WNIPT
July 2017 vol.31 no.2
PP100007403

WHAT'S NEW IN PROCESS TECHNOLOGY

AUTOMATION + CONTROL + INSTRUMENTATION

Heartbeat Technology

On your wavelength

The best - fitting radar frequency for all applications!

Endress+Hauser has completed its portfolio of radar instruments with the Micropilot FMR6x series. The new Micropilots are the first devices with 80 GHz technology that have been developed in line with a safety-by-design concept and designed according to IEC 61508. Furthermore, they belong to the first generation of level instruments that supports Heartbeat Technology for reliable and flexible diagnostics and verification of the measurement. With the addition of the new range, we could say that Endress+Hauser's radar competence stands at 113 GHz (see our graphic opposite). Level product specialist Chris Brennan explains: "To give people a picture of our complete offering, we've added the frequencies of our radar level measuring instruments together. Everybody talks about the highest radar frequencies at the moment but for us it is not about the one-upmanship of being faster, higher, further. What really matters is finding the right frequency for each individual application, which is not automatically the highest one. We have to have a deep understanding of our customers' needs to offer the right frequency or alternatives outside of radar instrumentation. For us it is about being on the same wavelength as our customers."
In the field of tank gauging, Endress+Hauser recently launched the first device with 80 GHz technology, the Micropilot NMR81, for custody transfer and inventory control applications in oil and gas. Now with the Micropilot FMR6x, other industries can benefit from 80 GHz radar technology. The main priorities in designing the FMR6x range were accuracy, safety and simplified lifecycle processes for customers. It is the first time that an 80 GHz process radar has been developed according to IEC 61508, which eases the safety burden for its users. The radar also offers a wide variety of Ex approvals for ease of installation with existing wiring architecture. The focusing of the radar signal as well as dynamic algorithms such as Endress+Hauser's unique Multi Echo Tracking offer reliable and stable measurements in an effective range of up to 125m and a higher accuracy of ±1mm. Mountings and obstacles at the walls of the tanks do not influence the measurement; neither does build-up or condensation thanks to the innovative antenna design. With the help of our interactive software, installation and commissioning is quick and easy.

Heartbeat Technology Until now, Endress+Hauser's Heartbeat Technology, which gives instruments their own verification ability, has been integrated exclusively in flowmeters. Now this unique concept has been extended to our level portfolio. Devices with the technology can be verified and documented without the need to remove them from the process and without any downtime. Operators don't need to have expert device knowledge to carry out the verification: they just follow the simple, predefined procedure. The test results are then documented clearly. A guided SIL proof test is also available, including all documentation, to ensure safety-critical SIL instruments are working correctly. A test protocol is automatically generated to help with compliance. Heartbeat Technology's monitoring ability also provides device and process data to enable predictive maintenance. The combination of device and process parameters provides crucial information to optimise processes.

Endress+Hauser

People for Process Automation

Overview of Heartbeat Technology:

Heartbeat Diagnostics

- Standardised diagnostic messages and instructions on how to remedy problems to facilitate fast, cost-effective maintenence.
- Permanent device diagnostic to ensure instruments are performing safely and to specification.

Heartbeat Verification

- Heartbeat Technology allows verification of the correct function of the measuring device. Automatically generated verification reports provide the evidence to comply with Australian regulations and standards.

Heartbeat Monitoring

- Provides additional parameters for predictive maintenance and process optimisation.
- Wizards for easy set-up of foam or build-up detection alow operations to optimise processes without expert device knowledge.

Advantages of 1 GHz

- Guided radar is suitable for applications involving foam and low dielectric constant values.
- Enables interface measurement, gas phase compensation and is ideal for use in bypass applications.

Advantages of 6 GHz

- Works reliably even in applications with turbulence. heavy condensation and foam.
- Ideal for stilling well applications.

Advantages of 26 GHz

- Good beam angle for most applications.
- Suitable for 90% of applications.
- Good in applications with turbulence.

Advantages of 80 GHz

- Highly focused 3º beam angle.
- Large measuring range up to 125m.
- Highest accuracy: ±0.5mm (NMR81).

For more information please visit http://bit.ly/2sIVE3J

Endress+Hauser

People for Process Automation

FLUKE®

SIMPLIFY PRESSURE CALIBRATION

for faster, more accurate results.

Let the new Fluke 729 Automatic Pressure Calibrator change the way you calibrate.

- Fast, easy setup with **automatic pressure regulation**
- Automatic, no-hassle calibration and documentation
- Built-in HART communication
- No hand pumps or manual adjustments required

Learn More
au.fluke.com/729

Contact Fluke Australia

www.fluke.com.au ☎ 1300 1 FLUKE ✉ auinfo@fluke.com

0717

WHAT'S NEW IN
PROCESS TECHNOLOGY
JULY 2017

CONTENTS

6 Digitising complex discrete manufacturing processes

10 Hot products online

14 New products

16 The undiscovered country — Part 2

30 The connected mine

38 Cloud robotics

49 Safety in Action coming to Melbourne

50 The evolution of industrial control systems

ON THE COVER

FLIR has been a world leader in thermal imaging for more than 50 years, since pioneering the revolutionary infrared (IR) commercial technology in the 1950s. With significant ongoing investment in R&D since then FLIR is continually able to improve and refine its products with better resolution, increased sensitivity and cutting-edge additional features extending IR applications into markets that have not traditionally used thermal imaging. 2017 has already seen the FLIR range grow substantially, with the release of a suite of new and updated products across the handheld camera, test and measurement, and moisture meter product categories just to name a few!

FLIR's latest release is the ETS320, a bench-mounted thermal imaging device designed to allow fast and accurate bench testing of electronic components and circuit boards. Traditionally, infrared bench testing of electrical components has been difficult and clumsy; however, with the purpose-built FLIR ETS320 it is quick, accurate and cost effective. Including a 320 x 240 resolution (76,800 pixels), a vibrant 3″ LCD display, a 45° field of view and simple usability, FLIR has made IR bench testing easy and affordable. The FLIR ETS320 records standard radiometric JPEGs and comes with FLIR Tools+ reporting software enabling professional report writing.

No matter what your application, FLIR has the right 'fit-for-purpose' thermal imaging device for your requirements.

FLIR Systems Australia Pty Ltd
www.flir.com.au/ETS320

FLIR® | The World's Sixth Sense®

DIGITISING COMPLEX DISCRETE MANUFACTURING PROCESSES

Digitising MES processes helps to drive lower costs, higher quality and faster production to stay competitive today and ensure success tomorrow.

Complex discrete manufacturers today are part of multifaceted, fast-moving supply chains, with the production of distinct items in an increasingly global and competitive environment. Orchestrating the movement of parts and components around the world is an intricate process, especially as constant change becomes the norm.

Whether in aerospace, defence, energy, heavy equipment, or other complex discrete manufacturing industries, the need for comprehensive visibility into production performance has become imperative to stay competitive. Fast, reliable and accurate information is the name of the game, and manufacturers need to rely on more digitised processes and less manual interaction as they seek to effectively manage their operations and work toward optimising their supply chains.

According to ARC Advisory Group, the next decade will be about empowering value networks, whereby manufacturers will transform from a plant-centric integrated model to a more advanced model that focuses on value network collaboration. This network includes the companies that work together to deliver goods and services to end customers — creating an interrelated supply chain ecosystem that manufacturers need to succeed in for a competitive edge.

The key toward this transition for empowering a value network begins at the line and plant level with classic manufacturing execution system (MES) capabilities such as quality, resource allocation (operators, workstations, tooling, etc) work-in-process (WIP) tracking, traceability and work instructions. Only when manufacturers can leverage critical insight within their own operations can they reap the benefits of tightly integrating their suppliers, supported by more advanced MES capabilities.

Industry trends and challenges

Complex discrete manufacturers and their suppliers face multiple industry challenges, including:

- **Shorter development times:** The demand for new products and engineering changes is ongoing and can shift rapidly, with the window of time to develop and introduce new products becoming increasingly tighter. Manufacturers must produce products faster and often have limited timeframes to recoup their investment for a new offering.
- **Increasing price pressures:** Many discrete manufacturers face competitive global price pressures as well as rising manufacturing costs for raw materials, labour and energy. They must do more with less and protect their profitability margins without raising prices.
- **Greater demand for customisation and quality:** Driven by the need to balance customer expectations for more flexibility and minimise the high costs associated with a pure engineer-to-order (ETO) model, manufacturers are increasingly seeking to adopt a build-to-order (BTO) business model. The need for agility and responsiveness without compromising quality to meet demands has become more important than ever.
- **Extreme pressure to manage costs:** From costs for labour and warranties to operational overhead, discrete manufacturers must minimise these costs while increasing productivity to stay ahead. Competition from emerging economies creates even greater urgency to keep costs in check.

A key obstacle to addressing the challenges

Despite these trends and challenges, complex discrete manufacturers and their suppliers have the opportunity to drive growth but are held back by paper-based processes and legacy systems built on ageing technology used to manage their plant floor production. This is especially true of many manufacturers and suppliers of large, complex products in industries such as aerospace, defence, energy and heavy equipment.

Processes are manual, and manufacturers lack the infrastructure to access pertinent quality information to make the best informed decisions. Challenged by too much WIP and a lack of visibility into where that WIP exists, they are burdened by hidden manufacturing costs and the inability to track and trace products. It becomes difficult to deliver quality information demanded by customers or, for example, to find relevant data to address a warranty claim.

Furthermore, the use of paper-based production trails hinders optimised operational and financial results. It slows down production, leads to greater potential for errors that affect quality, and generates higher costs.

MES digitisation for increased competitiveness

As complex discrete manufacturers continue to lean out their operations, they need modern MES software systems to leverage the benefits of digitised processes such as

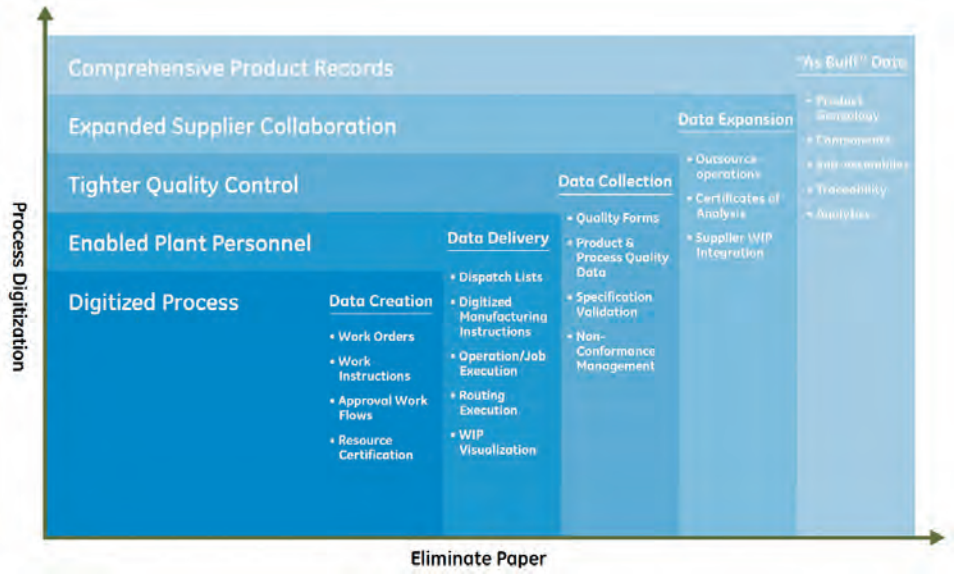


Figure 1: MES digitisation for complex discrete manufacturing.

reducing waste, increasing flexibility and decreasing lead times. Today's technologies make it possible to capitalise on the value of fast, reliable and accurate information to maximise production performance.

Through the power of MES digitisation, complex discrete manufacturers can leverage real-time information and automate their processes — saving time and money while still providing a consistently high-quality product. For instance, they can easily monitor production, record production data, analyse quality and yield issues, and uncover the root causes behind performance requirements misses, as well as the drivers behind waste and inefficiencies. With deep visibility across their operations, complex discrete manufacturers can drive robust strategies for growth and competitiveness.

Digitisation also affords the realisation of comprehensive product records. No longer do shop floor personnel need to physically include quality certificates from suppliers with paper-based product records — a manual process prone to errors. It further reduces errors by eliminating the manual tracking and updating of non-conformances, quality data measurements, quality approvals, etc, which are inherent in a paper-based system. Digitised product records not only include the manufacturing instructions and the routes used to manufacture the product but also the approvals that were obtained before release to manufacturing — providing a comprehensive view.

Aligning to tomorrow's manufacturing needs

MES digitisation sets the path for manufacturers to evolve with the trends of the future, such as a virtualised enterprise. It enables the transition toward more advanced MES capabilities that will become critical as manufacturers' needs continue to grow with rising expectations from customers, increasing competition and powerful new IT capabilities.

For example, using cloud-based technologies and mobile capabilities, real-time collaboration enables an expert sitting in one location to view a manufacturing site in another part of the world and troubleshoot a problem. It enables an executive anywhere in the world to access the real-time information needed to maximise supply chain operations and efficiencies.

The possibilities are many, and it begins with the deployment of a modern IT infrastructure that allows for digitisation at the plant level.

The journey toward full MES digitisation

Digitisation, enabled by the latest MES software capabilities, provides the foundation that allows manufacturers to achieve lean manufacturing and increased competitiveness. A step-by-step methodology to help complex discrete manufacturers achieve full digitisation is outlined below.

Digitised process

The first step of the journey is to eliminate the paper-based traveller that is released with the production order to the floor. Based on the complexity of the final product, there can be tens of thousands of these orders and travellers released every year. Digitised systems are provided for the industrial engineer to define and manage the routes, and instructions are associated with each one of these orders, which can result in more than 100,000 documents that are digitally managed.

As part of the definition, it is important to identify what certifications are required for resources (ie, people and equipment) in order to perform the different manufacturing operations defined within the route. Quite often in this complex manufacturing environment, the routes and instructions need to be approved by others from quality, product engineering and manufacturing supervision. Digitised workflows can help make the accomplishment of this task easier.

Enabled plant personnel

The next step in the journey is to provide this digitised information to the operators on the floor as the orders are released and executed. A fully digitised system provides a list of jobs for the operator to select to execute. Once selected, the instructions are digitally provided, which helps eliminate many errors that can occur associated with using the wrong paper-based instructions. Once jobs are completed, the order is digitally routed to the next operation.

This digitised information also enables managing and having true real-time digitised visibility to the WIP. Manufacturing supervisors no longer need to manually run around the floor to identify locations and statuses of the orders within the plant. Flexible WIP displays are used to identify all in-process material across the entire manufacturing facility or just in one area. Views should also be provided for a collection of orders.

Tighter quality control

The next and very important step is to gain better control of quality through full digitisation of the quality process. All key quality variables are defined and digitised within

the MES system. Digitised forms replace the quality forms that were included in the paper traveller. Quality is automatically collected and stored from the associated equipment such as torque tools, gauges, etc, or plant-floor personnel may manually enter quality data.

This data is now validated instantly against the expected spec limits. The entered data may also be digitally routed to quality personnel to digitally stamp and validate the entered information. Non-conformances can be digitally created for out-of-tolerance material and routed to the right personnel for corrective action.

Expanded supplier collaboration

The fourth step in the journey is to expand the digitised MES ecosystem beyond the plant to the suppliers. Outsourced operations can now be digitally routed to suppliers, providing them with a digitised display containing a queue of their orders to work from. In addition, Certificates of Analysis can be digitally delivered from the supplier to the main manufacturer, whereby hundreds of suppliers can be included with the WIP being managed from the central MES system.

Comprehensive product records

All these prior steps of the journey enable the final step: producing a complete, comprehensive, digitised product record of the end product, including all associated components and subassemblies. No longer do paper-based product records need to be managed and retained in boxes at secure storage facilities; no longer do personnel need to manually retrieve and peruse stacks of paper to find the appropriate information if a warranty issue occurs. An online digitised product record database enables quick retrieval of any information that may be required.

