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For Precise, Reliable & Sustainable
Floatation Optimisation

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PROCESS TECHNOLOGY
MARCH 2021

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ON THE COVER
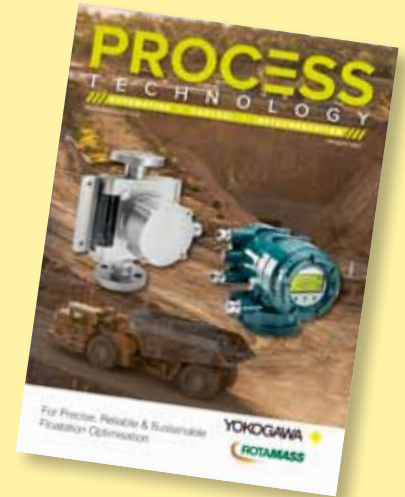
The mining industry is facing many challenges that are having both short-term and long-term impacts. Mines are driving to lower operating costs and operate in more reliable and sustainable ways.

One of the key areas highlighted for improvement is the floatation process. In this process, a ground ore slurry is mixed with chemicals (collector and frother) in an aerated vessel. The dosing of the collector and frother can have a significant impact on the mineral separation, plant operating costs, sustainability and asset availability.

Many mines have operated the same way for a long time and measurement of the dosage rates of these costly chemicals has been done poorly. Inaccurate and unreliable measurements have caused high costs and unplanned downtime. By employing the Yokogawa RotaMASS Nano Coriolis flowmeter users can optimise the floatation process. The RotaMASS Nano is the world's smallest dual bent Coriolis flowmeter, featuring an extremely stable zero, chemically compatible wetted parts, unique in-line temperature measurement and patented tube health check diagnostic. In applications where every drop counts, the RotaMASS Nano is the solution. The end results being seen by multiple mining plants utilising the RotaMASS Nano are improved up-time and a significant reduction in chemical use, which not only lowers operating costs but also provides more sustainable operations.

For further information please contact Yokogawa Australia at enquiries@au.yokogawa.com.

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INDUSTRIAL NETWORK INFRASTRUCTURE

YOUR FUTURE BUSINESS FOUNDATION — PART 1

Planning and managing a structured plant network.

Network infrastructure is one of the most vital yet undervalued business assets. Lose the network and you lose phones, email, internet, access to business systems or control/visibility of the manufacturing process. Many businesses strive to provide optimum versions of the devices connected to the network, such as computers, phones, machines, etc, yet attempt to economise on the network infrastructure that supports these devices.

Current-day industrial networks

Today's industrial networks are a composite of Ethernet protocols and what industry experts term legacy protocols. 'Legacy protocol' is a telling term because, like other legacies, we must live with them for a while. Legacy protocols age and become more difficult to support over time. This issue is further exacerbated by the ageing workforce megatrend. A large portion of the support staff for legacy protocols has reached retirement age. Forward-thinking organisations instituted plans to retain this outbound knowledge. Other companies meet the need by engaging professional services organisations backed by major automation manufacturers.

Protocol distribution in industrial networks

Legacy industrial protocols (fieldbus) account for almost half (48%) of the industrial network nodes sold. Ethernet variants account for 46% of nodes while wireless nodes have 6% share. The telling aspect of this story is that Ethernet and wireless are growing at double digit rates while Fieldbus is growing at a shrinking single-digit rate.

Network refresh rates

Industrial networks have added expectation versus their enterprise counterparts. Not only does the business require them to operate at peak levels, industrial networks have the longest refresh rate of any business network. Where data centres are refreshed every three to five years, industrial networks are refreshed every 12 to15 years. Further, the supporting physical infrastructure is often in place for more than 20 years. A major capital expenditure is required to install and commission a new network. ROCE expectations are extremely high for all businesses (Figure 1).

Industrial network refresh rates are accelerating over time as companies work to balance investment performance and network performance. However, we must still anticipate longer than desirable refresh rates to make planning effective.

Network planning and management

Like other business assets, a rigorous process governing the network ensures efficacy and availability as time goes by. There is not a particular methodology that is superior to others. Realistically, the best run business networks result from a collection of elements intertwined with the governing process. Justification for creating the process is simple:
- Lowers the total cost of network ownership.
- Improves business agility.
- Helps the business respond quickly and effectively.
- Increases availability.

The PPDIOO Process is a design and management methodology that spans the entire network lifecycle (Figure 2).
1. **Prepare:** Business agility is a result of good preparation. This phase is used to consider the broad vision, requirements and technologies you can employ to make your business more competitive.
2. **Plan:** Successful technology deployment must have an accurate assessment of the current state network, its security posture and the business readiness to support the chosen solution.
3. **Design:** A detailed design reduces risk, avoid delays and controls the total cost of network deployments.
4. **Implement:** Here the business works to integrate devices and new capabilities in accordance with the design phase without compromising network availability or performance.
5. **Operate:** The business proactively monitors the network to improve service quality, reduce disruptions and mitigate outages while maintaining high availability, reliability and security.
6. **Optimise:** Best-in-class businesses never stop looking for a competitive edge. So continuous improvement is a mainstay of any network lifecycle.

Network documentation

Does comprehensive, up-to-date documentation exist for your network? Most companies do not have the required documentation, but all of them should consider it an absolute necessity. Accurate documentation and identification substantially shortens the time to recover from a network issue. Many methods to generate this documentation exist, ranging from a summer intern project to engaging a professional services organisation to assess and document the network.

Network assessment

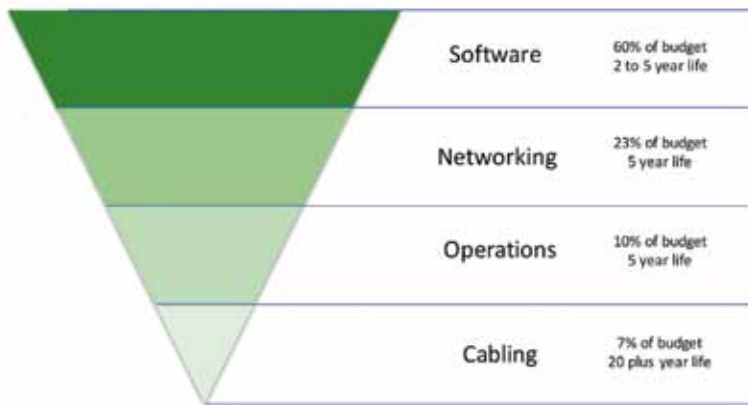Professional services organisations, backed by major automation manufacturers, perform cabling

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Figure 1: Infrastructure investment versus longevity.

Figure 2: The PPDIOO process.

and network infrastructure assessments. Many use software that 'crawls' unobtrusively through the network, discovering and visualising the network footprint (Table 1).

Legacy protocols

During the assessment process, pay attention to legacy protocols, ie, fieldbus. If legacy protocols are present, plans to migrate them to a modern technology must be at the forefront. Legacy protocols migrate out of the network as it ages because they become difficult and expensive to support, even if their performance is adequate. Their replacement is infrequently a 'rip-and-replace' proposition.

Network longevity

Consider the age of the existing network and physical infrastructure. Are any of the active components, network switches, servers, programmable controllers, drivers or other end devices approaching 'end-of-sale' or 'end-of-support' from the manufacturer? Aged active components have support costs that grow exponentially after a certain age, so they need to retire before your business is frantically searching for good used replacements to get manufacturing up and running.

Evaluate the age of transmission media and its condition. Consider wire speed as well. Category 5e is adequate for 10 Mbps and 100 Mbps traffic but is insufficient in the long term. Pay attention to the connections and the cable. Jacket materials are commonly thermoplastic, which ages over time, particularly in challenging environmental conditions like UV exposure, temperature extremes and chemical exposure. The same exposures age the metallic portion of connectors. Along cable routes, look for sharp bends and areas where cables appear to have been struck or deformed. With multi-pair copper Ethernet media, these physical deformations displace pairs in the cable, damaging its performance. With fibre-optic media, there can be microfractures from physical deformation that attenuate or, in severe cases, interrupt signal flow.

Cabled infrastructure

As the network grows the cabled infrastructure must evolve. There are two cabling topologies used for industrial networks: point-to-point and structured cabling. Older industrial networks employ a point-to-point cabling topology where each connected asset has a home run cable to the control room or data centre. Engineers chose this solution in the belief that connection points were vulnerable and would cause reliability issues. More connections meant more risk. In the very early days of Ethernet connectors there may have been some credence to that conclusion. Connector and media design as well as manufacturing processes are significantly more robust today. So, in modern networks, this argument is no longer valid. Also, the flexibility and network resiliency gained from a structured cabling topology far outweighs the point-to-point reliability argument.

Enterprise networks were once point-to-point cabling. They quickly evolved to structured cabling for several reasons, notably:

- Structured cabling provides the needed flexibility to accommodate moves, adds and changes (MACs).
- Structured cabling can adapt network topology and configuration to business needs without pulling new cabling and resultant disruption of business activities.
- Structured cabling topologies enhance network reliability and recovery speed from outages.

Industrial networks are on this evolutionary path because the value proposition for structured cabling networks is so strong. Elimination of downtime is the strongest argument for structured cabling topologies in industrial networks. Industrial network downtime is easily monetised in lost production dollars. As such, a business can readily justify adoption of this topology.

Structured cabling enables patching or otherwise redirecting network traffic to rapidly address infrastructure-related outages. It allows
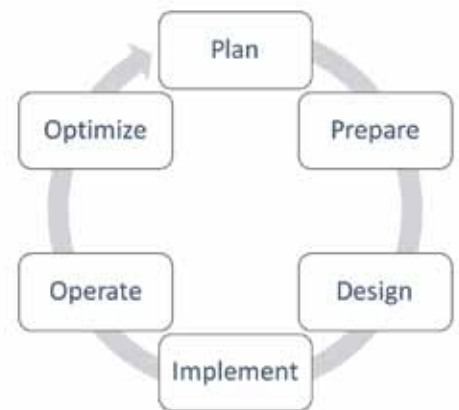
outages due to fault in the horizontal cabling to be immediately addressed by patching to a different horizontal link. After the outage is resolved, the patching infrastructure permits technicians to quickly attach diagnostic instruments to the failed link. The link can be returned to normal service with minimal disruption in network operation. Table 2 shows the functional comparison between enterprise and industrial networks.

Installing structured cabling

When installing structured cabling, it's good to have a few guidelines in mind to ensure maximum viability from the new installation.

- Require the cable installer to connect a network analyser to each link installed, including spares.
- Measured link performance becomes one of the job completion deliverables; doing so establishes that the link delivers expected transmission performance, not just electrical continuity. Further, if there are problems with a link in the future, baseline performance data exists in your files.
- Premium cable manufacturers extend a generous warranty in exchange for fidelity to their offering using a certified installer; it is a worthwhile investigation when selecting materials and installers.

Network management software

Another important topic for the current-day network discussion is a three-letter acronym: NMS. NMS stands for network management software. It is an emergent category of software for industrial networks. Just as the name implies, it is purpose-built software used to manage networks. There are Enterprise NMS solutions and have been for a while. Due to the unique properties of industrial networks, these tools are not suited for the job. When selecting this category of software, make certain the NMS solution you consider is purpose-built for industrial networks.

