PROCESS TECHNOLOGY

AUTOMATION + CONTROL + INSTRUMENTATION

June 2019 vol.33 no.1

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ON THE COVER

Mitsubishi Electric has introduced the next generation of intelligent industrial robots — the MELFA FR series. The FR series includes vertical and SCARA robots, offering speed, accuracy and compact design as well as long working life.

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The MELFA FR series Robot is an integral part of the Mitsubishi Electric iQ platform, which brings together a full automation suite, including; the powerful compact iQ-F series automation controller; the revolutionary iQ-R next-generation controllers; the advanced performance GOT 2000 series graphic operator terminals; the FR-A800 range of high performance inverters; as well as the high function MR-J4 servo systems. The iQ platform has been developed to provide a next-generation automation environment focused on adding value while reducing total cost of ownership.

Mitsubishi Electric is one of the world's leading names in the manufacture and sales of electrical and electronic products and systems used in a broad range of fields and applications. As a global company, we're applying our technologies to contribute to society and daily life around the world.

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Mitsubishi Electric Australia
www.mitsubishielectric.com.au/fa/products

BLOCKCHAIN AND SUPPLY CHAINS

Glenn Johnson, Editor

Is the latest darling of IT ready for the world of supply chains?

It seems that some subjects are dogging us daily in the automation and process control sector — terms like Industry 4.0, smart manufacturing, IIoT and big data are bandied around so much that this editor (and I suspect many other readers) feel like we are sorely in need of something else to read about. It seems every company that has anything to do with industrial automation or associated technology has to have its "me too" flag waving, for fear of being seen as behind the times.

Now another subject is getting more and more attention: blockchain technology — another technology that is promised by many to be the panacea for many ills. Is it really? As it turns out, there is some debate about that.

One major area of interest in the application of blockchain technology is the management of today's global supply chains — an integral part of any large manufacturing or process industry business. The complexity of modern supply chains, and a need for much greater transparency, is what is creating interest in the adaptation of blockchain technology to supply chains. It is believed to offer an opportunity to tackle some of the perennial issues that compromise supply chain effectiveness, such as the lack of traceability.

First let's look at why it is of interest by way of some examples:

Tracing and recalls

One example being discussed is using blockchain to track products and improve crisis handling. For example, in the case of a food-borne illness, once the product responsible is identified, blockchain can be used to check the audit trail, including the origins of its ingredients and the ingredient that is causing the issue. With the source of contamination identified, the authorities can focus on recalling the products affected. US company Walmart did a blockchain pilot in China that enabled them to trace a package of mangoes from store to farm in a few seconds. Previously, this would have taken days or weeks.[1]

Counterfeit prevention

Another example is the detection of counterfeit products. Here in Australia, the wine industry has had examples of the damage such activity can do. In March 2018, Chinese police seized some 50,000 counterfeit bottles of Australian wine.[2] Using blockchain, retailers can provide customers with indisputable proof of the provenance and authenticity of their products. A tech start-up in Australia is using blockchain technology to combat the counterfeiting of wine bottles exported from Australia.[3]

Replacing slow manual processes

Modern supply chains can currently handle large, complex data sets. However, many processes still exist, especially those in lower supply tiers such as at the farm level in a food supply chain, or in the shipping industry, that are slow and rely entirely on paper.

How it works

For those who don't know what a blockchain is, it is basically a chain of 'ledger transactions'.

Imagine a bunch of blocks of transaction data (Figure 1).

In the Figure, Block 1 shows 12 transactions and Block 2 has the next 15. If we now create a cryptographic hash function of Block 1 and add it to the end of Block 2 as a new piece of data, then Block 1 is cryptographically chained to Block 2. Repeating the process, creating a cryptographic hash function of Block 2, including Block 1's hash and adding it to Block 3 now adds both Block 1 and Block 2 into a chain with Block 3. So each block's hash function is dependent on all blocks that came before (Figure 2).

The result is that the chain can be stored in many places, available to public access (in the case of Bitcoin), yet it remains an immutable ledger of all the transactions. For a blockchain to work, all computing nodes storing the chain need to establish a consensus on the truth of the blockchain. It is protected from alteration by virtue of

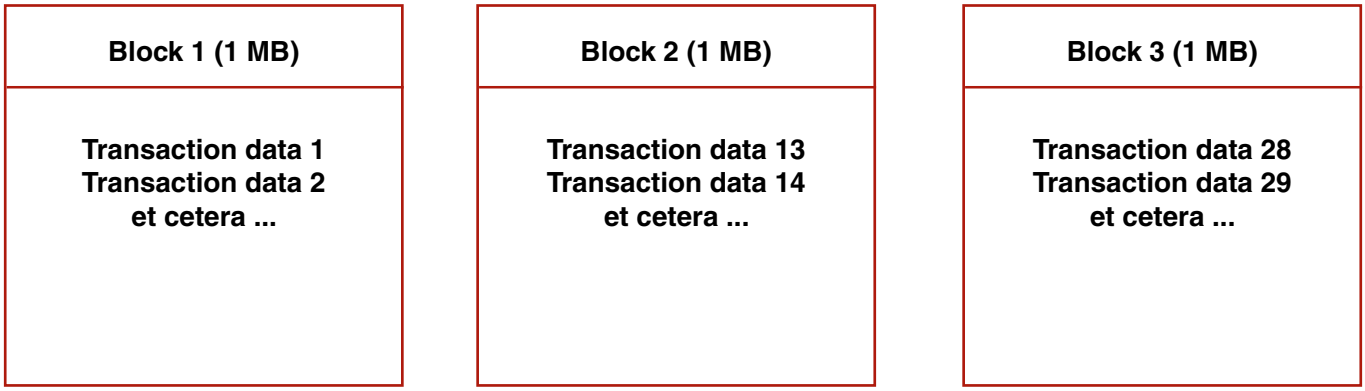

Figure 1: A set of unlinked blocks of transaction data. (Source: GoodAudience.com[4])

the fact that a change to even a single bit of data in a single block will dramatically change its hash function, and it will no longer chain with the next block.

So if Block 1 is changed it will no longer link to Block 2, making the alteration apparent to all systems and users involved in the chain. They therefore reject this change by shifting back to their previous record of the blockchain where all the blocks are still chained together. The only way to successfully alter data in a block is to then correspondingly alter every other block afterward without detection, which would be a formidable task.

The chain is immutable because of the fact that blockchain is a consensus system. Even if a party has altered a block of transactions and is now trying to calculate new signatures for the subsequent blocks in order to have the rest of the network accept his change, the rest of the network is also calculating new signatures for new blocks. The intruder will have to calculate new signatures for these blocks too as they are being added to the end of the chain. After all, he needs to keep all of the blocks linked, including the new ones constantly being added. Unless the bad actor has more computational power than the rest of the network combined, he will never catch up with the rest of the network finding signatures.

Conflicting opinions

There are many who are claiming that blockchain technology has the potential to turbocharge the effectiveness and profitability of most (if not all) businesses. The supporters of the adoption of blockchain are suggesting that businesses that ignore blockchain technology do so at their peril.

There are, however, some who are saying that blockchain may not be appropriate for supply chains — at least not all of them — and those who have attempted it have struggled to get past a pilot phase.

According to a report published by Gartner[6] in May, supply chain early adopters are failing to find suitable use cases. The report predicts that "by 2023, 90% of blockchain-based supply chain initiatives will suffer 'blockchain fatigue' due to a lack of strong use cases". The report went on to say that most blockchain supply chain projects "have remained pilot projects due to a combination of technology immaturity, lack of standards, overly ambitious scope and a misunderstanding of how blockchain could, or should, actually help the supply chain".

Information security: who has permission?

An essential feature of blockchain technology was that it was initially invented to support transactions in Bitcoin, a digital cryptocurrency that operates independently from a central bank, while offering more security than the banking system combined with instantaneous transmission via the internet. Bitcoin is an example of a 'permissionless' distributed ledger, residing in the public domain. As a result the Bitcoin blockchain has become increasingly large; however, validation of a single transaction requires only a few previous blocks. Due to the architecture, the parties involved are not known or trusted, but the blockchain itself remains secure from tampering.

In contrast to Bitcoin there are also 'permissioned' ledgers that are centralised and governed by 'actors', 'nodes' or 'miners', held outside the public domain. These private blockchains can be established for a smaller group of individuals or organisations to share among themselves. In most supply chains, the parties are known and trusted. The members of the supply chain are also unlikely to accept open access because its users don't want to reveal proprietary details, such as demand, capacities, orders, prices and margins, at all points of the value chain to unknown participants, as would be the case in a public permissionless system. This means most supply-chain blockchains would need to be governed centrally and restricted to known parties who may be limited to certain segments of data.

Technical challenges

There are a few challenges that need to be overcome before blockchain technology could be in widespread use in supply chains.

- **Lack of standardisation:** There are competing systems currently in use (such as HyperLedger and Ethereum), which means there are no definitive standards on things such as algorithms for consensus (immutability) and which encryption technology to use.
- **Larger data requirements than Bitcoin:** Rather than just simple financial transactions, supply chain blocks will involve significantly larger data sets and greater processing requirements at each step in the chain, even for smaller permissioned systems.
- **E-commerce systems are already fast:** E- commerce makes it possible to take an order, process it and pass it to a distribution centre in close to real time. This already-achieved performance progress leaves less room for blockchain technology to prove its value in verification.
- **Volume:** The large public ledger of Bitcoin requires a huge amount of processing power and energy, but the maximum speed is still only about 450 trillion transactions per second. The predicted transaction workload of supply chains will be much larger. For example, a single car manufacturer can typically generate

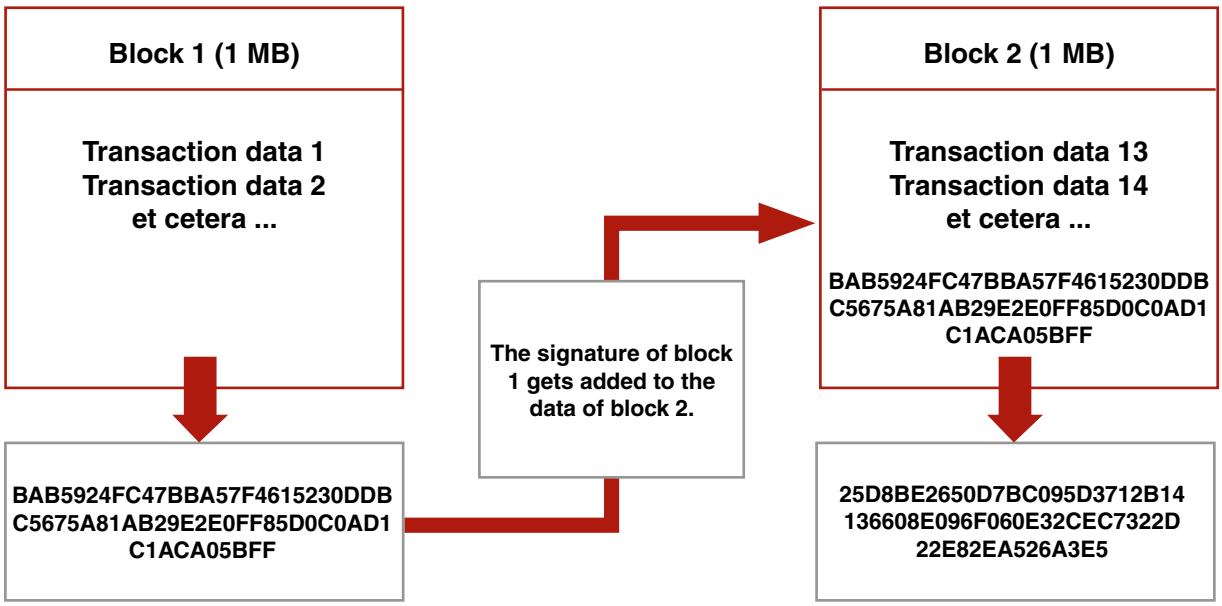

Figure 2: Linking blocks of transaction data into a blockchain. (Source: GoodAudience.com[5])

> THERE ARE A FEW CHALLENGES THAT NEED TO BE OVERCOME BEFORE BLOCKCHAIN TECHNOLOGY COULD BE IN WIDESPREAD USE IN SUPPLY CHAINS.

around 10 billion calls to its suppliers in a 90-day period. Permissioned blockchain technology is still (to date) slower than centralised database systems.

- **Who will pay?:** Bitcoin processing is funded by paying its participants a small fee per block validation. For a supply chain, there are questions to be answered about who will be responsible for the cost of the infrastructure and processing required.