Delivering benefits that drive manufacturing performance

The benefits for digitising complex discrete manufacturing processes are significant. Manufacturers can produce products faster through reduced cycle times, reduced lead time from order placement and first-time production of a new product. In general, digitisation helps eliminate non-value-added production time, which directly impacts cycle times.

> DIGITISATION, ENABLED BY THE LATEST MES SOFTWARE CAPABILITIES, PROVIDES THE FOUNDATION THAT ALLOWS MANUFACTURERS TO ACHIEVE LEAN MANUFACTURING AND INCREASED COMPETITIVENESS.

For example, some manufacturing businesses have reduced cycle times in the range of 20% through digitisation — enabling a significant competitive edge, especially as complex discrete manufacturing cycles are typically long.

Furthermore, the simple capability of providing real-time WIP visibility can reduce WIP inventory levels by at least 10% and as much as 30%. By understanding where WIP exists, manufacturers can respond to changes in demand and eliminate bottlenecks to quickly bring products to completion.

Using the right digitised instructions helps tighten control on quality by monitoring and validating quality data against the expected spec limits. This enables products to be built right the first time, avoiding rework and scrap by as much as 25%. Manufacturers can also streamline the supply chain with more efficient supplier collaboration through outsourced operations management and Certificates of Analysis for components received. Digitised product record retrieval reduces warranty investigation time by as much as 70% and contains warranty exposure information to reduce warranty costs.

Additionally, there are other cost benefits associated with implementing a fully digitised system, including labour and paper savings. Long-cycle, complex manufacturing requires significant labour to manufacture all the components and assemble the final product. Therefore, any reduction in cycle time directly impacts the labour costs associated with the product.

Finally, eliminating the costs of paper and related items such as printers, ink, etc — along with the hidden costs associated with the process, including handling, storage and retrieval of paper — enables further cost savings.

Conclusion

As complex discrete manufacturers find themselves having to compete in an increasingly global and competitive business environment, the need for digitised processes cannot be overlooked. Defining how a product will be manufactured and managing all the associated components to produce the end product requires precise, accurate and timely orchestration and complete production visibility.

To that end, digitising MES processes at the line and plant level is a critical enabler to achieving effective operations and supply chain optimisation. The journey towards full digitisation enables manufacturers to reap significant rewards that can help them leapfrog their competition with the value of real-time information and the elimination of non-value-added production time.

Greater production accuracy, faster approval routing, reduced WIP, tighter quality and better integration with suppliers are among the cumulative benefits of MES digitisation. The culmination is the ability to produce a complete digitised product record of the end product — providing the infrastructure to make the best informed decisions which, in turn, helps optimise operational and financial results.

Lastly, digitisation enables manufacturers to leverage more advanced MES capabilities as their needs extend into the future. It is the backbone to drive results quickly and reliably, without compromising product quality — allowing manufacturers to stay competitive by successfully transforming from a plant-centric model to one that can capitalise on the advantages of a collaborative value network.

GE Digital

http://www.ge.com/digital/

HOT PRODUCTS
ON WWW.PROCESSONLINE.COM.AU THIS MONTH

CALIBRATOR FOR PRESSURE INSTRUMENTATION

The DPI 612 provides flexible pressure ranging by virtue of high-accuracy interchangeable pressure modules covering pressures up to 1000 bar.

Thermo Fisher Scientific

http://bit.ly/2sicGbo

ETHERNET DAQ CHASSIS WITH TSN

The cDAQ-9185 and cDAQ-9189 multislot Ethernet chassis introduce time-based synchronisation built on the latest Ethernet standards.

National Instruments Australia Pty Ltd

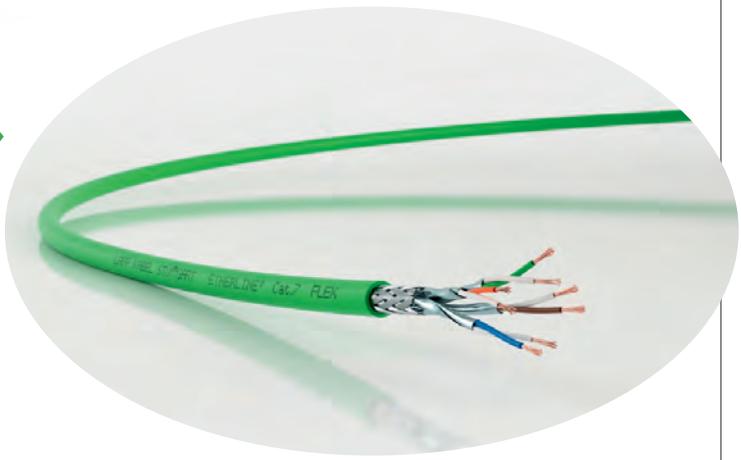
http://bit.ly/2rcI9IG

TORSION-RESISTANT ETHERNET CABLE

The ETHERLINE TORSION Cat.7 cable can be twisted by 180° in both directions along a length of 1 m, at least 5 million times.

Treotham Automation Pty Ltd

http://bit.ly/2sWymYr

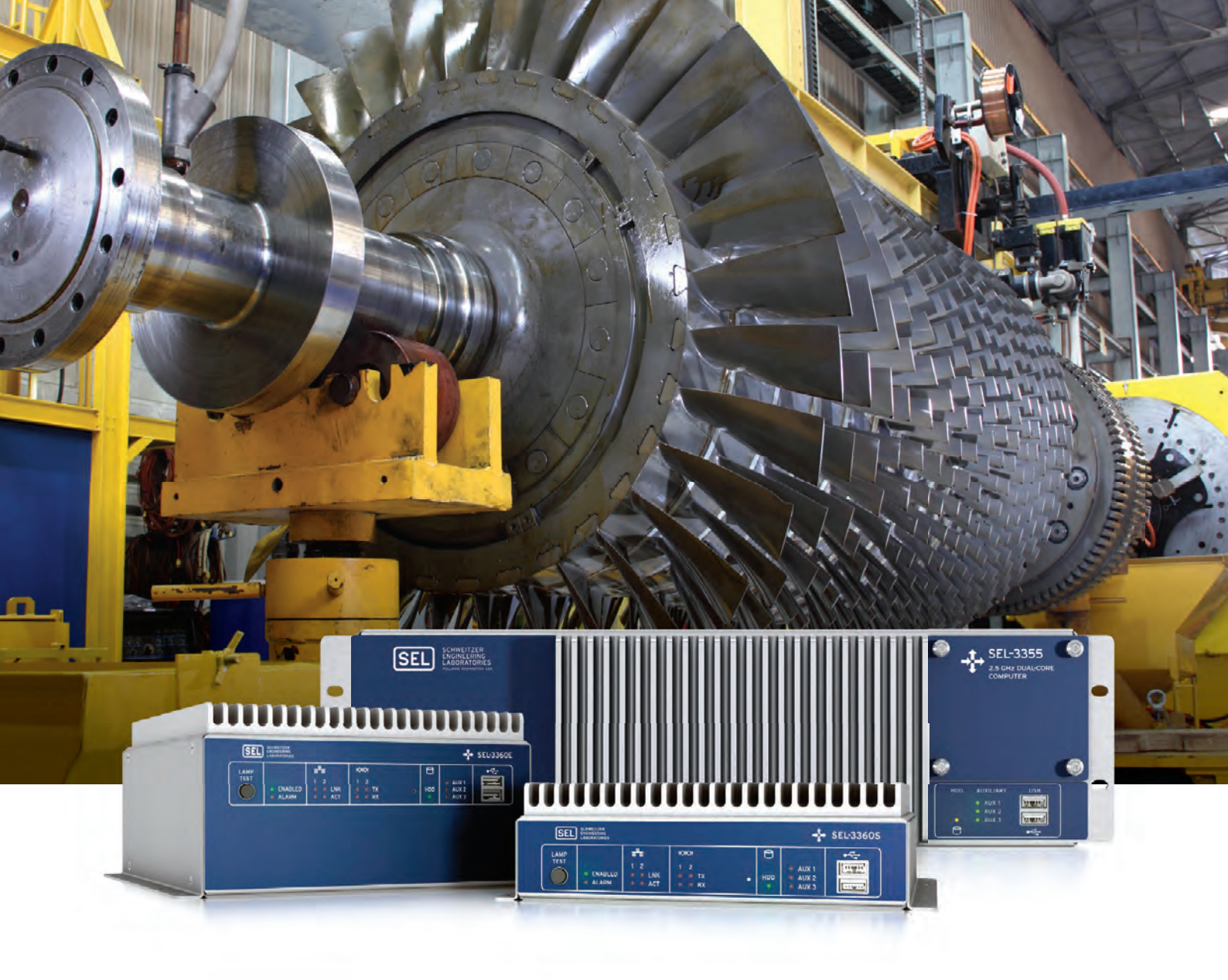


RFID INTERFACE

The ultracompact TBEN-S-RFID module eliminates complex PLC integration with its mapped RFID data, and can easily read and write 8 kb HF tags.

Turck Australia Pty Ltd

http://bit.ly/2siadNV



Ten Years of High-Availability Computing—Guaranteed

SEL computers are the only industrial computers with a standard ten-year warranty and >100-year mean time between failures. They feature advanced thermal management and are built to work through 15 g of shock, large electromagnetic fields, radio frequency interference, and 15 kV of electrostatic discharge.

Powerful, reliable, and highly available SEL computers employ:

- A broad operating temperature range of −40° to +75°C.
- Multicore Intel® i7 processors.
- High-quality single-level cell SSDs and error-correcting code memory.
- Passive cooling technology.
- No moving parts.

For more details about what makes SEL computers powerful, reliable, and available, visit **selinc.com/computers**.

Phone: +61 3 9485 0700 | Email: selmelb@selinc.com

Investment in next-gen crushing boosts plant safety and efficiency

Located in the Adelaide suburb of Seacliff Park, Boral's Linwood quarry is positioned within one of South Australia's most important sources of hard rock. Quarrying started here over 130 years ago, when in 1882 the quarry was first operated to supply limestone to the nearby Brighton Cement works. Boral acquired the quarry in 1994. Today Linwood's operations are focused on providing high-quality aggregate, critical in the production of composite materials such as concrete and asphalt.

Linwood is currently the largest capacity quarry servicing the Adelaide metropolitan area. In recent years, the region has seen a flurry of large construction projects such as Adelaide's Desalination Plant, the city's Northern and Southern Expressways and the Royal Adelaide Hospital. As a consequence of these important projects, the demand for aggregate products has progressively increased, challenging the quarry's production capabilities. In 2013, site management identified the need to upgrade the quarry's crushing and screening plant with the latest technology in order to meet this growing demand.

The requirement for new equipment first became evident in the quarry's primary crushing section. The plant's 30-year-old primary jaw crusher was struggling to keep up with production demands. The machine's reliability and downtime were affecting overall plant performance. Maintenance costs had risen sharply and the availability of spares had become an ongoing problem. After considering the cost of refurbishing the existing crusher, Linwood's management decided that investing in a new machine was the best option. Following a detailed analysis of the quarry's requirements, the team selected Metso's C140 jaw crusher.

Quarry Manager Andy Baker explains the decision: "Minimising the need to modify our existing civils was a key prerequisite for the new machine. Essentially we needed a modern like-for-like crusher that would fit into the existing footprint, increase throughput and be easy to maintain — Metso's C140 met all these criteria."

While improving throughput and reliability was a priority, Linwood's management also recognised the upgrade as an opportunity to improve site safety. As part of the crusher installation, new walkways and access platforms were designed to improve access to the quarry's primary crushing station.

Once the C140 was installed, the crusher's performance and reliability significantly improved product quality and throughput. The new machine's ability to deliver more consistent output also immediately reduced the load and wear rates in other key areas of the plant. Where personnel previously needed to constantly monitor the crusher to ensure a consistent product output size, this was now an automated process.

"Now we can simply program the gap setting and be confident about what product we are going to get. The C140's hydraulic adjustment provides a massive advantage for us in terms of overall efficiency and safety. It eliminates manual adjustments and associated hazards," said Baker.

However, shortly after the new crusher was installed in 2014, its increased production capacity shifted the site's bottleneck to the tertiary crushing circuit. Tertiary crushing involves further reducing aggregate in size while shaping it into final end products. While it's important to keep

up with upstream feed rates, high precision is required to ensure the right product shape. Linwood had two cone crushers responsible for this task that were nearing the end of their effective service life.

Eventually, the Linwood team decided that the installation of two new machines would provide the best solution. After an exhaustive selection process which took into acount all of the quarry's requirements, in 2015 Metso was awarded with a contract to supply two HP3 cone crushers.

When Linwood needed to select its new crushers, the HP3 had just been released. There weren't any of these machines operating in Australia, which meant Linwood's decision makers couldn't call upon the experiences of their usual references within Boral or the broader quarrying community. The availability of spares for the first and only units in Australia was also a concern.

Santanu Ghosal, Linwood's project manager, said "The benefits were clear to us, but choosing the HP3s was still a leap of faith. Ultimately I think it was the confidence and expertise of Metso's people that gave us the assurance we needed."

"The support we received helped us to fully explore and understand the options and benefits the HP3s could offer, specific to our situation. For me, a key differentiating factor was the integrated control and automated operation of the HP3s — we knew this was the single biggest technology step towards improving our product quality and efficiency," said Baker.

The upgrades to Linwood's crushing circuit have improved the site's production capabilities and modernised its crushing process. Commenting on these outcomes, Baker believes the site is now capable of producing more, while maintaining high-product quality and improving safety.

"The throughput we are getting has surpassed our expectations. Our ongoing maintenance costs have come down, while the automation and access platform upgrades have improved plant safety. Overall, we can now more reliably meet market demands for our key-specification products," he said.

A longer and more detailed version of this article can be read online at: http://bit.ly/2tbolK7

Metso Australia Limited
www.metso.com

Switch to a gas partner with dedicated welding, laser and flame cutting gases

ARCAL™
Welding Gas

Reliable and simple, yet high-performing range of 4 main gases and many special mixes that can handle any welding job.

LASAL™
Laser Gas

Our full range of gases are designed with the ultimate performance of your laser in mind, and our assist gases are available in convenient packages designed to ensure peak cutting performance.

FLAMAL™
Flame Cutting Gas

With over 100 years of experience producing gas supply modes, Air Liquide FLAMAL™ gases are designed to optimize your processes no matter what flame process you use. In addition, there is the added safety of our unique cylinder tops.

Gas that works for you™

Air Liquide
creative oxygen

www.airliquide.com.au

MACHINE CONTROLLER

Based on Omron's Sysmac (System for Machine Automation Control) platform, the NX1P machine controller features advanced motion control, with built-in EtherNet/IP and EtherCAT ports. With an EtherCat real-time field network, users can connect up to eight servos, I/O devices, vision systems and other devices using a single cable, thus reducing wiring work, while the EtherNet/IP port is utilised to share data with a host PC, other controllers or the internet. The IO-Link master unit also makes monitoring machine information possible.

The product can control up to four synchronised axes, giving functionality like electronic gear/cam and linear/circular interpolation. It is battery-free to reduce machine maintenance and features an SD memory card slot to restore, back up and verify data in the controller. With the capability to add one or two built-in option boards, there is no need to increase the size of the control panel for adding serial and analog communication. This makes it a compact controller with push-in plus terminals for the I/O on the CPU unit, to simplify connection and save wiring time. These features, together with a fast execution time of 3.3 ns, make the NX1P an easy-to-use, high-performance compact controller.

Omron Electronics Pty Ltd
www.omron.com.au

PLC

Honeywell Process Solutions (HPS) has announced the latest release of its ControlEdge PLC. This release, combined with Honeywell's Experion DCS, is claimed to provide a significant reduction in integration efforts and project costs as well as increased security and availability through enhanced cybersecurity for industrial facilities.

Experion and ControlEdge PLC leverage a common HMI platform, providing fast field device commissioning and improved device diagnostics.

The PLC is being offered to end users, original equipment manufacturers (OEMs) and engineering, procurement and construction (EPC) companies, particularly those in refining, oil and gas, power, chemical, water management and infrastructure applications.