Design consideration	Assessment criteria	Design impacts
Connectivity	Number of devices, machines, etc.	Pathway capacity, switch port counts, number of cable runs plus growth factor
Environment	MICE table (TIA-1005-A)	Protection, separation from environmental influences, transmission media choice
Bandwidth	Current network utilisation and estimated future load	Transmission media, network switch specs, installation practices
Cable reach	Required cable run lengths	Transmission media, network switch specs
Safety	Nearby hazards, e.g. high voltage, heat, chemicals, etc.	Device access, O&M worker protection
Security	Threat level, isolation needs, accidental versus intentional threats	Port protection, enclosure access control, hardening of media
Longevity	Desired years of service	Infrastructure hardening, business growth

Table 1: Network design assessment criteria.

Parameter	Office/Enterprise	Plant/Industrial
Connected devices	80% clients 20% servers	20% clients 80% servers
Traffic	Infrequent larger messages that travel to/from data centre	Frequent, numerous but smaller messages that travel between networked devices
Service access	Many devices operated during normal business hours in accessible areas	Systems operate 24x7, scattered throughout the plant, often in hazardous locations
Downtime	Mostly nuisance. Client problems take up to a day to resolve	Direct result is lost profit. Downtime must be eliminated.

Table 2: Functional comparison – enterprise and industrial networks.

Industrial networks have two main NMS use cases.
- A consultant or system integrator working with the business uses NMS software located on their computer to discover and visualise the network; this application is to assess and document the current state network in anticipation of service activities that the consultant undertakes on behalf of the business.
- An NMS solution is installed permanently in the network, typically on a server in the DMZ so the entire industrial network is visible and monitored; this application acknowledges the dynamic nature of the network and acts as a watchdog sniffing out problems; visualises the network so a common understanding of status is provided for varying worker experience levels and dependent on the NMS solution; and provides a portal for secure remote access when needed.

The first use case focuses on the needs of network maintenance. An expert uses the NMS tool to discover and visualise the network. This step generates a baseline documentation package for the network. Typically, businesses retain this expert to perform maintenance, usually to upgrade or expand to the network. Up-to-date documentation for the network is a welcome latent outcome of the exercise. While the expert's NMS package is connected to the network, performance and health metrics can be seen, helping the expert spot deficiencies that must be corrected. However, these values are a snapshot, in that the NMS solution does not remain connected to the network long term.

The second use case addresses a greater portion of the network lifecycle. In this use case, the NMS solution resides in the network, typically on a server in the DMZ or the Manufacturing Zone. Residence in the network allows the NMS software to act as a dashboard, allowing network users to see network health and performance. Further, more members of the workforce interact with the network nowadays, all with varying levels of network knowledge. These workers need information out of the network to ascertain if there is a network-related problem slowing down production. A production planner can use that information to make better decisions but may not have the needed skills to access the information.

Network building blocks
Another practice that has risen to prominence is the use of pre-populated and preconfigured network enclosures. The solution allows companies to rapidly deploy or expand without bearing the time penalty and expense of a bespoke enclosure.

Enclosure designs are validated electrically and thermally to eliminate risk during installation and commissioning. Active component placement within the enclosure is optimised for function, thermal performance and maintainability.

Since the network building blocks are built to a validated design, companies gain enhanced supportability through their use, avoiding the 'snowflake' scenario where each bespoke enclosure is 'just a bit different'. This factor is important in a local deployment but becomes vital when multiple locations across a global footprint are considered.

Worker education
Businesses need to invest in their personnel as certainly as they make other business investments. Creating productive collaboration between IT and OT staffs is of immense benefit to businesses. The progression towards more ubiquitous use of Ethernet sets the stage for this collaboration to occur. To hasten engagement, worker training investments are necessary.

Industry experts have long provided training and certification for IT staff in Ethernet-based enterprise applications. Training materials to support industrial staff in a similar realm have been sparse at best.

In Part 2
In Part 2 of this article we will look at emerging technologies and industrial network planning for both the near term and the long term.

References
1. Cisco Systems and Rockwell Automation 2017, *Converged Plantwide Ethernet Design and Implementation Guide*.
2. Colville, RJ, Spafford, G 2010, 'Top Seven Considerations for Configuration Management for Virtual and Cloud Infrastructures', *Gartner RAS Core Research Note G00208328*, 《https://img2.insight.com/graphics/no/info2/insight_art6.pdf》

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PANEL PC

The Aplex ARCHMI-932AP rugged industrial 32″ all-in-one HMI computer is housed in a fanless aluminium case providing IP-66 front panel protection.

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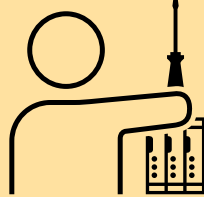| You create	We build	You install
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PILZ
THE SPIRIT OF SAFETY

HANNOVER MESSE, Hall 9, Stand D17

Next generation technologies support mining productivity and innovation

Photo courtesy of Rio Tinto

Australia is the world's largest producer of bauxite, the primary component of aluminium. Aluminium is a key part of our everyday life and helps us travel far and wide. It is used in bikes, cars, trains and planes because it's strong, lightweight and corrosion resistant. These properties also make aluminium the perfect solution for countless food and beverage applications — from drink cans to aluminium foil — and most importantly, it can be recycled over and over.

Rio Tinto is a global leader in aluminium, and located in Far North Queensland on Cape York in Australia, is their Amrun mine. The Amrun mine is the third continuous mining operation alongside East Weipa and Andoom in the Rio Tinto Weipa Operations portfolio, which has been producing bauxite since 1963, and exports more than 30 million tonnes of bauxite annually.

Constructing Amrun took three years, with automation and control requirements needing to be carefully considered with the mine being in such a remote and isolated location. The project went to market for a main automation contractor (MAC) to provide engineering design services, equipment supply, implementation services, site services through offsite switch room testing, pre-commissioning and commissioning support, as well as training services. A key aspect of selecting the MAC was partnering with an organisation that could demonstrate capability in delivering an end-to-end automation solution for a major capital project. Of importance was the project delivery personnel who would see the project through from design office, Factory Acceptance Testing (FAT), pre-commissioning and commissioning.

The Rockwell Automation suite of products was chosen to provide a complete solution from the ground up — from its communications stack through security, product integration, diagnostics and engineering tools — as a complete solution.

The processing plant, materials handling systems, water and tailings, mine infrastructure, wharf and rail-mounted machines are all controlled by Allen-Bradley ControlLogix controllers, together with Allen-Bradley CompactLogix controllers for smaller outdoor MCCs and package controllers.

Given the scale of the Amrun site, there are approximately 50 PLC controllers in operation across the site.

With a large, distributed architecture, Amrun needed a modern process control system that could provide seamless integration between critical mine processes.

After looking at various technologies, a Rockwell Automation PlantPAx solution was implemented, delivering cost savings and schedule benefits. Using a predefined and standardised library ensured rich functionality and robust performance. The usability of the PlantPAx toolset allows for quick modify configuration and its ability to be easily integrated across multiple systems has simplified control system troubleshooting.

By using a common automation platform, the PlantPAx system provided seamless integration between critical process areas of the processing plant. Amrun's control and automation system uses plant-wide Ethernet communications with the complete FactoryTalk suite of products. The entire suite of application servers are virtualised on high availability data centres.

While Amrun is located in an isolated site approximately 800 km from Cairns, the data centre is integrated into Rio Tinto's IT infrastructure, enabling centralised management and remote access. A set of portable mobility tablets was implemented so operators could access data from the plant. These devices were enabled by Rockwell's ThinManager, providing users access to real time information.

"With integrated software that can collect and manage the information from various sensors, devices and systems from across the site, operators can now collect, coordinate and share data internally," said Bernard Ooi, project manager, Rockwell Automation. "This helps to ensure better data-driven decision-making and greater consistency in results."

Safety was a key priority for the mine and processing plant and as such, Amrun uses the latest technology to run operations safely and efficiently. Functional safety was implemented in GuardLogix controllers and integrated with the PLCs to provide seamless visibility of safety and control.

With such a large-scale project, it was important that commissioning was a smooth process. To help achieve this, the FAT was undertaken at the Rockwell Automation facility in Melbourne. The majority of the plant was staged and tested in a complete integration test to simulate the control of the plant from the dump truck through to the ship loader. The full integration test was conducted with the required controllers and application servers hosted on the VMWare-enabled data centres.

The Amrun project was delivered under budget and ahead of schedule as a result of an integrated approach to design, construction and commissioning.

"Amrun is a great example of innovation through collaboration which is vital for advancing the future of mining," said Glenn Otway, manager, Power and Automation, Rio Tinto.

Rockwell Automation Australia
www.rockwellautomation.com/en_au

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PLC WITH MQTT SUPPORT

IDEC Corporation has released a firmware upgrade enabling its MicroSmart FC6A Plus PLC CPUs to support the industry-standard MQTT protocol. The upgrade can be downloaded to the FC6A CPU, so it is easy for users to connect all types of field data to onsite and cloud-based brokers and make the information readily available for users and analytical applications. Users can also send commands to the FC6A using MQTT.

The FC6A with MQTT capability is suitable for new automation system designs or for adding IIoT connectivity to existing systems. MQTT is supported on Ethernet port 1, so the FC6A can use existing wired, Wi-Fi or mobile data wireless networking to connect with onsite or cloud-based brokers. A typical application would publish machine data from many machines to the cloud, where it would be historised and could be transmitted to subscribing mobile applications.

No additional hardware is needed. Users can take advantage of the traditional PLC control logic and I/O functionality, or they can use the FC6A as an IIoT data concentrator for many other PLCs and intelligent devices. The FC6A with MQTT supports Amazon Web Services AWS IoT Core, with future support planned for Microsoft Azure and Google Cloud.

IDEC Australia Pty Ltd
www.idec.com/australia

SAFETY GATE SYSTEM

With the Pilz PSENmech safety gate system, the safety gate is safely locked until the plant or machine is stopped. An unintended restart of hazardous movements is prevented as long as the gate is open. An escape release and emergency release can also be added with guard locking, making it suitable for use on accessible gates.

The safety gate system with head section and metallic 3D actuator is insensitive to water, dirt and dust. Due to its robust design, the product has a long service life and a high mechanical load capacity. The ability to select between different actuators and multiple actuation directions means the user benefits from a quick, simple and flexible installation.

In conjunction with the PNOZmulti 2 configurable safe small controllers, the system is said to offer a complete, one-stop solution for safety gate monitoring with guard locking.

Pilz Australia Industrial Automation LP
www.pilz.com.au

BOX PC

The FabiaTech FX5327 box PC has an Intel N3160 1.6 GHz quad-core CPU packaged with 4 GB DDR3 RAM system memory and a 256 GB solid state hard drive. It comes standard with Windows 10 IoT but can be optioned with Linux. Also included as standard on the FX5327 are four USB2.0 and one USB3.0 ports, two RS-232/422/485 ports (one port supporting CANbus), a VGA display output, programmable digital isolated inputs and outputs (two in and two out) and an audio output jack.

