retail industry
- Maintenance, repair, and operations functions in any business process
- Machine Learning layered with Artificial Intelligence

Choosing the correct ML/AI model

A child touches a burning candle. The touch is the sensor, and the burning candle is the reason for the reflex action of moving the finger away, the reflex action being the actuator. The moment the child touches the burning candle the reaction is a knee-jerk reaction of moving the fingers away. So, a sensor and actuator come into play, and this describes what ML does in the real world of sensors and actuators.

Now the same child sees a burning candle but does not

Real-time asset condition and performance monitoring has been observed in ATM maintenance around the world



touch the candle. While this is the child's experience of being hurt, it has created a set of memories of things that she or he must not do to avoid harm.

This is the advent of Artificial Intelligence when a sensor, upon sensing a certain set of activities, uses a set of rules to ensure that a set of instructional messages are sent to an actuator. Hence, ML and AI go hand in hand to create use cases for multiple predictive monitoring use cases.

The predictive model

In Machine Learning, there is a fundamental principle called the 'No Free Lunch' theorem. It states that no one Machine Learning algorithm works best for every problem, and every problem will need supervised learning, resulting in predictive modelling. The predictive model we use will be tailored to the use case in which we intend to apply the model for predictive maintenance.

As a result, the algorithms for your problem will be specific, the data set will be specific, and how you will use machine learning to provide automation will also be very different from industry to industry and case to case.

The algorithms we try must be appropriate for a problem, which is where picking the right Machine Learning task comes in. As an analogy, if we need to clean a house, we might use a vacuum, a broom, or a mop, but we wouldn't bust out a shovel and start digging.

The basic principle of predictive maintenance is predictive

modelling, which works on learning a target function that maps input variables to an output variable. This is a general learning task where we would like to make predictions for the future (Y) given new examples of input variables (X). We don't know what function (f) looks like or its form. If we did, we would use it directly and not need to learn it from data using Machine Learning algorithms.

The most common type of Machine Learning is learning the mapping $Y = f(X)$ in order to predict Y for new X. This is called predictive modelling or predictive analytics, and our goal is to make the most accurate predictions possible.

Most used learning algorithms for ML models

Linear regression: This is the oldest and best-known algorithm from statistics that is used in predictive modelling. Predictive modelling is concerned with minimising the error of the model or making the most accurate predictions. This is a simple tool that is used in predictive modelling where one needs to ensure similar data (correlated data) is avoided and the noise is removed from the data.

Logistic regression: This is a go-to method when we have binary classification problems to deal with. This model will always result in non-linear functions. This model is used when you want to provide the predictive model with a rationale for the prediction. This model also works when you have homogenised the data to remove similar or correlated data.



The algorithms one tries must be appropriate for a problem, which is where picking the right Machine Learning task comes in

Linear discriminant analysis: The general rule of thumb is to use logistic regression when one has a binary classification. In cases where the variables are more than two, linear discriminant analysis which uses statistical attributes of the data that include the mean value of each class and the variance calculated across classes can be used. Predictive models are based on the discriminant value for each class and make predictions for the class with the largest values.

This model will throw data into a bell curve, also known as a Gaussian Distribution, and hence homogenising the data by removing the outliers will help improve the predictability of the tool. This is considered a powerful tool for the classification of predictive modelling tools.

Classification and regression trees: This is an important tool and is used when there is a clear yes or no answer to every decision that needs to be considered. A simple example of a predictive model from an industry use case in banking is most commonly used for ATM health monitoring.

Naïve Bayes: This is a powerful and simple algorithm model that uses the Bayes Theorem on the results from the probability of two aspects of the trained data – the probability of each class and the conditional probability for each class given at each value of the variable. This is, however, assuming that the input data variable is independent, which is mostly not the case with real data since each variable will have a dependency on another input variable. However, the model is very powerful and is used to solve a large range of complex problems.

K-Nearest Neighbours (KNN): The modelling technique is very powerful but needs you to train the complete data set that you will use to build the prediction algorithm. Using the correct data points and defining the neighbour in terms of what needs to be predicted based on the calculation of the distances based on the differences between the variables in the consideration set.

It is important to determine the similarity of the data instances to use the tool effectively. Training the instances using the KNN tool is a prerequisite to ensuring that the predictions are accurate. The only weakness one should look out for is the curse of dimensionality, which is a lot of data inputs that lie in very close proximity to one another and could harm the algorithm.

Learning Vector Quantisation (LVQ): A similar model to KNN that does not need to use the entire data set. The Learning Vector Quantisation algorithm (LVQ) is an artificial neural network algorithm that allows you to choose how many training instances to hang onto and learns exactly what those instances should look like. This is a collection of codebook vectors, and at the heart of the algorithm, we are still using the KNN concept of finding the closest neighbour codebook vector and hence the accuracy of the predictability.

So, if we have used the KNN algorithm and find that it serves the data set you are working on to create the predictive model, one can then use LVQ to reduce the storage and memory constraints in the KNN algorithm. □

The second part to be continued in the next issue.

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Proportionate security measures – A cardinal way to identify critical assets

It is essential to implement and maintain safety processes to help prevent and identify safety risks and hazards for industrial automation workers. This column illustrates occupational safety, health, and working conditions which are discussed along with their applications to the industry in terms that are clear to the average person.



Prof Vijay Kumar Singh,
Dean and Head of School
Mechanical Engineering,
Lovely Professional University

Identifying critical assets and implementing proportionate security measures to protect them from a variety of plausible attack scenarios requires an ever-deepening understanding of the operations within a high-hazard site. This is similar to the method used in safety cases to evaluate and reduce the risk associated with a variety of major accident scenarios. Safety-critical assets are typically also security-critical because both security and safety have as their primary goal the protection of people. Consequently, adopting a unified approach to security and safety would bring consistency, and if it were integrated, it would be easy to spot and

resolve conflicts and realise efficiency gains.