The ControlEdge PLC provides an IIoT-ready open platform that uses OPC UA as a communication protocol and enables users to better leverage data across their assets.

Honeywell Process Solutions Ltd
www.honeywell.com.au

INDUCTIVE SAFETY SENSORS

Balluff is expanding its safety range with inductive safety sensors. They can be connected directly to the safe Balluff IO-Link I/O module or to any safety controller using standard M12 connectors.

Unlike traditional safety switches, the Balluff inductive safety switch requires no special mating part. This means it can generate safe signals for position and end-of-travel or directly sense metallic workpiece carriers. The sensor is also suitable as a pulse transmitter for counting tasks and speed sensing.

In addition the inductive safety sensor can be connected to any desired safety processor, including safety relays, programmable logic modules or safety controllers. Wiring is simple using standardised M12 plug connections.

Balluff Pty Ltd
www.balluff.com.au

GAS LEAK DETECTOR

The Fluke Ti450 SF6 gas leak detector combines a high-quality infrared camera with an SF_6 leak detector that visually pinpoints the location of SF_6 leaks without shutting equipment down. The product lets utility crews include it as a normal part of their maintenance routine, letting them conduct both infrared and gas inspections whenever and wherever necessary.

The pistol-grip device makes diagnoses of issues point-and-shoot convenient, even in hard-to-reach or high overhead locations. Technicians can monitor leaks more frequently, allowing maintenance to be scheduled at a convenient time. The leak detector can also be used to quickly verify that the repair was fixed.

The infrared camera includes Fluke's LaserSharp Auto Focus, which delivers instant focus on a single target using a built-in laser distance meter to calculate and display the distance to the designated target. The feature enables technicians to precisely target up to 30 m away for infrared readings and SF_6 gas detection, no matter how awkward the position of the target. This makes it safe to measure around high-voltage areas and potentially dangerous areas.

It also features Fluke IR-Fusion technology, which combines both digital and infrared images in one for better clarity. By adjusting the blending of the image, technicians can easily detect then pinpoint the exact location of the SF_6 gas leak.

The product comes with a 2x telephoto smart lens; a tripod holder for mounting to any industry standard tripod; an eyepiece; a cable; a viewer; batteries and chargers; and a hard-shell carrying case.

Fluke Australia Pty Ltd
www.fluke.com.au

TORQUE AND THRUST BI-AXIAL SENSOR

The Futek MBA500 torque and thrust bi-axial load cell is designed to measure reaction torque moments as well as tension and compression loads, all in one transducer. Temperature compensated and constructed of all aluminium, this torque/thrust sensor is able to achieve 0.2% nonlinearity and provide 125% overcapacity. Two separate outputs are provided for applied torque and thrust forces. Force/torque sensors are used throughout industry for product testing, robotic assembly, grinding and polishing.

The MBA500 offers a suitable solution for measuring loads in tension and compression as well as torque in clockwise and counter-clockwise direction. Offering a compact design and weighing 185 g, the MBA500 uses metal foil strain gauge technology.

This particular sensor uses can be modified or customised to meet many requirements.

Metromatics Pty Ltd
www.metromatics.com.au

THE UNDISCOVERED COUNTRY

THE FUTURE OF INDUSTRIAL AUTOMATION – PART 2

Paul McLaughlin and Rohan McAdam^*

The Industrial Internet of Things (IIoT) has significant architectural differences compared with the wider Internet of Things (IoT) concept. Additionally, the question of how the conventional Purdue model for automation systems, and today's installed base, fits with new IIoT architectures needs to be examined.

As described in Part 1 of this article, one of the main differences between IoT and IIoT architectures concerns the nature of the edge computing environment. In the IIoT the edge computing environment provides the opportunity to address key requirements in the areas of performance and robustness needed in industrial process control. Another significant characteristic of the edge computing environment in the IIoT that sets it apart from the IoT is a high degree of heterogeneity in the devices used and the protocols with which they communicate.

The IIoT edge computing environment consists of a wide range of devices, including sensors, actuators, controllers and HMIs. These devices are located in close proximity to the production process and may communicate directly with cloud-based services or via an edge gateway that acts as a data concentrator or filter and protocol converter. Edge devices may act collectively in a federation of devices to provide an autonomous coordinated set of capabilities at the edge. For example, a federation of sensors, actuators, controllers and HMIs may provide real-time control and management for a process unit or area. Such a federation would utilise peer-to-peer communication among devices using a variety of protocols. While there is a trend toward open IP-based protocols in the IIoT, such as OPC UA, there will continue to be a role for existing protocols such as HART, Profibus, Modbus and so on, particularly for existing installed devices. Edge gateways are used to interface heterogeneous devices and protocols with cloud-based services.

IIoT vs DCS

Some of the key differences between an IIoT architecture and a conventional DCS architecture can be illustrated by comparing the architectures at their highest levels. The structure of a DCS and associated applications typically conform to the well understood Purdue Enterprise Reference Architecture developed in the 1990s. The Purdue model structures an industrial enterprise into a series of layers ranging from the physical process (Level 0), basic control (Level 1), area control (Level 2), site manufacturing operations and control (Level 3), and business planning and logistics (Level 4). Enterprise-wide business systems such as ERP systems are often considered as Level 5 of the Purdue model.

This abstract model typically has a corresponding realisation in the topology of the system in which boundaries between levels are often expressed as network boundaries across which security can be enforced.

Figure 1 illustrates the basic organisation of the Purdue model, including a Level 3.5 DMZ that helps segregate the system in terms of access control and cybersecurity. The IIoT architecture illustrated previously in Part 1 is, at the highest level, separated into two major subdivisions — the edge and the cloud. This structure can be further broken down into a seven-level model, also shown in Figure 1.

An initial reconciliation of the Purdue model with the IoT model considers the partitioning of the functionality represented by the four main layers in the Purdue model within the two main layers in the IoT model. Level 1 of the Purdue model, basic control, moves to the edge in the IoT model, while Level 4, business planning and logistics, moves to the cloud. There is also a strong argument for moving much of Level 2, area control, to the edge to keep it close to the process being controlled for performance, security and reliability reasons. The functionality represented by Level 3, site manufacturing operations, will get pulled up into the cloud and pushed down to the edge depending on the balance of key system quality attributes. History, advanced process control, S88 batch and alarm management are all examples of functions that can be deployed either in the cloud or on-premise in embedded devices, or both.

An approximate allocation of Purdue model levels to the basic IoT partitioning is illustrated in Figure 2. In general, moving functionality to either the cloud or the edge represents a trade-off among a number of system qualities. For example, moving functionality to the edge can improve performance and reliability at the expense of having to provision and manage functionality distributed across a large number of devices. On the other hand, moving functionality to the cloud makes it easier to install, scale up, upgrade and retire at the expense of the functionality being remote from the devices and controllers on which the functionality may depend.

In general, the move to an IIoT-based architecture will result in a system unconstrained by the hierarchical structure of a DCS.

IIoT benefits

The IIoT can deliver better support for key requirements in the areas of safety, security, reliability and efficiency.

Safety

The overriding concern in any industrial enterprise is safety. There are well-understood and well-developed sets of practices and standards concerning the basic safety of an industrial process. For example, the Safety Integrity Level model provides a quantitative measure of the risk reduction provided by safety instrumented systems that are responsible for the basic safety of a process and formalised in IEC 61511. There will continue to be a key role for safety instrumented systems in any IIoT-based automation system.

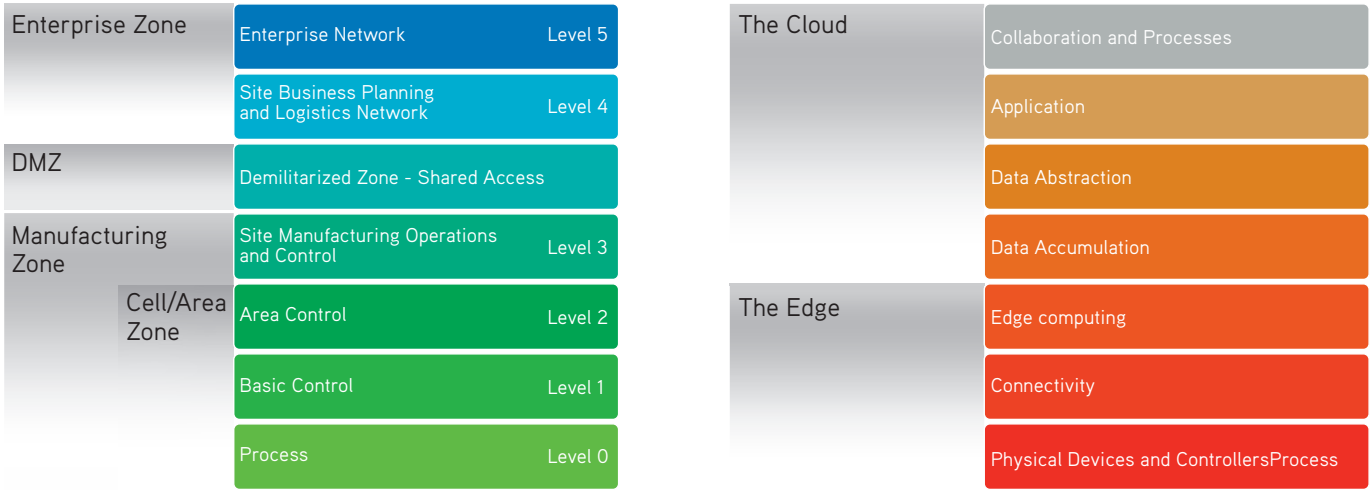


Figure 1: Purdue Enterprise Reference Architecture model (left) and IoT Reference Model (right).

Security

A concern closely related to safety is that of security. Unless an automation system is secure from unauthorised access and activity, its safety cannot be guaranteed. Aside from preventing compromises to the safety of the plant, security also serves to protect the intellectual property inherent in an industrial process itself and the procedures for planning, scheduling, executing, maintaining and optimising production on the process. Increasing levels of computer-based automation have increased the risks associated with cybersecurity attacks and has led to the development of cybersecurity standards and practices such as ISA/EC-62443 (formerly ISA-99).

Many existing DCS components have no inherent security built in. For example, they may lack any explicit access control mechanism and may transmit data on the network in plain text, as well as other well-known vulnerabilities. The legacy components do not disappear in an IIoT-based system, but are confined to the edge computing environment to which access is strictly controlled.

IIoT helps address these issues by pushing automation system functionality either down into the hardened edge computing environment or up into the cloud. The cloud computing environment has rich access control and communications security mechanisms built in and the centralised nature of the infrastructure makes it much easier to maintain in order to address vulnerabilities that are discovered.

Reliability

Reliability refers to the ability of a system to remain operational over time. The probability that a highly reliable system will fail to perform its intended function is very small and is a key characteristic of industrial automation systems. An IIoT-based approach can contribute to the reliability of an industrial enterprise both in terms of the reliability of the automation system itself as well as the reliability of the production process more generally.

The reliability of the automation system can be enhanced by pushing functions both out to the edge and into the cloud. As with safety, pushing functions, especially control functions, out to the edge allows those functions to act more autonomously with fewer dependencies on other components, reducing the potential causes of failure. Moving functions into the cloud allows them to be more easily managed, maintained and upgraded, reducing the impact of these operations on the system.

Efficiency

With a production process that is running safely, securely and reliably, attention can turn to making production as efficient as possible in order to maximise the profitability of the enterprise. This amounts to optimising operations in a range of areas such as maximising throughput or yield, minimising energy and raw material usage, minimising engineering, maintenance and labour costs, and so on.

Optimisation is essentially a decision-making process directed toward achieving a specified goal subject to constraints that limit the actions that can be taken to achieve that goal. The decision-making process may occur second-to-second, as in the case of online optimisation of process control variables, or day-to-day, as in the case of production and maintenance planning.

The ability to collect more data from uncorrelated sources provides opportunities for applying data analytics, modelling and machine learning techniques to gain better insight into the current and future state of the enterprise. This information can then be delivered to those in decision-making roles in ways that allow the decision-makers to act on that information.

Analytics, modelling, simulation and machine learning techniques also provide additional opportunities for closing the loop and enacting decisions automatically. In these cases, the decision-making process can be pushed out to the edge environment to enhance the capabilities of the autonomous elements of the system. Moving model-based control into the real-time control platform means that on-premise elements of the system are able to continue to optimise the process rather than just regulate it without depending on non-local resources.

Standards

A significant difference between today's DCS and an IIoT system has to do with heterogeneity; while a DCS tends to be a combination of a vendor's proprietary technology, the IIoT must accommodate fine-grained use of technologies and functions from multiple vendors, and do so over a long-time horizon. To do this, new standards

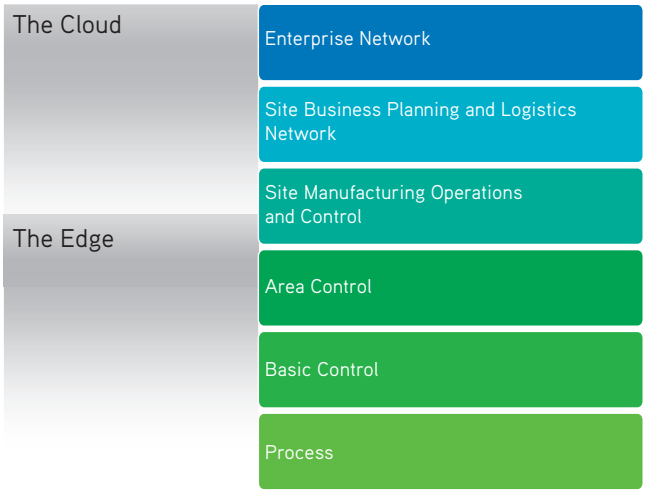


Figure 2: Approximate correspondence between levels in the Purdue model and the basic structure of the IoT.

THE BENEFITS THAT FLOW FROM NEW, HIGHLY SCALABLE DEPLOYMENT PATTERNS, SMARTER DEVICES, MORE COMPREHENSIVE DATA COLLECTION AND ANALYTICS, AND BROADER REACH THROUGH MOBILE APPLICATIONS ARE LARGE.

beyond those allowing for communications interoperability (HART, Foundation Fieldbus, Profibus, OPC, etc) will need to emerge to allow for functional alignment from multiple sources. OPC UA (OPC Unified Architecture) is one such standard. Although it won't be the only standard employed in IIoT, it has the potential to be the lingua franca of interoperable and well-bred IIoT solutions.

Getting there from here

The IIoT represents a step change in the evolution of automation systems. The benefits that flow from new, highly scalable deployment patterns, smarter devices, more comprehensive data collection and analytics, and broader reach through mobile applications are large. However, achieving these benefits requires an orderly transition from the automation system of today to the automation system of the future. This transition will be a stepwise initiative that will need to consider the following key aspects:

- **Preservation of core IP:** Control strategies, supervisory applications and HMI graphics need to be preserved as the automation system evolves. Re-engineering these is expensive and adds little value. It is far better to preserve this investment either by providing ongoing support for these items in their current form or by providing high-fidelity translation to new forms.
- **Preserving in-place equipment and solutions:** In addition to the engineering content of an automation system, there is a lot of associated equipment. Ripping this equipment out and replacing it with new equipment is usually not feasible or cost-effective, so it is imperative that evolution to the IIoT accommodates existing equipment. A key strategy here is to provide support for existing communications protocols that allows existing equipment to be integrated into an IIoT architecture in a secure way.
- **Maintaining SIL levels:** Any move to new deployment patterns and new devices needs to maintain existing SIL levels. Of course, the same applies to maintaining the security of a system. In both cases, the evolution of the system should be seen as an opportunity to not only maintain levels of safety and security, but to enhance them beyond their current levels.
- **On-process updates to control hardware and software solutions:** A stepwise evolution to new forms of automation systems will occur over a period of time. As changes to a system are introduced, they need to be done in a way that does not interrupt or compromise plant production. The updating of hardware and software, as well as the introduction of new system components, needs to be done 'on process'.
- **Performance/capacity of existing systems and demand placed on them from cloud-based applications:** The IIoT encourages the collection of more data from more sources, so the impact of this additional demand for data on the existing components of an automation system needs to be managed. There is little point in enabling new forms of application if the needs of those applications compromise the core mission of the automation system.