Not ready for prime time?

McKinsey and Company[7] have suggested that companies need to consider all the facts before jumping in. They say that "blockchain technology may ultimately be a good solution for some types of supply chains, but it is not yet ready for mass adoption". The company's view is based partly on the fact that — as Gartner has also said — many pilots conducted so far have failed to deliver the expected value. Also, there are other ways to solve issues of traceability and full transparency, and the gap between blockchain's current capacity and that needed by supply chains is still too large.

The McKinsey report[8] suggests that blockchain is best suited to supply chains where participants are not known or trusted, since it can add trust, transparency and traceability. However, for supply chains with known and trusted players, a centralised database approach is generally more than adequate. Even though many existing supply chains use siloed databases that contain data with only limited traceability, nevertheless they do not necessarily need blockchain technology to solve such issues, as they can leverage existing technologies that are better suited to high-volume transactions.

Caution advised

It would seem that organisations need to remain cautious about early adoption of blockchain and not to rush into making it work in their supply chain until there is a clear distinction between hype and its core capability.

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8. Ibid.

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Extremely mobile — a crane for loads up to 500 tons

The development and production program of Kranbau Köthen GmbH has been described as "anything but standard". The company, engaged in crane manufacturing since 1934, specialises in sophisticated process cranes that are closely integrated into production systems. Example applications of these cranes are in the steel industry, for which Kranbau Köthen builds slab, charging and foundry cranes.

The cranes often work under adverse environmental conditions such as heat, dirt and high mechanical stresses. A recently built process crane does not have these requirements, but the needs are really unusual and extreme in many respects. It is used in an ABB plant in Sweden that manufactures large transformers — and by 'large' they mean really massive: the new transformers, being built at the plant weigh up to 500 tons.

This weight increase from previous transformers weighing up to 300 tons required the investment in a new process crane, and the Kranbau Köthen GmbH was commissioned for its development and production. A special feature had to be taken into account: the centre of gravity of the transformers is distributed very unequally. The crane must adapt accordingly and always ensure a smooth and sensitive lifting and lowering of the heavy load.

Based on these specifications, the Kranbau Köthen engineers developed a process crane with the required lifting capacity and a special heavy-duty shaft end support. It consists of two carriers whose spacing is changed by lead screws. The two attachment points on each carrier are also adjustable so that each of the four winches can be positioned separately. The transformer can therefore always be attached in such a way that the large weight is evenly distributed over all four attachment points. In addition, the entire shaft end support is rotatable, and is suspended on a load-measuring bolt of impressive dimensions.

In addition to its extremely high load-bearing capacity, the crane itself also has some special features. These include three auxiliary strokes, each with a loading capacity of 20 tons, and an extraction system on the trolley travelling winch. The reason for this is that if impurities get into the large transformer during the assembly process, this can have serious consequences for its function. For this reason, ABB produces these plants in a very clean environment and demands that the crane does not generate any abrasion during operation.

Cable must be guided on the crane girder to the 30 m-wide bridge; here a standard energy chain from igus, the E4 4040HD series, has been used. Due to the special design of the chain links with undercut design, the chain is able to absorb high push-pull forces and also provides very good strength to absorb lateral forces. The material the energy chain is made of ensures optimised sliding properties and a very long service life with low abrasion, meeting ABB's requirements.

The design of energy chains follows a standard process at Kranbau Köthen. "We use a form that contains all the necessary information such as specifications, installation situation and options. This allows igus to design the chain quickly and reliably," said Tom Kuhnt, the engineer in charge of electrical projects. "In this case, the extras included a double strain relief and a floating moving end, which compensates for any lateral misalignment and wheel clearance in the trolley drive. Kranbau Köthen has already had good experience with this system in other projects.

The company has a well-established relationship with igus. "From our point of view, we have been able to order a complete system that is designed precisely for the individual conditions," Kuhnt said. The chainflex cables were developed specifically for use in mobile systems, and due to the favourable environmental conditions (normal climate window, no high travel speed), cables with a PVC outer jacket can be used in the ABB process crane. They are more cost-effective than TPE cables and also generate less abrasion than PUR jackets, ensuring the required cleanliness.

The electrical connection between the two shaft end supports, which can be moved towards each other, is also built with energy chains and chainflex cables from igus. The E4 series e-chains are also used here, since the undercut design provides firm grip in lateral acceleration and inclination of the shaft end support. An integrated brake offers very smooth running.

At the rotating joint of the shaft end support, an enclosed triflex R energy chain with twistable cables from the igus chainflex range ensures mobility in the rotary axis. This chain was originally developed by igus for robotics. In the process crane, it protects the cables reliably in the required rotary movement.

Before a crane leaves the site of Kranbau Köthen, a factory acceptance test takes place. Here, the crane is fully evaluated and tested jointly with the customer. This elaborate test is a standard procedure at Köthen and shortens the commissioning time of the crane system for the customer.

Subsequently, the crane was distributed over several flat bed vehicles and transported to Sweden. Part of the route was by sea, so ferry loading of the fragile cargo was inevitable.

The test and final inspection of the process crane at ABB also posed special challenges to those in charge; 625 tons of test weight (corresponding to 125% of the maximum nominal load) had to be provided for the acceptance test. Tests of the emergency stop device at full speed were also part of the test series. At the customer's plant, the acceptance was carried out thoroughly. "After all, as a globally leading technology company, ABB is also a specialist in the field of crane technology and therefore also a critical and competent customer," said Maik Stern, Head of Production at Kranbau Köthen.

Treotham Automation Pty Ltd

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PORTABLE ACCELEROMETER CALIBRATOR

The Endevco 28959G is a portable calibrator for accelerometers. This self-contained system includes a built-in vibration exciter, signal generator, computer-controlled amplifier and servo mechanism, reference accelerometer, signal conditioners and necessary connectors and mounting accessories. It is designed to provide precise calibration of all types of accelerometers in the field.

The Endevco 28959G can calibrate both piezoresistive and variable capacitance accelerometers in one system. Sensor types can be selected from the built-in sensor library and the system will identify the frequency range of the selected system. The results are calculated and displayed in real time through the colour LCD screen. They can also be saved in PDF format or to USB storage devices. The calibration procedure can also be done in automatic test mode requiring little to no user interaction.

Commonly used to calibrate individual accelerometers for test and measurement, the Endevco 28959G can also be used in a wide range of process control or condition monitoring applications. It can determine whether faults are present in the measurement chain and identify which part of the process is faulty. The 28959G can also be used as a standalone shaker that can assist engineers to check the performance of individual components separately in the system and identify the root cause.

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www.bestech.com.au

ULTRA-COMPACT AS-I MODULE

The Pepperl+Fuchs G10 ultra-compact AS-Interface module is an AS-I slave module with a size of 22 x 27 x 40 mm per I/O. The ultra-compact safety module fits into every cable duct and can be mounted securely using a single stainless steel screw. As the G10 ultra-compact module fits easily into the cable duct, the flat cable remains in the cable tray at all times. In applications where sensors are widely scattered, the decentralised installation reduces cable lengths and optimises line lengths to sensors and actuators. Since cable outputs are used, this means that no connection cables are required.

Users can take advantage of AS-Interface with the Pepperl+Fuchs G10 ultra-compact module to solve decentralised installations and cost-optimisation in a small space. The one-piece enclosure can be quickly installed and give every standard sensor AS-Interface capabilities.

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CLEANROOM ENERGY CHAINS

The easily openable igus e-skin is an enclosed corrugated tube that is made of tribologically optimised, abrasion-resistant plastic, has a modular structure and can be filled quickly. To make the e-skin suitable for use in compact cleanrooms, it has now been fitted with a softer material. The e-skin soft can also be used in small installation spaces on short unsupported lengths. For very flat installation spaces, there is also a solution with a chamber design: the e-skin flat. Both energy chains are also very quiet: the e-skin soft had a value of 32.4 dBA and the e-skin flat, 29 dBA.

The e-skin soft is based entirely on the modular principle of the e-skin: the separable upper and lower shells of the energy chain can be easily put together by a 'zipper' to a fully enclosed tube, which is highly dustproof and water-resistant. This guarantees both cleanroom compatibility, quick filling and maintenance of the cables.

The e-skin flat is designed for very tight installation spaces, eg, in semiconductor manufacturing. It consists of a profile with three cable chambers, which are extruded from high-performance plastics. It allows a very small bend radius and a low clearance height. In the event of a need for maintenance, the cables can simply be pulled in without having to install a new energy supply system. The individual chambers are openable from the outside thanks to a zipper system, so that maintenance can be sped up.

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FOOD-SAFE BALL BEARINGS

ABB's Dodge Food Safe mounted ball bearings are designed to withstand caustic, high-pressure cleaning and sanitation processes. They are the first industrial bearings to achieve the IP69 water protection rating without the use of an end cover, the company claims, making them suitable for use in the food and beverage industry where equipment must be aggressively cleaned. They carry a warranty against failure due to water ingress.

The bearings are resilient against cleaning agents. The 100% stainless steel insert design, combined with a KleenTec top coat, offers protection against corrosion. The smooth housing without a grease fitting minimises contamination harbour points and is easy to clean. The bearing is sealed and lubricated for life to minimise maintenance costs.

To prevent grease washout, the bearing is equipped with lubrication protection. The Hydro armor sealing system, with a stainless steel flinger and four contact lip seals, prevents water and contamination from entering the bearing. The company's ball retainer, the Maxlife cage, retains a large volume of grease in compartments around the rolling elements to prevent washout during high-pressure cleaning.

The bearings are available in a variety of housing styles, including pillow block, tapped base, flange and take-ups ranging in sizes from 20 to 50 mm.

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MILITARY-GRADE PANEL PC

The Winmate R20IB3S-RKA2ML is a heavy-duty, military-grade, rack-mount fanless panel PC with a 20.1″ LCD screen.

Winmate's military-grade panel PCs are designed for durability. With an anti-corrosion housing, a standard operating temperature range of 0 to 60°C, optional wide range of -10 to 70°C, and meeting MIL-STD-810F/G for vibration, humidity and transit drop, this panel PC is built to endure harsh conditions.

Within the fanless PC sits a low-power Intel Celeron N2930 2.16 GHz processor. It also offers convenient on-screen display controls, a built-in light sensor for automatic brightness control, military-grade power connector (MIL-DTL-38999/1) and a rack-mount mechanical design for easy installation and straightforward use in demanding environments. And if EMI is a concern, there is an option of upgrading to an EMI mesh resistive touch screen.

In terms of I/O, the R20IB3S-RKA2ML features standard USB 2.0 and USB 3.0 ports, two RJ45 ports, a VGA port and optional RS232 to facilitate connectivity. It also supports up to 256 GB of storage (mSATA SSD, default 64 GB) and 8 GB of RAM (SO-DIMM DDR3 1666, default 4 GB). Power supply can be 110–240 VAC or optionally 9–36 VDC.

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

THIN CLIENTS

R. Stahl has released firmware version 5.5 for its EXICOM Series 500 Thin Clients. The industrial-grade remote HMI firmware, based on Windows 10 IoT Enterprise LTSB (Long Term Service Branch) is made for efficient connectivity, security and manageability.

The firmware has a protected kiosk mode where user rights are restricted, and access to the operating system is barred. It is highly secure against threats and unauthorised access and includes a filter that can be used to limit access to the USB port to defined storage media and other specific devices. Users can only access normal settings as well as apps specially set up for them, such as Citrix clients, ERP or CCTV systems.

A feature of the latest firmware is the simultaneous display of multiple sessions: it is possible, for example, to simultaneously access the control system and the ERP system, either in split-screen mode on the same screen or in a dual-monitor system. For apps and functions that are frequently used, the user interface will suggest one-touch shortcuts. All other functions are easily accessible via clearly structured menus.

For reliable failure protection and non-stop availability, the remote access protocols RDP, VNC and KVM over IP feature an immediate re-connect as well as redundancy with dual Ethernet interfaces. The firmware user interface adapts to different-sized displays as well as landscape/portrait formats. Virtual keyboards with various fonts are available for data input. Stability and progressive compatibility of the firmware is ensured by Microsoft's operating system security updates.

R. STAHL Australia Pty Ltd
www.stahl.com.au

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The 5322A electrical tester calibrator helps calibration technicians comply with new regulatory standards up to four times faster than with traditional manual, multiple-instrument methods.

The Fluke Calibration 5322A facilitates compliance with exacting international standards including Australia and New Zealand's AS/NZS 3000 and regulations for various electrical testers.