This PC also supports expansion interfaces with a PCIe Mini Card slot suitable for 4G LTE modem cards. The fanless and low power consumption design has an operating temperature rating of -20 to 55°C and its dimensions are 54 x 104 x 145 mm. The input supply voltage is 9–32 VDC and the device has internal sockets for memory expansion using CFast and SD memory cards.

The FX5327 industrial computer system is suitable for use in factory automation, digital signage, transportation, motion control and in-vehicle solutions. It can be panel, VESA or DIN-rail mounted, and is suitable for use as a communication PC for remote desktop applications or running remote support software such as TeamViewer.

Global Automation Asia-Pacific
www.globalautomation.com.au

ETHERNET SWITCHES

Hirschmann has expanded the BOBCAT range of Ethernet switches, bringing the features and security advantages of the HiOS-based range to applications that require a high density of ports.

The previous range was limited to a maximum of 12 ports but now the range extends to 24 ports of Fast Ethernet, 24 ports of Gigabit and the BRS50 has a maximum of four 2.5 Gb with 20 Gb ports.

Recent firmware changes to the range have increased the feature set to include full IPv6 management support, 802.1AS time sync, IEEE1588 v2 time sync, monitoring via popular industrial protocols with future support to include OPC UA in a future release.

The switches also enable real-time communication using time-sensitive networking (TSN) and are a suitable solution for classic automation applications that require real-time communication, advanced security, low latency and the simultaneous synchronisation of data and information to control operations.

Control Logic Pty Ltd

www.controllogic.com.au

4G GATEWAY

The ICP DAS GRP-541M-4GC is a 4G dual SIM card gateway for 10/100Base-Tx Ethernet, serial port and CAN. With the integrated GPS function, the GRP-541M-4GC can also be a GPS tracking system. It can be used in machine-to-machine communication application fields to transfer the remote I/O, Modbus data or video of the camera via 4G, 3G and 2G.

With a high-performance CPU, the GRP-541M-4GC is claimed to handle a large amount of data and is suitable for industrial environments with its metal casing and an operating temperature range of -25 to +75°C.

The functions of the GRP-541M-4GC include 4G router, port mapping and a serial-to-4G gateway function.
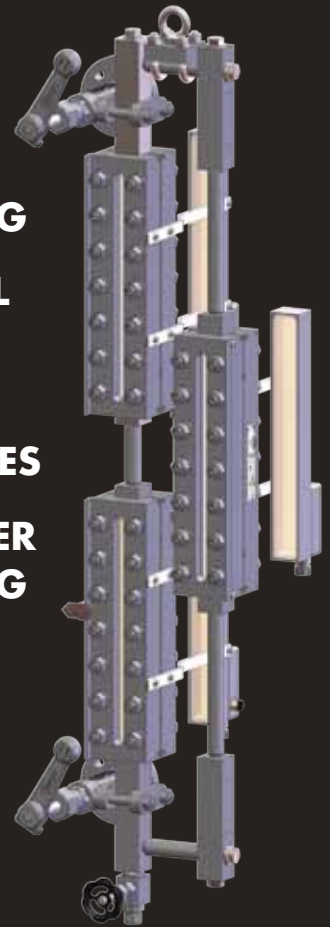
ICP Electronics Australia Pty Ltd

www.icp-australia.com.au

GIGABIT PROFINET SWITCHES

Red Lion has introduced the NT4008 series of 8-port Gigabit managed industrial Ethernet switches. The switches are certified to meet Profinet PNIO v2.34 Conformance Class-B standards to ensure seamless integration into Profinet networks using standard PLC configuration and management tools.

The switches are UL Class 1, Division 2 and ATEX listed for use in hazardous and ordinary locations, ABS certified for shipboard applications and EN50155 certified for rail applications, ensuring operation in nearly any environment. The IP30 metal DIN rail enclosures, redundant 12–58 VDC power inputs, wide -40 to +75°C operating temperature range and up to 50g shock resistance make them suitable for industrial conditions.

With advanced security and traffic control, they are available in both copper and fibre options in Fast Ethernet and Gigabit configurations.

Control Logic Pty Ltd
www.controllogic.com.au

SCARA ROBOT

Omron says its i4L SCARA robot is capable of high-speed, high-precision motion with payloads up to 5 kg. It offers simple integration with a compact design, easy wall or table mounting and Ethernet or EtherCAT connectivity in the base. Cable connections can be arranged so that they exit through or are parallel to the mounting surface.

Users can also maximise uptime by means of interactive maintenance alarms and an RGB dome light.

A status light helps to diagnose problems quickly and efficiently. The robot is designed for high-speed, repeatable applications and comes with three options of working envelope with reaches of 350, 450 and 550 mm.

The product offers high-end inertia and ±0.01 mm repeatability for a light-duty SCARA robot, providing all the performance necessary. Set-up complexity and programming time are said to be reduced due to simple integration and synchronisation when deploying multiple robots.

Omron Electronics Pty Ltd
www.omron.com.au

SAFETY RELAY MODULE

The IDEC HR6S safety relay module is a microcomputer-based device that supports a wide variety of connections, input devices and operating modes, as well as adding diagnostic and status monitoring important for the growing number of manufacturing sites relying on IoT data.

Safety relays are crucial for monitoring safety-related inputs, and for protecting both machines and operators by enabling equipment via outputs only when normal and safe conditions are confirmed.

The adaptable safety relay module is designed to meet ISO 13849 requirements, with one model for low-risk Safety Category 1 applications and six models suitable high-risk Safety Category 3 and 4 processes requiring redundancy. Up to eight different start modes are dial-selectable, including options for manual and automatic start. Certain models have adjustable off-delays and all use a compact DIN-mountable form factor. An expansion module is available to expand the number of safety outputs.

Depending on the model, up to seven types of input devices are dial-selectable, including emergency stop switches, two-handed switches, pressure-sensitive devices and other types of interlock switches. Terminations are arranged intuitively, with terminal blocks available as push-in or screw type.

Maintainability and convenience are aided by multiple LEDs with steady or flashing coloured lights indicating various conditions such as power, error and operating state. Users can quickly check the status onsite, identifying any issues so immediate action can be taken.

IDEC Australia Pty Ltd
www.idec.com/australia

INDUSTRIAL UPS

The UB40.241 from PULS is the latest addition to its range of 24 VDC uninterruptable power supplies. The UB40.241 has the highest output current and largest battery size in the range. A maximum continuous output current of 50 A (below 50°C) and up to 60 A for 5s burst and maximum battery size of 200 Ah provides for higher power and longer buffer times. At a constant load of 20 A the buffer time would be over 10 h and at constant 5 A the buffer time would be nearly 2 days.

The UB40.241 uses the 1-battery concept where each 12 V battery is charged and monitored separately, so that matching of batteries is not necessary. A battery size selection switch enables optimising for system battery size, and the temperature-controlled charging extends battery service life. A selectable buffer limit timer can be tuned to specific requirements to disable buffering after the set period in order to reduce recharge times and further extend battery service life. Diagnostic and monitoring functions and dry contact status outputs can be connected to a PLC or to local indicators for early warning. An inhibit input can also be used to prevent system buffering during servicing or other requirements.

Multiple UB40.241 units can also be arranged in various architectures to allow for increased voltage, higher current or to create a redundant UPS system. Designed for industrial applications, the UB40.241 is DIN rail mounted and has an operating temperature range of -25 to 70°C.

Control Logic Pty Ltd
www.controllogic.com.au

CONVEYOR BELT AI MONITORING SYSTEM

Technology company Continental's service solution is designed to monitor conveyor belt systems. It permits early identification of weak points along a belt conveyor system before damage resulting in unscheduled downtimes occurs.

The monitoring system offers a combination of visual and acoustic inspection while also permitting the efficient, data-assisted planning of maintenance intervals. It can replace the current conventional and manual operations by permitting a precise inspection process, reducing verification input and enabling predictive maintenance through sensor-based technologies.

Continental's service solution addresses different applications and sections. The inspection of open sections and operations is carried out from the air using a drone equipped with infrared and RGB cameras that monitors both sides of the belt conveyor. As soon as the drone has flown over the section under inspection, it returns to an autonomous charging station to upload the data collected to the relevant cloud via an IoT module during the charging process. The image data is processed with the aid of an AI-assisted algorithm and analysed with reference to any detected idler defects.

Continuous maintenance in covered sections or underground conveyors is carried out using fixed microphones installed every 20 to 25 m that capture frequency variations in the numerous idlers. The audio recording is conducted twice a day, with the data being uploaded to the cloud specified above. Events that indicate a damaged idler are then investigated using an AI-based algorithm.

Continental Pty Ltd
www.continental-corporation.com

OPTICAL DATA COUPLERS

The Pepperl+Fuchs LS682 optical data couplers are said to maintain constant data rates over the entire distance of their range to provide a stable and consistently strong connection. Since this technology is optical rather than mechanical, there are no moving parts and wear is reduced. They are suitable for many applications, including high-bay storage retrieval.

The dependability of the LS682 optical data coupler prevents disconnects and avoids costly downtime. With the LS682 optical data coupler, devices can be connected in industrial Ethernet networks utilising protocols such as Profinet and EtherNet/IP. Datagrams are not stored, which means that instant data transfer of 100 Mbps full duplex can be achieved. The high transfer rate opens up a host of new application areas, such as the use of IP-based cameras for monitoring, maintenance and inspection purposes.

When mounting the optical data coupler, no minimum distance has to be considered since it can provide data transmission beginning at distance 0. This allows optimum use of existing space and easy commissioning.

Pepperl+Fuchs (Aust) Pty Ltd
www.pepperl-fuchs.com

OPC SUITE SUPPORTING MQTT

Version V5.10 of Softing's dataFEED OPC Suite Extended has been released. With the help of the new MQTT Subscriber, data can be received from an MQTT Broker and transmitted to other applications via OPC UA or written to a controller. This allows, for example, a recipe manager to be implemented in the cloud. In addition, a range of data preprocessing features now permits the execution of mathematical and logical calculations. Use cases include converting a temperature value from Celsius to Fahrenheit or filtering out a specific part of a word.

The company says the dataFEED OPC Suite Extended makes the provision of production data for IoT cloud applications simple and secure. The company is working to further expand the data integration capabilities and make them even more flexible.

dataFEED OPC Suite Extended is said to be a complete package for OPC communication and cloud connectivity in a single product. The suite can be used to access the controllers of leading suppliers and to connect to IoT devices.

Ti2 Pty Ltd
www.ti2.com.au

LATEST EVOLUTION IN CONDITION MONITORING PULLS OUT ALL STOPS

The latest version of HYDAC's CMExpert hydraulic fluid and system condition monitoring unit, the soon-to-be-released CME-AU2000, brings with it a range of smart sensors, a central data collection system, edge computing, ease of system expansion and the limitless possibilities of MindSphere data analytics.

What differentiates the latest version compared to its predecessor, the CME-AU1000, is its ability take in more information from different sensors that are not necessarily hydraulics-related, according to HYDAC Managing Director Mark Keen.

"There are new sensors coming into the market from HYDAC and other suppliers, which are smart sensors," he said. "The end result is far more correlated data, enabling understanding of the relationship between pressure and temperature with one sensor, with built-in warnings, as an example. If that is multiplied out by many sensors, there are huge possibilities for understanding what's going on with a machine."