Conclusion

In many ways, the IIoT represents an 'undiscovered country' — full of promise, but waiting to be explored and mapped out. This article has attempted to map out this undiscovered country and provide pointers to how the promise of future automation systems will be realised. The resulting vision is a new form of automation system architecture that balances the computational and life cycle benefits of cloud computing with the requisite on-premise, appliance-hosted capabilities necessary to provide safe, secure and long-lasting automation for complex manufacturing systems and processes.

Honeywell Process Solutions Ltd
www.honeywell.com.au

**Paul McLaughlin is Chief Engineer at Honeywell Process Solutions. He has worked in the automation industry for 35 years and been with Honeywell for the past 30. Paul is currently responsible for the development of the HPS Industrial Internet of Things strategy and has degrees in mathematics and computer science from the University of Delaware and the University of Pennsylvania.*

^Rohan McAdam is Chief Architect for Honeywell Process Solutions. He has worked in the field of industrial process control since 1988. Prior to joining Honeywell in 1993, he worked in the alumina industry in Western Australia. He has a mathematics degree from Charles Sturt University, a master's degree in cognitive science from the University of New South Wales and a PhD in computer science from Charles Sturt University.

SAFETY CONTROLLERS

The Schmersal Protect PSC1 range of compact safety controllers offer a flexible and efficient design interface, enabling users to tailor-make safety related solutions with simple and reduced setup times and options.

The PSC1 is freely programmable, with IO extension modules for signal processing of mechanical and electronic safety switchgear — including the ability to generate schematic wiring diagrams automatically when the controller is programmed. The range is equipped with a universal communication interface and only requires one hardware element to create a connection to most common forms of fieldbus systems.

Installation is quick due to a TÜV certified safe Ethernet network and is suitable for distributing I/O to minimise the complexity and time required to wire the system. An option to integrate the SD bus gateway allows for additional non-secure diagnostic signals from connected sensors to be transmitted via a standard bus system to an automation control system. Signals can be evaluated to prevent downtime and increase plant availability and efficiency.

Control Logic Pty Ltd

www.control-logic.com.au

ETHERNET/IP TO PROFIBUS DP INTERFACE

The EtherNet/IP to Profibus DP Linking Device from HMS Industrial Networks allows users to connect devices on Profibus to a Rockwell ControlLogix or CompactLogix PLC. Users will benefit from the integration into Studio5000 Logix Designer from Rockwell Automation, as all configuration is made from inside Studio 5000.

Contrary to an in-chassis module which is physically connected to the PLC, the EtherNet/IP to Profibus DP Linking Device can be mounted close to the connected devices. This means that it is possible to establish a connection via a single Ethernet cable instead of multiple network-specific cables. All EtherNet/IP Linking Devices from HMS support ODVA's Device Level Ring (DLR) for ring topology.

Users access their Profibus DP network and device configuration through their existing Studio 5000 software. All configuration is made inside Studio 5000 where there is support for process variable data tags, as well as manual and automatic generation of named and structured Studio 5000 controller tags without any required user logic.

The Profibus Linking Device supports up to 7000 B of I/O data, 3500 in each direction. Since the linking device operates standalone (distributed), it doesn't affect PLC backplane performance, even when large amounts of data are transferred. The PLC simply scans the linking device as if it were any other I/O device on the network.

Global M2M

www.globalm2m.com.au

MANAGING CORROSION TO CREATE MARGIN

For many industries, raw materials are natural products that vary in quality, creating risk to output quality, risk to plant efficiency and risk to plant reliability. If you can manage the risks, then you can create a profit margin where competitors cannot.

Plants with process control systems designed to handle product variability are positioned to source raw materials that come on to the market at the most attractive price. However, product variability can also mean variation in risk to the plant.

Corrosion is a common problem faced by many industries. Often the raw material itself may be corrosive, or may require processing by potentially corrosive chemicals. In some instances, the material's potential to corrode can change at elevated temperatures or when it contacts water.

Dosing to neutralise process streams and the insertion of sacrificial coupons into a process stream go some way to managing and monitoring corrosion. Controlling pH reduces the likelihood that a process stream will cause damage and fluid corrosivity affecting a coupon will indicate the likelihood that damage is happening to similar metals in the plant. Neither method, however, measures actual metal loss to critical assets.

Pipework, one of the most common pieces of metallic equipment in processing plants, will sustain loss from harsh products and at some point, will need replacement. As varying products pass through a plant, the rate of corrosion will change so it is difficult to extrapolate a simple rate of change into a useful service life duration to determine an accurate replacement date.

Manual testing

Equipment in plants corrodes (or sometimes erodes) from the inside out, potentially reaching its failure point without any external indication. An unchecked pipe can therefore fail at any time, with disastrous results.

The health of fixed equipment such as pipes and vessels is traditionally measured by taking manual readings of pipe wall thickness. Manual readings require staff to enter the plant at scheduled intervals, require the installation and removal of scaffolding and the removal and replacement of any lagging.

There is no guarantee that a set of manual tests, often taken months or years apart, are readings from the same precise location on a pipe, by the same person, with the same measurement tool. Changes in location, staff and equipment increase variability, reducing precision. Without a high precision measurement, you cannot provide a precise estimate of useful life.

Online monitoring

Over 160 plant operators have turned to Emerson's Permasense solution to improve precision of corrosion monitoring. The Permasense non-invasive sensors attach to critical areas of pipework on the outside and report thickness measurements twice daily. A central server adjusts the reading for temperature and inspects the measurement provided for noise, which is indicative of changes in the inner surface of the pipe — a common precursor to actual wall loss. With this quality and frequency of readings, in exactly the same location by the same instrument, and without any human intervention, extremely high precision measurements of rates of metal loss can be determined.

Operators can now monitor the impact of corrosion, to a per-batch level, adjusting corrosion mitigation processes and scheduling maintenance as required. Metal loss management then becomes part of the operational process control rather than just part of the maintenance process. Operators can be proactive about what raw materials they process and how they approach each batch, backed by precise up-to-date knowledge of the condition of their plant, and how it is impacted by varying raw materials. Managing these risks allows operators to choose which products and process decisions will provide them with the healthiest profit margins, without unplanned outages or loss of containment.

A live webinar on the topic of pipework monitoring will be presented on the 17th of August. Register at *http://emr.sn/5WB4*.

Emerson Automation Solutions
www.emersonprocess.com.au

EMERSON

NEW PRODUCTS

CONDUCTIVITY CONVERSION APP

Mettler Toledo Process Analytics has released a smartphone/tablet app that converts conductivity readings to concentration levels and vice versa.

One of the key applications for the measurement of electrolytic conductivity in process analytical chemistry is analysing solution strength in concentration control or monitoring. The principle of this analytical method is based on pure salts and acids showing distinctive electrolytic conductivity behaviour at different concentrations in aqueous solutions.

The characteristic conductivity curves of chemical solutions are often hard to come by, as literature on the subject is limited and data are not published widely. With its free CONDverter app, Mettler Toledo Process Analytics has provided a simple reference tool that allows the user to select a species from a list of typically used industrial chemicals and enter a concentration value.

CONDverter calculates and displays the corresponding conductivity value in a wide range of measurement units. The tool also works vice versa, calculating concentration after entering a conductivity value.

The app is available from the App Store and Google Play store, as well as from Mettler Toledo's website.

Mettler-Toledo Ltd
www.mt.com

M12 CONNECTORS

Phoenix Contact has released M12 connectors featuring push-in connection technology, complementing the existing M12 connector range that includes QUICKON, crimp, screw and Piercecon connection technology.

The direct plug-in capability of the push-in M12 connector means installation can occur quickly and efficiently. Whether working with solid conductors or conductors with ferrules, the push-in connector lets technicians connect directly to the terminal point, making the process simple and hassle-free. It does not require the use of tools: the technician simply lifts the coloured lever on the terminal point to connect or release the corresponding colour-coded conductor.

The connector also helps keep human error to a minimum. As no soldering is required to connect conductors to the push-in M12 connector, the opportunity to damage the connector or for human error to occur is significantly reduced.

Shock- and vibration-resistant, the push-in M12 connector features a spring-cage connection to secure the conductor to the M12 even under harsh conditions. The SPEEDCON fast-locking system provides maximum contact reliability to deliver a high level of performance.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

TRANSPONDER CODED SAFETY SWITCHES

In potentially explosive atmospheres, according to the ATEX directive and the corresponding standards, special requirements are placed on the equipment used from which a potential ignition hazard can exist. The CES-C04-AP/AR transponder coded safety switches from Euchner can now be used in potentially explosive atmospheres in Zone 2 (gases) and Zone 22 (dusts).

The CES-C04 is placed into a specially developed plastic housing guard to effectively protect the safety switch against the effects of possible impacts, thereby meeting the requirements of the ATEX directive.

For explosion protection, the compact safety switches are available as interlocking devices without guard locking or with monitored guard locking for the safety of personnel. Status LED indications on the CES-C04 are readily visible through windows in the housing guard. Already installed CES-C04 devices in the field can be retrofitted at any time.

Treotham Automation Pty Ltd
www.treotham.com.au

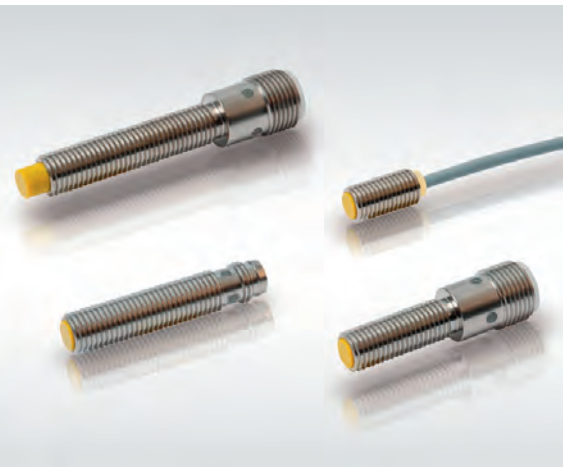
CORIOLIS FLOWMETERS

The Proline Promass Q 300/500 Coriolis flowmeter offers a high level of accuracy for mass flow, volume flow and density across a wide range of flow rates due to its low pressure drop and high immunity to fluctuating process conditions — making it suitable for use in the oil and gas industry with its need for high levels of accuracy in hydrocarbon custody transfer.

The Proline Promass Q 300/500 range has a density measurement performance under real-world process conditions of ±0.2 kg/m³, while Multi-Frequency Technology (MFT) gives enhanced accuracy when metering liquids with entrained gas.

An optimised tube shape and flow splitter allows for maximum flow rates while maintaining low pressure drops without having to sacrifice low-end performance. A low zero point combined with a low pressure drop means that the Proline Promass Q 300/500 range offers a larger than usual turndown. These meters also incorporate Endress+Hauser's Heartbeat Technology, allowing on-demand instrument verification during process operation, enhancing instrument condition monitoring and maintenance.

Endress+Hauser Australia Pty Ltd
www.au.endress.com



PROXIMITY SENSORS

Turck has announced an updated range of 8 mm barrel inductive proximity sensors. The technology of the ferrite core sensors has evolved, increasing the sensing range by up to 50%. As a result, flush-mounted solutions can now be offered with an extended sensing range of 3 mm as well as with the conventional sensing range of 2 mm. The non-flush sensors are likewise available with a 3 or 5 mm sensing range. Due to the newly developed sensor electronics, Turck is also now able to produce devices with an ultrashort 15 mm design.

The modular development approach of the sensor series has led to a broad range of variants that allows users to find a suitable 8 mm barrel sensor for their application. The sensors are available in 15, 22, 30 and 40 mm lengths. On the connectivity side, Turck is offering M8 or M12 connectors as well as sensors with a cable outlet, which in turn can be ordered with a 3- or 4-wire connection as NC or changeover contacts.

The sensors with a cable outlet are provided with a cable suitable for E-chain use and a semi-transparent LED ring at the sensor end, which shows the sensing state from any viewing angle. The sensors are IP67 rated and have an operating temperature of -25 to 70°C.

Turck Australia Pty Ltd
www.turck.com.au

REFRIGERATION DRYERS

Compressed air dryers are essential for avoiding interruptions to operations or even production downtime, due to water in the compressed air system and in the application.

For the majority of applications, the drying capacity of a refrigeration dryer with a residual moisture content of up to 6 g/m^3 is entirely adequate. The DS-2 refrigeration dryer from BOGE also fulfils this requirement, but the fully integrated aluminium heat exchanger, power losses in the refrigeration cycle and the use of coolants are very low. Combined with a reduction of power consumption of up to 30%, the overall operating costs of the Boge DS-2 are low.

For optimum operation, the whole series has digital control including an isolated alarm contact. This gives an immediate alert if operating conditions such as the pressure dew points move into the critical range. Models from 2.6 m^3/min are available with an optional energy-saving function. This reduces the power consumption in partial load operation even further. Designed for 50 and 60 Hz, the DS-2 refrigeration dryers are suitable for use worldwide.

Boge Compressors Ltd
www.boge.net.au

RADAR LEVEL TRANSMITTER

At a time when experienced personnel are retiring and processes are being run closer to their capacity, Emerson Automation Solutions has launched a non-contacting radar transmitter that helps operators increase reliability and safety. The SIL 3-capable Rosemount 5408 non-contacting radar level transmitter uses enhanced technology and Human Centered Design to deliver accurate, reliable measurement and ease of use, supporting greater worker efficiency and plant safety.

To reduce complexity and enable less experienced workers to easily manage their level measurements for tank monitoring, process control and overfill prevention, the Rosemount 5408 has been designed to simplify operator tasks. Pictorial instructions and an intuitive software interface guide the operator through installation, commissioning, proof-testing, operation and maintenance. Enhanced onboard diagnostics support preventive maintenance and provide actionable information, streamlining the troubleshooting process. The ability to perform proof-testing and site acceptance tests remotely saves time, increases worker efficiency and reduces the reliance on highly experienced staff.

The Rosemount 5408 uses two-wire frequency modulated continuous wave (FMCW) technology that uses a continuous echo to maximise radar signal strength and produce a more robust and reliable measurement. In addition, radar-on-chip technology replaces a circuit board, thereby removing sources of EMC noise that can cause signal disturbance, improving measurement accuracy and reliability.

To further enhance measurement reliability, an embedded power back-up removes vulnerability to intermittent power losses.

Supporting efforts to increase plant safety, the Rosemount 5408's SIL 3 capability enables it to be seamlessly integrated into a safety instrumented system. ATEX and IECEx approvals allow installation in hazardous locations.

Emerson Automation Solutions
www.emersonprocess.com.au

AUTOMATIC PRESSURE CALIBRATOR

The Fluke 729 automatic pressure calibrator simplifies the calibration of pressure instruments by automatically generating precise test pressures, improving calibration integrity by compensating for leaks and automatically documenting the pressure calibration process. Technicians input a target pressure and the calibrator pumps to the desired setpoint while the internal control stabilises the pressure at the requested value, delivering more accurate results and speeding the calibration process.

The 729 features automatic pressure generation and control for multiple tests to 300 psi (20 bar, 2 MPa). Users can fill in a test template and the 729 automatically pumps to and documents a multiple-point pressure calibration test. Easy calibration documentation can be generated using defined templates for transmitters and switches. Users input the starting and ending test pressures and number of test points and the calibrator documents the applied pressure, measured mA and percentage error for each test point. The bright colour graphical display flags out-of-tolerance test results in red.