The 5322A combines many functions into a single instrument, replacing discrete resistors, decade boxes and other custom solutions commonly used to calibrate electrical testers. This single-box solution speeds and simplifies calibration because users only need to learn, operate and maintain one calibrator rather than multiple instruments. And while it's difficult to automate multiple instruments, the 5322A can be automated with Fluke's MET/CAL Calibration Software, further increasing speed and throughput.

The 5322A calibrates a broad range of equipment, including hipot testers, insulation resistance testers (megohm-meters) including older analog testers, loop/line impedance testers, continuity testers, earth resistance testers, ground bond testers, leakage current testers, circuit breaker testers (RCD/GFCI), multifunction installation testers and portable appliance testers (PATs).

Fluke Australia Pty Ltd
www.fluke.com.au

MASS FLOW METERS AND CONTROLLERS

For the consumption measurement of high gas flow rates, volumetric flow meters are often selected, such as vortex flow meters, turbine flow meters or instruments based on the measurement of differential pressure. To read mass flow, all these measurement principles require temperature and pressure compensation. The Bronkhorst IN-FLOW Series F-106 and F-107 directly measure high mass flow rates of gases up to a pipe size of 10″ or DN 250. Their digital electronics offers counter and alarm functions as a standard feature, as well as the option to integrate an onboard interface board for DeviceNet, Profibus DP, Profinet, Modbus or FLOW-BUS communication.

IN-FLOW 'High-Flow' models F-206AI and F-206BI are compact mass flow controllers with integrated, normally closed control valves with K_V values up to 6.0 and flow rates up to approx. 375 m^3/h N_2-equivalent. For higher flow ranges Bronkhorst can offer IN-FLOW 'High-Flow' flow meters combined with separate control valves from other manufacturers.

As an option, IN-FLOW Mass Flow Meters and Controllers can be offered for use in explosive environments. For the European market, all IN-FLOW instruments can be adapted for application in ATEX Category 3, Zone 1. For the North American market, IN-FLOW devices can be offered with FM Class I Division 2 approval.

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

PRESSURE GAUGE

The Ralston Instruments Field Gauge LC10 pressure gauge is compact and features a large LCD display that shows numbers and bar graphs clearly, with a bright backlight for use in low-light situations. It is made from durable aluminium and high-impact plastic, the protective hard cover on the LCD resists cracking, and the gauge is waterproof to 1 m (IP67).

The product allows users to change units on the fly from 15 standard engineering units with a tap of the button. Ralston Instruments FieldLab Desktop software is included, which makes it easy to create custom engineering units, remove unnecessary units and configure other settings easily.

The gauge is powered by two standard AA batteries, and its measurement precision is ASME grade 3A and ISO Class 0.25 (±0.25% of full scale). The device is designed and manufactured in the USA with approvals for use in the US, Canada, Europe and Australia.

The unit offers 11 pressure ranges, from 35 kPa up to 70 MPa, as well as compound ranges and vacuum-only ranges.

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KEY CHALLENGES IN THE FOOD AND BEVERAGE INDUSTRY

AUTOMATED WAREHOUSING SOLUTIONS CAN IMPROVE INTRALOGISTICS

Fast, reliable and efficient intralogistics, from pallet handling to storage to order fulfilment, can mitigate today's key challenges.

The food and beverage (F&B) sector is changing rapidly, with new trends and drivers creating new challenges for manufacturers. Grocery retailers are putting pressure on supplier margins, consumers are becoming more price conscious while at the same time asking for a greater range of products, input costs including labour, raw materials and energy are increasing, and safety and product tracking regulations are becoming more onerous. All these trends pose significant challenges to F&B manufacturer supply chain and logistics operations.

Leading F&B manufacturers are investing in warehouse automation to address these challenges and to realise significant and lasting competitive advantages to their supply chains and businesses.

1. Cost pressures

The imperative to optimise productivity and reduce costs in supply chains has never been greater for F&B manufacturers, and cost pressures are being compounded like never before by the increasing concentration of the grocery retail market and increasingly price-conscious consumers.

Concentrated grocery retail market putting pressure on manufacturer margins

A continuing trend toward concentrated grocery retail markets means fewer numbers of retailers are becoming increasingly dominant. This position of strength has major implications for F&B manufacturers. For example, in Australia the market share of the two top grocery chains stood at 67.5% in 2017–18.[1] The major grocers have also consolidated market share in the liquor retail sector. The two major grocers — with the introduction of big box liquor outlets and aggressive pricing — now control 67.5% of the alcohol retail market.[2]

The grocers have leveraged this market position to drive strong agreements with suppliers, eroding supplier margins and enabling them to offer low store prices that smaller outlets find very difficult to compete with. They are also using their position to drive their own private label ranges at the expense of branded products.

Grocery retailers pushing inventory back to manufacturers

The major grocery retailers are also pushing inventory back towards suppliers, increasing logistics costs for manufacturers — especially those that have outsourced their distribution to third-party logistics (3PL) providers. With grocers pushing inventory back on suppliers, the 3PLs are holding higher levels of inventory with consequent costs for many of their manufacturing customers.

As a result, manufacturers are increasingly looking to insource their logistics operations and build supply chain competence back into their own business. For many, the timing of this presents an ideal opportunity to optimise their distribution activities.

Price-conscious consumers

Consumers are remaining highly price conscious, and are favouring low-cost supermarkets over convenience stores. Volumes shift toward lower-margin grocery retailers at the expense of higher-margin convenience and small food retailers.

Consumers are also increasingly open to purchasing an expanding array of private labels. Consumers consider private labels as good alternatives to national brands, with many believing private label brands to be of equivalent quality. This trend places further pressure on F&B manufacturer margins.

Labour issues

Decreasing labour availability — primarily driven by an ageing population and a workforce increasingly reluctant to work in warehouses, especially cold stores — has major implications for distribution costs.

While manufacturers have automated their processing lines, for many their distribution and warehousing operations remain highly labour-intensive.

In recent years, many companies across different sectors have increased labour productivity through human resources measures. Many are now recognising that having implemented these measures to their full extent, the next step change in improving labour productivity will be through investment in productivity-enhancing technology.

Increasing productivity and reducing costs

Automated storage and retrieval systems (ASRSs) fully automate the process of product storage and handling, eliminating 'touches' by operators and greatly reducing warehouse labour and operating costs. Although highly dependent on the specific inventory profile of a manufacturer, productivity gains of up to 20–30% can typically be realised with ASRSs.

ASRSs also reduce waste, product and rack damage associated with forklift trucks, and typically have lower maintenance requirements in comparison to forklift leasing and maintenance costs.

2. Consolidation of production and distribution

There is a growing trend for manufacturers to consolidate their production facilities in response to cost pressures, reducing the number of nodes in their networks to lower warehousing and transport costs.

As part of this consolidation, F&B companies are building their distribution operations adjacent to their manufacturing lines, eliminating the costly and labour-intensive process of shipping finished goods from a processing facility to a warehouse.

However, the limited availability of land next to manufacturing facilities and the increasing cost of land — at least in high-density population centres — can make this prohibitive with conventional manual storage and handling solutions.

Increasing storage density

By maximising storage density and allowing heights up to 35 m, pallet ASRSs require up to 60% less space compared to conventional pallet storage.

With a reduced building footprint, ASRSs can make it feasible for manufacturers to build finished goods distribution facilities adjacent to their manufacturing plants, even where land is limited. And by consolidating distribution into an ASRS warehouse, manufacturers can reduce safety stock holding requirements and total inventory costs.

An ASRS is also a very cost-effective solution for conventional warehouses that are running out of space. Replacing conventional pallet racking with an ASRS significantly increases pallet storage capacity, extending the life of the existing building, reducing costs and eliminating the need, costs and disruption associated with constructing a new facility or relocating.

3. Ensuring superior customer service levels

In such a competitive consumer-driven market it is imperative for F&B manufacturers to get the right product in the right quantity at the right time to customers, more so than in any other industry. Grocery distributors are less tolerant of missed delivery windows or incorrect products that lead to out-of-stock store shelves, imposing penalties for late or incomplete deliveries. Manufacturer distribution operations need to ensure they have the correct product in the required stock quantity, and that orders are complete and accurately dispatched in a timely manner. They also need sufficient redundancy and tolerance to operational disruptions. Just as importantly, distribution functions need to ensure they are not causing bottlenecks for operations, which can lead to production lines being stopped.

Optimising service levels

Completely automating the processes of put-away, storage and retrieval, ASRSs eliminate potential operator errors and ensure optimal inventory availability and maximum order accuracy. Operations know exactly what is in stock and customer orders are assured of being correct.

ASRSs also deliver significant benefits for staging and dispatch applications and for consolidated production and distribution facility processing lines — all critical elements in ensuring customer orders are fulfilled on time and in full.

Ensuring efficient staging and dispatch

In a manual staging and dispatch area, pallets need to be staged in trailer-load quantities to ensure trucks can be loaded rapidly. Having a large enough dispatch area is critical for dealing with daily operation fluctuations; however, many dock areas have limited floor space and the headroom is usually underused (as opposed to in an ASRS). In the event of a disruption, such as a truck breakdown on the way to the facility, stock for orders is often left in dispatch until the problem is rectified. This can lead to potential bottlenecks for other orders, which can cascade into disruptions to upstream operations, with significant impact on delivering customer orders.

A very effective alternative is extending the use of an ASRS to staging and dispatch. With ASRSs delivering faster cycle times than manually operated forklift trucks, pallets of stock can be retrieved from the system so they are ready for loading when the transport vehicle arrives in the yard.

Automated guided vehicles: integrating processing lines and ASRSs

For consolidated production and distribution facilities, automating the complete process from end-of-processing line palletising through to an ASRS increases the complete system redundancy and resilience, eliminating potential bottlenecks to critical process operations which can occur in manual systems, for example if an operator leaves accumulated pallets at a processing line outfeed.

While pallet conveyors and monorails provide robust and reliable links between production and automated storage, the ideal solution for operations that are looking for maximum redundancy and flexibility is automated guided vehicles (AGVs). Apart from providing reliable and cost-effective pallet transport, the inherent flexibility of AGVs means that as throughput requirements and pick-up and delivery destinations change, pathways can be easily adjusted and additional AGVs readily added to the fleet.

4. SKU proliferation and order complexity

Consumers are demanding a wider range of products, driven by tastes and food fashion trends, fitness and health concerns. Manufacturers are responding by introducing many new products.

The impact on F&B manufacturer supply chains is continuing SKU proliferation and the need to stock an ever-increasing variety of product. For manufacturers who are also producing private labels for retailers, this only adds to the SKU complexity they need to manage.

In a manual warehouse system, the implications of handling additional SKUs means that everything has to get larger — more pallet storage and picking locations and more travel, which leads to slower and less efficient operations, in bigger, more expensive warehouses.

An ASRS delivers greater storage capacity

By offering greater storage density and the opportunity to go

higher, ASRSs provide operations with significantly more storage locations for handling additional SKUs without increased travel.

And with order profiles changing, including variations in throughputs of individual SKUs as they shift from slow to fast movers and vice versa, ASRSs can readily re-slot product to ensure fast movers are located closer to outfeed zones, increasing system responsiveness.

5. Managing OH&S

OH&S is regularly cited as the number one priority for many F&B manufacturers. The movement and storage of heavy pallet loads, potential breakages and spills all pose dangers to operators. Many DCs require complete operational separation of MHE and personnel to ensure operator safety and compliance with new work safety requirements.

Minimising OH&S risks

ASRSs, by eliminating the need for operators and forklift trucks in storage and staging applications, significantly reduce the OH&S risks associated with manual handling.

ASRSs deliver precise put-away and retrieval from storage locations, removing the risk of product, pallet or rack damage. With regards to chain of responsibility, ASRSs can deliver pallet loads to a trailer in the precise sequence specified by a host system according to axle load requirements.

6. Rising energy costs

Rising energy costs are also impacting on F&B manufacturer margins; this has particular significance for manufacturers with energy-intensive cold store operations.

Reducing total energy consumption

By maximising storage density and reducing the footprint, ASRSs reduce energy requirements for cooling or warming the storage cube. ASRSs also require significantly less lighting, further reducing energy consumption. Equipped with energy recovery technology, ASRSs also conserve energy during operation. For example, braking energy is regenerated and used by the lifting motor, enabling ASRSs to consume up to 29% less energy than conventional non-regen ASRSs.