He underscores that the series 2000 (Level 2) comes with a central data collection system that monitors itself, automatically interprets data and points out corrective action before it becomes a serious problem.

Wizardry of edge computing

The series 2000 enables HYDAC to integrate edge computing, which comprises a computer embedded into the system to enable much of the processing and interpretation of data to take place locally and not just remotely.

This, Keen says, means that the amount of data that has to be transmitted to the cloud or some other location, is dramatically reduced, taking into account that "a lot of number crunching" is done at a local level.

"We embed edge into the new system with our new Data+," he said. "This allows us to have multiple inputs with different formats and to execute smart processing of all that input as well as communicate externally as an output."

He highlights that the edge device's technical side clearly shows it's a "very smart little computer with a high amount of storage and a high amount of processing".

"The magic is that it's also the Swiss Army Knife of connectivity, enabling reception of signals from different formats. So we look at it as a bit of a Lego set in terms of building solutions for our customers."

Ease of expansion order of the day

Keen points out that if a client wants to add more sensors or data points he can do that easily without needing to buy a more expensive system.

"Through IO-Link, CAN and Modbus we can bridge anything and then cloud the data with pre-interpreted data as a result of our smart data programming, which avoids redundant and superfluous information, using the power of edge technology."

The edge device keeps detailed data available, so if a cloud warning comes through it's possible for a client to examine the detail, receive the necessary information and thereby to react appropriately.

This comes through a cloud dashboard that is "nicely configured" and equipped to show basic information and an overview of "how things are going". On its right-hand side are all the channels of inputs in a list that enables an operator to drill down for more details on a channel.

Advantages of MindSphere

Keen explains that cloud computing is a standard feature with the series 2000 whereas the series 1000 is available with edge computing. "The MindSphere dashboard comes once you choose the Level 2 package and get cloud subscription," he said.

He adds that drilling down and looking at historical information is also possible, among many more features and capabilities. Especially relevant is the ability to provide customers with 'smart' information around alarms and fault codes to enable decisions as to how alerts will be received for potential malfunctions and to easily determine whether an issue merits attention or not.

Qualified technicians with the correct tools and parts can be tasked to a service job quickly and automatically, taking into account 70% of all hydraulic system failures are directly related to the condition of the fluid and 30% are electrical failures and misuse among other errors.

System connectivity spans levels

System connectivity spans Level 1, 2 and 3. Keen points that Level 1 — focused on oil analysis — has been designed as a base module to allow integration of condition monitoring easily into the system.

HYDAC's oil condition monitoring Level 1 unit also enables the user to leverage the Level 2 solution. This means that if a user has 10 machines in one factory they don't need 10 Level 2 units.

"The customer can have nine Level 1s, which are cheaper, and bridge them together to one master Level 2 or Level 3 unit depending on the desired outcome," said Keen. "So the difference between Level 2 and Level 3 is Level 2 gives a customer edge computing with internet connectivity and Level 3 gives a PLC at a local level to allow added control."

HYDAC International
www.hydac.com.au

HYDAC

DIGITAL PANEL METERS

Acromag Vertu VPM2000 loop-powered 1/8 DIN digital panel meters are designed to provide a convenient and informative display of any 4–20 mA signal. A dual line display shows the process value on the top line and the units or a tag on the bottom line. Alternatively, users can display the input in one scale on the top line (eg, height) and another scale on the bottom (eg, volume). A bar graph option indicates the percentage the value represents.

All models include a digital input and two open collector outputs. For signal isolator and alarm trip applications, model options add two solid state relays or 4–20 mA analog output. The digital input enables remote reset or triggering of alarms. Open collector outputs are useful for alarm indication or pulse output. Relays support alarm activation, on/off control and pump alternation functions.

Installation is simplified as the meters acquire power from the 4–20 mA loop and therefore require no separate power source. A low voltage drop adds very little burden to the loop. The NEMA 4X IP65 panel, conformal-coated PCBs, wide temperature operation and a backlit LCD enable use in most environments. Intrinsically safe and non-incendive versions allow installation in hazardous areas.

Set-up is fast and easy using the front panel buttons or the free configuration software. A microUSB cable connects the meter to the PC and provides power for software-based programming and saving the file. The pushbuttons also serve as programmable function keys.

Metromatics Pty Ltd
www.metromatics.com.au

TORQUE SENSORS

The NCTE 7000 Series are robust torque sensors for high nominal torque ranges of up to 5000 Nm. Based on magnetostrictive technology, they measure contactless, wear-free and precisely. They can be used to directly determine torque, force, shear and bending. The series is mainly used in test facilities, automotive engineering (agriculture and off-highway), process monitoring and quality control.

Transmitted torque can be measured statically and dynamically in real time and a range of different connection possibilities are available. For example, in agriculture or off-highway applications a PTO shaft and flange system can be used.

Each sensor can be configured individually with an angle sensor and speed sensor, and offer a wide range of output signals such as 0–10 V, 4–20 mA, CANbus or USB. With a USB connection, data can be visualised in real time with special NCTE software.

Each sensor is provided with 5 m connection cable and calibration certificate.

Slentech Pty Ltd
www.slentech.com.au

OPC UA I/O MODULE WITH POE

The ICP DAS UA-7560M is an OPC UA I/O module that provides six digital input channels and six digital output relay channels. It has a built-in two-port Ethernet switch to implement a daisy-chain topology. The cabling is much easier and the total costs of cable and switch are significantly reduced.

The module follows the IEEE 802.3af PoE specification, allowing it to receive power from a PoE-enabled network. This feature provides greater flexibility and efficiency to simplify system design, save space, and reduce wirings and power sockets.

The OPC UA I/O capability provides an OPC UA server and MQTT client function. Users can choose the networking mode according to their needs and environment, to transmit the values of built-in I/O channels to a cloud system or field control system for reading and writing.

ICP Electronics Australia Pty Ltd
www.icp-australia.com.au
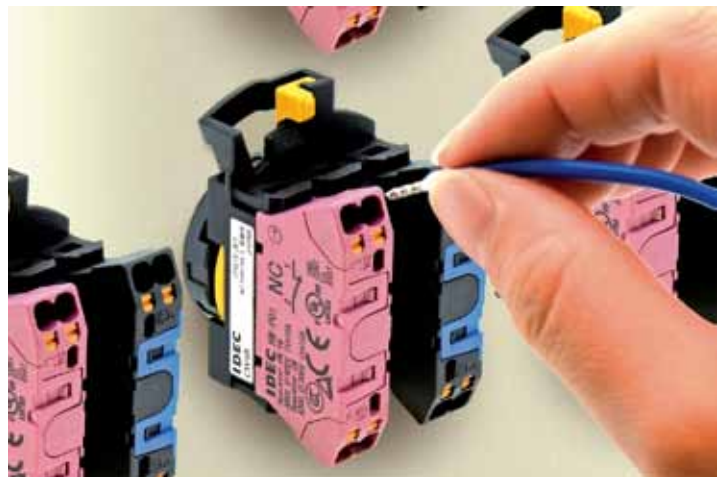
SWITCHES AND RELAYS WITH PUSH-IN CONTACTS

IDEC Corporation has enhanced its HW series of 22 mm switches and pilot lights, as well as the SJ/SU series of relay sockets, with options for push-in wiring technology.

Ferrules and stripped solid wires can be connected by simply pushing them in, without the need for any tools. There are no screws to torque or tighten. Wires can be removed by pushing down a small orange release pin with a screwdriver. Wiring can be performed by workers of any skill level, and wiring time is reduced by about 55% compared with conventional screw terminal connections.

Constant spring-loaded tension on the wire maintains a reliable connection and improves vibration resistance. The entire push-in structure is designed as finger-safe so workers never touch the conductors.

Push-in contact blocks are compact, taking less depth than traditional versions. This improves working space inside a panel and potentially enables enclosures to be downsized. Connections are angled to facilitate wire entry, and the contact blocks feature a handy test point for insertion of a multimeter probe. Both switch contact block and relay socket electrical connections are rated IP20 finger-safe. All other panel design considerations, product functions, features and ratings remain at the same high level of quality and performance.

IDEC Australia Pty Ltd
www.idec.com/australia

COMPACT RUGGED TABLET

The Winmate E430RQ8 is a 4.3″ rugged IP65 and MIL-STD-810G certified handheld mobile.

The E430RQ8 is waterproof and dustproof and has an 800 x 480 pixel touch screen with direct optical bonding as well as an optional 1D/2D barcode reader for data collection. It is equipped with a Qualcomm Snapdragon 660 octa-core processor that delivers stable performance at a higher level of power efficiency.

Compliant with MIL-STD-810G, it can operate in extreme temperatures ranging from -20 to 60°C and endure shock, vibration and drops of up to 1.3 m.

Weighing only 260 g the E430RQ8 is a compact pocket-size 4.3″ rugged mobile computer for on-the-go real-time communications, monitoring and data capture. It offers WLAN, Bluetooth and WWAN functions and a built-in 8.0 MP camera on the rear side, to capture photos, videos and documents instantly, or the front 2.0 MP camera can be used for applications such as self-video recording or video communications.

Backplane Systems Technology Pty Ltd
www.backplane.com.au

SEMI-RUGGED LAPTOP

Getac has announced its next-generation S410 semi-rugged laptop, offering upgraded all-day battery capacity, a brighter display and enhanced memory and processing power. It includes 11th Generation Intel Core i5/i7 processors with integrated Intel Iris Xe Graphics, a PCIe NVMe SSD as default and user-removable storage that improves efficiency for daily workflows and graphics-intensive tasks.

The S410 also supports the IEEE 802.11ax standard, empowering smooth streaming of high-resolution video, fewer dropped connections and faster connections at farther distances from a wireless router. Thunderbolt 4 technology provides fast transfer speeds for large amounts of data, while also making it easier to share that data with other devices.

A brighter screen (up to 1000 nits), coupled with LumiBond 2.0 technology, is designed to provide comfortable outdoor viewing, even when under direct sunlight. It is also expandable, accommodating up to three batteries, thus ensuring zero downtime from shift to shift. A backlit keyboard makes work in low-light environments easier, while a larger touchpad enables a smooth user experience with fewer input errors.

The S410 is MIL-STD-810H certified, resists a 1 m drop and has a wide operating temperature range from -29 to 63°C. Compliance with the IP53 rating lets users operate in dusty and light rain conditions without fear of damaging the unit.

Getac Technology Corp
www.getac.com/apac/

The Sensor People

Leuze

DRT 25C –
The one for everything.

Thanks to intelligent CAT technology the dynamic reference diffuse sensor reliably detects confectionery and baked goods. All without readjustment when changing objects!

More information at www.leuze.com.au

OPINION

INACTION ON EMISSIONS IS NOT AN OPTION IN A POST-PANDEMIC WORLD

COVID-19 has caused a great deal of economic loss to the Australian economy, and forced authorities to act swiftly with unpopular measures. However, not all has been 'doom and gloom' — it has had positive outcomes as well.

State governments' science-led decisiveness in addressing this pandemic through stay-at-home orders has had the less-publicised side effect of drastically improving air quality in our most populated cities.

But before COVID-19 there were other invisible airborne threats not dealt with the same way. We should not forget that nitrogen oxides[1] together with ground-level ozone, carbon monoxide, volatile organic compounds and particulate matter as primary toxic pollutants are responsible for seven million deaths a year — a much larger figure than current casualties because of the pandemic.