Safety has two sides for industrial automation workers. It depends on the safety precautions included in the process operations as well as the commitment and familiarity of the process operators with safety strategies and guidelines. Automated safety layers in control systems are intended to prevent accidents, but machines and alarms can only take on a certain amount of risk. The remaining portion of that obligation—and the key to reducing risk—rests with the people and the safety procedures that are used.



Reducing risk depends with the people and the safety procedures that are used

Safety strategies and guidelines

The typical design of a Basic Process Control System (BPCS) includes layers of safety functions and built-in safeguards to remove or reduce risks. Through Independent Protection Layers (IPLs), the BPCS not only controls the process but also serves as the operators' first line of defence. It recognises anomalous circumstances, such as an out-of-tolerance measurement or another problem, and responds by sounding an alarm or taking some other action.

A Process Hazard Analysis (PHA), Hazard And Operability (HAZOP) study, or other audit is conducted to identify the situations or other potential system failures that could occur to cause an accident or issue in order to address the next layer of safety risk. The Safety Instrumented System (SIS) layer is then created to reduce the risks that the HAZOP study identified as unacceptable. With independently operating Safety Instrumented Functions (SIF), it is integrated with the BPCS - SIF. The significance of SIS increases as the BPCS gets older, when it isn't maintained, or even when operator skill levels change as a result of employee attrition or ignorance.

Even with all of these built-in safeguards and protection layers, safety systems still need to be monitored and maintained. These systems do not completely replace the requirement for on-site personnel. Nothing is completely foolproof. Anywhere, at any time, any number of factors could result in a safety risk. As a result, it's critical to implement safety initiatives, strategies, and policies. To ensure the staff's safety, there should be a zero-tolerance policy for disregarding safety policies and procedures.

Operator safety awareness

The enemy of process operations is complacency. A company's culture and policies can have the biggest impact on safety in this area by making a strong effort to instil safety policies and procedures in operators and other staff members to keep them knowledgeable, alert, and vigilant. Sharing tribal knowledge and training operators are essential. To make sure operators are properly trained, ask the following six questions:

1. Are the operators aware of how important it is for them to keep both themselves and others safe?
2. Do they have situational awareness training? Do they know how to get help? What should they do in an emergency?
3. How well-versed are they in the system of the facility and the dangers it poses?
4. Are they informed of modifications to the systems and procedures?
5. Are they familiar with the best safety procedures for any unfamiliar or extracurricular tasks that may be required of them?
6. Does their system have the right information readily available at the appropriate times and is it designed to interface with operators in a clear, concise manner?

Operators of some systems may become overloaded with information and unintentionally forget to take the necessary steps to reduce safety risks. For instance, the colours may be off on some older Human-Machine Interface (HMI) screens in a control room. An operator may see a variety of alarm colours to denote possible compromises or failures, such as a stuck valve,



With required components in place, a strong corporate safety culture can be created to protect both people and automation systems

rising pressure, or an overfilled tank. To open and close a valve, the alarms may change to blue and yellow in one area of the facility, but green and red in all others. Confusion arises because an operator might question whether or not seeing red is unusual. The control system's monitor may display a sea of vibrant icons, but flashy graphics may make it difficult for the operator to recognise critical alarms. Alarms that are frequently observed might be dismissed as a bother and ignored because it's normal to think they don't signify a serious safety risk.

When operators are unable to distinguish between a critical event and a routine one, safety incidents take place. Operators can recognise alarms using grayscale screens with dependable colours or shapes thanks to high-performance HMI graphics. Operators must still be properly trained in critical alarm components as well as other Piping and Instrumentation Diagram (P&ID) symbols in order to recognise abnormal situations and react appropriately.

Additionally, they ought to be fully informed of the state of the facility's systems and operations. Utilising the automated safety features of the SIS and BPCS requires trained operators. One represents the right hand, the other the left. The risk of an incident rising in the absence of either one or the other. For instance, the purpose of having system safeguards is defeated if an SIS or BPCS emits a warning signal and it is disregarded or if the operator is not properly trained to recognise its warning signs.

Likewise, the benefits are quickly lost if steps are taken to reduce facility risk. Still, the equipment is deteriorating, or the proper machine or predictive maintenance policies and procedures have not been followed. The best course of action is to follow the recommendations if a PHA/HAZOP audit identifies potential risk factors in a system in order to avoid a

potentially disastrous event. A comprehensive safety policy that covers the staff and how the facility is run must be in place.