7. Tracking requirements

Government food safety agencies require food to be tracked through all stages of production, processing and distribution (also known as farm to fork). The aim is to enable quick and effective corrective action in the event of something going wrong, such as a product recall, and prevent contaminated product from reaching consumers.

In addition to meeting Food Standards Code requirements, F&B companies recognise that product traceability systems help protect their brands by enabling a rapid and effective response to any incident. Apart from batch and lot tracking, warehouse management systems need to effectively manage inventory and FIFO rules; in many cases, major grocers will only accept consecutively numbered batches and expiry dates.

ASRSs and WCSs provide tracking and responsiveness capabilities

ASRSs can be fully integrated into an ERP/MRP or WMS via a warehouse control system (WCS). The WCS provides precise tracking of product movement and storage locations in real time. As part of its comprehensive inventory tracking capabilities, the WCS manages batch and lot tracking of products and, in conjunction with the host, manages FIFO and FILO rules.

Conclusion

The latest developments in ASRS and associated materials handling and software solutions provide significant benefits for F&B manufacturers looking to address the latest challenges facing their distribution operations.

Automation provides distinct and lasting competitive advantage by reducing labour touches and improving productivity by up to 30%, increasing service levels, minimising OH&S risks and enhancing operational flexibility and resilience, while delivering comprehensive tracking, visibility and operational management capabilities. And automation achieves this using up to 60% less space compared to conventional storage solutions.

Automation allows F&B companies to review their complete manufacturing and supply chain networks and look at where they can consolidate storage and distribution to reduce total costs and deliver superior operational capabilities. And with the cost of automation falling significantly in recent years, the business case and return on investment has never been greater.

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Dematic Pty Ltd
www.dematic.com.au

NEW PRODUCTS

SCREW BLOWERS

The efficiency of the Kaeser HBS screw blower is said to remain consistent across the entire control range, not just at certain specific levels, making the machine an alternative to turbo compressors. This screw blower designed for the low-pressure range offers a 132 to 250 kW power range, with flow rates from 60 to 160 m³/min and differential pressures up to 1100 mbar. They are said to be up to 35% more efficient than conventional rotary blowers and also deliver significant energy advantages.

The blower block of the HBS screw blower is driven by a loss-free direct drive, meaning the HBS combines highly efficient operation with a low-maintenance requirement. A frequency converter is integrated for dynamic adjustment of the flow rate to actual demand.

As assurance that the predicted high savings are actually achieved, Kaeser guarantees the power consumption per unit of flow rate (specific power consumption in kW per pro m³/h) in accordance with ISO 1217, Annex E.

The integrated Sigma Control 2 controller is designed to ensure operational reliability and smart communication via integration into process control systems. The Sigma Air Manager 4.0 master controller is recommended for blower stations with multiple blowers as it features control and regulation algorithms specially developed for the needs of low-pressure applications. This enables even greater energy savings and simplification of automation.

The HBS screw blowers are suitable for applications with especially high energy requirements, such as production of aeration air for wastewater treatment and bioreactors, as well as for flotation and fluidisation.

Kaeser Compressors Australia
www.kaeser.com.au

SAFETY LASER SCANNER

The PSENscan safety laser scanners from Pilz are now also suitable for area guarding in vertical applications, eg, for access protection. PSENscan applications can now be designed with greater flexibility, which minimises downtimes and increases cost-effectiveness.

Due to integrated muting inputs, applications can now be monitored in which material is simultaneously transported in and out. The material is detected by the safety laser scanner and it can cross the protected field without deceleration of the conveyor. This will avoid downtime and increase productivity.

With the PSENscan Light, Master and Slave versions users can monitor up to 70 switchable configurations and up to three separate zones simultaneously. Up to four safety laser scanners can be connected in series, thus reducing the cabling and set-up work considerably. The warning fields and protected fields are freely configurable. With its compact housing, PSENscan can be integrated flexibly into various applications.

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

QUARTER TURN ACTUATOR

The Festo DFPD quarter turn actuator offers a simple, compact and modular design. The DFPD is suitable for many tasks in the process industry, including automating butterfly or ball valves and air dampers in the chemical, beverage and pharmaceutical industries, as well as in water treatment. It can be used as an individual actuator or combined with other components, such as sensor boxes, positioners and pilot valves or as part of a complete, integrated automated process valve system.

The rack-and-pinion combination is available in both single- and double-acting versions with maximum torque of up to 2300 Nm. The rotation angle for standard sizes is up to 90° and up to 180° with the double-acting version. The standard version is suitable for temperatures between -20 and +80°C, with variants also available that are designed to operate reliably at either low or high extreme temperatures, ranging from -50 to +150°C.

With its versatile and corrosion-resistant surface coatings, the actuator can also be used in harsh conditions. It can be mounted anywhere and the end positions can be adjusted by ±5° at both ends, ensuring high flexibility during operation.

The full range of variants, the standardised hole patterns to NAMUR VDI/VDE 3845 for pilot valves, as well as its many compatible peripheral components means that it can fulfil a large variety of applications.

Festo Pty Ltd
www.festo.com.au

EMBEDDED PC

The ACS-2332 multi-core embedded PC from Aplex Technology is a high-performance standalone PC featuring fanless operation, compact size and robust construction.

The ACS-2332 is based on the Intel H170 chipset and can be purchased with a 6th Generation Intel Core i5-6500TE 2.3 GHz or i7-6700TE 2.4 GHz processor. It is equipped with two SODIMM sockets supporting up to 32 GB of DDR4 system memory, four Gigabit RJ-45 Ethernet connectors, four USB 3.0 ports, two USB 2.0 ports, four digital inputs, four digital outputs, two RS-232 ports and two RS-232/422/485 ports for communication.

Two easily accessible 2.5″ SATA hard drives can be internally mounted for operating system and data storage. System expansion is possible via two PCIe slots and three Mini-PCIe Card slots. One Mini-PCIe slot can be used for mSATA SSD storage. The onboard Intel HD graphics engine provides a DisplayPort, DVI-D and HDMI output with support for 4K UHD high-resolution displays.

The heatsink and fanless design of the ACS-2332 is designed to ensure long-term, reliable operation in industrial and embedded environments. The system require a 9–36 VDC power source for normal operation. An optional 100–240 VAC power pack is also available.

Interworld Electronics and Computer Industries
www.ieci.com.au

DIGITAL PANEL METERS

The WPMZ series digital panel meters from Watanabe Electronics offer a high-speed sampling rate of up to 4 kHz for single channel operation. This enables the user to measure instantaneous change or tiny changes in process parameters. They are easy to use and provide a large display for high visibility. The display is selectable as a numerical or graphical display according to the measurement purposes. An optional 90° display is also available for use in narrow or restricted spaces.

Available in four different series, the WPMZ series digital panel meters offer versatility for measurement in a wide range of applications. The WPMZ-1 measures DC voltage and current and is equipped with an alarm function. The WPMZ-2 accepts strain gauge inputs for process control applications. WPMZ-5 is designed for rotational speed measurements with pulse and line driver inputs. Lastly, the WPMZ-6 is designed for measuring instantaneous or integrated flow rate. It can measure the flow of two different liquids and monitor the difference.

The WPMZ digital panel meters are available with analog, BCD, RS-232C and RS-485 outputs for different industrial applications, and also have 10 integrated arithmetic expressions for input calculations.

Bestech Australia Pty Ltd
www.bestech.com.au

FIELDBUS POWER SUPPLY

FieldConnex Power Hubs for Yokogawa are equipped with plugs for two AKB 336 system cables in redundant configuration. They connect four segments at once. The position of the connectors can be selected on the right and left side of the motherboard. This enables best practices for control cabinet design with segregation of cables to the control system from field cabling.

All DCS wiring is routed through the centre cable duct with connectors selectable. This enables best possible installation quality for best communications quality and reliability: wiring errors eliminated; best protection from power surges; and minimal effort for cable checkout.

With 10 or more years in operation, many fieldbus installations begin to age. FieldConnex Power Hubs are a suitable replacement for any power supply with no work that is required in the cabinet because the small size fits between existing cable trays; connectors stay in place; and power dissipation is said to be lower than existing power supplies.

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

OPTICAL ALIGNMENT SYSTEM

The Pruftechnik Optalign Touch standard optical alignment system is a suitable device for simple, fast and daily alignment jobs. It is suitable for most maintenance workshops with its 0.001 mm resolution and 30 m measurement range. It is available to rent from TechRentals.

The device features a continuous sweep mode that offers fast and precise measurements with high-data quality. Its Live Move function allows for real-time machine corrections with heads at any position.

The Optalign Touch also features sensALIGN 5 laser/sensor heads providing single-laser and bi-axial dual detector technology for various measurement capabilities. Its touchscreen display and Bluetooth communication between the sensor head and computer allow for easy operation.

The unit is waterproof and dustproof and has a shockproof sturdy frame, making it an alignment system that will withstand rough environments.

TechRentals
www.techrentals.com.au

TOTAL RESIDUAL OXIDANT ANALYSER

Thermo Fisher Scientific has developed a total residual oxidant (TRO) analyser to address the needs of the wastewater industry, which requires a robust, dependable instrument capable of measuring low ppb chlorine concentrations in effluent and treated wastewater in line with regulatory requirements.

Operating on US Environmental Protection Agency-approved iodometric electrode technology, the Thermo Scientific Orion 7070iX TRO Analyzer has been designed to offer high sensitivity for low-level chlorine measurements down to 1 ppb with 1 ppb resolution. With this capability, the system provides users with the confidence that chlorine concentrations in water discharged into natural water sources do not exceed the safety threshold or pose a threat to marine life. For optimal application flexibility, the analyser also enables full range measurements up to 15 ppm.

Compared with the conventional DPD (N,N-Diethyl-1,4-Phenylenediamine Sulfate) colorimetric method, the iodometric electrode technology does not suffer from turbidity or colour interferences, which can have a negative impact on result accuracy and precision. Further, the analyser is capable of operating autonomously for long periods of time with minimal instrument drift (<5% for over 180 days without calibration), eliminating the need for routine maintenance.

The system can operate automatically on-demand in intermittent on-off mode, based on sample flow: once the flow starts, the unit's pumps turn on and they shut down as soon as the flow stops. The analyser also provides real-time monitoring of TRO fluctuations, alerting users within just 120 s from the change, prompting timely corrective action.

Thermo Fisher Scientific
www.thermofisher.com.au

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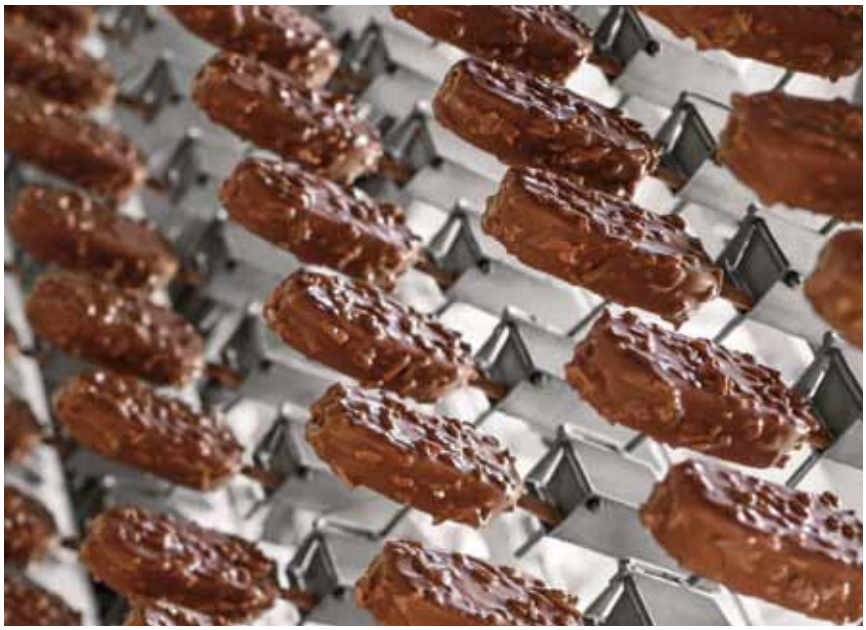

Ice-cream is refreshing, and with its proteins and carbohydrates is considered a source of energy. However, it also takes a lot of energy to mix ingredients like milk, dairy chocolate, sugar and vanilla beans into the finished product. Electricity and compressed air play an important role in the thermal and kinetic processes for everything from mixing and extruding the ingredients, deep-freezing to -25°C, dipping into various chocolate coatings through to final packaging. Energy efficiency is therefore right at the top of Unilever's list of priorities. As part of the Unilever Sustainable Living Plan, this global corporation has succeeded in saving more than €150 million in energy costs from efficiency improvements in production alone since 2008.