One might wonder: Will the same decisiveness be used by the authorities to deal with air pollutants in the near future? Will the federal government commit to stricter emission reduction targets? If so, will the measures be effective enough? Certainly, international pressure on Australia to improve its environmental commitments and the erosion of votes for political parties looms unless drastic changes are made.

Most emissions-intensive facilities are facing the choice of either extending plant life through implementing sustainability measures or of falling by the wayside. Their decision will be to innovate or decommission, as there is unlikely to be a middle ground in the green future we all envision. For some large emitters, making a final choice will likely be accelerated by the negative economic impact of COVID-19. Others who have committed to change by becoming carbon neutral by 2050 — regardless of the current apathetic regulatory stance — have started offsetting their emissions by investing in renewables, optimising fuel consumption and improving on their emissions monitoring methods and equipment.

Historically, many emissions have been estimated using moderately inaccurate models. Often based on fuel inflow and mass balance measurements, these models were once considered the most appropriate tools when reporting to the environment protection authorities. Unless the environment protection licence had specifically instructed the business to 'continuously monitor' stacks for pollutants, the use of analysers (whether in-situ or extractive) has thus far remained optional. The issue here is that the practice of using flow-based reporting may have led to inadvertent under-reporting of actual emissions.

Yet measurement technology is advancing at a breathless pace. Efforts by space agencies and private satellite operators to improve understanding of the carbon cycle threaten to expose reporting inaccuracies sooner rather than later. Through the collection of data using high-resolution infrared spectrometers, satellites are accurately monitoring ground-level concentration of gases near and around major sources of carbon dioxide and methane pockets.

Understanding where and how carbon dioxide is concentrating and behaving will assist governments and environmental protection agencies in making well-informed decisions when enforcing their climate change policies. This can easily extend to major industrial emitters such as oil and gas facilities, underground coalmines, power stations, wastewater treatment plants and even the agriculture sector. Critical review of measurements will focus attention on those who have been fortunate to date when using manual reports to comply with legal frameworks, a mechanism which will not withstand future scrutiny.

Many businesses have already applied emissions monitoring with the future in mind. The implementation of improved analytical systems in all their exhaust gas stacks gives them a real-time window on emissions and allows them to take corrective action quickly and efficiently. These systems may include infrared analysers — with similar principle of operation as those used by space agencies — for the detection of air pollutants such as nitrogen oxides and sulfur dioxide. Depending on the pollutant, other approved methods like gas chromatography and UV-Vis spectrometry can also be used.

For those who are yet to take corrective action, or who are simply waiting to see what happens, you are placing your business at risk.

Inaction is no longer an option and public opinion is growing for action. Satellite operators know this and can deliver a ready-made solution to expose those who fail to comply. Industries will need to improve operational efficiency and deliver accurate, reliable and transparent environmental data. In basic terms though the true risk is not only the loss of your licence to operate, but loss of a habitable planet for your future generations.

Reference

Brimblecombe P and Lai Y 2021, 'Subtle Changes or Dramatic Perceptions of Air Pollution in Sydney during COVID-19', *Environments 2021*, MDPI, ≪https://www.mdpi.com/2076-3298/8/1/2≫

Nelson Isea is the product manager for process analyser solutions at Yokogawa Australia and New Zealand. Nelson has a nationally accredited chemical engineering degree and an advanced diploma in refining and petrochemical processes. He has over 15 years of consulting experience in challenging instrumentation, automation and process control applications within various verticals.

GAS CONTAMINATION DETECTOR

LineVu is a video-based system designed to detect contamination in high-pressure gas systems, enable alarm notifications, and allow access to live video to both office-based and field-based engineers.

By providing better data on which to base operational decisions regarding process safety and efficiency, the system is designed to improve accountability of gas suppliers to gas network systems and boost production in gas treatment plants. With live data, immediate action can be taken to prevent or minimise further contamination entering a gas network system, and recorded data can be used as evidence to recover pigging and clean-up costs from suppliers who breach supply agreements.

Liquid carryover, foam or even hydrate formation are common problems in gas pipelines and gas treatment plants that need attention as soon as they occur. Unexpected liquids appearing in gas systems are the cause of large-scale loss and process failures, and can have an impact on asset integrity.

LineVu is a high-precision camera system that can be used to determine the real flow limits of a gas/liquid separator system to support and improve flow modelling of as-built processing plants. Permanent installation allows process failure events to be detected early; this prevents loss and damage of assets such as compressors or absorber beds, and means foam control becomes easier to manage.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

HMI TERMINALS

The capacitive operator terminals of the PMIvisu v8 series are available in a 7″ and 12″ version and come equipped with the Windows 10 operating system. The scratch- and impact-proof glass touchscreens are highly resistant and hard-wearing, making them suitable for use in industrial applications in dusty or dirty environments. Hardware and software are coordinated for optimum display and operation: the web-based visualisation software PASvisu is already pre-installed and licensed on the operator terminals. For efficient diagnostics the compact operator terminals display plain text messages.

With the corresponding software PMI Assistant, it is easy for the user to commission and manage the PMI v8. The Ethernet interface and integrated HDMI connection enable universal application as well as rapid commissioning. The terminals can be combined with the PSS 4000 automation system or the PNOZmulti 2 configurable small controller. Controllers with an OPC UA Server can also be connected. Due to their UL approval, the durable visualisation systems can be used in industrial applications worldwide.

Pilz Australia Industrial Automation LP
www.pilz.com.au

AI COMe COMPACT MODULE

The SOM-6883 is a COMe Compact Type 6 Module with 11th Gen. Intel Core processors. Adopting up to 96 GPUs and dual video decoder boxes with Intel Iris Xe graphics, the SOM-6883 supports up to four independent 4K display ports or two ports 8K HDR outputs.

Featuring AI acceleration with an Intel Deep Learning Boost engine, VNNI, the SOM-6883 can improve efficiency and increase the inferencing performance dramatically. Enabling super-speed data transmission capability with wider bandwidth of 2.5G LAN, PCIe Gen 4 and NVMe SSD, the SOM-6883 can transfer large amounts of data between AIoT applications. The 2.5G LAN equipped with TSN (Time Sensitive Networking) is a good choice for automation or edge applications in need of low latency. The SOM-6883 supports IB-ECC memory for error correct functions and features a TPM2.0 chip to help prevent cyber threats, an 8.5–20 V wide range power input and a -40 to 85°C operating temperature. It also supports BIOS storage protection and security boot, BIOS power-management and WISE-DeviceOn for remote hardware monitoring and over-the-air software updates.

With its onboard NVMe SSD and TPM2.0, IBECC memory, wide range power inputs, as well as wide operating temperatures, the SOM-6883 is suitable for mission-critical, machine learning and high-end test equipment applications.

Advantech Australia Pty Ltd
www.advantech.net.au

GYROSCOPES AND INTERNAL MEASUREMENT FOR AGVs

The transport of the containers at harbours is performed primarily by AGVs (automated guided vehicles), which are controlled from a control centre. Such automation is technologically very complex and requires maximum precision.

AGVs also perform a key function in Industry 4.0 applications in the smart factory. They connect production lines with each other to boost the efficiency of intralogistics processes. However, this requires that the vehicles reach their destination safely and via the shortest route.

The high precision needed depends on gyroscopes and inertial sensors to enable reliable monitoring and optimisation of vehicle dynamics along with precision navigation to ensure the smooth flow of materials and containers.

ASC has released a range suitable for AGVs in the form of the ASC 271 (uniaxial) and ASC 273 (triaxial) compact gyroscopes as well as the ASC IMU 7 inertial measurement units.

The gyroscopes detect the angular rate of the vehicles, which makes them suitable for the optimisation of curve speed. And for AGVs to navigate reliably to their destination, they must be equipped with inertial sensors. The more flexible the route regarding the degrees of freedom of motion, the more powerful the sensor system must be, since the requirements for safety, detection of the environment and localisation of the AGV are more complex.

If linear components also need to be monitored — such as in the control of vehicle behaviour during acceleration and braking — the ASC IMU 7 is recommended.

Slentech Pty Ltd
www.slentech.com.au

IMAGE SCANNER

The Datalogic Matrix 320 image reader is said to offer high scanning performance to achieve higher productivity, with its 2 MP sensor (1920 x 1080 pixels with a 16:9 form factor) achieving an extra-large field of view (FOV) on the horizontal axis that competes against 3 MP readers.

The reader is suited to factory automation and manufacturing applications, including automotive, food and beverage, pharmaceutical, electronics, general manufacturing and retail.

The compact reader offers full industrial connectivity and rotating connectors on top for ease of installation. The reader's configurable, 360° multicolour read feedback, coupled with green/red spot technology, provides visual feedback to simplify installation and maintenance. A web diagnostic suite and high-performance image saving capability provide information to improve the production process and set preventative maintenance for higher productivity and lower maintenance cost, the company says.

Datalogic Automation Pty Ltd
www.datalogic.com

THE INTERNET OF THINGS AND 5G
TURNING DIGITAL THEORY INTO PHYSICAL REALITY FOR AUSTRALIAN MANUFACTURERS

Elizabeth Gil, Robotics Specialist, and Martin Keetels, National Manager Emerging Technology, Konica Minolta

Leveraging the IoT and 5G in smart connected ways will make it possible to build a strong technology infrastructure to support autonomous robots.

The profound impact of industrial robots on intralogistics was underlined in 2020 when COVID-19 increased the pressure on supply chains and infrastructure. New consumer and commercial behaviours are likely to remain in place, with increasing demand for e-commerce and on-demand delivery, facilitated by the streamlined workflows that robots can execute.

Australian manufacturers can leverage the recent supply chain disruptions to revitalise the local manufacturing industry. It's no longer true to say that offshore providers have a competitive advantage over local businesses; offshore vulnerabilities have been laid bare in recent months and local supply is more attractive than ever. To capitalise on this opportunity, Australian manufacturers and warehouse and logistics providers need to maximise efficiencies and manage safety concerns.

Robots have been used in manufacturing for six decades. From the first industrial robot, their mission has been to streamline processes and introduce efficiencies for manufacturing operations. By automating dangerous, repetitive or exhausting tasks, robots can free up personnel to add more value in a manufacturing environment. Working alongside robots has never been safer and, indeed, the robots themselves

> **WHEN DEPLOYING ROBOTS INTO AN IoT-RICH ENVIRONMENT, THE PRODUCTIVITY OF BOTH THE ROBOT AND THE ENVIRONMENT CAN INCREASE SIGNIFICANTLY.**

5G is the latest iteration of wireless connectivity, providing ultra-high-speed data transmission and capable of connecting 10 times the number of devices compared with 4G[1]. 5G will become the underlying fabric of a modern ecosystem fully connected by intelligent sensors and devices. When the data from sensors can be communicated almost instantly, the connected systems can respond faster. This could lead to more widespread adoption of technologies that currently seem futuristic, such as self-driving cars or driverless trains, for example.

As the IoT expands and 5G becomes available, the power of robots to improve manufacturing operations becomes even more pronounced, especially as current challenges like poor Wi-Fi connectivity become obsolete. Faster responses from robots to commands triggered by sensors or other connected devices can dramatically improve efficiency and output while reducing errors and waste.