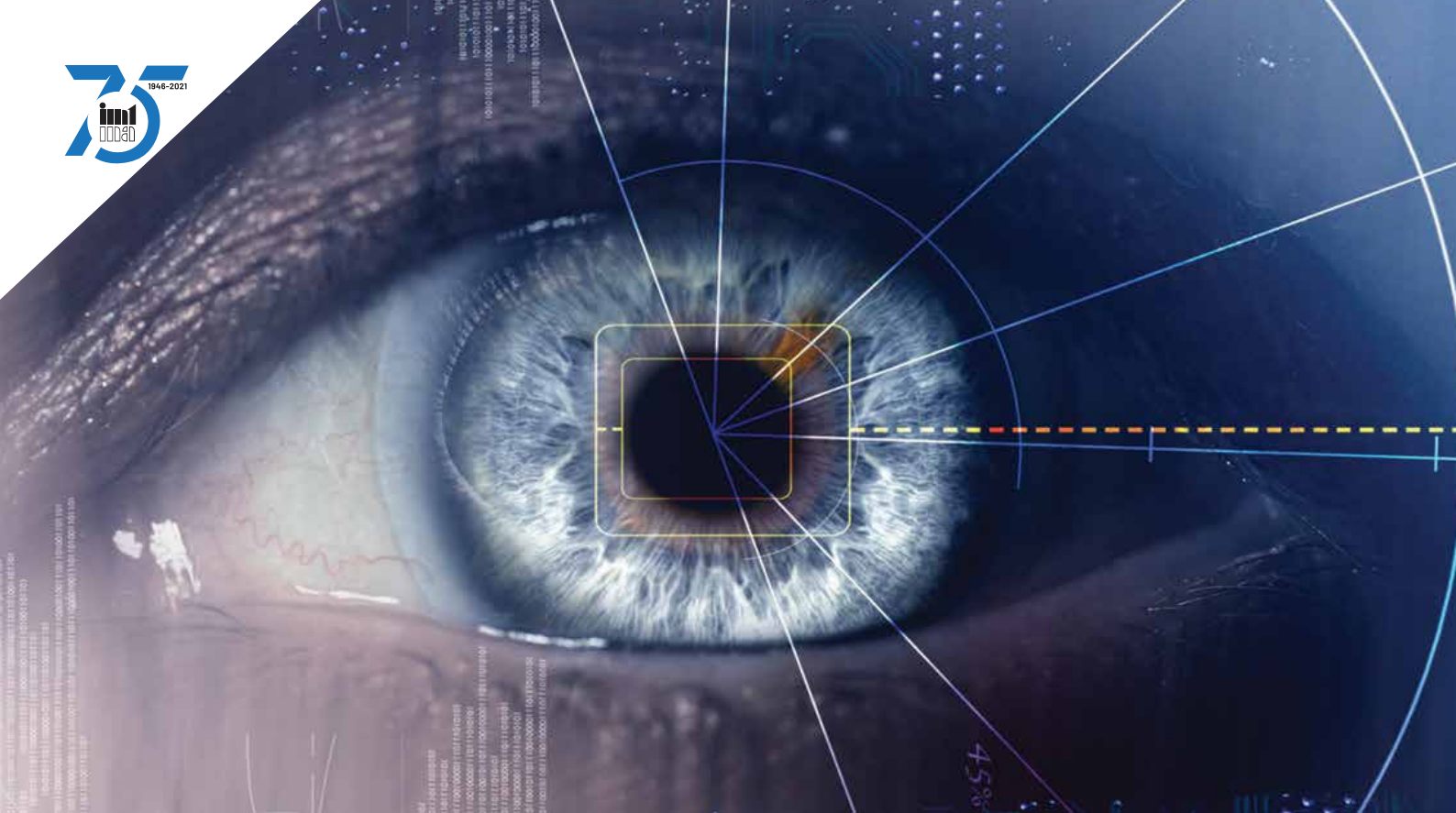
Risk tolerance level

Look at the larger automation picture and conduct an analysis of the current systems and processes as part of the process to advance corporate culture safety strategies, policies, and initiatives. It's crucial to establish acceptable and intolerable risks while doing this. Examining how well the facility's automation, safety systems, and personnel cooperate to guarantee safe and secure operations will be one of the key areas.

SIS and SIF decisions may benefit from the functional safety-safety instrumented systems for the process industry sector and the standard for safety instrumented systems. A platform-independent automation solutions provider who combines process and automation knowledge with SIS expertise may be needed to assist with the process because it is a significant undertaking. They can help improve operations and analyse safety factors. Additionally, operators will require training to comprehend their responsibilities within the context of overall safety and acceptable risk levels.

Safety culture- For people & automation systems

The support of the facility's management, engineering, operations, maintenance, etc. is crucial. It necessitates a combination of safety policies, strategies, and initiatives, as well as process control safeguards. With these components in place, a strong corporate safety culture can be created to protect both people and automation systems. □



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Enterprise intelligence with AI

The article explains how effective data strategy and data readiness is critical for Indian businesses to achieve enterprise intelligence by adopting Artificial Intelligence.



Swapnil Shende,
Associate Research Manager –
Artificial Intelligence,
IDC India

Enterprises are in the process of leveraging AI at scale, while multiple questions still linger – are the solutions capable of fulfilling business expectations? What are the key tenets of a successful AI implementation strategy? What role does data play for AI implementation to be successful? What are some of the key trends in AI in India in the past year? What is the role of data strategy in deriving the best value from AI investments?

Growth of Artificial Intelligence

Businesses in India, until a few years back, were not embracing AI as a mainstream technology. Multiple factors such as the increased need to improve early detection of disease and

prevention; provide personalised learning; Industry 4.0; enhance IT infrastructure resiliency, need for enhanced customer experience; and others lead to the adoption of advanced computing, thereby increasing overall AI spending in India.

Moreover, factors such as the generation of huge data volumes, improved digital infrastructure, and technological advancements in data management and cloud have enabled AI growth in India. Seeing the widescale opportunity in improving efficiency that businesses can achieve, enterprises today are optimistic about leveraging AI. As per IDC's worldwide Artificial Intelligence spending guide, V1 2022, the overall AI spending in India has reached \$759.6 million in 2021, showcasing about three times the growth of over 216% when compared to the AI spend in 2018.

Growth of Artificial Intelligence in the businesses in India



Benefits of AI

Benefits of AI vary across industries with different use cases ranging from analysing images in healthcare for early disease detection to robotic automation and advisory in BFSI and others. Despite the huge potential that AI can bring to businesses, certain challenges hamper the widescale adoption of AI in India. IDC research reflects that organisations need to overcome a variety of challenges to adopt AI solutions—disruptive results to current business processes, lack of follow-up from the business units, lack of necessary data, and others have been some of the reasons behind enterprise failures in their AI projects in India. The amount of data being generated and made available to train AI systems is critical for a successful AI implementation.

IDC's conversations with business leaders in India reveal that for enterprises, leveraging data to understand the entire ecosystem of partners, employees, and suppliers is among the top priorities. Moreover, according to IDC's Future Of Intelligence August 2021 survey, 19.7% of respondents in India stated the lack of data literacy as a major enterprise intelligence challenge.

Driving optimal data utilisation

The Indian government's push for digitisation along with the increasing adoption of AI/ML, deep learning, and IoT-based technologies has imbibed the need for developing a data culture within enterprises that drives optimal utilisation of data and content to enhance enterprise intelligence, and how a lack of data literacy acts as a major roadblock for that process. In February 2022, IDC predicted that by 2026, to elevate their data culture, 40% of large enterprises in India

will have data literacy programs, including training to help employees spot misinformation and communicate or influence with data.