In the area of pneumatics the use of innovative developments offers the potential to save energy and thereby lower costs. In the Unilever plant in Heppenheim, Germany, the MSE6-E2M energy efficiency module from Festo has recently been deployed to reduce the compressed air consumption of a plant manufacturing Magnum ice-creams. Unilever and Festo worked together closely to get this prototype of the energy efficiency module ready for series production. This process also showed that it is not just in the field of energy consumption that less is more.

The Heppenheim factory is one of the main Unilever production locations for ice-cream. These include products of the well-known Wall's brand including Magnum, Feast, Viennetta and Carte d'Or. High production quantities form the basis for supplying other parts of the European market. Just one of the five Magnum production lines in Heppenheim produces more than 20,000 ice-creams on a stick per hour. This requires a lot of energy. In order to reduce the compressed air consumption of the pneumatic components, the ability to visualise and measure the compressed air consumption was of huge importance to Unilever.

Previously, the consumption on the individual production lines had not been determined. As part of the Unilever Sustainable Living Plan there had already been successes in other areas of the plant. Energy-intensive geared motors were replaced with more efficient ones, achieving energy savings of up to 60%. Numerous 18 kW ventilators in the cooling tunnels, which previously ran for 24 hours in continuous operation, were also converted to frequency converters with variable torque loads, lowering the energy consumption of the ventilators by around 40%.

Alexander Hemmerich, Automation Engineer at the plant, along with his team, took the decisive step towards lowering compressed air consumption with the introduction of the MSE6-E2M energy efficiency module from Festo.

"The energy efficiency module gave us the opportunity to see the amount of compressed air we were using during operation of a line," explained Hemmerich. "In addition, we were able to determine how the compressed air requirement developed when we switched off individual consumers. We were thus able to locate leaks and eliminate unnecessary consumption."

One of the core functions of the MSE6-E2M is the automatic shutoff of the compressed air in standby mode, which made it possible to establish how quickly the system empties. The MSE6-E2M module immediately reports an unusually quick drop in pressure to the system controller.

At the same time, the automatic pressure shutoff function prevents further compressed air consumption while the system is not in operation. Due to its onboard intelligence and the specific model for operating the compressed air systems, the MSE6-E2M independently identifies when a system is in production and when it is at standstill. At Unilever, however, they decided to use the alternative option to operate the MSE6-E2M via the system controller so that all information is merged centrally.

Now, with the new condition monitoring for the pneumatic components of his Magnum machine, Alexander Hemmerich has continuous process-relevant data. The MSE6-E2M regularly exchanges important measurement parameters — such as flow, pressure and consumption — with the machine controls via Profibus.

"We've been able to reduce compressed air consumption on the Magnum production system step by step with the new energy efficiency module," he said. "And the Profibus connection had the advantage that we did not have to add any more cables when converting our existing systems."

The Magnum line at Unilever provided an ideal environment to field test the MSE6-E2M prototype. The pilot use in the Heppenheim plant and the close cooperation with Festo developers showed what daily operation would be like. While the first version of the energy efficiency module still had I/O slots, the final MSE6-E2M uses a Profibus interface. The exhaust valve of the first product generation was also dropped. It was more important to keep the energy efficiency module compact, especially given the limited installation space of existing systems. Thus the MSE6-E2M was designed on the basis of a combination of pressure and flow sensor, shut-off valve and fieldbus node.

Festo Pty Ltd
www.festo.com.au

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BALL TRANSFER UNITS

Ball tables are used wherever sensitive or heavy loads are transported from A to B: items such as circuit boards, food, goods in airports, glass panes or goods in the sheet-metal-processing industry. By using ball transfer units in the conveyor tables, loads can be transferred quickly and easily in any direction. The latest ball transfer units from igus are made of high-performance polymers that ensure smooth transport even at high loads. For the advanced polymer-ball transfer units, igus uses its xirodur B180 material. All igus units are lubrication-free and maintenance-free, ensuring no lubricating grease can adhere to the goods. By using a plastic ball, the use of new rollers is particularly suitable when sensitive goods are to be transported. Another advantage is that the ball transfer units can be used in any installation position, whether horizontal, vertical or overhead, which now also extends the field of application to the furniture industry.

The optimised polymer-ball transfer units have a new housing interior, so they can now take up to five times more load than before. The ball transfer units are currently available in three installation sizes and, depending on their size, can withstand an axial load of 150 to 500 N. Due to their material, they are very abrasion-resistant, have a long service life and have an electrically insulating effect. The rollers are mounted by simply pressing into the housing.

Treotham Automation Pty Ltd
www.treotham.com.au

POWER SUPPLY WITH IO-LINK INTERFACE

The PULS DIMENSION QT40.241-B2 is a three-phase 960 W (24 V, 40 A) DIN rail power supply with an IO-Link interface. Users can obtain application data quickly and easily, such as the load level of the power supply, network quality, remaining lifetime, temperature and output current.

With high immunity to transients and power surges as well as low electromagnetic emissions, the power supply can be used in the majority of environments. In the event of an overload, upcoming maintenance, excessive temperature or voltage, the device provides a warning in advance. Additionally, its remote function makes it possible for the power supply to be switched on and off remotely as well as setting the output voltage if required.

The PULS QT40.241 data can assist in increasing availability, resulting in a more efficient utilisation of the system and reducing maintenance and operating costs.

Control Logic Pty Ltd
www.controllogic.com.au

DIVERTER VALVE FOR CIP CLEANING

Coperion and Coperion K-Tron have redesigned their stainless steel WYK diverter valve for CIP cleaning and the ZV rotary valve is now also available in larger sizes from 400 to 630.

Developed for powder and pellets, the diverter valve enables CIP applications to fulfil required criteria especially in the food sector; ie, the diverter valve must be absolutely clean and free of contamination after wet cleaning — with no additional disassembly or manual cleaning. This saves time, effort and costs since manual post cleaning is not necessary. In doing so, the WYK diverter valve can easily be installed even at points that are poorly accessible.

During bulk material conveying, the conical rotor seals the conveying pipes to each other. During CIP cleaning, the rotor is minimally pulled out of the housing and flushed by the cleaning fluid. Now, the diverter valve has been optimised according to current EHEDG guidelines (Class I EL certification is currently in process). Coperion redesigned and optimised the CIP-capable pipe sealing such that now operation with even the finest powders is possible. The pneumatic drives are separated — for turning and pulling the rotor, respectively — so that the rotor is supported on both sides. Along with its compact design, the diverter valve offers an improved cast design with increased surface quality. All materials conform to (EC) Regulation no.1935/2004 and the sealing materials are FDA-conform as well. Moreover, further flange connections, such as those per DIN 11864, can be realised simply on the housing.

The diverter valve is available in sizes DN 65, 80, 100 and 125. It is also available as a standard stainless steel diverter valve without the CIP cleaning function for non-wet cleaning applications. The diverter valve will be offered in Europe and Asia beginning of September 2019 and is expected to be offered in the USA by year end.

Brolton Group
www.brolton.com.au

COLLABORATIVE ROBOTS

DESIGNING FOR PRODUCTIVITY AND SAFETY

*Steven Keeping**

Industrial robots are commonplace in factories because they provide an effective alternative to manual workers for repetitive, high-volume assembly line tasks. The machines can continuously repeat high-precision tasks for many years with only the occasional interruption for routine maintenance. Boosted productivity ensures a return on the initial high capital investment.

But relatively low-cost human workers remain the best option for low-volume, high-mix, intricate assembly work because they are dexterous, flexible and able to solve problems that would grind a machine to a halt. Collaborative robots — the lightweight, compact, and relatively inexpensive cousins of full-size industrial robots — are now being introduced to combine the advantages of robots with the assets of humans. However, because collaborative robots share the workspace with humans, new engineering techniques are required to maximise productivity while keeping the workers safe.

Sharing the workspace

Collaborative robots fill a niche in a manufacturing environment where the product mix is consolidating and volumes are increasing but not to the extent that justifies full automation. The robots can do the picking of parts, lifting and fetching, and repetitive, routine actions while the humans work on the intricate fabrication and intellectual challenges of the process.

Collaboration is not a natural extension for traditional industrial robots. The International Organization for Standardization (ISO) defines an industrial robot as "An automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which can be either fixed in place or mobile for use in industrial automation applications." The description fits a machine purpose-designed for maximum productivity without human assistance.

It's not surprising that from the introduction of industrial robots in the 1970s, a division on the factory floor has remained a requirement for the safe automation of their high-volume applications. Today, workers are kept well away and the machines are enclosed behind metal barriers to eliminate the hazards posed by rapidly moving and heavy mechanical parts. Basic external sensor technology provokes an emergency stop of the industrial robots when someone or something crosses a beam or triggers a switch by opening the barrier. And when technicians do intentionally enter the robots' operating envelopes for maintenance or reprogramming, the machines are powered-down with their arms locked in a safe position.

Speed, strength and precision remain important for collaborative robots, but to maximise the advantages of collaborative working, humans and robots need to work in harmony. And to justify the

Collaborative robots are making their mark — combining robot muscle with human dexterity and problem-solving skills is dramatically improving productivity.

introduction of a collaborative robot, it must cost no more than the equivalent for human labour. A robot that's moving parts into position and adding quick-drying adhesive is of little value if a human coworker still has the previous two to three workpieces to fit together. But more importantly than that, robots must be constantly aware of where the humans are positioned, how they are moving and the force they're applying when contact is made (whether intentionally or unintentionally) to ensure safe working.

The key design objectives for collaborative robots can be summarised as achieving:

- safe interaction with human workers and delicate assembly equipment
- reduced costs to justify use of robotic labour applications
- robotic operations at a rate compatible with human capabilities
- clean and low-noise operations
- compact and light form factors
- simple and fast programming by non-expert workers to cope with high-mix production.

Collaborative robot system design guidelines

Key factors in collaborative robot design relate to the fact that the machine and human share the same workspace. The designer needs not only to ensure that efficiency is high but also that the robot is constantly aware of the sometimes-unpredictable movements of its coworker and can react in a safe manner. The designer also needs to ensure that the robot doesn't apply excessive force if there's intentional or unintentional contact between itself and the human. This adds complexity, because unlike industrial robots in which safety systems are not an intrinsic part of the robot, collaborative robots contain safety systems that are generally integrated into its own structure and controlled by its own systems.

Fortunately, guidance on these design challenges comes in the form of international safety standards for collaborative robots, which have been developed in parallel with the rapid introduction of these robots in the workplace. For example, the ISO provides some guidelines for designing collaborative robots in its ISO 10218 document, and a technical specification created by the organisation — the ISO/TS 15066 — highlights the importance of safety-related control system integrity with regards to controlling process parameters such as speed and force.

ISO/TS 15066 also provides general information for a collaborative robot designer to use, such as information explaining the need for a risk assessment of hazards in the workspace. For example, even the best robot design can't be considered safe if it allows the robot to wave around a sharp object with its manipulator. In another example, the workspace could be dangerous if it's closed in by fixed objects that cause a worker to become trapped then crushed by robot movement.

The key sections of ISO/TS 15066 address the design of workspaces, design of a robot's operations and the transitions between a robot's collaborative and non-collaborative operations. Specifically, the document provides extensive details for implementing the following collaborative-operation requirements, which creates safe, efficient solutions that fulfil the design objectives mentioned above:

Safety-rated monitored stop

A safety-rated monitored stop is an assured robot stop without removing power and occurs when a human worker enters the collaborative workspace. The system ensures that the robot and human don't move at the same time and is primarily employed when the robot is rapidly moving heavy parts through the workspace.

Before a hand-guided operation can start, a robot must perform a safety-rated monitored stop. During the operation, a worker is in direct contact with the robot arm and can utilise hand controls to move it. This operation is used for lift assists or highly variable tool applications.

Speed and separation monitoring

This collaborative work method is perhaps the most relevant, as it allows the operator and robot to move simultaneously within the workplace by equipping the robot with sensors to monitor the proximity of the worker. At large separations, the robot continues to operate at medium speed, but upon closer approaches, the robot reduces its speed, and at very close approaches, it comes to a complete safety-rated monitored stop.

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Power and force limiting

Power and force limiting are required in applications where there could be intentional or unintentional contact between a collaborative robot (or any workpiece) and a worker when both are working in the collaborative workspace. Contact can either be quasi-static, such as the clamping part of a worker's body between a robot's manipulator and a fixed object, or transient, such as knocking into a part of a coworker's body where the worker is able to recoil.