Using IoT devices to boost productivity

When deploying robots into an IoT-rich environment, the productivity of both the robot and the environment can increase significantly. Letting the robot communicate directly with other pieces of equipment removes bottlenecks and streamlines workflows. For example, robots connected to production systems or point solutions can be automatically sent to retrieve a finished good from the production line or move products or raw materials to the next stage in their manufacturing cycle. At the same time, robots are continuously learning, so they can be aware of other moving objects within the facility and optimise movements, further increasing productivity.

For example, connecting an artificial intelligence (AI) camera to the network can greatly assist in traffic management. The camera can identify the periods of increased activity in certain spots, then direct robots to avoid that area, taking alternative routes to avoid congested areas and get to where they need to be faster. This AI works hand in glove with sophisticated avoidance systems which include onboard micro laser scanners, 3D data cameras and dynamic safety fields.

COVID-19 created a need for humans to be able to work together without coming into physical contact. Industrial robots integrated with information from IoT devices are ideal for this

are also now actively involved in making the workplace even safer for humans.

It's essential to have a strong technology infrastructure underpinning autonomous robots to ensure they can deliver maximum value at scale. This is where the IoT and 5G come into their own.

The Internet of Things (IoT) is a network of objects that can collect and transfer data over a wireless network without human intervention. Often, these objects are sensors that can communicate crucial information about a machine or environment. For example, air sensors can alert air conditioning systems of air quality and temperature, triggering the air conditioning system to switch on or turn the temperature up or down.

scenario as they reduce the need for peer-to-peer contact, in turn reducing the risk to an organisation's workforce. And, because these autonomous robots don't need to follow physical or pre-set guidance tracks, they can be deployed quickly and can be flexible in decision-making when it comes to the routes they take throughout the facility, maximising productivity.

In recognition of these potential benefits, research indicates that around half of surveyed warehouse organisations were looking to implement autonomous mobile robots (AMRs) within the next two years[2]. Future warehouses will gravitate away from forklifts, automated guided vehicles (AGVs) and other manually operated vehicles towards AMRs as organisations embrace the concept of automation as a way to cope with unexpected challenges as well as boost productivity.

These robots will not replace the need for people in manufacturing or warehouse and logistics facilities. Instead, they will make it possible for people to apply their creative and critical problem-solving and decision-making skills to have a real impact on operations beyond manual labour. This is likely to lead to fewer injuries, less lost time and deeper engagement from employees.

Powerful networks underpin fast data transmission

The combination of the IoT and fast 5G speeds means that devices including industrial robots will be able to communicate with each other in real time. This has significant implications for their use in manufacturing and warehouses, as they will be able to respond instantly to external stimuli. For example, an autonomous mobile robot may be able to digitally communicate with an autonomous forklift made by a different manufacturer. Rather than both robots having to adjust their trajectory to avoid each other, one will be able to take a different aisle or route to ensure a more productive environment.

Using 5G will also let autonomous robots leverage cloud-based AI platforms for faster decision-making and more effective planning and execution of tasks. This, in turn, can dramatically improve the quality of picking and packing, ensuring the right orders are sent out at the right time, and reducing or even eliminating double handling.

Utilising these technologies can also be a key component of meeting sustainability goals as it can drive waste reduction throughout an organisation's value chain. By using 5G's speed and broad accessibility in remote areas, real-time data can be leveraged to run complex scenarios, optimising decision-making in the manufacturing process in real time, minimising the potential for manufacturing waste to be produced.

Machine-based sensors can also be combined with wearable sensors worn by the people in the facility to create an even more connected environment. This could be as simple as using a data collection method to find out how far people are walking each day, then using that data to map ways for the robots to help reduce the amount of walking they do. For example, the robot could bring materials to workers and then take away their finished output, all without the worker having to leave their station. This reduces the time that's wasted while employees are walking to retrieve materials for example,
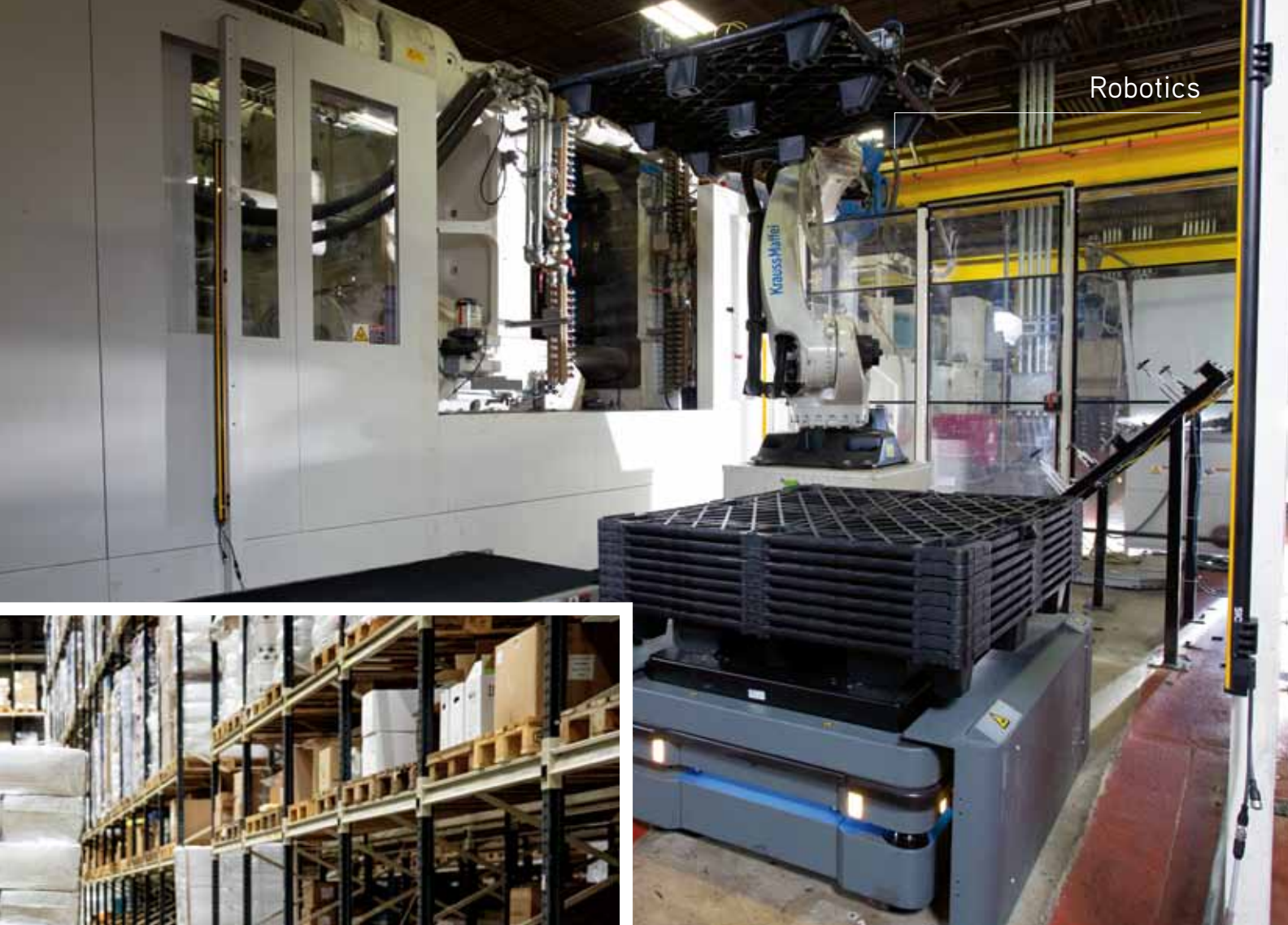
> " THE COMBINATION OF THE IOT AND FAST 5G SPEEDS MEANS THAT DEVICES INCLUDING INDUSTRIAL ROBOTS WILL BE ABLE TO COMMUNICATE WITH EACH OTHER IN REAL TIME.

helping them focus their energies on their core task and increasing their physical output. The robot would know what to pick up, from where, and when, based on data provided by IoT sensors and integrated with the organisation's manufacturing execution system (MES).

An on-premise MES can be expensive and inflexible. However, with the advent of 5G, these systems can be cloud based, which makes them more accessible and flexible, especially when it comes to using them to help feed information to autonomous robots.

5G speeds can also help manufacturers leverage digital twins more effectively. Creating a digital simulation of a real-world process or product lets manufacturers experiment at a lower cost. Connected robots can then make decisions based on that simulation, turning digital theory into physical reality.

don't have to come back to base for routine maintenance; those routine checks would be completed constantly by the sensors and the robot would only need to be pulled off the floor if repairs or physical maintenance were required. Technical issues could be addressed using cloud-based applications to execute remote fixes, further reducing the need for physical intervention.

IoT sensors can also track how far the robots have travelled and load capacity transported. Careful analysis of this data may reveal ways to further optimise the robots for increased efficiency. The data can also be compared with manual labour to determine the return on investment provided by the robots.

With autonomous mobile robots taking their place as the future of manufacturing and warehousing, the question for manufacturers isn't whether to invest in robots. Instead, the question is how to maximise the return on that investment so the business can be highly competitive. The answer is to leverage technologies including the IoT and 5G in smart, connected ways. Doing so will propel Australian manufacturers into Industry 4.0.

References
1. Australian Government 2020, *What are the benefits of 5G?*, Department of Infrastructure, Transport, Regional Development and Communications, ‹https://www.communications.gov.au/what-we-do/spectrum/5g-and-eme/what-are-benefits-5g›
2. Konica Minolta 2020, *The Automation of Intralogistics in Australia*, ‹https://www.konicaminolta.com.au/KonicaMinolta/media/KonicaMinolta/Whitepapers/robotic-automation-trend-report.pdf›

Konica Minolta Business Solutions Australia Pty Ltd
www.konicaminolta.com.au

Maximising robot uptime and value

When businesses rely on their autonomous robots for mission-critical activities, any unplanned downtime is unacceptable. Maintaining and optimising these robots is easier and more effective with real-time data capture and analysis, along with remote monitoring and control.

For example, IoT sensors can be configured to send alerts if the robot's battery is running low, load carriage isn't optimised or if it's suffering from temperature extremes, vibration or other issues that can occur in a factory or warehouse environment. Since this data is collected in real time, the problem can be rectified before the robot breaks down, minimising the time it spends off the floor.

Maintenance time and costs can also be reduced by using IoT sensors to monitor robots remotely. This means robots

VPN ROUTERS WITH INTEGRATED WI-FI

The TOSIBOX solution creates a direct point-to-point VPN tunnel between user and device. The solution consists of modular components that offer expandability and flexibility. All components are compatible with each other as well as internet connection and operator, and are device agnostic. The solution works both in internal and external networks, and users can connect both modern IoT devices and legacy systems.

The TOSIBOX Lock 210 and 250 are efficient and robust industrial routers with integrated Wi-Fi. They serve as an endpoint for secure remote connections in operational networks. Devices connected to the Lock are securely accessed over the internet and most LAN and WAN networks through an encrypted VPN connection.