With data playing a key role in deriving insights and shaping business and operational strategies, organisations are realising the advantage of adopting AI/ML technologies in driving human-machine augmented foresight. IDC predicts that, in India, by 2024, 20% of business intelligence solutions will incorporate intelligent knowledge networks, extending core ML-based user augmentation with collaborative and collective intelligence functionality.

Aligning business intelligence with ROI

Enterprises in India are looking to incorporate AI/ML technologies into automating data processing and analytics workflow steps to enable business intelligence solutions to ingest, clean, transform, and catalogue data for real-time analytics. To enhance the quality of data analytics and forecasting models, businesses are looking to integrate Business Intelligence and Analytics (BIA) solutions with emerging technologies such as crowdsourcing, swarm intelligence, and prediction markets.

Vendors and service providers play a key role in the success of enterprise AI initiatives by providing the necessary skills and supportive IT infrastructure to deliver better ROI. As data becomes an integral component of enterprise intelligence, service providers have started focusing on providing solutions that enhance operational efficiencies, improve customer service, and achieve cost efficiency. Enterprises plan to focus on becoming more data-led to take critical business decisions and provide personalised offers or analyse targeted stuff for customers. □



Dangers of the dark web

With an increasing number of incidents of cyber attacks being reported by industries, government organisations and individuals, cyber space has turned into a danger zone. So what is being done to make it safe?



Rajeev Chandrasekhar,
Union Minister of State
for Skill Development
and Entrepreneurship,
Electronics and
Information Technology

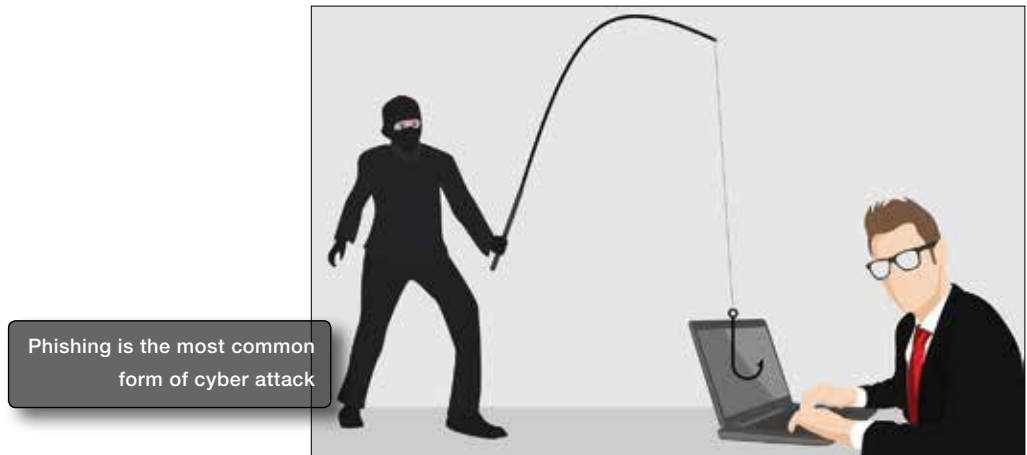
If at all one needs to understand why cyberspace is a crucial segment and its security such a matter of importance, consider the fact that in the financial year 2021, over 38000 government services in India were provided over the internet. A CLSA report indicates the value of digital payments in India will grow three-fold – close to \$1 trillion in FY26 from \$300 billion in FY21. Further, a Deloitte study has said India will have 1 billion smart phone users by 2026. The country was home to 1.2 billion mobile subscribers in 2021, of which about 750 million were smart phone users. As on January 2021, India had 448 million social media users.

In 2021, the DBS Digital Readiness survey revealed almost 62% of large and middle-market companies are still in the formative stages of digitalisation in India. In this context, what is significant to note is the data available with the Indian Computer Emergency Response Team (CERT-In), the government agency for computer security, which showed that the number of incidents of cyber attacks rose from 208,456 in 2018 to 1,402,809 in 2021. In the first two months

of 2022, 212,485 such cases have been recorded. Given the serious implications that cyber attacks pose, in its recent budget the government said it would spend ₹515 crore on cyber security in 2022-23. That's a 10 times increase compared to 2014-15.

One of the most recent developments in this march towards beefing up cyber security is a government notification that states that all companies and enterprises will mandatorily have to report all cyber incidents to the Indian Computer Emergency Response Team as per the new guidelines issued under section 70B of the IT act. This is in order to coordinate response activities as well as emergency measures with respect to cyber security incidents, CERT-In said in a statement. All service providers, intermediaries, data centres, body corporate and government organisations shall mandatorily enable logs of all their ICT systems & maintain them securely for a rolling period of 180 days within Indian jurisdiction.

“These should be provided to CERT-In along with reporting



of any incident or when ordered or directed by CERT-In,” as per the guidelines. These rules will come into effect 60 days after being issued. During the course of handling cyber incidents and interactions with the constituency, CERT-In has identified certain gaps causing hindrance in incident analysis. To address the identified gaps and issues so as to facilitate incident response measures, CERT-In has issued directions relating to information security practices, procedure, prevention, response and reporting of cyber incidents under the provisions of sub-section (6) of section 70B of the Information Technology Act, 2000.

Other directives include synchronisation of ICT system clocks, maintenance of logs of ICT systems, subscriber and customer registrations details by data centres, Virtual Private Server (VPS) providers, VPN service providers, cloud service providers, KYC norms and practices by virtual asset service providers, virtual asset exchange providers and custodian wallet providers. The list of cyber incidents to be reported includes data leaks and breaches, attacks on mobile apps, unauthorised access of IT systems and identification of theft and phishing attacks. India has the opportunity to leapfrog in exponential technologies like cybersecurity and the country needs investment in these technologies to keep its enterprises and key infrastructure secure from bad actors.