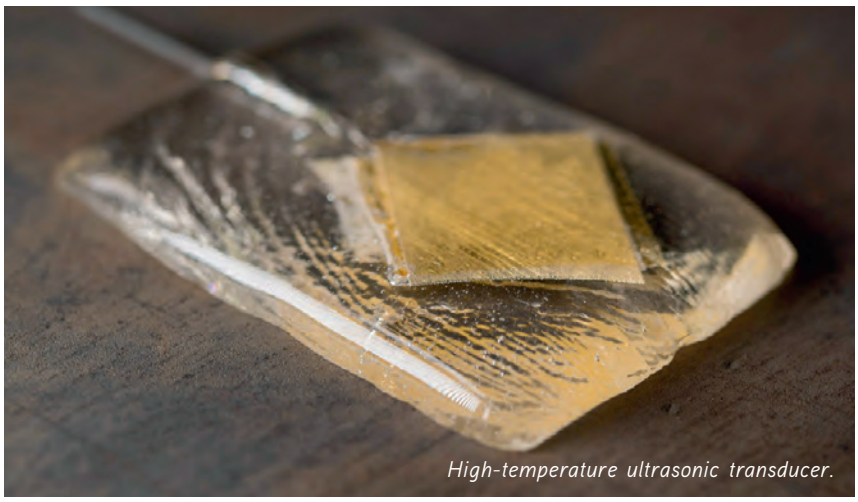
HART communication enables mA output trim, trim to applied values and pressure zero trimming of HART pressure transmitters, eliminating the need for an additional HART calibrator. Technicians can also perform light configuration tasks such as changing a transmitter tag, measurement units and ranging. The Fluke 729 also provides measurement of mA signals on transmitter outputs and sourcing and simulation of mA signals for testing I/Ps and other mA loop devices. It includes a 24 VDC loop power supply for testing and powering transmitters in standalone tests disconnected from the control system.

Fluke Australia Pty Ltd
www.fluke.com.au

Heat-resistant ultrasonic transducers

If a component such as a steam pipe in a coal-fired power station has a crack, corrosion or other flaw, repairing it is imperative. Ultrasonic sensors mounted externally can detect flaws like these, but only when the component does not heat up to more than around 200°C. Above that temperature, conventional piezoelectric materials can no longer determine pressure, force, voltage or acceleration or act as a gas sensor. Furthermore, at these temperatures any plastic encapsulations that are not heat resistant will fail.

Researchers at the Fraunhofer Institute for Silicate Research ISC have now successfully realised piezo sensors for high-temperature applications.



High-temperature ultrasonic transducer.

©Katrin Selsam-Geißler/Fraunhofer ISC.

"We have already implemented our sensors at temperatures of up to 600°C," said Dr Bernhard Brunner, head of the Application Technology department at Fraunhofer ISC's Center for Smart Materials. Additionally, the ultrasonic sensors remain stable over long periods — at least two years in any use case — and for many applications, researchers expect a service life of several decades.

The principle is the same as for other piezo sensors: they are mounted externally on the component; for instance, on a hot steel pipe. When an alternating voltage is applied to the piezoelectric crystal, it mechanically deforms and sends an ultrasonic wave into the material. After the sound wave, the sensor switches to receive and detects the signal reflected by the component. In most cases, it receives the same original signal it sent. However, if the component is cracked or has a corroded spot, the defect alters the reflected signal and indicates the defect's location. When several transducers are used that serve as transmitter and receiver, the location of the flaw can be pinpointed exactly to within a few millimetres. Depending on the component's material, the sensor's range covers a few metres.

The challenge lies in constructing standard piezoelectric crystals that can withstand long-term use as sound transducers on hot components. Especially problematic is the adhesive that coats the sensors and attaches them to the component: it can't withstand very high temperatures.

"That's why we use glass solder as both a glue and a housing material," explained Brunner. This means the glass belonging to this group of adhesives must withstand not only heat, but in particular the several hundred degrees difference between the ambient temperature in the room and the operating temperature of the component.

While the steel in the component expands significantly when it is heated, the dimensions of the crystal change only marginally. The glass solder in which the sensor is embedded has to endure these deformations without shattering. To this end, the researchers coat the sensor with multiple layers consisting of different glass solders that are perfectly compatible with each other as well as with the component's material specifications. The corresponding glass solders, as well as the process technology and processing technique, all come from Fraunhofer ISC. To ensure that the electric signalling lines do not corrode at high temperatures, the feed lines are made of precious metals such as platinum.

There are numerous possible applications for the high-temperature ultrasonic transducer: for example, the researchers can also use their sensors for contactless measurements of how much of a hot liquid — such as oil — flows through a pipe or of the temperature of a gas or a liquid. While a probe takes a few seconds to ascertain the exact temperature, the ultrasonic transducer can provide a result within a few milliseconds. It measures temperature based on sound velocity, which is temperature dependent.

Fraunhofer Institute for Silicate Research ISC
www.isc.fraunhofer.de/en.html

WILL YOU BE PART OF THE WORKPLACE HEALTH & SAFETY SECTOR'S PREMIER EVENT IN 2017?

SAFETY 2017 CONNECT

enhancing the future for health & safety professionals

16–17 AUGUST 2017 Rosehill Gardens, Sydney

KEYNOTE SPEAKERS:

Dr Karen McDonnell
Immediate Past President
IOSH
(United Kingdom)

Stephen Woolger
Manager Health & Safety
Gold Coast 2018 Commonwealth Games Corporation

SPEAKERS INCLUDE:

Glenn Barlow
Product Services Global Sales Manager
SAI Global

Michael Tooma
Partner
Clyde & Co

Tim Fleming
General Manager HSE – Australia Hub
Laing O'Rourke

Anna Blaikie
Head of Health Safety and Environment – Pacific
CBRE

René van der Merwe
Head of Workplace Health & Safety
Qantas

Christian Frost
Head of HR Program Delivery and WHS
News Corp Australia

Geoff Hurst
President
Risk Engineering Society, Engineers Australia

Dr Peta Miller
Strategic WHS Advisor
Safe Work Australia

NAMING PARTNER:

GIO WORKERS COMPENSATION

EXHIBITORS:

SIGN VIZ
HEIGHT SAFETY
PRO SAFETY GEAR prosafetygear.com
move 4life
uvex
ProVisual PUBLISHING PTY LTD
SCRIM SAFETY FIRST
AssistEM
THORZT HYDRATE. ENERGISE. PERFORM
PRATT SAFETY SYSTEMS

www.safety-connect.com.au

INTERESTED IN EXHIBITING OR SPONSORING? Contact Narelle Granger: ngranger@wfmedia.com.au or 02 9487 2700

Organised by:

NSCA Foundation Ltd

wfmedia westwick-farrow media

Media partners:

National safety PROTECTING YOUR MOST IMPORTANT ASSET: PEOPLE

safety solutions health & safety at work

NON-INTRUSIVE TEMPERATURE INSTRUMENT

Emerson Automation Solutions has introduced its X-well Technology with a Rosemount 3144P transmitter in addition to its original WirelessHART X-well Technology to extend this non-intrusive temperature sensing technology to a conventional wired I/O environment.

Users have found X-well to be a useful replacement for difficult thermowell installations, which often have a wired connection already available and can be re-used with the wired version of X-well. The technology works by measuring the pipe surface temperature and ambient temperature, combining this information with an understanding of the thermal conductivity properties of the installation and process piping to produce a process temperature measurement.

The technology provides process temperature measurement without requiring any intrusions or penetrations into the process, allowing for quick and easy installation along with simplified long-term maintenance. Users do not have to design, size or maintain thermowells. Wake frequency calculations are eliminated, as well as time spent determining material compatibility, the right insertion length and the necessary profile.

Applications that can benefit from the technology include pipelines, small line sizes, high-velocity flows, slurries, heavy particulate fluids, wellheads, clean-in-place processes, high-viscosity fluids and harsh processes in the oil and gas, chemical, refining, food and beverage, metals and mining, pulp and paper, and other industries.

With X-well Technology, users can also add temperature measurement points without having to shut down a process. X-well Technology instruments can be installed with a standard pipe clamp procedure and ordinary hand tools.

Pairing an X-well Technology pipe clamp sensor with the 3144P transmitter combines the versatile sensing technology with a widely used temperature transmitter. Users can now quickly add temperature measuring points wherever they can provide the greatest benefit and choose between a conventional wired or a WirelessHART connection.

Emerson Automation Solutions
www.emersonprocess.com.au

SOLID-STATE CABLE-PULL SWITCH

The Allen-Bradley Guardmaster Lifeline 5 cable-pull switch from Rockwell Automation is a solid-state, cable-pull e-stop with microprocessor-based technology.

Traditional cable-pull switches are prone to nuisance trips and unreliable operation due to temperature-based changes in cable tension. The solid-state operation of the Lifeline 5 cable-pull switch offers an electronic rope-monitoring system to compensate for thermal expansion and cable sag.

The switch provides constant access to the e-stop function, stopping a machine hazard with a simple pull of the attached cable. The microprocessor-based solution simplifies set-up and allows for more efficient maintenance and troubleshooting. The easy-to-see LED indicators assist in cable tensioning for quick, precise set-up while providing switch status and diagnostics during operation.

The unit is available in diecast aluminium or rugged stainless steel housings with IP66 and IP67 environmental ratings, respectively. The diecast aluminium model also offers an optional, integrated e-stop button for greater application flexibility.

Rockwell Automation Australia
www.rockwellautomation.com.au

TRANSPONDER CODED SAFETY SENSORS

Balluff is expanding its safety range with transponder coded safety sensors. They are connected directly to the safe Balluff IO-Link I/O module or to any safety controller using standard M12 connectors.

The transponder coded safety sensor is suitable for monitoring guard doors and flaps. Since the passive RFID transponder is uniquely identified by the sensor, high coding levels and accordingly high bypass protection can be implemented. The generous detection range of the sensor also makes it insensitive to vibration and mechanical play on the protection device, and the detection range simplifies installation.

The compact size offers users greater flexibility in integrating the device into the application. The devices can be used in applications up to PLe and SIL 3 due to the integrated safety logic and the OSSD output stage.

Balluff Pty Ltd
www.balluff.com.au

CORROSION-RESISTANT ALUMINIUM DRIVES

NORD Drivesystems nsd tupH aluminium drives offer permanent corrosion resistance through a sealed surface conversion system.

The drives are given a smooth, ultrahard surface which, in contrast to paint, is unaffected by blows or scratches. The drives have been tested in wet applications and are resilient against blistering and corrosion as per ASTM and ISO standards. The unit showed no loss of adhesion or chipping during the spray test and produced no corrosion even after 2000 h.

In demanding atmospheres, the drives can be used beyond the usual service life of paint-coated systems. Their resilience and prolonged service life reduces service and maintenance requirements. In addition, the treatment ensures high process safety: since no coating is applied but the surface itself is hardened, there can be no pollution of products or process media as, for instance, with chipping paint. Even heavy impacts or scratches do not diminish the corrosion resistance.

nsd tupH is available for all aluminium-enclosed drives — four gearbox families, smooth-surface motors and distributed drive electronics units. Treated systems resist cleaning agents in the 2–12 pH range.

NORD DRIVESYSTEMS (Aust) Pty Ltd

www.nord.com

THE CONNECTED MINE

Paul McRoberts, Regional Industry Manager – Mining, Rockwell Automation

Seamless connectivity and information sharing can improve business performance, increase yield and reduce safety risks.

A volatile commodities market has impacted mining companies' profitability and sustainability in recent years. Whether this situation continues for the foreseeable future or a turnaround is just around the corner remains to be seen, but the fact is it's having a transformative effect on mining operations and business priorities.

Today, mining companies are focusing their operational investments on areas that can help them maximise yield recoveries and improve operating efficiencies while still meeting regulatory requirements and maintaining safe or 'zero harm' working environments. They're also seeking opportunities to better utilise their shrinking pools of skilled workers, and to gain new flexibility to meet future supply chain demands.

Connected or 'smart' operations can help in all of these areas. Greater connectivity and information sharing can help mining companies better understand their operations, improve their performance and reduce safety risks. However, the legacy systems in place at most mining companies today lack the connectivity and embedded intelligence to realise these benefits. Instead, companies must incorporate new systems and technologies that enable seamless connectivity across people, processes and technology, and that provide scalability for future growth and expansions.

The power of information

Some of the largest mining companies in the world are already harnessing the power of connected operations to significantly transform their operations. They're using connected devices and smart machines to capture real-time process information and make better business decisions. They're gaining deeper insights into their equipment to improve asset productivity. They're identifying and reducing variability across their processes. And they're using greater connectivity to establish remote-operations centres and support autonomous material transportation.

Beyond these operational benefits, companies are using better connectivity to help better track employees for enhanced safety and improved metal accounting, and to achieve significant energy savings.

This is the connected mine. It's created from the convergence of traditionally separate information technology (IT) and operations technology (OT) systems into a single, unified network infrastructure that allows for seamless connectivity and information sharing across the mining enterprise. It's enabled by emerging technologies for the mining sector, such as advanced diagnostics, cloud computing and remote access. Cloud solutions, for example, can be used for important safety and security communications such as underground ventilation information to keep workers appraised of environmental conditions.

Companies can harness the power of a connected mine to capture greater value from their operations in three key ways:

- Operational intelligence.
- Reduced safety risks.
- Remote and autonomous operations support.

Operational intelligence

The controllers, smart devices and software within a connected mine's operations can access and collect data that historically was trapped in a mining company's machines and processes. This data can be integrated both horizontally, such as with other machines, and vertically, with operational and enterprise systems to help streamline data management and reduce islands of automation.

Analytics software in a connected mine can collect data from thousands of points and contextualise it into actionable information, enabling operators to have complete visibility on plant conditions and act on it. This information can be shared across the enterprise on role-based reports, dashboards and KPIs to help drive better decision-making across multiple job functions:

- Mining equipment operators can track KPIs such as overall equipment efficiency (OEE) and mean time between failures (MTBF).
- Maintenance technicians can monitor asset health to support predictive maintenance and reduce unexpected downtime occurrences.
- Quality managers can review ore grade and monitor product quality.
- Site managers can view cross-operations data and metrics areas such as the real-time cost of production.
- Executives can compare operations in real time against commodity prices and make adjustments accordingly.

"The future of mining operations will approach fully untended equipment. Autonomy will benefit performance metrics, while improving safety for the labour force. By automating tasks with autonomous systems, the operation becomes a safer place for employees and also frees up their time to do tasks which are less repetitive and require greater skills levels." – Sal Spada and Scott Evans, ARC Advisory Group

> A CONNECTED MINE IS TRANSFORMATIVE BUT IT DOES NOT NEED TO BE A COMPLETE OVERHAUL OF A COMPANY'S EXISTING INFRASTRUCTURE. MUCH OF THE DATA SOUGHT ALREADY EXISTS WITHIN A COMPANY'S SYSTEMS — IT JUST LACKS A MEANS OF BEING COLLECTED, ANALYSED AND SHARED.

Unearthing better insights

Data can be collected from virtually any aspect of a connected mine's operations, providing numerous insights into how and where improvements can be made. Some examples include:

- **Daily targets:** Predictive visibility on delays, real-time tracking of performance against plans and visibility into emerging machine health issues to help meet daily targets.
- **Production variability:** Feed and processing rates enable managers to compare each work shift's performance against daily and hourly production targets, or for their conformance to specification. This operations visibility can help identify and reduce production variability.
- **Predictive monitoring:** Reporting and information models use real-time data to create leading indicators that can help predict production outcomes, chokepoints and equipment failures.
- **Asset performance:** Throughput sensors that measure feed and processing rates, flow, viscosity and other variables can help maximise asset performance.
- **Condition monitoring:** Equipment sensors that monitor vibration, wear and heat can provide valuable condition-monitoring insights to help companies stay ahead of costly unplanned failures.
- **Throughput:** Intelligent systems with abnormal-situation-management capabilities can allow workers to focus on high-value non-repetitive tasks and operational process improvements to help improve productivity and throughput.

"The condition monitoring system identifies at least 10 pending failures per year, and at an average repair time of 10 hours per incident, the downtime saved is very significant to the business." – Scott Liddell, senior electrical engineer, Newcastle Coal Infrastructure Group

Key business benefits

The benefits of greater operational intelligence can add up and have significant business impacts.