NAT- and firewall-friendly, the Lock's plug-and-go connection method takes deployment out of the box and into use in less than 5 min, without the need for software installations, network configurations or special IT skills.

LAPP Australia Pty Ltd

lappaustralia.com.au

PRESSURE GAUGE

With rugged construction and ±0.1% of full-scale accuracy, the Ralston Field Gauge LC20 is a reference-grade digital gauge with various customisation options. Users can switch between 15 standard engineering units or create custom units using the included FieldLab software. The software can be set up for logging and live viewing of pressure over USB, or tests can be monitored remotely utilising a wireless option.

The product is suitable for pressure monitoring, calibration of analog pressure gauges and transmitters, pressure switch testing, and leak testing. It is available in 11 pressure ranges from 5 psi/35 kPa to 10,000 psi/70 MPa, as a compound vacuum/pressure gauge from ±15 psi, and a digital vacuum gauge measuring up to 30 inHg/760 mbar.

Ralston Instruments LLC

www.ralstoninst.com

WARNING SIGNALS UPGRADED TO LED

E2S Warning Signals has upgraded its B350TLA traffic light-style warning signal beacons. They feature a compact 100 x 140 mm housing, suitable for space-constrained applications or for mounting directly onto machinery. The larger 140 x 177 mm B450TLA units have also been upgraded. The light engine for both is an array of 18 high-output white LEDs,

which give bright outputs up to 356 candela. The ultrasonic-welded diffused lens determines the output light colour: amber, blue, clear, green, red and yellow are standard, enabling on-site reconfiguration of colours and greater flexibility in inventory management. There are now seven flash patterns, including a temporal pattern for greater effectiveness, in addition to a steady output for status indication.

The included connector enables multiple units to be assembled into stacks and dual-pluggable terminals simplify cable installation for looped installations. The operating voltage are ranges are 10–14 VDC, 16–33 VDC and 48–260 VAC/DC. The 1 Hz flash operating current is only 88 mA at 24 VDC and the operating temperature is -40 to +70°C.

Also upgraded with the latest 18 white LED array light source are the STA and STB ranges of customisable stack signals, UL-approved for general signalling applications such as status indication, security and process control. The STA stacks have an SONF1 compact 100 dB(A) alarm horn sounder to give an integrated audible/visual unit.

Mechtric Pty Ltd

www.mechtric.com.au

Digital twin helps deliver a remote plant in the DRC

Katanga is a remote province located in the southern part of the Democratic Republic of the Congo (DRC). As a resource-rich area, it boasts abundant reserves of copper and cobalt, with copper accounting for 50% of all DRC exports. To leach copper oxide minerals, the copper mines need sulfuric acid, and the supply in Katanga is constrained, having to be hauled long distances over sections of unpaved road to reach the secluded area. This situation causes high environmental risks, so to sustain one of the largest copper mining operations in the DRC, a new sulfuric acid plant is being built in Katanga that will manufacture thousands of tons of acid daily. Global professional services company Hatch was retained as the engineering, procurement, construction and manufacturing contractor to deliver the facility.

The US$245 million project features a 1400 ton-per-day manufacturing facility and an electrical waste heat power generation system with a steam turbine unit — critical to plant operations due to the limited power grid supply in the area — and complex integration with the existing electrical network. In addition to these technical challenges, the project presented logistical and environmental difficulties, given its remote location. A further challenge was meeting the client's fast-tracked schedule.

To overcome these complexities and accommodate the accelerated timeline amid a team of engineers distributed globally across five offices, Hatch sought a sustainable technology solution, digitalising all workflows and deliverables. Upon completion, the DRC plant will be capable of making all the sulfuric acid that the copper mines need while exceeding world standards for sulfur dioxide emissions, optimising environmental sustainability.

Hatch implemented a collaborative digital strategy using Bentley's open applications, streamlining workflows and facilitating quality engineering processes that saved time and costs. The project team used Bentley's STAAD structural analysis and design software to model and analyse the structural steel components, and OpenPlant and OpenBuildings Designer to create a digital twin model of the entire acid plant. ProjectWise served as the collaborative platform to establish an open, connected data environment to manage and share information across five globally dispersed engineering offices.

"Bentley's industrial plant products, and specifically ProjectWise, assisted the teams in executing the project following the same work-sharing principles out of our offices in Canada, South Africa, India, Australia and the DRC," said Johan Palm, Project Manager at Hatch.

Bentley's open applications provided flexibility within the design environment, enabling a single 3D model to be used for layout, analysis, design and fabrication. This flexibility also optimised coordination throughout all stages of engineering and construction, as well as presenting opportunities to capitalise on digitalisation to improve efficiencies. The interoperable digital technology allowed operations teams to interact in the model environment for hazard and operability study checks, improving operations reviews and enhancing operational safety. Integrating Navigator facilitated digital communication with on-site personnel, commissioning teams, and installation contractors through mobile devices and tablets. Providing field teams with real-time digital access to the accurate 3D model eliminated time otherwise needed to deliver drawings onsite, facilitated quality engineering and enabled issues to be resolved prior to construction and installation.

Overall, leveraging Bentley's intelligent design and analysis applications within the connected data environment enabled Hatch to upstream quality processes, improve procurement and logistical strategies, and minimise construction rework. The digital solution optimised coordination between global delivery teams and site fabrication to accommodate the aggressive schedule.

Both structural steel and piping were along the critical path of the accelerated project schedule. Having a single digital twin model for engineering into fabrication and analysis saved six weeks on the critical path.

By directly purchasing steel quantities from the 3D model, the project team automatically produced digital deliverables to the fabrication management systems. This digital approach moved the steel fabrication process upstream as part of the engineering efforts, reducing engineering time by eliminating the need to generate redundant steel layout drawings.

The 3D digital twin, with its accurate information in a centralised data environment, cut three months from the schedule compared to producing and taking measurements from paper drawings. Using the digital twin model allowed the material supply process to simultaneously occur with production of piping isometric deliverables, resulting in saving 10% to 15% in purchasing costs for the client.

"Hatch has done several paperless projects, and it established an improved digital way of working that we offer on all our projects," said Randy McMeekin, Global Managing Director at Hatch. "The benefits that our clients gain from our approach span not only the engineering, procurement and construction management (EPCM) project delivery phase but also extend well into operations and maintenance."

The biggest value within the concept of utilising a digital twin is the ability to shift forward the start of production and cut the ramp-up time. The 100% digital solution accelerated operational readiness, reduced capital expenditure costs by 20% and enabled Hatch to deliver the fast-paced project in under two years, from feasibility to start-up.

Bentley Systems Pty Ltd
www.bentley.com/en-AU/

TWELVE COMMON
INDUSTRIAL
ETHERNET MISTAKES

Whether you're a process or plant engineer, a technician, or an electrician, you've got to be an expert in a wide array of areas today — including Industrial Ethernet. Sooner or later, you're going to run into a problem caused by others who aren't as well-versed in the vagaries of this networking technology. Here are the worst problems that you may face when dealing with Industrial Ethernet. Hopefully, you can find and correct them (or, better yet, avoid them) before they lead to plant downtime.

1. Using office-grade connectors, cables, and network gear

It's true that much of the customer- and office-grade equipment out there will work with Industrial Ethernet. But the question is, for how long? Non-industrial gear isn't ready for the vibration, moisture, electrical interference (EMI), chemicals, and more that you'll find in a plant. Smart people realise this, but sometimes they use suboptimal gear for a quick fix to get operations back up and running. Since quick fixes are often forgotten, it's best to avoid using non-industrial gear for your Industrial Ethernet.

2. Careless cable routing

Some cabling is designed to handle the worst of all the MICE (mechanical, ingress, climatic, and electromagnetic) environments, so you can be a little looser in how you route that cable. In most instances, however, cabling has some limitations and you need to be aware of those limitations when routing it. Is it too close to electromagnetic interference sources like variable frequency

drives? Are there areas where it will get too hot or exposed to harsh chemicals or just plain water? The worst part about making this mistake is that the cable will usually function properly — until things change just enough to cause a failure.

3. Not labelling your cabling installations

Just as plants have requirements and standards for the labelling of piping and conduit, so does cabling (see TIA 606-B). The issue here isn't safety, but time and frustration. Knowing which cable goes where can save vast amounts of time when troubleshooting or upgrading.

4. Not testing cabling before installing a new line

Verifying your cabling can save hours of time when you're installing and starting a new system. While a quick check of the cable takes only seconds, problems like an improperly terminated connector, or a cable that's too long or susceptible to EMI, can take hours to troubleshoot and lead to finger-pointing and project delays.

5. Not testing extended cabling parameters

Basic cable testing as described above can help ensure that the cabling is installed properly, but it can't tell you how it will perform. Advanced testers measure many more parameters, such as crosstalk (which affects the throughput of the cable), resistance and return loss (which can indicate connectors that are susceptible to vibration or moisture), as well as transverse conversion loss (which indicates susceptibility to electromagnetic interference). Ensuring that cabling meets performance standards for these parameters provides assurance that the cabling will work not only at startup but well into the future.

6. Using 'digital extension cords'

One quick fix that's often attempted for a cable that isn't performing properly is to connect it to an unmanaged switch somewhere in the middle of the link and run a cable from there to the end device. While this sometimes works it adds a point of failure, which is especially problematic if the device is an office- or consumer-grade product. Worse, when connected like this, the device can't be controlled and is in fact 'invisible' to network management or any tech trying to troubleshoot a problem.

7. Trusting the link LED

Connecting a cable to a device and seeing the Link LED illuminate is satisfying, but it's not a guarantee that the communications link is working properly, or even at all. The link light will typically come on whether the communications are solid or barely working — which means very little margin for error. Most experienced networking techs can tell you stories of the time the light came on when the link didn't work at all or wasn't even connected. That's why they don't trust those lights, and neither should you.

8. Performing 'swap-until-you-drop' troubleshooting

When your Industrial Ethernet network stops working, it looks good and feels good to start fixing things. Unplug and plug things. Try a different switch port. Route a new cable. Replace a controller.

Unfortunately, this scattershot approach has multiple problems. First, you could waste a lot of time fixing things that aren't broken. Second, it can be costly to replace things that aren't broken. Third, and worst of all, since you don't know what the problem was when your communications start working again, you can't be sure you've really solved the issue or if it will be back again to ruin your day tomorrow.

9. Being unprepared for the leading cause of Industrial Ethernet failures

Research shows that the most common cause of Industrial Ethernet failures is cabling and connectors. The good news is that with a small investment you can be ready to quickly pinpoint and repair them. Having a cable tester on-site — even a basic one — not only enables you to determine if the cabling is at fault (if not, you can focus on the real problem) but also tells you where the problem is: most commonly a connector. Having termination tools and replacement connectors (maybe even spare cabling) onsite will save hours or days compared to purchasing them or hiring an expert.

10. Neglecting fibre inspection and cleaning

If your Industrial Ethernet installation includes fibre, you know that the most common cause of fibre failure is contaminated connector end faces — an especially severe problem in dirty or dusty factory environments. Since fibre connections handle more data and are more likely to be critical, failure can be catastrophic. Avoid problems by inspecting and, if necessary, cleaning and reinspecting any fibre connections whenever they are connected or reconnected.