IBM in February 2022 announced a new cybersecurity hub that will train companies in Asia Pacific (APAC) region to manage the growing threat of cyber attacks. Located in Bengaluru, the new IBM security command centre will leverage industry-leading audio and visual effects as well as live malware, ransomware and other real-world hacker tools. The IBM cybersecurity centres will help address the most pressing need of the hour for organisations of all types to accelerate their security strategies and align business priorities with a ‘security-first’ approach.

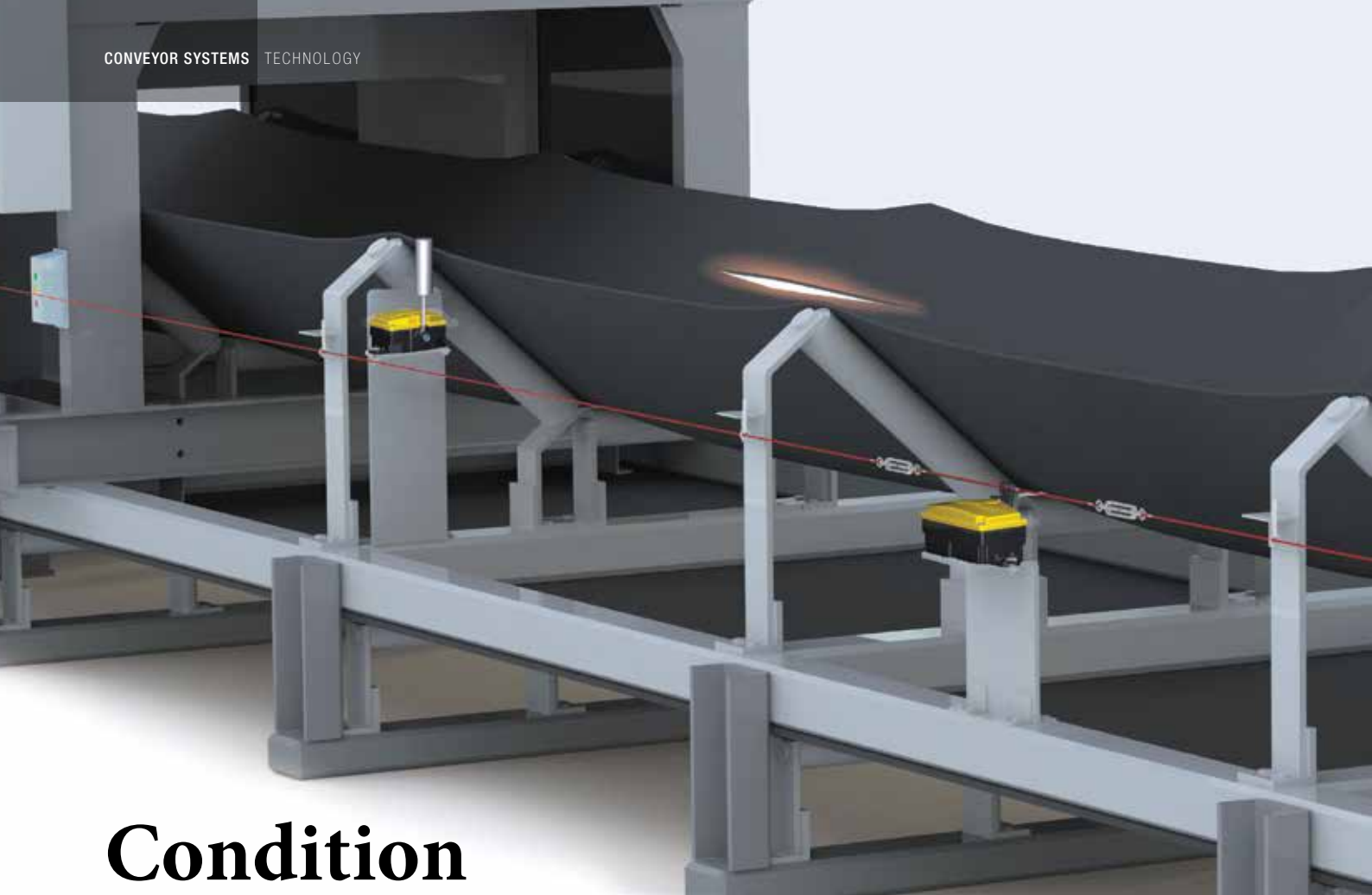
Government strategy

India is dealing with the increase in cybersecurity threats by revamping its policies and focusing on existing systems, such as strengthening CERT-In, to address any challenges that come its way. Cybersecurity incidents are on the rise due to a combination of delayed awareness among people on the issue of cybersecurity, and a cybersecurity culture needs to be more developed so that more people causing such issues are aware of how to combat user harm.

India is also working on cross-border cooperation to ensure cybersecurity threats can be effectively addressed, as it teams up with private partners to provide better resources to combat cyber incidents. The cyber space does not have any jurisdiction. We will focus on strengthening and expanding the mandate of CERT-In. Cyber space is characterised by growth, but it continuously needs policy interventions to ensure that the internet can be a safe and trusted space. The government is also working on a separate policy for social media companies to ensure that the internet, without the pitfalls of user harm, can be made accessible to everyone.

Major cyber attacks

In October 2020, the country’s financial capital, Mumbai, was hit by a massive power outage prompting the cancellation of train services which brought the whole city to its knees. Later, in February 2021, it was reported that hackers stole the personal data of 4.5 million Air India passengers. In November 2021, a cybersecurity firm had alleged that the personal and financial information of nearly 180 million PNB customers was left exposed for seven months. On similar lines, a Cisco report last year had stated that some Indian SMEs lost up to ₹7 crore in cyber attacks from September 2020 to September 2021. □



Condition monitoring for conveyor systems

The article explains the range of systems and solutions for machine and process safety in the conveyance of bulky materials that optimally covers the entire field of condition monitoring.



Heiko Bach,
Business Development
Manager - Heavy Industry,
Schmersal Group

Safe, fault-free operation of conveyor systems is an essential factor when it comes to production efficiency and profitability. The Schmersal Group offers intelligent components and systems for safe and efficient conveyor systems. These also include solutions for condition monitoring – the capture and evaluation of process and diagnosis data from system components to enable predictive maintenance and increase availability.