For example, mining companies are required by law to conduct metal accounting to calculate the amount of saleable metal being recovered during a specific period of time. Control systems in a connected mine play a crucial role in predicting recoveries, calculating the amount of metal produced and generating data — and then delivering that information to the financial side in real time to provide the latest and most accurate information available. The result is better record keeping for regulatory agencies.

Energy management is another key area. Mining operations in Australia have experienced a 70% increase in energy consumption in the last 30 years, and energy costs now account for up to 15% of total input costs, according to the Australian government's Energy Efficiency Exchange initiative.

A connected mine can collect data from various equipment and distributed points across a mining operation to help operators and managers receive more accurate energy reporting and forecasting, identify leading causes of energy inefficiency, and optimise asset utilisation and energy efficiency without impacting outputs. It also can help operators make critical adjustments on the fly, such as keeping a mine running at reduced capacity following failure of a major piece of process equipment such as a ball mill.

Greater connectivity and information sharing in a connected mine also can open the door to IT savings. For example, virtualisation decouples physical computer assets from their operating systems and software. This can allow multiple virtual machines to run from one computer to optimise server and workstation assets, and reduce industrial-computing maintenance demands. It also allows the same software to remain in place even as computer assets are replaced or upgraded, which can help reduce engineering expenses and avoid downtime.

Reduced safety risks

A connected mine offers new opportunities to enhance safety and reduce risks for workers. RFID tags and wireless technology can

Four tips for creating a connected mine

1. **Modernise and standardise control equipment and software** for system interoperability across the entire mining enterprise and consistent performance measurement across sites.
2. **Use production intelligence software** to obtain a cohesive view of seemingly disparate mining data. Such software can provide context for relationships among mining equipment, raw materials, ore and people to help optimise process control and maximise production. A modern distributed control system with integrated control and information-gathering capabilities provides the means for collecting the intelligence and acting on it.
3. **Use model predictive control (MPC) software** to help operators push equipment to its limits. MPC software has been shown to successfully increase throughput by up to 8% in mining applications, as well as reduce variability by 45% and emissions by 35%.
4. **Deploy a defence-in-depth (DiD) security approach** to mitigate potential risks. While the connected mine promises tremendous benefit, it also brings security concerns to the forefront. DiD is a recommended best security practice that uses multiple layers of protection through a combination of physical, electronic and procedural safeguards.

help managers keep track of how many workers are underground or located on a mine site at any given time. Should something happen, they can immediately identify how many people are on-site and who's where.

Video camera, voice and display technologies connected to a network also can be used to monitor and communicate with employees should a safety incident occur. Wireless cameras can be placed nearly anywhere within a mine to help track employees in even the most rugged environments, while digital media signage systems can deliver safety warnings or emergency instructions to workers.

From an analytical standpoint, the ability to collect and analyse data surrounding safety-related events can help teams better understand the factors that led to these incidents or identify particularly incident-prone processes. From there, processes can be adjusted or safety training can be refined, as needed.

"Detailed analysis of mining safety information is key to understanding the current and historical safety experience and how to advance this forward. Advanced data analytics is the cornerstone of safety analytics. It can be applied to the simple investigation of accidents or to sophisticated statistical modelling and data mining." – Deloitte, "Mine Health and Safety – Striving to Achieve Zero Harm"

Remote and autonomous operations support

Remotely connected operations have the potential to transform how companies operate their mines, enabling them to monitor and run processes for dispersed operations that are located hundreds or even thousands of miles apart from one central location.

BHP is doing just that with its Integrated Remote Operations Centre (IROC). Situated in Perth, Australia, the IROC houses the company's planning, scheduling, controlling and analysis teams to coordinate all activities across its iron-ore operations in Western Australia. A purpose-built control floor gives workers real-time visibility into the iron ore network and hosts mine control, plant control, rail control, port control and on-the-day scheduling.

"The IROC will play an integral role in increasing the system-wide availability, utilisation and rate of our existing assets. It allows us to look at the 'bigger picture' of our operations and benefit from collaboration and coordination across the different functions in the IROC." – BHP

Remote-access technology also offers new ways for experts to support dispersed operations from a single location. This could include remote monitoring of equipment and alerting on-site workers should an issue arise — or even virtually logging in to help address the issue. It could also include remotely connecting with on-site employees through a mobile video feed for maintenance and troubleshooting, which can reduce travel burdens put on a company's experts and help resolve downtime issues faster.

Extending a connected mine's reach into the supply chain can help companies better coordinate the transportation of mined metals. Global mining companies are already transporting materials using autonomous trucks and trains that can be tracked and controlled from a central location, achieving true 'pit-to-port' connectivity.

The data's already there

A connected mine is transformative but it does not need to be a complete overhaul of a company's existing infrastructure. Much of the data sought already exists within a company's systems — it just lacks a means of being collected, analysed and shared. Taking the necessary steps to migrate control systems and pull together historically disparate systems will create the foundation to mine this data, reduce safety risks and achieve a new level of operational intelligence to improve productivity and global competitiveness.

Rockwell Automation Australia
www.rockwellautomation.com.au

REMOTE VISUAL INSPECTION SYSTEM

The GE Everest Ca-Zoom 6.2 remote visual inspection system provides still image and motion video capture with high-intensity lighting and an integrated temperature warning system. It has an advanced camera set-up, integrated image capture and full motion video recording capabilities. It is available to rent from TechRentals.

The Ca-Zoom has the option of interchangeable camera heads which include the PTZ-70 and the PTZ-140. The PTZ-70 camera head offers 10x optical zoom and 4x digital zoom and is equipped with eight 5 W LED lights. The PTZ-140 camera module incorporates 36x optical zoom and 12x digital zoom and is fitted with two 35 W lights with narrow and wide beam spreads.

The Ca-Zoom's remote viewing capabilities enable users to reach into confined spaces such as tanks, towers and pipes to conduct inspections of such things as corrosion, welding and cleaning. It is capable of both in-air or underwater operation, and is supplied with a 1.8 to 3.6 m telescopic mounting pole and 30 m of cable.

TechRentals

www.techrentals.com.au

SYSTEM DESIGN SOFTWARE

NI has announced LabVIEW NXG 1.0, the first release of the next generation of LabVIEW engineering system design software. LabVIEW NXG is claimed to bridge the gap between configuration-based software and custom programming languages with an approach to measurement automation that empowers domain experts to focus on the problem, not the tool.

The 1.0 release of LabVIEW NXG is designed to help engineers performing benchtop measurements increase their productivity with updated non-programming workflows to acquire and iteratively analyse measurement data. These non-programming workflows simplify automation by building the necessary code behind the scenes. For instance, engineers can drag and drop a section of code equivalent to 50 lines of text-based code.

LabVIEW NXG introduces a re-engineered editor with functionality that experienced LabVIEW users often request. The refreshed editor is said to further extend the openness of LabVIEW to integrate with a broader set of languages. It is designed to improve programming productivity by streamlining the editor micro-interactions, user interface objects based on vector graphics and zooming capabilities.

NI is also releasing LabVIEW 2017 with capabilities to target the development, deployment and management of large, complex and distributed test and embedded applications. These include features that enhance interoperability with standard IP and standard communications protocols such as IEC 61131-3, OPC UA and the secure DDS messaging standard.

National Instruments Australia Pty Ltd

www.ni.com

HYGIENIC AIR/WATER HEAT EXCHANGERS

Rittal has revamped its air/water enclosure heat exchangers and now offers two variants of hygienic design. Air/water heat exchangers for wall mounting can supply cooling outputs of either 0.65 or 1.2 kW.

The attachment to the enclosure has been designed so that screw fastenings are not visible from the outside. The enclosure is made from stainless steel with a brushed grain size of 400, producing a surface roughness Ra of less than 0.8 μm.

The silicone seal between the enclosure and the case prevents the transfer of colourants, flavourings and unwanted odours, and eliminates gaps between the air/water heat exchanger and the enclosure. The seals are available as spare parts, easily replaced in the event of mechanical damage and dyed blue in accordance with FDA Guideline 21 CFR 177.2600. The flat seals on the water connection fittings are likewise dyed blue and geometrically designed to sit flush against the shape of the fitting. A metal-end stop prevents compression of the seal so that edges cannot protrude and allow contaminants or microorganisms to accumulate.

The top of the heat exchanger enclosure tilts forwards by 30°, preventing objects from being deposited and ensuring that liquids run off quickly. The units offer protection categories of IP56/59.

The units have C-UR and CSA approval, and the hygienic design was tested in accordance with GS-NV 6. The devices comply with standard DIN EN ISO 14159:2008 and are suitable for use in the food sector in conformity with DIN EN 1672-2:2009.

Rittal Pty Ltd

www.rittal.com.au

SAFE ROTARY ENCODERS

The CDV75M and CDH75M safe rotary encoders can now be used directly with safety-oriented EtherCAT networks, as they support the Functional Safety over EtherCAT (FSoE) protocol and transmit safe speed and safe position values.

The measured values are acquired by two independent scanning units, with reliability ensured by a cross comparison of the data. The rotary encoders are certified and can be used in safety functions where safety levels of SIL3 or PLe are mandated.

Safety is integrated directly into the rotary encoder; no further evaluation units or safety modules are required. This means a considerable reduction in wiring and configuration is accomplished. During configuration, parameters such as difference and standstill window, and direction of rotation or integration time, are set directly via the safe parameterisation channels per the FSoE protocol.

During standstill, the rotary encoder output value can be moved to within the measuring range by means of a safe protocol, without mechanically turning the shaft. This simplifies adaptation of the mechanical system. At the same time, position and speed can also be read out via non-safe, or 'normal', EtherCAT protocol. The position values are therefore also available for quick position control outside the secure data range.

Safety over EtherCAT enables new system layouts including cooperative workstations, where operator and machine can share the same workspace efficiently and safely.

Leuze electronic Pty Ltd
www.leuze.com.au

NEW PRODUCTS

VALVE MATRIX SOLUTIONS

Processes in hygienic industries such as beverage, food, dairy, pharma and personal care are becoming increasingly complex. Some of the challenges include higher volumes, increased efficiency, and reduction in water and energy use. That is why it is essential to optimise flow management without compromising flexibility, plant safety, product quality or hygiene.

A valve matrix — also known as valve cluster — helps to maximise process efficiency through optimised flow management. Compared to traditional flow plates, a valve matrix is designed to allow simultaneous circulation of liquids — including CIP — on several levels, with the exact number of lines and rows to match the specific requirements of the process. The matrix ensures the flexibility to run multiple products to multiple destinations, while other lines are being cleaned.

Alfa Laval provide prebuilt valve matrices customised to meet specific, individual requirements, helping to ensure efficient flow management using as few components as possible and dealing effectively with key issues such as thermal cycling, cleanability, drainability and flow control.

Alfa Laval valve matrices can be supplied preassembled and pretested, as well as fully wired and with all the necessary pneumatic tubing, junction boxes and control panels preconnected. Complex installations can be brought online as quickly as possible, saving time and avoiding lost revenue associated with on-site assembly, troubleshooting and downtime.

Alfa Laval Pty Ltd
www.alfalaval.com.au

PROCESS MONITORING TRANSMITTER

Endress+Hauser has expanded its transmitter platform with the release of the Liquiline CM44P transmitter.

Liquiline CM44P offers the possibility of combining process photometers and Memosens sensors in one transmitter. Processes such as fermentation, filtration, phase separation and filling require monitoring of multiple parameters. Optical sensors for cell growth, turbidity and colour monitoring can now be combined with Memosens sensors for pH, conductivity and dissolved oxygen.

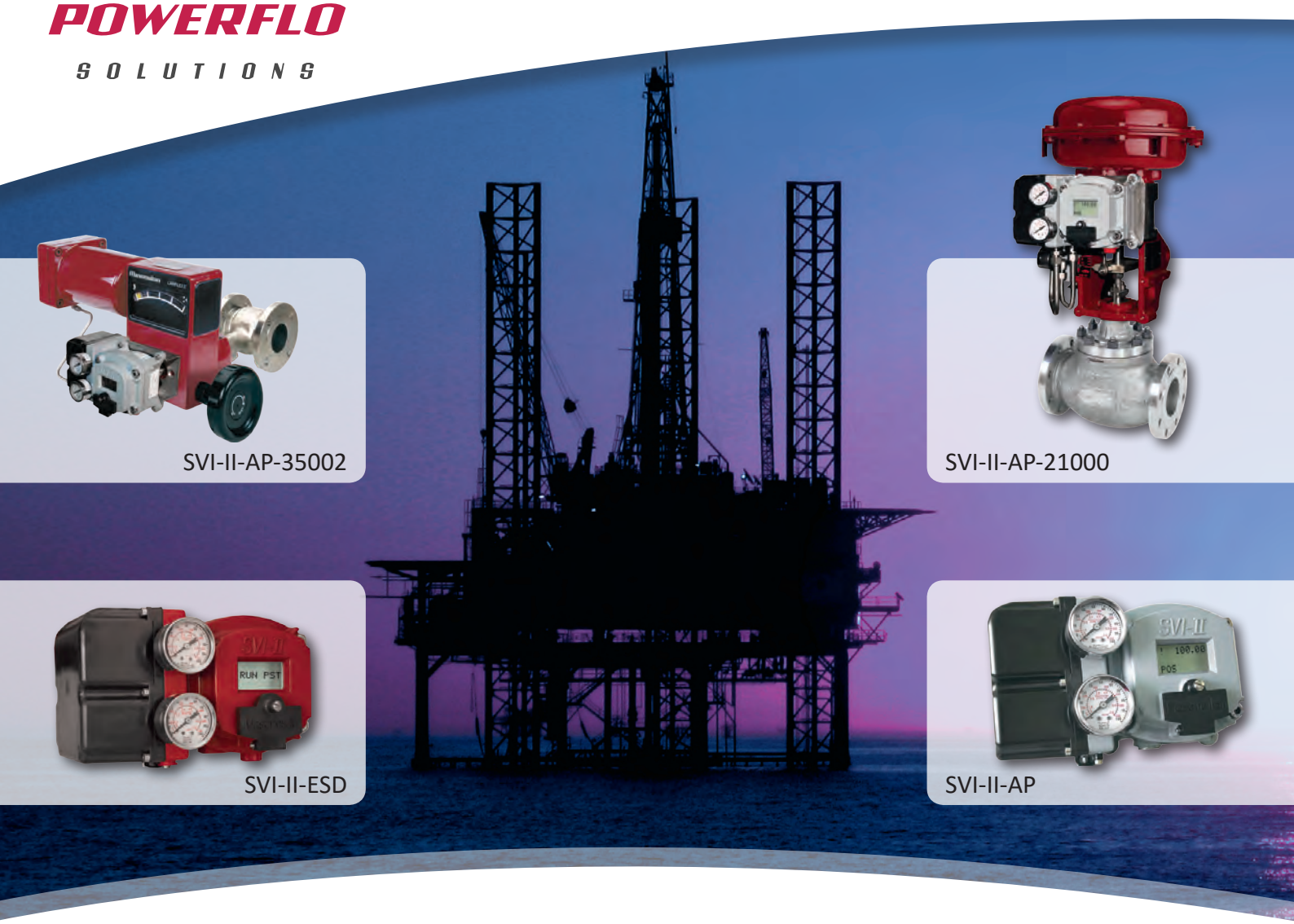
Liquiline CM44P takes inputs from up to two process photometers and four Memosens sensors simultaneously allowing plant managers to obtain all quality control-related parameters from one transmitter. Liquiline CM44P offers multiple I/O options designed to lead to perfect adaptability to a wide range of applications. It also speaks common communication protocols such as HART, PROFIBUS, Modbus and EtherNet/IP, which means it can be seamlessly integrated into distributed control systems.

Standardisation on a single transmitter platform such as Liquiline brings the benefit that all devices operate in the same way, reducing potential operating errors while also reducing capital and installation costs. Furthermore, with its modular design, the CM44P transmitter can be customised and expanded to exactly suit both current and potential future requirements.