Design safety challenges

With some adaptations to limit cost, size and complexity, collaborative robot designers can employ existing industrial robot technology for some systems while still implementing the work methods described above. For example, the safety-rated monitored stop is an established technology for industrial robots that uses safety barriers to implement an emergency stop when a human enters the operational envelope.

Speed and separation monitoring demands new engineering techniques considering industrial robots are designed to come to a dead halt when a person breaches the work zone. In contrast, collaborative robots will keep moving, albeit at a reduced speed, when workers are sharing the workspace, unless an approach is close enough to trigger a safety-rated monitored stop. Key to implementing such systems is integrating sensors into the robot's control systems so that the closed-loop feedback enables rapid motor response when speed reduction is necessary.

But the most difficult design challenge is power and force limiting. Designers can learn little from industrial robot design because its emphasis is on load capacity and speed. An annex for ISO/TS 15066 offers help by suggesting limits to quasi-static and transient forces for pain thresholds as well as minor, reversible and irreversible injury thresholds for humans. Transient force thresholds can be twice as high as quasi-static ones, because they occur within a shorter timeframe and the worker is able to recoil.

While research continues on pain and injury thresholds, the present guidelines recommend lowering clamping risks by reducing a robot's speed to less than 250 mm/s and its force to less than 150 N during speed and separation monitoring operations, though transient forces can be twice as high but must not be applied for longer than 500 ms.

Meeting these thresholds is challenging. For example, a 2 kg robot arm carrying a 0.5 kg load and moving at 1 m/s must decelerate at 60 m/s^2 to limit its crushing force to below 150 N if unintentional contact occurs. In that time, the arm will travel 8 mm, which is acceptable for collaborative operation. An identical robot arm carrying a 3 kg load would need to decelerate at 19 m/s^2 to limit its crushing force to less than 150 N, during which time it will have travelled 27 mm (which is acceptable with padding). This example illustrates that the robot designer must consider the differing dynamic forces generated by collaborative robots with different payload and speed of movement capabilities.

Other advice in the ISO guidelines includes:

- eliminating pinch and crush points on the robot
- reducing robot inertia and mass
- reducing robot velocity when it approaches a fixed surface, so it can stop quickly
- increasing the surface area of contact points
- organising the workspace layout to limit clamping points and to allow recoil after transient collisions.

Conclusion

Collaborative robots are making their mark in workspaces shared with humans — combining robot muscle with human dexterity and problem-solving skills is dramatically improving productivity. Factory managers are just recently beginning to appreciate the number of assembly applications — currently performed solely by human labour — that collaborative robots can be used for. That's why the impact of collaborative robots is predicted to increase, with growth expectations roughly set to equal the size of today's entire quantity of industrial robotics by 2025.

But it's still early for the technology, and engineers are now learning that only some of the design techniques used in engineering industrial robots are truly applicable for their collaborative cousins. A new design methodology is required to ensure that collaborative robots remain safe around coworkers while still bringing speed, precision and load-handling benefits to the job.

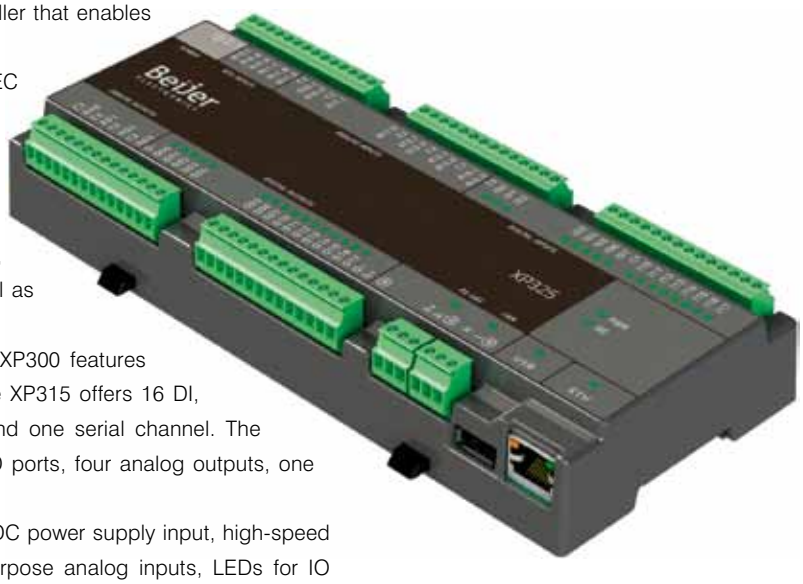
Designing collaborative robots is a nascent discipline, and as such, there is little guidance to draw upon. But international safety standards for collaborative robots are being developed in parallel with the introduction of the first wave models into the workplace. The ISO 10218 standard provides specific guidelines for collaborative robots, while ISO/TS 15066 establishes safety parameters for collaborative operations. And suppliers are doing their part by teaming electronics and sensors up with advanced mechanical assemblies to create new critical components, such as specialised joints specifically engineered for the unique demands placed on collaborative robots during everyday duties, operations and interactions.

**Steven Keeping has a BEng (Hons.) degree at Brighton University, U.K., and worked in the electronics divisions of Eurotherm and BOC for seven years. He has since held senior editorial and publishing roles in a number of electronics manufacturing, test and design publications. Steven is now a freelance journalist specialising in electronics, based in Sydney.*

Mouser Electronics
au.mouser.com

CONTROLLER WITH OPC UA

Beijer Electronics has released the Nexto Xpress compact controller that enables Industry 4.0 applications via its built-in OPC UA interface.



Nexto Xpress applications are created using the CODESYS IEC 61131-3 development tool, complete with online debugging and monitoring, online changes, offline simulation, symbolic variables, system diagnostics and global variable lists.

The Nexto Xpress offers an Ethernet port for programming and Modbus TCP client/server and OPC DA/OPC UA communication, a serial port for RS-485 with Modbus RTU communication as well as a CANopen communication port.

The product comes in three different hardware versions. The XP300 features 16 DI, 16 DO, an Ethernet port and one serial channel, while the XP315 offers 16 DI, 16 DO, five analog inputs, two RTD ports, one Ethernet port and one serial channel. The XP325 model features 16 DI, 16 DO, five analog inputs, two RTD ports, four analog outputs, one Ethernet port, one serial channel and one CANopen Master.

All versions feature DIN rail mounting, a compact design, 24 VDC power supply input, high-speed 32-bit ARM-based processor, a high density of I/O with multipurpose analog inputs, LEDs for IO status indication and diagnostics, and a real-time clock.

The product is suitable for use with Beijer Electronics industry solutions for water and wastewater including remote control, pump station control, reservoir level control, etc. It is also suitable for machine builders and OEMs targeting smaller and medium applications such as labelling, filling, washers, injection machines, packaging and grinders.

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

OPINION

MAKE LEARNING AND DEVELOPMENT PART OF YOUR MANTRA IN YOUR JOB AND WITHIN YOUR TEAM

The instrumentation world is full of the talk of Industry 4.0 and the rapid change occurring. As a result there is feverish industry chatter about the critical need for ongoing learning and development for our engineering teams; but I believe many managers only pay lip-service to genuine learning opportunities. Oftentimes an employee is on a training course to 'tick the box' — to comply with some 'magical' company development plan or to fulfil the requirements of an arcane new policy.

We do, however, need to make learning a key part of what we do in our working careers. It not only provides us with useful technical skills which help boost productivity, but it contributes to the firm's culture in a positive way. Admittedly there is training which is totally wasted, with no tangible outcomes besides having a 'jolly' at the firm's expense. A few suggestions thus follow on how to make the most of your ongoing learning and how to make it a key part of your firm's culture and activities.

At the outset it should be noted that only a small percentage of learning and training is derived from formal training courses; it is in fact informal learning — from a colleague, a book or a browse on some internet site — which constitutes the majority of learning these days (generally over 70%).

But if you do engage in some formal training, share it with your colleagues. Demonstrating and explaining new skills to others is an effective way of embedding new knowledge. You may have finished a course on variable speed drives, pump cavitation problems, corrosion, how to more effectively troubleshoot current problems or designs with the latest concepts. If you can show how your learning is genuinely boosting your skills and expertise you will motivate others to engage in a similar journey.

It is also important to help facilitate those in your team to learn. When they attend training courses make sure they are supported while away. Nothing is more disconcerting than having one's phone ring while on a course because urgent help is needed to troubleshoot that pesky conveyer belt tramp iron magnet or because the flowmeter is showing an incorrect reading.

If, however, you return from a training course with the observation that it was 'mildly interesting' or if you cannot show how it has the potential to benefit you and the company, then money and time has surely been wasted. It is critical that formal training is selected carefully.

Another important way to learn is to face failure. A detailed assessment of current projects that have been deemed failures, or at least failed to deliver the results everyone expected, allows everyone to learn from the experience. Failure is very often followed by success, and it is certainly a great way of guaranteeing that a disappointing project is not completely wasted.

Merely freshening up your work experience is also an effective way to learn. Join new projects with unfamiliar challenges, for example. You will be expected to draw on and hone new expertise, and this may involve moving locations.

Training and development isn't a comfortable experience. Ensure that you and those in your team understand that learning may be challenging and demanding. Tackling new technologies and approaches can be especially tough when old approaches to work and projects no longer offer the required results. The learning process can involve some anxiety, uncertainty and resistance — particularly in the early stages.

Finally, if your attitude is right — if you are passionate and enthusiastic about learning — you will thrive and grow in your career. Be endlessly curious and strive to learn: when faced with new technologies and skills, and when you are grappling with new knowledge, ask for help from those who know. An old Chinese proverb (from Alice Fonda-Marsland) sums it up: *A man who asks is a fool for five minutes. A man who never asks is a fool for life.*

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.

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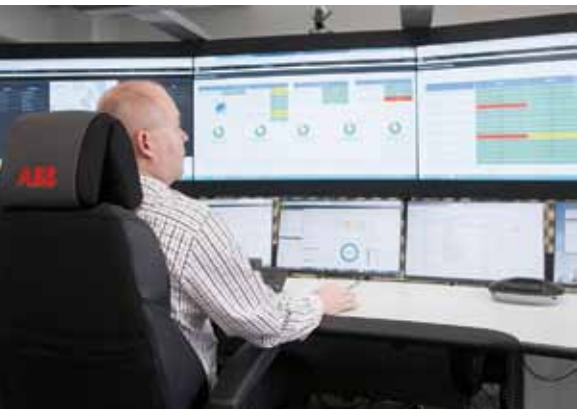


DATA ANALYTICS FOR METALS PROCESSING

ABB Ability Data Analytics Platform is a digital solution designed for iron, steel and other metals manufacturing organisations that helps them to visualise every piece of data across the value chain, so they can make real time decisions on planning and plant-wide operations.

ABB Ability Data Analytics collects, analyses and visualises data from a variety of sub-systems and devices within a metals plant, harnessing large volumes of complex data and integrating operations technology (OT) and information technology (IT) in a single platform. Fully scalable, secure and vendor neutral, it can be connected to any ABB or third-party systems and devices. By breaking down data silos and increasing information transparency, ABB Ability Data Analytics is designed to help organisations take the essential steps towards realising fully digitalised plants.

Specific features provide an integrated view of operations in real time via powerful, high-resolution dashboards. With either on-premises or cloud connectivity, this centralised platform solution allows for better planning and process control through the continuous monitoring of production data, downtime, and movement of heats and raw materials as examples. Analysis of complex, large data across timeframes and facilities provides opportunities to improve quality, identify bottlenecks and optimise the plant-wide resourcing of utilities, by-product gases and production. It can be used when applying new technologies such as machine learning, or to optimise specific process areas such as cold rolling and long product mills.

ABB Australia Pty Ltd

www.abbaustralia.com.au

RUGGED EMBEDDED COMPUTER

Crystal Group is expanding its Rugged Embedded (RE) product line with the RE1529 Rugged Embedded computer.

The configurable RE1529 is engineered with the latest commercial off-the-shelf (COTS) technologies, including Intel chipsets and processors, stabilised in a compact, rugged enclosure made from carbon fibre composites and billet-milled, strain-hardened aluminium, to provide robust compute power over a long operational life in extreme environments.

Manufactured with lightweight composites and delivered with Xeon D multicore processors, the product offers up to 128 GB of ECC DDR4 RAM, nine internal 7/9 mm SATA solid-state drive (SSD) bays, and flexible I/O in a rugged package measuring 15.24 x 39.12 x 24.38 cm and weighing 3.4 kg. It provides a flexible server-class architecture that also accommodates customers' specific I/O and third-party card requirements.

