



IN AUTO MODE

THERE IS A NEED FOR PRECISE MOTION CONTROL WHICH IS DRIVEN BY DEMAND FROM GOODS PLACED ON THE LINE TO THE STATIONS THEY ARE WORKED ON

BY BINDU GOPAL RAO

THE FOURTH INDUSTRIAL REVOLUTION OR Industry 4.0 is seeing the convergence of Information Technology and Operating Technology (OT). Within IT, lines between applications and infrastructure are blurring in the cloud era. Connectivity is ubiquitous and cheap, while computing power has gone up manifold. Simultaneously, the cost of robotic systems has come down and their versatility has gone up.

The top 10 technologies at the heart of smart

manufacturing that are gaining maturity include Internet of Things (IoT), smart sensors, cloud, big data analytics, artificial intelligence (AI), industrial robotics, digital twins, 3D printing, augmented/virtual reality (AR/VR), and cyber-security.

“Leaders across the industry are adopting smart manufacturing to gain efficiencies right from the factory floor to the consumer. Manufacturing systems are being upgraded to increase shop-floor productivity, reduce time-to-market, improve quality, enhance



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PROCESS
AUTOMATION
S/W USING AI
WILL BRING
ENHANCEMENT
TO WORKFLOW
MANAGEMENT.



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2. Data is collected to gather insights that drive best practices and improvements.

workplace safety, and gain real-time visibility into operations," says Ganesh Kalyanaraman, global delivery head for manufacturing, logistics, energy and utilities, Cognizant.

Siba Prasad, senior engineering manager, AM-ETEK Instruments India, adds, "Smart manufacturing involves harnessing data; data will tell us "what to do" and "when to do it." It creates a platform for data collection and sharing with all major resources and uses all intelligence technologies to take smart decision. It connects starting from a small sensor, machines, lines, PLC's (Programmable Logic Con-

troller), HMI's (Human Machine Interface), SCADA (Supervisory Control and Data acquisition systems), MES (Manufacturing Execution System), ERP (Enterprise Resource Planning), PLM (Product Life Cycle Management), and supply chain."

Also, by incorporating smart sensors and IIOT (Industrial Internet of Things), today manufacturing can reach quality levels with zero defect. It is today's reality that legacy manufacturing systems are transitioning to smart, connected, automated systems for improving efficiency and costs.

Data is collected to gather insights that drive best practices and improvements. "Striving for accuracy is core to predictive intelligence, not only to lower costs but also to use energy and materials efficiently, which contributes to building a sustainable future. This is the crux of what we call modern manufacturing. Sensors enabled by IoT and embedded in the system, automate the process of data collection and have the potential to capture every detail. Sensors feed data to machines that crunch the data, to gather insights into where improvements can be made. This machine-to-machine communication and analytics capacity speeds up and scales production – enhancing the ability to compete," avers Sekaran Letchumanan, vice president, operations, Flex India.

ROBUST ROBOTICS

Robots are now making their appearance felt in the

technology world. New process automation software incorporating artificial intelligence tools are poised to bring similar productivity enhancement to workflow management, especially handling heavy data tasks including communications such as email, data entry and regulatory compliance.

Robots on the shop floor are transforming manufacturing through huge gains in productivity. According to the World Robotics Report 2018, sales of multipurpose industrial robots grew 32 percent in 2017-18; compound annual growth is expected at 19 percent between 2019 and 2021. Applications are numerous and there are a great number of use cases for the same.

Industrial automation is the key enabler for manufacturers to adopt smarter technologies as they scale up the value chain and strive to align their offerings in sync with the global standards and the ever-dynamic technological trends.

"In the robotics arena, few of the key rising trends are Coots and Autonomous Intelligent Vehicles (AIV) – also known as mobile robots - for material and intermediate goods transport. We've one of the largest



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3



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installed bases of AIVs that work as a fleet in a variety of manufacturing applications related to material movement. Robots are also emerging as one of the key parts of end-to-end traceability automation solutions. So, they no longer work as performing standalone tasks but rather as well integrated elements into the entire automation scheme for the shop floor as a part of the smart automation architecture," says Sameer Gandhi, MD, Omron Automation, India.

MOTION CONTROL

Precise motion control is an integral part of a manufacturing setup. While automation of motion control process existed earlier, IT-OT integration is bringing about a complete transformation today as IoT can enable closed-loop control in real time.