Endress+Hauser Australia Pty Ltd
www.au.endress.com

POWERFLO SOLUTIONS

Engineered Control Valves, Regulators, Relief Valves and Process Instrumentation



SVI-II-AP-35002

SVI-II-AP-21000

SVI-II-ESD

SVI-II-AP

Masoneilan SVI II AP Digital Valve Positioner

- Field-proven non-contact position sensor or remote-mount positioner feedback
- Field upgradable options and firmware
- Explosion proof external LCD & pushbuttons
- Standard or high flow capacities eliminating or reducing the need of additional accessories (Booster, Quick exhaust…)
- Two (2) configurable and built-in isolated solid-state switches
- Industrial Aluminium or 316 Stainless Steel housing
- IEC Certified EEX ‘d’ & ‘ia’ enclosure
- Universal design for all types of linear and rotary Valve applications!!

Masoneilan SVI II ESD Controller

- The first SIL 3 Smart ESD device that is LIVE during and after a shutdown
- Analog safety demand (ASD) or discrete demand (DSD) and 4-wire analog setpoint with DSD (A/DSD) outputs
- ESD health monitoring and PST Auto-Archiving
- Embedded local control panel & explosion proof buttons for:
  - Valve configurations & calibration
  - Local PST
  - PST, Safety trip and device data
  - Position feedback
- 70 + ESD warnings
- No Solenoid Required!!

Quality Control Solutions
Advanced Digital Technology
Global Customer Service

1300 658 701
sales@powerflo.com.au
www.powerflo.com.au

Masoneilan

CLOUD ROBOTICS

H Pei-Breivold, K Sandström, L Rizvanovic, M Lehtola, S Azhar, R Kulläng, M Larsson, ABB

Few doubt that in the near future, robotics will fundamentally change production systems and dramatically increase their level of automation. To do so, robots will have to figure out for themselves how to solve problems and adapt to dynamic environments. This can be achieved by exploiting the IoT to facilitate the creation of new technology involving large-scale data propagation, stream analytics and machine learning.

It is predicted that the use of robotics in manufacturing and automation will increase significantly in the near future and that this growth will drive a major expansion of the industrial robot market[1]. These expectations are predicated on industrial robots finding their way into many more automation scenarios than is currently the case.

Today, industrial robots can tirelessly repeat complex tasks with high precision — for example, welding, painting, automobile production and certain types of assembly. However, there are many other manufacturing or assembly scenarios that would benefit from robotic automation but that are challenging to automate. This can be due to, for example, short production runs or environments that are not well enough controlled. In many of these cases, humans currently play an important role. If the use of robots is to be extended to these challenging scenarios, robots have to become more flexible, easier to program and more autonomous. Further, at

the same time as robots need to more intelligently use information provided by humans and the environment, robots also need to channel information to humans in a more intelligent way. They can do this by analysing known information, extracting knowledge from it and making that knowledge easily accessible also to non-experts.

The importance of IoT and cloud technologies

With commercial Internet of Things (IoT) and cloud technologies, it is currently possible to transport large amounts of sensor data and other information from devices to data centres. Within the data centre, stream analytics can be used to process the device information in real time for filtering, selection and aggregation.

The processed information can be fed into different cloud services such as business intelligence (BI) tools that turn raw data into tables and graphs — giving instant insight into production situations. The information can also be used by machine-learning packages to make predictions — for process optimisation or predictive maintenance, for example. Many such highly scalable and cost-effective services that can analyse large quantities of data in data centres are already available.

It is, of course, imperative that such analysis is done safely, securely and with full data integrity. Also, reliability and availability levels must be maintained.

By increasing robot capabilities using IoT and cloud technologies, and by locating most storage, analysis and large-scale computation in data centres, future requirements for robot intelligence can most likely be met without any increase in the cost or physical size of controllers.

Motivation

The ways in which the IoT can help improve operational performance in robotic production scenarios can be illustrated by considering an example: In a small-part assembly cell, two robots are working collaboratively. Small parts come in on two separate feeders. The robots pick parts from their respective feeders, assemble them and put the assembly on a conveyor belt. An operator or a production manager can use a mobile device to monitor the production status and obtain information about the devices in the production cell at any time and from any location. Device predictive KPIs can also be checked so that maintenance decisions can be made.

In the case of a sudden disturbance — such as one feeder slowing down due to an assembly part supply problem — information is exchanged between the robots, feeders and conveyor belt, which all adapt their rate of operation to accommodate the new circumstances. The operator is notified of the situation via their mobile device. If operational performance is within a certain tolerance, they may decide not to interrupt the production process. Or, in the case of a faulty feeder, they may check the KPIs of the devices and find out that a service technician is shortly due to replace some parts on that feeder. This may mean the system can be run in its current state until the service occurs, meaning a possibly costly immediate production shutdown can be avoided.

Solution strategy

The scenario just described involves industrial robotics control, and networks of sensors and actuators that demand real-time and predictable temporal behaviour of the robot control system. A further requirement is a set of intelligent robot service features that can be deployed using IoT technologies to improve operational performance on the factory floor. One way to make this constellation of requirements a reality is to:

- enable data sharing among connected robots and other devices within a production cell;
- host real-time robot applications that require very low and predictable latency at the network edge or in the robot controllers;
- connect to a remote data centre for large-scale BI and data analytic capabilities.

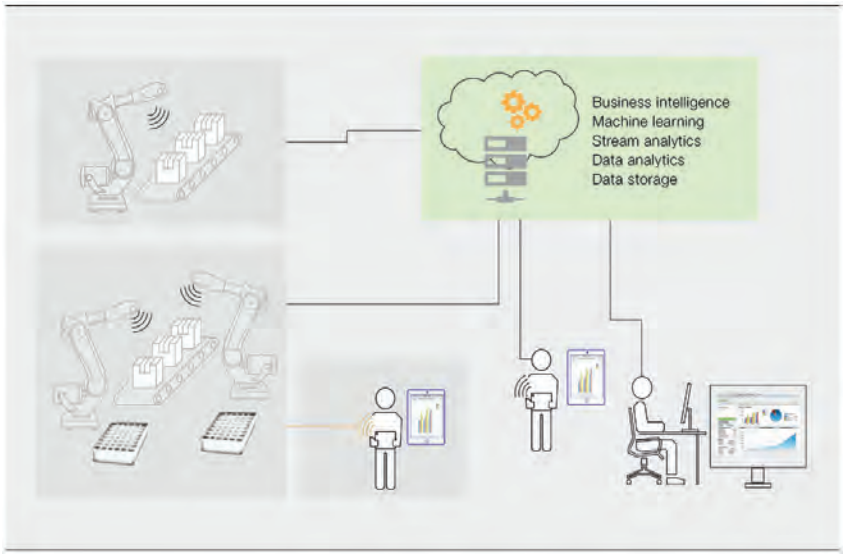


Figure 1: Industrial IoT from edge to cloud.

> IF THE USE OF ROBOTS IS TO BE EXTENDED TO (MORE) CHALLENGING SCENARIOS, ROBOTS HAVE TO BECOME MORE FLEXIBLE, EASIER TO PROGRAM AND MORE AUTONOMOUS.

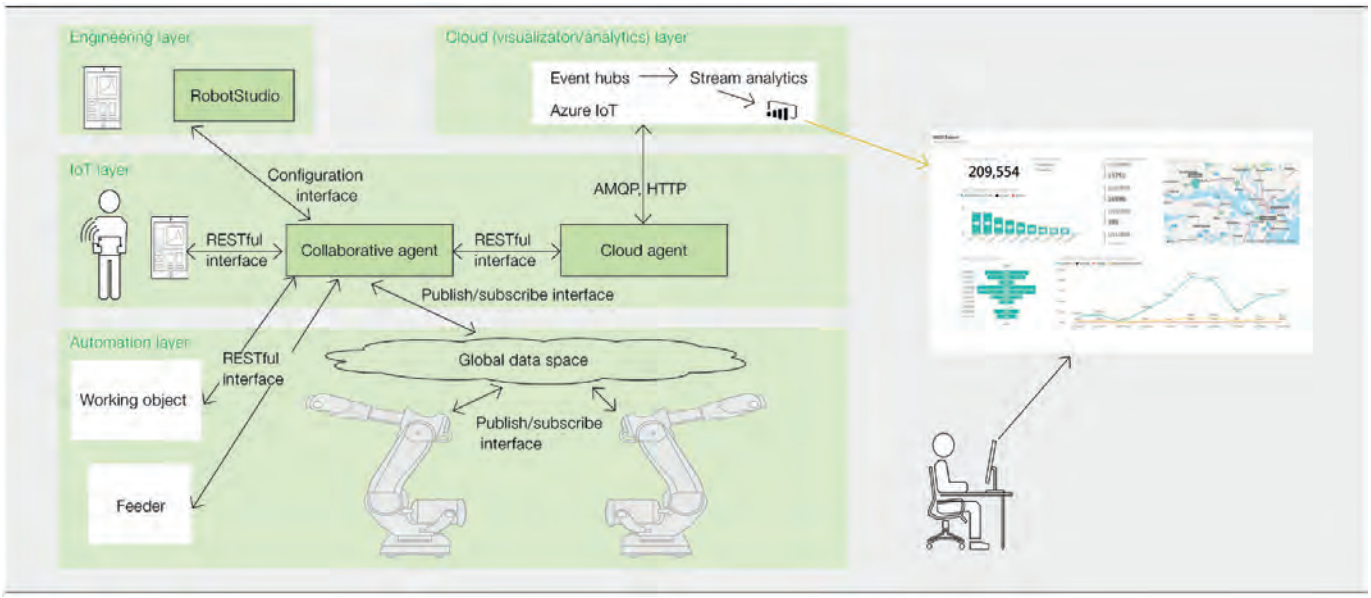


Figure 2: System architecture for a scalable collaboration platform.

In this way, additional cloud-based service solutions can be offered to customers, such as easy access to, and visualisation of, production data in the cloud. Moreover, by utilising cloud infrastructures that can provide elastic computation resources and storage, new intelligent robot services centralised on BI and data analytics can be developed (Figure 1). Examples of these are machine learning and advanced analysis of large datasets of robot information collected during operation life cycles.

End-to-end concept and technical solution

To realise the solution strategy just described, an example of a scalable collaboration platform that enables information sharing between connected industrial robots, other industrial devices in a production cell and people is shown in Figure 2. Such a platform, when it becomes a final product, will offer ease of use with respect to configuration, for example, discovery of robots, connecting robots for collaboration and service provision.

In the platform's automation layer, real-time data exchange between robots is enabled through publish-subscribe middleware technology, such as the data distribution service (DDS) framework. One device publishes information on a topic and other interested devices can subscribe to receive it. Subscriber devices do not need to know where information comes from as context data is also provided to tell the subscriber devices what to do with the information.

The devices exchange information through a virtual global data space. The robots and the feeder mentioned in the example above could, for instance, exchange information (current position, speed, etc) through this global data space.

Not all devices in a production cell may be suitable for participation in a publish/subscribe framework. This can be due to, for example, accessibility limitations of third-party devices or finite computing power. Such devices can, however, interact with robots and other devices through a lightweight RESTful interface, which is provided by a collaborative agent in the IoT layer. RESTful interfaces are based on REST (representational state transfer) — a web architecture that takes up less bandwidth than other equivalent architectures and that simplifies connection of diverse clients. The collaborative agent can be deployed on any device (including the robot controller) on which the published/subscribe framework can be installed. The RESTful interface is also employed by the different mobile devices that are

used for production cell monitoring, as well as by a cloud agent. The cloud agent, deployed on a robot controller or some other device in the production cell, uses AMQP (advanced message queuing protocol) and HTTP as an interface to send data to or interact with the cloud layer.

The proposed cloud layer in the architecture enables increased service opportunities by connecting the devices in the production cell, or the production cell itself, to the cloud. A cloud platform is used such as Microsoft Azure IoT Suite[2], which offers a broad range of capabilities — for example, data collection from devices, stream analytics, machine learning, storage and data presentation. In particular, such a solution would consist of an IoT client, an event hub (which acts as an event ingester), stream analytics and a self-service BI solution. The cloud agent sends robot data to the event hub. The stream analytics service consumes that data and enables stream processing logic (in a simple SQL-like language) to be run. The results of this processing are sent to the BI application, which carries out the monitoring and visualisation of the production data.

In the engineering layer, two types of applications are distinguished: web-based simplified configuration applications and desktop applications for advanced configuration of the robots and the rest of production (such as ABB RobotStudio).

Grasping the future

Using IoT technology to connect things, services and people will change the everyday life of users and enable intelligent industrial operations. Imagine that the small parts in the example scenario described earlier have attached to them smart tags that allow, via wireless communication, the transmission of certain types of information — for example, CAD drawings, item description and handling instructions — to robots and operators. The dissemination of such information could, for example, allow the adjustment of robot grasp planning with the available grippers when there are changes in the types of small parts. At present, this is an offline and manual task.

The key idea of utilising the IoT in this way is to obtain information about devices and the environment, analyse data from the physical and virtual world for optimised operations, and provide enhanced services to users. By delivering new end-customer software services and experiences that are based on information extracted from multiple connected devices, the IoT is providing a new way of realising business agility and a faster pace of innovation.

References

1. "Industrial robotics market expected to reach $41 billion by 2020", *Modern Materials Handling*, 28 October 2015, ‹http://www.mmh.com/article/industrial_robotics_market_expected_to_reach_41_billion_by_20202›
2. Microsoft Azure IoT Suite, ‹https://www.microsoft.com/en-us/server-cloud/internet-of-things/azure-iot-suite.aspx›

This article is based on an article previously published in ABB Review.

ABB Australia Pty Ltd
www.abbaustralia.com.au

FLEXIBLE SCREW CONVEYOR

Flexicon has released a flexible screw conveyor with trough hopper, which can receive material from multiple outlets of feeders, grinders, blenders and other process equipment. It features an extended-length charging adapter that exposes 1143 mm of the flexible screw, rotating within an inclined U-shaped trough, to charge material entering the hopper at any point.

The rugged inner screw is the only moving part contacting material and is offered in numerous designs to handle both free- and non-free-flowing materials, including products that pack, cake or smear, with no separation of blends. As it rotates, the flexible screw self-centres within the tube, providing ample clearance between the screw and tube wall to eliminate or minimise degradation. Material exits the conveyor below the drive point, precluding contact with bearings or seals.

The hopper is equipped with a stainless steel grate for worker safety and to prevent oversized particles from entering the conveyor. Smooth, crevice-free surfaces of the screw and tube interior allow in-place flushing with water, steam or cleaning solutions through a lower clean-out cap and/or upper discharge housing. The flexible screw can also be removed through the clean-out for separate sanitising and inspection of the polymer conveyor tube and stainless steel hopper, as well as the screw.

Flexicon Corporation (Aust) Pty Ltd
www.flexicon.com.au

COMPACT POWER SUPPLIES

Acromag is now offering its PS5R Slim Line range of nine power supplies with universal voltage inputs. They can be used in tight spaces or to save valuable DIN rail space.

The PS5R Slim Line models are lightweight and compact in size, with a universal 85–264 VAC or 100–370 VDC input and worldwide approvals including: CE, UL/cUL, TÜV, UL 1604, Class 1, Div 2, Groups ABCD hazardous locations (all units), UL 508 (all units), UL 1310, NEC Class 2 (10 and 60 W only), EN50178:1997, LVD: EN60950:2000 and EMC: Directive EN61204-3:2000 (EMI: Class B, EMS: Industrial).

The power supplies come with power factor correction (EN61000-3-2, 60 to 240 W models only) and meet SEMI F47 sag immunity (120 and 240 W models only). They also offer ±10% output voltage adjustment, spring-up finger-safe terminals, IP20 protection and a choice of DIN rail or surface mounting.

Metromatics Pty Ltd
www.metromatics.com.au

PHOTOELECTRIC DATA TRANSMISSION

The DDLSS 500 from Leuze electronic is claimed to be the world's first data transmission photoelectric sensor.