The product is designed and tested for SWaP-sensitive applications including airborne and transit case use with a minimal footprint and wide-range voltage inputs. The system is claimed to be virtually maintenance-free, with high performance in harsh conditions including temperature extremes, high shock and vibration, high humidity, high altitudes and dust.

Metromatics Pty Ltd

www.metromatics.com.au

MOISTURE SENSORS

The Ahlborn FHA 696 GF1 sensors can be used for determining the moisture content in granulated materials. Some examples of the materials include wood chips or pellets, sawdust, cereals and various types of grains. The sensor operates based on the principle of an open plate capacitor. Moisture content in the materials can be determined based on the dielectric constant of the materials.

The FHA696 offers quick determination of moisture content in a matter of seconds. To get an accurate reading, measurements need to be made in the sealed air-tight package filled with approximately 10 L of granulated sample. The readings are compared with the reference data, which is measured on dried samples. These reference values are programmed into the ALMEMO connector for the moisture probe.

This sensor is suitable for measuring the moisture content of hydrophobics material. It can measure from 0 to 99.9% of moisture based on its weight percentage with 0.1% resolution. The FHA696 works in conjunction with other measuring instruments from ALMEMO for data display and monitoring.

Bestech Australia Pty Ltd
www.bestech.com.au

ILLUMINATED SAFETY DOOR HANDLES

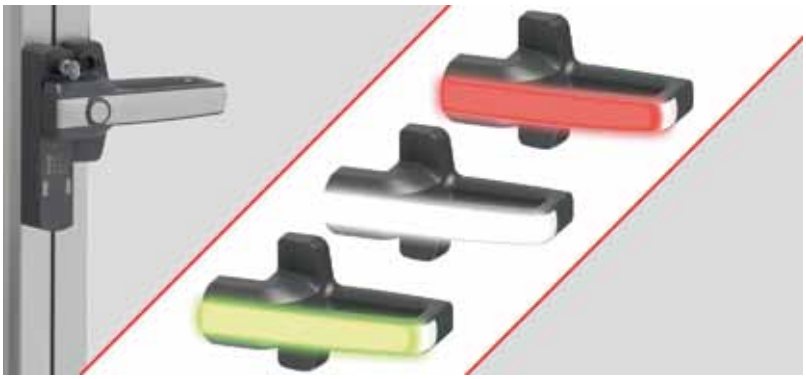
The Pizzato Elettrica P-KUBE Krome series combines the characteristics of a robust handle for safety enclosures with an ergonomic, rounded grip and built-in, customisable control button, with various illuminated signalling options. These indicate the state of the guard, or other operating conditions that can be visualised externally to the guard. They are compatible with the company's NG and NS series safety locking switches and lockout devices with RFID technology.

An internal, 5 mm-thick steel fixing plate ensures the robustness of the locking system and increased service life. The handle front is customisable in satin chrome and illuminated white finishes. An illuminated control button, built into the handle, can provide call, open, reset and other functions.

The handles have a modern and ergonomic design with fully concealed fixing screws and cabling, as well as tamper prevention, from interlocking protection caps inserted to fixing screw holes.

The handles are illuminated with integrated RGB LEDs for local signalling of guard state, and offer high signalling visibility, even from a considerable distance in brightly lit environments.

Leuze electronic Pty Ltd
www.leuze.com.au



IO-LINK MASTER MODULE

The PSS u2 ES 4IOL IO-Link master module is designed to enable communication between the PSSuniversal 2 remote I/O system and sensors or actuators.

The IO-Link master module PSS u2 ES 4IOL can be integrated into Profinet and EtherNet/IP networks using the corresponding head modules. IO-Link devices such as sensors or actuators are connected to the PSSuniversal 2 remote I/O system via four IO-Link ports on the master module. One module transfers up to 128 bytes of process data via point-to-point communication. The process and device data of the devices is available centrally in the master module. The IO-Link data interface simplifies all the maintenance tasks due to the detailed device and cabling diagnostics.

The master module is configured simply via the PASconfig software from Pilz. The user can save the device configurations centrally in the master module: when a sensor is exchanged, its data is simply transferred to the new sensor; no new parameters need to be set. This automated parameterisation saves the operator time. In addition, faults are reduced and plant availability is increased. The IO-Link module can be hot-swapped, which further minimises downtimes.

An LED display on the master module indicates the IO-Link mode, operating status and module errors. Expanded diagnostics through communication with the IO-Link devices also enables open circuit detection. The PSS u2 ES 4IOL IO-Link master module provides the information to the intelligent devices for further processing for a networked production and it can support future solutions for preventive maintenance.

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

SAFETY SWITCHES WITH INTEGRATED CONTROL DEVICES

The Pizzato Elettrica NG series safety switches equipped with RFID technology now include versions with integrated buttons for control and signalling functions.

The user can wire the buttons inside the switch, through terminal blocks with a push-in spring connection. There is no need to install dedicated boxes with special buttons and the device is compact, of the same size as the standard version.

Users can combine the switch with control devices and Pizzato's P-KUBE 2 handle, resulting in a robust metal body, compact and configurable, incorporating an RFID safety switch with a pin for the centring of the door, an anti-panic release, an adjustable handle with a lockout device to be closed with a padlock, and a control console.

Different versions of the switches with one, two or three buttons are available. Users can illuminate the buttons in a fast and intuitive way through the internal terminals for the wiring of the LEDs.

Pizzato Elettrica provides different configurations and combinations of control and signalling devices: with buttons, signalling lights, emergency buttons and selectors, as well as switching with 1NO, 1NC, 1NO+1NC and 2NC options.

All versions of the switches with built-in control devices have IP65 protection.

Leuze electronic Pty Ltd
www.leuze.com.au

PRESSURE TRANSMITTER MANIFOLDS

Emerson has introduced a range of manifolds for its Rosemount pressure transmitters. Manifolds shut off or equalise pressure at the transmitter, and also provide the critical mounting mechanisms required in many installations. The Rosemount R305 integral manifolds and Rosemount R306 inline manifolds have been designed to offer significant user improvements on these basic functions.

The most important improvement for both manifolds is the Pressure-Lock Valve design, which simplifies high-pressure operation, increases safety and enhances reliability. With the new design, the two-piece stem does not rotate in the seat, providing solid closure with minimal wear. The devices are easier to turn while delivering positive shut-off, and the adjustable packing nut simplifies valve maintenance.

In addition, the back seating has been designed to prevent blowouts, and the stem and bonnet threads are fully isolated from the process fluid. Modular packing ensures only the stem and body are exposed to the process fluid, and larger internal passages enhance reliability.

The R305 is designed for both differential or gauge pressure applications and mounts directly to any Rosemount coplanar transmitter. This reduces the number of potential leak points by 50% compared with traditional bi-planar transmitter setups. Two-, three- and five-valve configurations are available.

The R306 is designed for inline pressure transmitters for gauge or absolute pressure applications. When a Rosemount R305 or R306 is selected with a transmitter, the components are fully assembled and high-pressure leak tested at the factory, allowing the transmitter to be installed right out of the box.

Emerson Automation Solutions
www.emerson.com/au/automation

NEW PRODUCTS

DIGITAL TWIN SOFTWARE FOR PROCESS PLANTS

The latest release of Emerson's Mimic Simulation Software is designed to make it easier for plants to develop a more accurate digital twin. Updated modelling capabilities, usability enhancements and tuning options will help engineers more easily create, modify and integrate dynamic simulations for process improvements.

Emerson has upgraded Mimic Advanced Modeling Objects with blocks and objects to improve simulation, making simulation design easier for a wide range of industries including oil and gas, liquefied natural gas, refining and petrochemical. Advanced Modeling Objects provide rigorous first-principles dynamic models of plant unit operations such as those performed by separators, compressors, heat exchangers, valves, turbines, evaporators and more. Plate and frame heat exchanger and three-phase flash vapour-liquid-liquid equilibrium (VLLE) separation objects are now available, as are plug flow reactor objects that reduce the engineering time and complexity of model development for continuous processes in the chemical and hydrocarbon industries.

Organisations can also use simpler reaction modelling to more easily simulate reactions in a vessel. These models offer increased flexibility in the use of reactions for organisations such as those in the specialty chemical and life sciences industries, which commonly use such medium-fidelity simulations. Users can create simplified reactions in engineering design — without the need for complex or private reaction data, or a background in kinetics and thermodynamics — to achieve desired results, such as the impact of a reaction on pH.

Mimic is now natively integrated with AspenTech's HYSYS simulation software, providing control platform integration and training functionality to the HYSYS simulation.

Emerson Automation Solutions

www.emerson.com/au/automation

RIGHT-ANGLE DC GEARMOTOR

maxon motor has released a 60 mm diameter, 400 W 48 V brushless DC motor and right-angle helical bevel gear combination that can deliver 25 Nm of torque. The gearmotor features high power density.

Loads can be mounted traditionally via keyway or coupling and through-shaft clamp collar fittings can also be used. The brushless DC motor's rear cable entry housing contains a 5000 CPT, three-channel encoder and a DC holding brake for safety-critical power failure load holding.

Two different 48 V windings allow for high speed and low current preferences, making control selection easy. All surfaces are gasketed, all bearings are rubber sealed and cables are grommeted for industrial operation in harsh environments, making the drive suitable for oil and gas, mining and agriculture applications.

maxon motor Australia Pty Ltd

www.maxonmotor.com.au

RETRACTABLE PACKING GLAND KITS

FCI Retractable Packaging Gland Kits for the ST Series flowmeters make maintenance simpler for the insertion-style meters. The meters provide both ease of installation, requiring just a single tap point into the process line, and the convenience of retracting their flow sensing elements from the line.

The packing gland kits are offered as an option when ordering the ST50, ST80 and ST100 Series air/gas flowmeters from Fluid Components International (FCI).

The FCI Retractable Packaging Gland Kit for the ST Series Flow Meters comes in low- or medium-pressure configurations. The low-pressure kit is suitable for lines pressurised up to 3.5 bar (g), while the medium-pressure configuration is designed for lines pressurised up to 34 bar (g). They are available with a choice of graphite or Teflon packing material and one threaded or flanged process connection. The Teflon packing material is required when the process media is ozone, chlorine or bromine.

AMS Instrumentation & Calibration Pty Ltd

www.ams-ic.com.au

DECENTRALISED FREQUENCY INVERTER

The SK 200E NORDAC Flex is a decentralised drive unit with versatile installation possibilities. It offers scalable functionality and flexible configuration. The simple installation and maintenance of this unit is made possible through the plug-in capability and the easy parameter transfer using EEPROM memory. It is available in the power range up to 22 kW for wall or motor installation with IP55 or IP66 rating.

The product features torques, simple operation and commissioning, and is available for a range of applications. It can be used in packaging, logistics, food and beverage and pump applications.

Available in sizes up to 22 kW (although other models are available in sizes ranging up to 160 kW suitable for heavy-duty applications).

With IP ratings IP66 available it is suitable for washdown applications.

NORD Drivesystems (Aust) Pty Ltd
www.nord.com

INDUSTRIAL EDGE DEVICE

The Schneider Electric Magelis IIoT Edge Box, with Node-RED pre-installed, is an industrial edge device that requires no maintenance.

It is designed to run in harsh environments, and the device stands alongside (in parallel to) the existing automation control system, minimising plant disruption. It connects to and collects data from field devices, and provides a wide array of connectivity options, hardwired I/O and remote access via Wi-Fi or 4G, plus options including blind box or local operator screen, expansion accessories and operating system options for Windows 10 and Linux. It is natively cybersecure.

Node-RED can be configured for one-way communications only, so device data is accessible in read-only mode. IIoT Edge Box also incorporates cybersecurity features such as end-to-end data encryption.

The Magelis IIoT Edge Box provides a first step towards IIoT and IT/OT integration without the need to change or stop the existing control system.