Process safety assurance

Raw materials are often transported in bulk directly from mines for processing or loaded onto rail vehicles or vessels for onward transport. Steel belt conveyor systems help to bridge large distances of several kilometres, with conveying speeds of up to 10,000 t/h. Process safety is where conveyor belt operation starts and ends. Operating companies have an economic interest in a fault-free operation, 24 days a week, 365 days a year. Faults, interruptions, or even failures of conveyor systems can have

major consequences – from delays in delivery and short-term supply bottlenecks to significant production interruptions, such as in cement, power, and steel plants, which can come with high financial losses. Over recent decades, Schmersal has steadily expanded its range of products and systems for process safety and personal protection in bulk materials handling.

Modular switchgear platform supports range of applications

One such example is the modular HDS switchgear series, which is designed for use in heavy industry. It unites several functions into a single platform, allowing it to be used for a range of different applications. Its key features include the uniform housing concept, which includes two versions – a plastic version (thermoset) and a version made of grey cast iron.

The plastic version is resistant to aggressive media and especially suitable in port logistics applications and loading and

unloading operations, as well as in the agricultural industry in the processing of fertilisers and phosphates. The robust grey cast iron version is particularly suitable for use in mining.

The devices also come in two basic functional versions: one for emergency stop, designed as a pull-wire emergency switch, and one for position monitoring. The basic switch on the position monitor version can be flexibly combined with a range of actuation elements. Typical application areas include emergency-stop shutdown, belt mis-alignment monitoring on conveyor belts, end position monitoring in steelmaking, and level monitoring in material silos.

Belt misalignment monitoring is an important function in the process of protecting conveyor systems. Conveyor belts can run out of their designated tracks, causing considerable damage. Belt alignment switches are used to detect any belt misalignment at an early stage. Smaller deviations trigger a pre-warning, while greater deviations trigger a shutdown. The pre-warning gives the conveyor system owner's maintenance department enough time to prevent unscheduled production shutdowns and rectify faults. Belt alignment switches thus help to reduce failures and downtime and ensure greater system availability. All basic versions of the HDS series can be optionally connected to the Dupline installation bus, allowing the switches to be quickly interconnected, and connected in series, thus enabling easier transmission of diagnosis data.

Wireless data transmission for expansive conveyor systems

Working in cooperation with its system partner Aconno, the Schmersal Group is currently developing a new idea in the form of an Industry 4.0-capable switch. On expansive conveyor systems, this new switch will enable wireless transmission of status information over several kilometres. The benefit of this is easier monitoring, more rapid rectification of faults, and, in turn, better process protection. It will be possible to monitor all switching operations in real-time and online via a web browser on a PC or smartphone. The data from the cloud will be transmitted directly to the control centre or a smartphone in the hands of maintenance and service technicians on site using the web interface or APP.

Process protection for conveyor belts with online monitoring

In addition to the stated components and systems designed to boost machine safety and process protection, the company is now able to offer a fully automated online monitoring system for existing or new conveyor systems through its system partner, ROXON. The HX270 enables optical 3D belt surface sampling in



real-time, both for the material side and running side of the conveyor belt. With high-speed precision scanning using novel 3D image analysis algorithms, the system can detect any change or damage to the belt surface fully automatically, 24 hours a day. In addition, optional belt thickness measurement gives the system a full-fledged condition-monitoring solution for smart maintenance and servicing.

The HX270 intelligent system automatically records existing belt damage and alerts the user if new damage is detected or if existing damage worsens to become critical. In this latter case, the conveyor belt is stopped automatically. The damage and wear data are stored in a database. Users can gain physical access with just a few clicks of the mouse and an automated conveyor belt control system so that they can inspect and repair the damage.

Conclusion

Conveyor systems are an essential tool for materials flows in the global bulky materials industry, whether in the mining of raw materials, gravel and cement plants, landfill or recycling sites, or the movement of seeds and animal feed. Just as varied as the range of applications is Schmersal's range of systems & solutions for machine safety and process safety in the conveyance of bulky materials, optimally covering the entire field of condition monitoring. □

Eminent leaders we heard in 2022



Akshat Jain,
CTO & Co-founder,
Cyware



Prashant Rao,
Head —
Application Engineering,
MathWorks India



Raghav Gupta,
Director,
Kanchan Metals



Ankush Patel,
Founder & CEO,
Treeni Sustainability
Solutions



Anand Parameswaran,
SVP &
Global Business Head,
Cyient



Xercsis Marker,
Executive Vice President
and Business Head,
Godrej Lawkim Motors



Manish Kant Sahay,
Managing Director,
Leuze



Krishnan KM,
CEO & Co-founder,
Utthunga Technologies

The budding innovators of 2022



Thirukumaran Saravanan,
Co-founder &
Chief Business Officer,
XR Labs



Nikhil Ramaswamy,
Co-founder & CEO,
CynLr



Aniruddha Banerjee,
Co-founder,
SwitchOn



Hrishikesh Kamat,
CEO,
Shalaka Connected Devices



R Abilash Chakaravarthy,
Founder & MD,
ACE Robotics



Aniket Badhekar,
CEO Sales –
India & International,
Lehonn Technology

Steering the industry in 2022



"The most effective change will be treating learning as a driver of business success" – Shailesh Sharma, Director of Manufacturing, SKF India

"COVID-19 emphasised the need for cloud technology" – Madan Mewari, Senior Vice President and Global Delivery & Operations Head, Birlasoft



"It is essential to develop automation-ready businesses" – Sunil Mehta, General Manager, e-F@ctory (IIoT) Promotions, Factory Automation & Industrial Division, Mitsubishi Electric India and President, Automation Industry Association (AIA)

"We will improve the competitive advantage of MSMEs" – Dr Jagannath Raju, Founder & CTO, Systemantics India



"Making warehouses smarter, efficient and sustainable" – Suunil Dabral, Senior Vice President & Business Head, Godrej Körber