Cognizant, for example, helped a client in the packaging equipment and packaging materials industry to build a digital solution that augmented the movement of their packaging line. "As part of the solution, a camera sensor placed above the line provides real-time alerts to the factory floor manager on a hand-held device. The alerts are based on algorithms that process sensor data to compute key performance indicators (KPIs) for the line. This real-time information flow allows the manager to take corrective action quickly and avoid the need to stop the line," says Kalyanaraman.

Automation can also help make the system much more versatile to cater to a wide variety of manufacturing requirements, as software-based controls can be modified easily. It also helps in making the workplace safer and more efficient. Varun Bhutani, managing director, Tangish, a Trihund product, says, "Cheaper, more capable, and more flexible technologies are accelerating the growth of fully automated production facilities. The key challenge for companies will be deciding how best to harness their power. Today, these factors are helping to boost robot adoption in the kinds of application they already excel at i.e. repetitive, high-volume production activities."

As the cost and complexity of automating tasks with robots goes down, it is likely that the kind of companies already using robots will use even more of them. In the next five to ten years, however, we expect a more fundamental change in the kinds of tasks for which robots become both, technically and economically viable, he adds.

MAKING THE CONNECTION

Smart manufacturing follows a multi-tier IoT architecture with hardware devices at the bottom and applications at the top. Sensors attached to the machines continuously capture operational data. Device-to-device connectivity is established with local wireless networks. With the help of edge com-

puting and cloud, enormous amounts of data can be processed instantly.

IoT platforms form the backbone of data analytics, as they gather data from various devices and various formats. Big data systems, often with AI capability, run data analytics algorithms and present KPIs to the user over a rich user interface. This architecture can then be extended to cover multiple plants in the network. As more and more historical data becomes available, predictive modelling can be used to identify issues in advance.

Finally, with digital twin, it is possible to simulate different usage scenarios and make necessary design and process changes to the manufacturing sys-

ASSET-INTENSIVE INDUSTRIES ARE POISED TO GAIN THE MOST FROM INDUSTRY 4.0.



tem and also prevent unnecessary shutdowns in operations. Lokesh Payik, general manager and head of connected industry/Industry 4.0, Robert Bosch Engineering & Business Solutions (RBEI), avers, "The primary method of linking the company's IT infrastructure with production equipment in state-of-the-art production is through the use of IoT. These may be routers, machine controllers or even sensors, for instance. But even if the advantages of the Internet of Things, such as increased efficiency and streamlined processes, are obvious, managing a large number of IoT devices can quickly become confusing, complex and thus time-consuming and expensive."

TREND CHECK

Asset-intensive industries from the factory to the consumer are poised to gain the most through Industry 4.0. Automation systems and drives are getting smarter with the ability to generate and process a huge amount of data that was not possible before. Along with data comes the issue of cyber-security, which is now getting increased attention.

Automation solutions and electric drives are the key enablers of this smart engineering, today. "We have seen the growing trend of using PLC over CNC, and the use of motion control with integrated robotics. We are also seeing an increased adop-



tion of electric drives that cover the complete power range of 100W-4MW, and the usage of intelligent drives that help maximize the productivity and efficiency of machine tools and ensure the best possible networking," says Payik.

Sahil Shanghavi, an industry expert, opines, "Evolution of connected products such as drives are the biggest evolution the industry has seen. Along with the connected products, there have been several advantages that have come into play as well due to the advent and improvements in data analytics. For drives, this allows the user to optimise their operation, monitor energy usage, control pumps, and provide remote communication ability. These can further help them by providing them with the ability to use predictive preventative maintenance scheduling, and overall improved operation and reduction in total system cost of ownership."

After the introduction of IIOT, OEMs can now have a live monitoring of crucial parameters in drives ensuring motor conditions are proper. "This has helped to check that the advanced warning systems can be prompted to ensure minimum down time. It can also reduce service cost as OEMs will soon be committed on up-time of the equipment and ensure the customer stays with them. Customers are, in turn, assured of life time services remotely. Smart cameras and sensors that are a part of advanced automation technology today go a long way in ensuring crucial machine parameters such as motor vibration and temperature can be monitored and analysed. This helps in prompt and efficient service even before the fault occurs," says Mohandas Alakkat, general manager, automation, Grauer & Weil (India) Ltd.

As 5G connectivity is rolled out in the near future, IoT technology will get a massive boost in terms of scale and velocity of data processing. This will help automation and drives become truly intelligent systems. ■



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