11. Installing fibre-optic cable and not testing it

Fibre-optic cable is often used between the access switches (usually near a machine) and distribution or core switches. They are also used in place of cable runs too long, or inhospitable to copper cable. But like many network components, a marginal fibre link may work well at startup, only to give you trouble down the line. Testing the fibre after it's installed ensures that it exceeds performance requirements and can even pinpoint potential points of failure.

12. Excessively long cables

No matter how good your copper or fibre cable is, there are limits to how long it can be. The danger of exceeding these limits is not only that it won't work, but worse, that it will work intermittently — leading to unplanned downtime. Testing your cables before startup or during troubleshooting can tell you if they're too long. What most people don't know is that cabling performance degrades as the ambient temperature rises. Cabling standards acknowledge this by applying a derating factor to copper cables in high temperature locations, resulting in a shorter allowable length. You can check for this issue by measuring the insertion loss and return loss of the cable at operating temperature to make sure these critical measurements are within limits. For situations where you need a link that's too long for standards, talk to your cabling vendor about specialised cabling designed to extend copper operating distance for your MICE environment.

Fluke Networks
www.flukenetworks.com

LIGHT CURTAINS

The Allen-Bradley GuardShield light curtains include the CIP Safety over EtherNet/IP module along with integrated laser alignment, muting, blanking and cascading.

Light curtains are an essential safety mechanism in a manufacturing plant, particularly those requiring cutting and chopping before packaging a final product. Staff need access to the product without having to regularly open and close guarding, which is where GuardShield safety light curtains are designed to help with their innovative design to ensure the safety of personnel. The design also helps to reduce maintenance and spare parts.

The integrated CIP Safety over EtherNet/IP modules provide detailed diagnostics and status information to Logix DLR networks to cascade to multiple 450L or other EtherNet/IP products together.

Most light curtains on the market contain a transmitter and receiver stick, but the GuardShield curtain leverages patented plug-in transceiver technology. Each stick can be used as either a transmitter or receiver via innovative plug-in modules, resulting in fewer parts being required.

To significantly reduce engineering effort, the GuardShield range was designed with embedded functions that are configured quickly and easily via DIP switches or software, including muting, blanking, start mode, external device monitoring and scanning ranges.

The range also features an Integrated Laser Alignment System (ILAS), designed for quick installation and reliable operation, which reduces alignment labour time. This can amount to cost savings when installing 450 L units across multiple locations, and improved up-time regarding maintenance and hardware-replacement efforts.

The units come in different lengths ranging from 150 to 1950 mm — in multiples of 150 mm in both 30 mm hand and 14 mm finger resolutions. There are no dead spots (passive zones) at the top or bottom of the stick, which means they can be installed inside a machine frame and do not have to be mounted outside or on the machine like a traditional light curtain system.

NHP Electrical Engineering Products Pty Ltd
www.nhp.com.au

STRAIN WAVE GEARBOX

In order to generate accurate movement along the 5th robot axis, igus has developed strain wave gears based on its tribo-polymer technology. Due to the use of lubrication-free polymers, they are compact and light, and also require very little maintenance.

The main components of the gearbox include a wave generator and a flexible ring with outer drive teeth, as well as an outer ring, fixed in place in the housing, and a rotary power take-off element with inner drive teeth. The wave generator has an elliptical shape, therefore the surrounding flexible ring also assumes this shape. The drive teeth of the flexible ring engage at two places in the inner drive teeth of the outer ring and power take-off element. As the outer ring has two teeth more than the other components, the flexible ring is only moved two teeth further per rotation when the wave generator is rotated. Along the last axis of an articulated arm, linear robot or delta robot, the strain wave gear can be used before different gripper systems. Here, it performs the task of gripping objects that are not rotationally symmetrical and positioning them exactly.

The current version is based on a NEMA 17 installation size for direct connection to a stepper motor and can be adapted to other types of motor. With a transmission ratio of 28:1, the gearbox has a service life of 1 million cycles under a load of 1.5 Nm and at a speed of 6 rpm.

Treotham Automation Pty Ltd
www.treotham.com.au

HUMIDITY AND TEMPERATURE TRANSMITTER FOR HAZARDOUS ENVIRONMENTS

The Vaisala HUMICAP HMT370EX intrinsically safe humidity and temperature transmitter series offers an improvement in robust design over the previous HMT360 series and is said to be more easy to use.

The series is designed specifically for hazardous and explosive environments. The entire transmitter can be installed directly in explosive areas, up to Zone 0 and Zone 20.

Typical applications include paint booths in the automotive industry, hydrogen-cooled generators in electricity generation, chemical plants and processes, the baking industry, pharmaceuticals manufacturing, oil and gas drilling platforms, and fuel tanks and storage.

The series consists of the transmitter and a wide selection of probes. The transmitter is equipped with an intuitive graphical display for ease of use. Hand-detachable measurement probes and easy product configuration and calibration with Vaisala Insight software enable smooth maintenance, minimising any downtime in the measurement.

Several probe options are available for different applications. In addition to measuring relative humidity and temperature, the transmitter outputs dew point temperature, wet-bulb temperature, absolute humidity, mixing ratio, water concentration, water mass fraction, water vapour pressure and enthalpy.

Vaisala Oyj
www.vaisala.com/en/

TANK OUTLET VALVE

SPX FLOW has added an additional model of tank outlet valve to its APV D4 series mix-proof valves. The valves enable users to clean the pipeline without having to empty the contents of the tank; this improves efficiency and eliminates changeover costs, saving time and reducing operating costs.

The valves are designed to enable separation between the tank and servicing pipeline in sanitary applications across industries including food and beverage, dairy, pharmaceuticals and cosmetics.

The tank side holding pressure is greater than 5 bar (73 psi) and a long stroke provides for gentle product handling and low flow resistance

Inventory costs are reduced as the same seal kit can be used on multiple size ranges: DN40-DN65 (1.5″–3″) and DN80-DN100 (4″). The valve also has low air consumption and air supply requirements, and a leak drain with clamp connection for CIP fluid collection.

SPX Flow Inc
www.spxflow.com/au

PORTABLE DRY BLOCK TEMPERATURE CALIBRATOR

IKM Instrutek has introduced a calibrator with touch display and a calibration interval up to three years. It is designed to meet the market requirements to save cost by extending the calibration interval.

With a contemporary design, the TC65 portable dry block temperature calibrator is developed to meet the toughest demands of environments.

The unit is compact and robust, designed for marine, industrial and laboratory use, approved according to DNVGL-CG-0339:2019(parts of). This is to ensure that users are be able to calibrate a vast range of temperature sensors, thermometers and temperature switches/thermostats.

TC65 specifications include: temperature range from 30 to 650°C; stability ±0.1°C; accuracy 1 year ±1.5°C; and accuracy 3 year ±3.5°C.

The dry block principle excludes the use of oil or other liquids. A dry block insert with various diameters ensures thermal contact to the sensor being tested.

To use, place the sensor to be calibrated in the calibrator. Set the temperature. When stabilisation occurs, read the true temperature from the calibrator and re-calibrate the sensor or system accordingly.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

FANLESS EDGE AI COMPUTER

The Neousys SEMIL-1300GC Series is a wide-temperature fanless graphics edge AI computer supporting an NVIDIA Tesla T4 or Quadro P2200 GPU card for demanding environments. Coupled with an Intel Xeon E or 9th/8th-Gen Core CPU, the system is said to deliver high CPU and GPU performance for modern edge AI applications.

Additionally, the wide-temperature GPU computer features Neousys's thermal system architecture to provide -25 to +70°C fanless operations in a rack-mountable or wall-mountable 2U 19 ″ enclosure.

The series provides M12 connectors for Gigabit PoE+, USB 2.0, VGA and COM ports to offer rugged cable connectivity. Other high-speed computer I/Os include DisplayPort, USB 3.1 Gen1, optional 10Gb Ethernet and storage interfaces, such as M2 for NVMe SSD and SATA ports.

Backplane Systems Technology Pty Ltd
www.backplane.com.au

AS I SEE IT

AI FOR INDUSTRIAL CONTROL: HOCUS POCUS OR REAL OUTCOMES?

In recent years, artificial intelligence and machine learning have been touted as a panacea for process plants: using instrumentation to gather the data and automated systems to effect improvements to the operations. There have been huge advances and some great successes, but maintaining a healthy cynicism is essential.

Machine learning is certainly one of the most exciting technologies in recent times, and there are three major types of machine learning: supervised, unsupervised and reinforcement learning.

Supervised learning is based on the relationship of given inputs to a set of outputs. For example, the sensor inputs in a process plant (using previous breakdown knowledge) are 'wired' to predict the likelihood of the failure of a pump, or a maintenance prompt for equipment.

Unsupervised learning is where no predefined relationship exists between input data and an output variable. For example, a sensor is programmed to log data from hundreds of similar industrial plants, searching for specific patterns for optimal operations. The algorithm is able to trawl large data sets and then classify the data.

Reinforcement learning uses algorithms to perform tasks, but they are designed to become ever more astute as feedback is received. They strive for actions that are rewarded and then optimise themselves in response. They are effective in a scenario where little training data exists and there is no clearly defined end state. For example, balancing the load on electricity grids in varying demand and supply cycles, or the optimisation of self-driving cars.

A fourth machine learning technique is deep learning using neural networks. This technique has made impressive advances in image processing and recognition, robotics and natural language processing.

Are these advances achievable for industrial plants and industrial automation? The picture is more nuanced than the AI consultants would have us believe. There are examples of singular successes and commercially useful applications that have lured us into the belief that AI can be ably applied to industrial plants. In fact, an almost superstitious awe exists around the capacity of AI.

The widely quoted industrial IoT guru, Jonas Berge[1], suggests caution. For instance, a dubious claim is that an analysis of existing plant data (such as the correlations between flow data and pump failures) will provide new insights and ultimately optimise plant processes. Often this costly exercise merely reveals what you already knew or suspected.

Rather than complex machine learning, a simple rules-based system is best when analysing plant data. A flow sensor, for instance, is level-sensitive; it acts by setting off an alarm or shutting down a pump, or closing a valve.

It has been suggested that AI is best placed to analyse humans; to find useful patterns from a morass of complexity. Machines, on the other hand, are predictable: it is harder to gain value from applying AI and machine learning to machines.

In conclusion, instrument specialists remain critical to industrial plants; their deep knowledge of the processes and operations ensure they run smoothly. Yes, AI is producing innovations (Chao and You 2019[2]), but not widely yet in terms of having a genuine and useful impact on plants.

References

1. Berge J 2020, Big Ideas 2021: The New Data Science, LinkedIn, 《https://www.linkedin.com/pulse/bigideas2021-new-data-science-jonas-berge?trk=portfolio_article-card_title》
2. Shang C and You F 2019, 'Data Analytics and Machine Learning for Smart Process Manufacturing: Recent Advances and Perspectives in the Big Data Era', Engineering, vol. 5, issue 6, pp101-1016.

*Steve Mackay PhD has worked across the world for the past 40 years in the design and construction of iron ore plants, oil and gas platforms and power stations, as well as plant maintenance. He believes university engineering programs need to be strongly focused on industry. He has been the author or editor of over 30 engineering textbooks and is currently leading the first fully online accredited engineering college with over 1500 students from over 140 countries.