"At the cusp of an industrial revolution transformation" – Gaurav Bawa, Managing Director & Senior Vice President, WIKA India



A&D India magazine in association with EM magazine makes the International Automotive Manufacturing Summit 2022 – 4th edition a roaring success

A&D India magazine in association with EM magazine concluded the fourth edition of the International Automotive Manufacturing Summit 2022 themed Cleaner, Safer, Futuristic mobility with a great success. The industry's eminent and knowledgeable speakers, along with more than 130 delegates, were in full attendance at the Sheraton Grand, Pune, on December 20, 2022. The event saw remarkable keynote speakers addressing the audience which included Vivek Sharma, Sr VP & Head – Central Manufacturing Engineering, Automotive Sector, Mahindra & Mahindra; Arvind Goel, MD & CEO, Tata AutoComp Systems; J M Paranjpe, Dy GM, ARAI; and Shailendra Goswami, Chairman & MD, Pushkaraj Group.

The event also turned out to be an enlightening one with profound panel discussions on 'Digitalization in Automotive Manufacturing', 'Indian EV Ecosystem: The Challenges & Opportunities' and 'Future of E-Mobility Manufacturing, and way forward'. A strong line-up of speakers and the full presence of industry bigwigs ensured that the event was a roaring success.



Software-based solution protects plant uptime through redundant control operation

Beckhoff Automation recently expanded its extensive range of solutions in automation technology to include a software solution for redundant control operations: TwinCAT controller redundancy. While the robust design of the company's industrial PCs alone already ensures a high level of availability, its expanded product portfolio will check yet another box with TwinCAT controller redundancy (TF1100).

Plant availability plays a crucial role in this process industry in particular, therefore building redundancy into automation technology designs is vital. Redundancy is particularly important in sensitive control and communication processes. By building redundancy into the automation technology, plant availability can be increased. This is because if a component fails, its tasks are taken over by the redundant component, allowing production to continue seamlessly. When this takes place, it is not only essential for the components to switch reliably, but also for the corresponding diagnostic options to be available at the same time, as this is the only way to allow the failed component to be repaired.

TwinCAT 3 offers redundancy solutions for different application areas to safeguard and control the communication processes, which can be used to increase plant availability. It also offers the possibility of increasing availability

with three different products for a wide range of different tasks.

TwinCAT 3 has three product subcategories under it, including, TwinCAT 3 EtherCAT Redundancy, which offers a redundant connection to the fieldbus level in order to facilitate communication with the I/O level. The TwinCAT 3 Parallel Redundancy Protocol (PRP) can be used at the MES (Manufacturing Execution System) level, as well as for horizontal communication between different systems. TwinCAT 3 Controller Redundancy is a new feature that increases the availability of the PLC itself.

The software-based solution allows two standard industrial PCs that both run the same PLC program to operate as redundant controllers in easy steps. An additional, high-performance network connection between the two controllers

provides the necessary synchronisation. Standard Ethernet is used here, therefore dedicated hardware components are not required. With minimal effort, this ensures that only one of the two industrial PCs addresses the fieldbus components at any given time and that the control programs are executed simultaneously on both computers. This synchronicity is the basic prerequisite for changing the primary industrial PC in the event of a fault without losing any information.



TwinCAT controller redundancy (TF1100)

Beckhoff Automation | Pune

Comprehensive safeguarding solution for AGV

Pilz recently offered manufacturers a new solution package to safeguard Automated Guided Vehicle Systems (AGVS), comprising safety and security.

With the complete solution comprising safe area monitoring for collision protection for human and AGVS, plus safe evaluation units and tamper protection, the company offers one-stop safety and security for mobile applications, whether it's for track-bound or freely navigating AGVS.

The complete solution includes the safety laser scanners PSENscan (collision protection for human and AGVS), the modular safety relay myPNOZ and configurable small controller PNOZmulti 2 (as evaluation units), along with the industrial firewall SecurityBridge (tamper protection). Various control and signal devices, such as the evaluation unit from the operating mode selection and access permission system PITmode fusion, PITreader, the E-STOP pushbutton PITestop and the muting lamps PITsign, complete an efficient monitoring package for users.

The integrated security solution via the firewall SecurityBridge protects automated guided vehicles from unauthorised access during wireless communication. It reliably ensures that no one can access the internal IT network of the mobile platform without authorisation during operation. As such,

the AGVS and its map data remains protected, and productivity is guaranteed.

Within the solution package, the safety laser scanner PSENscan enables safeguarding and productive area monitoring of mobile platforms. On track bound AGVS, PSENscan detects objects along the route, even at high speeds, and adjusts warning and safety zones in a functionally safe manner. PSENscan provides up to 70 protected fields. These enable dynamic protected field adjustment, even on freely navigating AGVS. ROS packages (open-source robot operating system) for the PSENscan provide the data for dynamic navigation of AGVS. Users can apply these for their own



PSENscan, Safety Relay, Security Bridge

Simultaneous Localisation and Mapping (SLAM) algorithm.

If additional safety functions are to be covered on the AGVS, such as E-STOP for example, users can apply a flexible product solution comprising PSENscan and the modular safety relay myPNOZ. This enables a high degree of flexibility when designing mobile applications. With the configurable small controller PNOZmulti 2 with motion monitoring module, the company also offers an efficient and flexible solution for more complex protected field adjustments on freely navigating AGVS.

Pilz India | Pune

Efficient control cabinet assembly

Eplan has newly presented Smart Mounting software. It supports manual control cabinet assembly in a highly efficient manner. It leads technicians step by step through the installation of DIN rails, cable ducts, and electrotechnical components, and shows where each component must be installed. Even inexperienced technicians can recognise where components must be placed with the help of a 3D visualisation. Presented in a user-friendly way and supported by a 3D visualisation, the technician immediately recognises where components must be placed. This software provides production employees a complete list of all the work steps to be carried out. It starts with the mounting of DIN rails and cable ducts and ends with electrotechnical components, including auxiliary switches and timing relays. The browser-based application with a central web server doesn't require any installation and can be used directly in the workshop. Production managers also get a better overview and more flexibility—they can see the status of open production orders at a glance.