Schneider Electric
www.schneider-electric.com.au

MOTOR CONDITION MONITORS

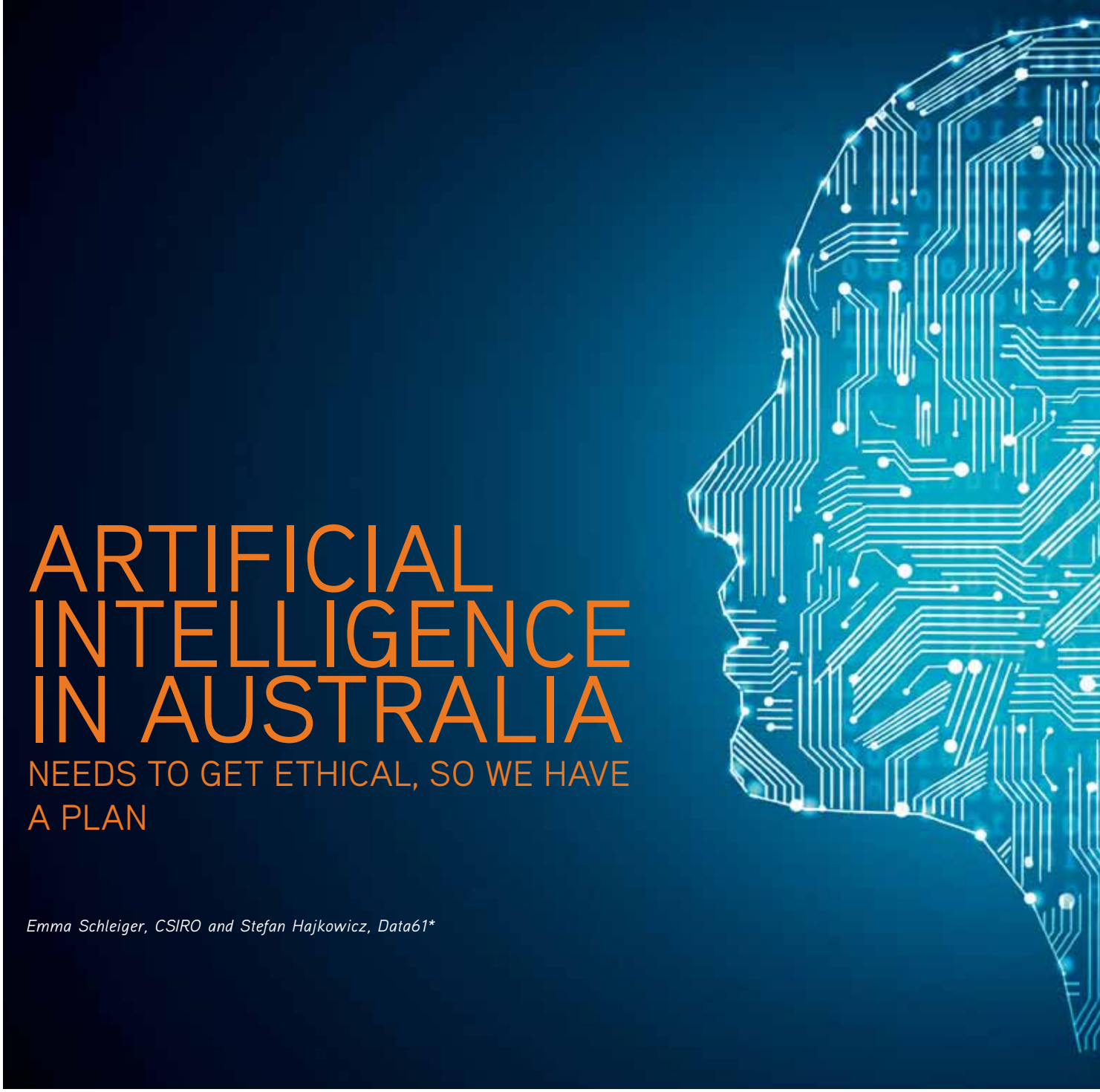
Omron has released a series of motor condition monitoring devices as part of a range of IoT components aimed at improving efficiency and productivity within the manufacturing industry.

The K6CM will be available in various types including the K6CM-CIM (comprehensive current diagnosis type), the K6CM-ISM (insulation resistance monitoring type) and the K6CM-VBM (vibration and temperature level measurement).

The K6CM can constantly monitor the condition of three-phase induction motors and detect errors in advance that may be the result of ageing and deterioration. This is achieved through comprehensive diagnosis and monitoring the changes of vibration, surface temperature, current and insulation resistance. The unit features an LCD with an alarm bar to easily display the output in three colours: green (normal), orange (warning) and red (critical). The user can also easily access and monitor the status of the motor on PC remotely by EtherNet/IP and the use of Omron's Motor Condition Monitoring Tool software.

With clamp-type CT/ZCT and push-in-plus technology, the K6CM is easy to install and reduces wiring time.

Omron Electronics Pty Ltd
www.omron.com.au



ARTIFICIAL INTELLIGENCE IN AUSTRALIA

NEEDS TO GET ETHICAL, SO WE HAVE A PLAN

*Emma Schleiger, CSIRO and Stefan Hajkowicz, Data61**

The question of whether technology is good or bad depends on how it's developed and used. Nowhere is that more topical than in technolgies using artificial intelligence.

When developed and used appropriately, artificial intelligence (AI) has the potential to transform the way we live, work, communicate and travel.

New AI-enabled medical technologies are being developed to improve patient care. There are persuasive indications that autonomous vehicles will improve safety and reduce the road toll. Machine learning and automation are streamlining workflows and allowing us to work smarter.

Around the world, AI-enabled technology is increasingly being adopted by individuals, governments, organisations and institutions. But along with the vast potential to improve our quality of life, comes a risk to our basic human rights and freedoms.

Appropriate oversight, guidance and understanding of the way AI is used and developed in Australia must be prioritised.

AI gone wild may conjure images of The Terminator and Ex Machina movies, but it is much simpler, fundamental issues that need to be addressed at present, such as:

- how data is used to develop AI
- whether an AI system is being used fairly
- in which situations should we continue to rely on human decision-making?

We have an AI ethics plan

That's why, in partnership with government and industry, we've developed an ethics framework for AI in Australia. The aim is to catalyse the discussion around how AI should be used and developed in Australia.

The ethical framework looks at various case studies from around the world to discuss how AI has been used in the past and the impacts that it has had. The case studies help us understand where things went wrong and how to avoid repeating past mistakes.

We also looked at what was being done around the world to address ethical concerns about AI development and use.

Based on the core issues and impacts of AI, eight principles were identified to support the ethical use and development of AI in Australia.

1. **Generates net benefits:** The AI system must generate benefits for people that are greater than the costs.
2. **Do no harm:** Civilian AI systems must not be designed to harm or deceive people and should be implemented in ways that minimise any negative outcomes.

3. **Regulatory and legal compliance:** The AI system must comply with all relevant international, Australian local, state/territory and federal government obligations, regulations and laws.
4. **Privacy protection:** Any system, including AI systems, must ensure people's private data is protected and kept confidential and prevent data breaches that could cause reputational, psychological, financial, professional or other types of harm.
5. **Fairness:** The development or use of the AI system must not result in unfair discrimination against individuals, communities or groups. This requires particular attention to ensure the "training data" is free from bias or characteristics which may cause the algorithm to behave unfairly.
6. **Transparency and explainability:** People must be informed when an algorithm is being used that impacts them and they should be provided with information about what information the algorithm uses to make decisions.
7. **Contestability:** When an algorithm impacts a person there must be an efficient process to allow that person to challenge the use or output of the algorithm.
8. **Accountability:** People and organisations responsible for the creation and implementation of AI algorithms should be identifiable and accountable for the impacts of that algorithm, even if the impacts are unintended.

In addition to the core principles various toolkit items are identified in the framework that could be used to help support these principles. These include impact assessments, ongoing monitoring and public consultation.

A plan, what about action?

But principles and ethical goals can only go so far. At some point we will need to get to work on deciding how we are going to implement and achieve them.

There are various complexities to consider when discussing the ethical use and development of AI. The vast reach of the technology has potential to impact every facet of our lives.

AI applications are already in use across households, businesses and governments, most Australians are already being impacted by them.

There is a pressing need to examine the effects that AI has on the vulnerable and on minority groups, making sure we protect these individuals and communities from bias, discrimination and exploitation. (Remember Tay, the racist chatbot?)

There is also the fact that AI used in Australia will often be developed in other countries, so how do we ensure it adheres to Australian standards and expectations?

Your say

The framework explores these issues and forms some of Australia's first steps on the journey towards the positive development and use of AI. But true progress needs input from stakeholders across government, business, academia and broader society.

That's why ethical framework discussion paper is now open to public comment. You have until May 31, 2019, to have your say in Australia's digital future.

With a proactive approach to the ethical development of AI, Australia can do more than just mitigate against any risks. If we can build AI for a fairer go, we can secure a competitive advantage as well as safeguard the rights of Australians.

Further reading:

1. Salmon P, Hancock P, Carden T 2019, 'To protect us from the risks of advanced artificial intelligence, we need to act now', *The Conversation*, ‹https://theconversation.com/to-protect-us-from-the-risks-of-advanced-artificial-intelligence-we-need-to-act-now-107615›
2. Agar N 2019, 'Careful how you treat today's AI: it might take revenge in the future', *The Conversation*, ‹https://theconversation.com/careful-how-you-treat-todays-ai-it-might-take-revenge-in-the-future-112611›

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AS I SEE IT

A STRONG CURRENT OF DIGITALISATION IN THE WATER INDUSTRY

The world of water is witnessing a digital transformation as more and more water and wastewater treatment plant operators look to leverage the benefits of automation and analytics.

But how does an operator start on a journey to realise the full promise of digitalisation? Striking the right balance of cloud-connected smart tools, supported by efficient analytical software to make sense of all the raw numbers, is quite important. However, to explore the wide spectrum of opportunities digitalisation has to offer, one must broaden one's horizons beyond a single, isolated operation.

Bogged down by the nitty-gritties of day-to-day activities, plant managers can sometime limit the scope of digitalisation to just helping them improve the understanding of their standalone facilities by providing a quick snapshot.

But, with the number of web-connected devices set to triple from 6 billion to 20 billion by 2020, collaboration through multisite networks — where various facilities can be easily be benchmarked against each other to figure out an optimal outcome — may hold the key. In a world hooked to the Internet of Things (IoT), remote monitoring and maintenance of facilities will also help water companies detect and manage quality issues much sooner.

However, the true value of digitalisation is in being able to identify early indications of things that are about to go wrong, rather than simply documenting things that have already gone wrong. Predictive maintenance is particularly handy in critical, 24/7 services like water treatment.

Intelligent instrumentation can detect shifts in the quality of water in real time, thus avoiding health and environmental hazards, not to mention potentially huge fines for non-compliance. Many such examples of digital readings improving our everyday lives are right here in Australia.

In Australian cities, as in many other parts of the world, fluoride is added to public water supplies to improve dental health. Ensuring correct levels is critical, as too much fluoride can cause medical disorders like skeletal fluorosis and osteoporosis. But the latest digital analysers, under round-the-clock cloud-based supervision, eliminate chances of any such fluctuations that can be triggered by even the slightest variation in ambient temperatures.

But we cannot ignore the fact that more data brings more complexity. With 2.5 quintillion bytes of data created every day around the globe, the risk of overlooking specific 'nuggets' of information can only be minimised by collective analysis through remote support from the manufacturers. And as an added benefit, rather than dealing with a huge pile of data, plant managers are now free to assign crews for routine maintenance and troubleshooting more effectively.

Many companies are still trying to figure out how to gain the maximum yield from digitalisation. The water industry has the added responsibility to source, treat, distribute and discharge the precious resource in a sustainable and safe way. The industry will increasingly recognise the power and value of data as they observe how higher levels of automation drive productivity and quality higher in every other field.

Digitalisation is going to be a disruptive force in the field of measurement and analytics, with more integrated and configurable instrumentation likely to assist ever-increasing levels of autonomy. Ultimately our ability to digest all the data and come up with all-encompassing solutions might be the key to unlock the true potential of digitalisation in the water industry.

Sachin Samel oversees ABB's industrial automation and measurement products team in Australia. Sachin has over 20 years' experience in the industrial instrumentation and process automation sector. He joined ABB in 2011 and holds an MBA and a bachelor's degree in instrumentation engineering.

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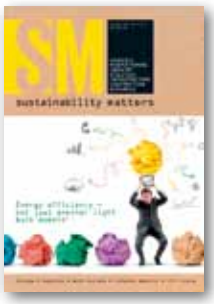

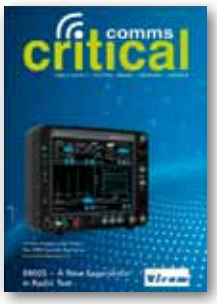

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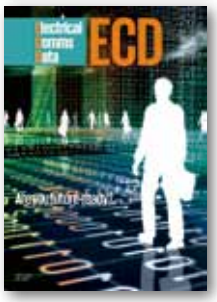

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