Smart Mounting system

EPLAN | Bengaluru

Networked intercom & paging applications device

Barix recently introduced the next-generation annuncicom audio over IP device. The versatile Annuncicom MPI400 intercom, paging, and background music device supports the latest internet security and audio quality standards across a wide variety of installed AV and IT environments. This device is developed for networked intercom and paging applications with elevated security standards. The device provides a versatile and future proof hardware and software platform that meets modern IT security requirements, is compatible with Microsoft Teams, and is adaptable to individual customer needs across a variety of audio environments. The Annuncicom MPI400 can serve as a robust IP intercom and paging end point between IP and legacy systems, microphones and speakers, or an amplifier. It is deployable within an InfomaCast or Syn-Apps architecture for emergency mass notification systems and meets the latest requirements for secure SIP (Session Initiation Protocol) integration with VoIP telephone systems.



Annuncicom MPI400

Barix AUDIO & CONTROL OVER IP | Switzerland

Industrial remote access gateways

HMS recently released the new generation of Ewon® industrial remote access gateways, bringing IIoT connectivity and cybersecurity to the next level. Featuring built-in hardware security, the Cosy+ range allows users to access PLC-based machines securely from anywhere, and do commissioning, troubleshooting, and programming online. The Cosy+ wireless addresses the increased demand for secure wireless access to machines. With the new Cosy+ wireless version, users can connect to their machines via Ethernet, Wi-Fi or cellular link depending on the industrial situation, enabling effective and sustainable support of machines by using secure remote access. The remote access to Ewon Cosy+ gateways is done over Talk2M®, with more than 400,000 Ewon gateways connected. The Cosy+ wireless range includes several layers of security and comprises unique built-in hardware security features. The Cosy+ wireless addresses the increased demand for secure wireless access to machines. The demand is driven by the need to increase productivity as well as maintain secure and sustainable operations.



Ewon®

HMS Industrial Networks India | Pune

Solutions for the crane industry

NORD DRIVESYSTEMS offers complete drive solutions from a single source that are characterised by maximum energy efficiency, economy and reliability, for the crane industry. The service- and maintenance-friendly drives reduce downtime and contribute to increased efficiency and availability of the entire system. An optimum and individual drive solution can be created by using the modular NORD system, consisting of the gear unit, motor, and drive electronics. All components are precisely matched to each other and ensure smooth operation. The motors up to I4, have operated reliably over many years with very high efficiency and high overload capacity and have met all common global efficiency regulations and standards. Due to the scalable functions, the drive electronics, as a solution for control cabinet installations or as a decentralised version for use in the field, can be adjusted to any drive application. They support all common bus systems and communicate with any control. NORD frequency inverters have a high-performance PLC for functions close to the drive.



Crane industry solution

NORD DRIVESYSTEMS | Pune

Highlights – Feb-Mar 2023



» SUPPLY CHAIN AND LOGISTICS

A supply chain is a network of businesses and activities that takes a product from raw material suppliers to end-consumers. Meanwhile, logistics refers to the processes of acquiring, transporting, and storing resources along the supply chain and logistics. The next edition will throw light on how automation is playing a key role in streamlining workflows, thus increasing efficiency.



» DRIVES & COMPONENTS

With each passing year and advancement of technology, there are a lot of emerging drives in the industry which provide an avenue to wide-ranging, umpteen structures & packaging and numerous power ratings. The following issue finds out the latest trends in drives and components, what they can offer and how they can be best used.

» SOFTWARE & ENGINEERING TOOLS

With increased digitisation over years, there is a need for software engineers to build, deliver and maintain high-quality software solutions. Over time software programs have grown increasingly complex, requiring meticulous work. Automated testing for software engineering is the need of the hour. The subsequent edition will focus on trends in automation for software and engineering tools.



» MACHINE-TO-MACHINE COMMUNICATION

Machine-to-Machine communications, often termed M2M/IoT have brought a revolution connecting more and more devices on internet. M2M communications refer to automated applications which involve machines or devices communicating through a network without human intervention. The upcoming issue will explore and dig deep on how M2M communication advances industrial automation.



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PROTECTION FOR MAN AND MACHINE COMPLETE SOLUTIONS FROM A SINGLE SOURCE

Safe signal processing



Safety-monitoring module
PROTECT SRB-E



Safety module
PROTECT SELECT



Safety controller
PROTECT PSC1

Installation systems



Parallel wiring
Safety Fieldbox



Series wiring
Passive Fieldbox



Extended diagnostic
SD interface



AS interface
Safety at Work

Safety switchgear



tec.nicum



integration



engineering



consulting



academy

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SCHMERSAL
THE DNA OF SAFETY

Seamless and Reliable Network Connectivity by LAPP

RNI NO. MAHENG/2010/34602

In today's Digital world where industries are creating, transferring and analysing more data than ever, there's greater need for seamless and reliable network connectivity. Driving Industry 4.0 are technologies like IIoT, Cloud Computing, Big Data and Artificial Intelligence which require multiple devices to be connected and intelligent communication in harsh industrial environments.

Data is the lifeblood of Industry 4.0, hence fast and reliable data transmission is important to make critical data driven decisions. LAPP, a leader in cable and connection technology offers comprehensive Industrial Communication solutions which are customised for Factory, Process and Building Automation.



INDUSTRIAL ETHERNET
Your Ethernet Connection Choice



HITRONIC®
Optical Transmission Systems



EPIC® CONNECTOR
Industrial Connectors



ETHERLINE® ACCESS
Managed & Unmanaged Switches

LAPP, a leader in cable and connection technology offers comprehensive Industrial Communication solutions which are customised for Factory, Process and Building Automation. We offer everything today's smart network needs such as, complete cabling and connector systems, comprehensive connectivity between the sensor/actuator and control levels to an ERP system all under one roof.