It links Ethernet networks using optical data transmission with a bandwidth of 100 Mbps and is thus a central network component. The devices transmit all common Ethernet protocols such as Profinet, EtherNet/IP, EtherCAT, Ethernet TCP/IP or Ethernet UDP in real time up to a distance of 200 m. For quick and simple on-site diagnostics, the product has a status LED visible from afar for displaying warnings and errors, and all relevant data can be called up using remote diagnostics.

Through the modular, basic design, the devices can be arranged flexibly depending on needs regarding operating range, remote diagnostics options and heating, and there is an integrated laser alignment aid. An integrated spirit level and the premounted mounting plate with spring-loaded pivoting brackets make alignment simple, only requiring one person.

All warning messages which may signal an interruption of the transfer are displayed in real time and, in the DDLS 548i version, actively transferred to the control using process data as a Profinet participant.

Leuze electronic Pty Ltd
www.leuze.com.au

WELL LIFT OPTIMISATION SOFTWARE

Emerson's Dynamic Lift Optimization (DLO) software allows producers to extract greater value from existing assets and reduce field decline rates by ensuring a field or platform is producing at maximum efficiency given current production constraints. Using the DLO software, a typical site operating multiple wells can experience a 10% production improvement because it responds immediately to changes in the field operation, continually reallocating available lift resources.

DLO software dynamically adjusts lift gas flows or electric submersible pump (ESP) speed based on the most recent well test curves.

The updated version of DLO is easier to implement and comes IIoT-ready allowing cloud-based infrastructure. The graphical user interface enables production engineers to safely and securely access crucial field optimisation data from any location with an internet connection. It now also uses the OSIsoft PI System — a highly scalable open data infrastructure and historian that provides a common data architecture from the plant floor to the enterprise level.

Since DLO utilises well test curves to determine how to allocate lift resources, it's important that these curves are updated as the well declines. Oil producers have the option of pairing DLO technology with Emerson's integrated well testing solution, which allows for more frequent updating of well curves.

The integrated well testing solution consists of a multi-port flow selector, a three-phase flow meter and a remote terminal unit that is delivered as a solution on a skid that can handle up to seven wells, and provides instantaneous readings for the oil, gas and water from each well.

Emerson Automation Solutions

www.emersonprocess.com.au

VISION SOFTWARE

Wenglor has released the weQubeVision software module with pattern matching to make its Smart Camera simpler to use and more intelligent. With edge-based object detection, complex image processing applications can be implemented in only three steps.

The implementation of complex applications, intuitive product configuration and the space-saving design are important for users of industrial image processing. The weQubeVision with pattern matching unites all of these aspects in the weQube Smart Camera.

The software licence, at no additional cost, is available in the hardware variant with auto-focus or with C mount threaded connection. It is also available with either a colour or a monochrome image chip, white or infrared light and optionally with Ethernet or Profinet and EtherNet/IP.

Objects can be recognised regardless of their position and rotational orientation within the image (X, Y and 360° tracking). An edge-based algorithm ensures that several identical and different objects within the camera's visual field can be simultaneously recognised. Superimposed objects and objects in front of complex, non-homogenous backgrounds can also be accurately and reliably detected.

Treotham Automation Pty Ltd
www.treotham.com.au

ANALOG SIGNAL TRANSDUCER

The Klemsan ASCON (Analog Signal CONverter) transducer has been designed to convert, measure and isolate analog signals and communicate them to industrial control systems.

With a width of 17.5 mm wide, the transducer is fast to install and configure. It can be utilised in a wide range of scenarios and industries for a number of analog signal types, including temperature, current and voltage, and convert into any uniform analog output or serial RS485 Modbus communications.

The transducer ensures complete isolation between its input, output and 11–30 VDC supply, and provides high linearity and and extended input range. It can be used for continuous analog signal conversion for building management systems, metering displays, SCADA systems, PLCs and other industrial technologies.

Control Logic Pty Ltd
www.control-logic.com.au

INDUSTRIAL CONNECTIVITY PLATFORM

Kepware has released its KEPServerEX version 6.2 industrial connectivity platform. Enhancements include updated functionality for the CODESYS Ethernet driver, a TIA Portal Exporter Utility, Configuration API support for the EFM Exporter and improved interoperability with the ThingWorx IoT Platform.

Building upon the connectivity provided in its initial release, the CODESYS Ethernet driver for KEPServerEX version 6.2 now provides real-time read/write data access to devices running CODESYS v2.3 and v3. Users with smart, connected operations using devices that run on CODESYS (a common PLC run time and development environment) can now easily collect industrial data from disparate devices across their plant.

Users with Siemens S7-300, S7-400, S7-1200 and S7-1500 controllers that utilise the Siemens TIA Portal can now gain immediate access to their data via the TIA Portal Exporter Utility.

Due to configuration API support for the EFM Exporter, users with third-party applications (such as SCADA, HMI, IoT applications and simple web applications) can now make programmatic changes to the EFM Exporter, enabling project standardisation and simplification.

Enhanced ThingWorx integration means that users utilising KEPServerEX with ThingWorx can now quickly and easily find and utilise industrial data in augmented reality experiences, machine learning models, mashups or other ThingWorx tools. In conjunction with ThingWorx version 8, KEPServerEX version 6.2 contains functionality that gives users easy access to all of their KEPServerEX data within ThingWorx Composer; the ability to quickly associate that data with things in the ThingModel; and the ability to view mapping and diagnostic information from the ThingWorx platform.

Fetch Automation
www.fetchautomation.com.au

Chocolate production relies on efficient and clean compressed air

The town of Wernigerode, in the foothills of the Harz Mountains in central Germany, is straight out of a fairy tale, complete with half-timbered houses, a medieval town hall and castle — and chocolate!

Chocolate has been manufactured in the town for over a century and, while the tradition continues, Wergona Schokoladen's manufacturing methods are very much 21st century.

When Wergona opened a new production building in 2003, the company had 56 employees and was manufacturing around 2000 tonnes of chocolate annually. Several expansions later, the production area now cover 24,000 m^2, where 250 permanent employees produce around 15,000 tonnes of chocolate products every year.

Wergona manufactures the range for the Friedel and Gubor brands, as well as chocolate products for leading retail chains. The proprietary chocolate masses, for which there are 57 basic recipes, are processed at a wide variety of casting plants. Up to 1.6 million individual products are manufactured and packed every day at one of two state-of-the-art rotary plants.

In chocolate production, compressed air is essential. Even the system of tubes for conveying the chocolate masses to the casting units is controlled by pneumatically activated valves.

The plants themselves feature numerous pneumatic drive elements and compressed air is also used as a process medium, such as when removing the powder from jelly products produced by mogul plants, and for cleaning the plants.

Chocolate is a very sensitive foodstuff, and every effort must be made at the production and packaging stages to prevent contamination with even the faintest traces of mineral oils. So when the compressed air station was no longer suitable for further expansion, it was clear that oil-free compressors should be used to meet the tough hygiene standards which apply across the business.

Wergona opted for a concept devised by Druckluft Krenge, a specialist provider, who recommended the installation of four oil-free piston compressors from the Champion range by CompAir.

The systems are now operational, with each compressor delivering a maximum 9.1 m^3/min of compressed air to the 8-bar network. This adds up to a maximum volume of 36.4 m^3/min, of which Wergona is currently using around two thirds, providing plenty of room for additional use.

The four systems providing the compressed air combine eight power levels, since piston compressors can be operated at two power levels. In the case of half load, the pistons only compress upwards; at full load they compress both upwards and downwards. The system is characterised by a high level of efficiency, even at half load; in comparison to full load, the energy consumption in this operating mode is 53%.

A narrow pressure band can be achieved with this mode of operation and the compressor is associated with very low consumption when idle.

The Champion machines at Wergona are of the water-cooled variety, as the compressor station is located in a central position near cool chocolate production and so the discharge of warm air is unwelcome. However, the higher compression temperature associated with piston compressors, as compared with screw compressors, is advantageous from a processing perspective, because the heat is recovered and used within the network. Chocolate production is ultimately a temperature-controlled process and a heat source is required to heat the chocolate masses.

In terms of control, the four compressors are connected together whereby one is the master system and the other three are 'slaves'. This has the benefit of keeping the control technology comparatively simple.

The system now combines energy efficiency with excellent production reliability and the company's management has calculated that it will make annual energy savings of €48,000.

Gardner Denver Industries Pty Ltd
www.compair.com

TANDEM DRYERS

Compressed air dryers are essential for avoiding interruptions to operations or even production downtime due to water in the compressed air system and in the final application.

With the FRDA tandem dryer, BOGE includes a combined refrigeration and adsorption dryer in its product range for the first time. FRDA is a suitable solution when consistent but variable pressure dew points between -70 and +3°C are required. The combination of the two drying processes enables a high level of energy efficiency and flexibility.

It is simple to switch between the pressure dew points of a refrigeration dryer and those of an adsorption dryer, without hardware adjustments being required, by means of the tandem dryer control. The result is that a residual moisture of up to 0.003 g/m³ is achieved, irrespective of seasonal temperature fluctuations. The FRDA is also distinguishable by its compact machine design. The technology is therefore suitable for container installations and where little space is available. In comparison with conventional adsorption dryers, not much maintenance is required.

Boge Compressors Ltd
www.boge.net.au

LIGHTLY MANAGED SWITCH

Unmanaged switches deliver the network connectivity required for less complex industrial applications, but they can't provide diagnostics, manage traffic or enhance security. The Allen-Bradley Stratix 2500 lightly managed switch is designed to provide the security, resiliency, segmentation and bandwidth-optimisation benefits of a managed switch without the need for extensive configuration.

When installed straight out of the box, the industrial Ethernet switch can prioritise critical industrial network traffic. It also can be configured for application-specific needs. Manufacturers can use this flexibility to futureproof their operations by deploying the switch out of the box and scaling it up to a lightly managed switch as their needs evolve.

The lightly managed switch is said to exceed the capabilities of an unmanaged switch by monitoring and optimising traffic flow and providing diagnostic information to help minimise downtime. It also can support up to 64 VLANs for logical segmentation, which helps reduce total cost of ownership. In addition, port security allows users to disable ports or control end-device connectivity based on the media access control address.

The lightly managed switch uses embedded Cisco technology and is part of the Rockwell Automation Integrated Architecture system. This helps ease network configuration, management and support while optimising integration with the enterprise network.

Rockwell Automation Australia
www.rockwellautomation.com.au

WI-FI ACCELEROMETER AND DATA LOGGER

The BeanDevice Wilow AX-3D is an ultralow-power Wi-Fi accelerometer with a built-in data logger. It is designed for wireless structural health monitoring, condition monitoring, dynamic measurement on rolling stock and vibration analysis.

The BeanDevice integrates an antenna-diversity design, boosting the radio link quality in environments subject to random and diverse disturbances. Antenna diversity improves both the quality and reliability of a wireless link by 30%.

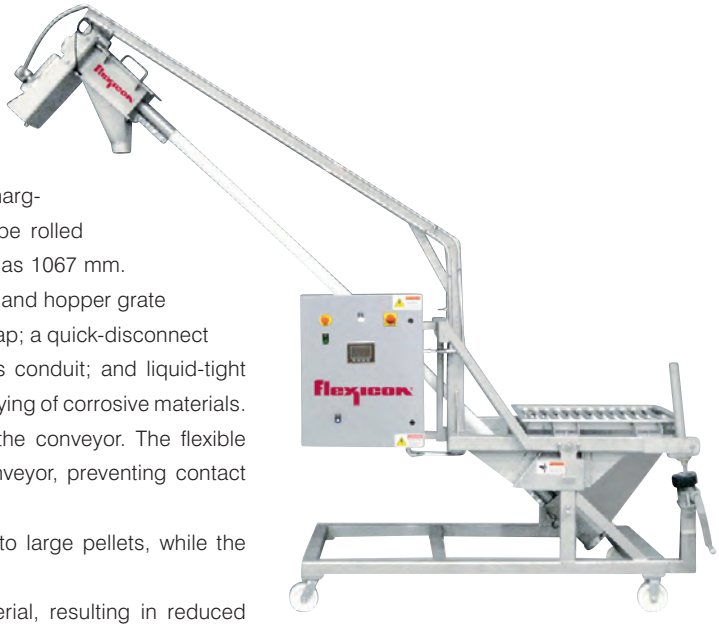
Due to an onboard shock sensor coming with SSD (smart shock detection) technology, the user can trigger both data acquisition and device wake-up on a shock threshold. A smart energy management system (USB and energy harvesting) allows the product to be powered by the internal lithium-polymer rechargeable battery, a USB power bank or directly from a solar panel. Store and Forward+, a lossless data transmission mechanism, enables a large-scale deployment of Wilow wireless sensors in industrial applications where data transmission is critical.

Ready for IoT applications, the unit integrates MQTT, a lightweight and open-source IoT protocol. Users can quickly set up a scalable IoT application.

With the ability to stores up to 5 million data points, the device is IP67 protected and has a lightweight aluminium casing. It is capable of low noise operation (45 $\mu g/\sqrt{Hz}$ for the $\pm 2g$ version), has an antenna range of 200 m and consumes only 60 μA in sleep mode.

Bestech Australia Pty Ltd
www.bestech.com.au

TILT-DOWN SANITARY SCREW CONVEYOR



Flexicon has released a sanitary flexible screw conveyor that can be tilted down and rolled to serve multiple functions. Using a manual jack screw, the support boom and conveyor can be raised for discharging into vessels or other process equipment. Fully lowered, it can be rolled through doorways as low as 2134 mm in height and aisles as narrow as 1067 mm.

Sanitary features include: a castor-mounted frame; a support boom and hopper grate constructed of 316 stainless steel; a sanitary quick-release clean-out cap; a quick-disconnect discharge box access cover; a stainless control panel with stainless conduit; and liquid-tight compression fittings, allowing washdown during changeovers or conveying of corrosive materials.

Material flows through the hopper into an adapter that charges the conveyor. The flexible screw is top-driven beyond the point at which material exits the conveyor, preventing contact with bearings or seals.

The conveyor transports bulk materials from submicron powders to large pellets, while the gentle rolling action of material prevents the separation of blends.

The rugged inner screw is the only moving part contacting material, resulting in reduced maintenance. A broad range of screws with specialised geometries is available to handle free- and non-free-flowing materials, including products that pack, cake or smear in other types of conveyors.

The conveyor frame can be finished to sanitary or industrial standards, or constructed of carbon steel with durable industrial coatings.

Flexicon Corporation (Aust) Pty Ltd
www.flexicon.com.au

FREE

to industry and business professionals

The magazine you are reading is just **one of thirteen** published by Westwick-Farrow Media.

To receive your **free subscription** (magazine and eNewsletter), visit the link below.

wfmedia
connecting industry

www.WFMedia.com.au/subscribe

SAFETY IN ACTION COMING TO MELBOURNE

Registration is now open for Australia's occupational health and safety trade show, Safety in Action, with major safety projects, safety innovations, mental health and wellbeing in the spotlight.

Safety innovation as well as mental health and wellbeing are becoming increasingly important components of occupational health and safety management. One in five Australian employees reported that they have taken time off work due to feeling mentally unwell in the past 12 months, due to stress, anxiousness or depression. Meanwhile innovation, whether in processes, technology or approaches to people, is becoming more and more crucial in helping to solve ongoing problems and ensuring employees go home safely after work.

The upcoming Safety in Action trade show will tap into these key health and safety topics by introducing three new dedicated safety zones. Each zone will include free, tailored seminar programs to educate today's OHS professionals. Next to the Safety Innovations and Mental Health & Wellbeing programs, the third safety zone will focus on case studies of current major safety projects in Australia to stay on top of the latest developments.

"This year, to cater for the extra demand, we have created three spaces on the trade show floor to run concurrent programs covering Major Projects, Innovations and Wellbeing. Delegates can attend as many as they like from across all three streams," said Keith Barks, general manager at Informa Australia, organiser of the event.

A snapshot of the free seminar sessions includes:

- **Implementing a mental health and wellbeing strategy in the workplace**, Nick Arvantis, Head of Research & Resource Development, Beyond Blue
- **Software to manage and improve Workplace Mental Health**, Sarah O'Leary, Opportunity Creator, myosh
- **The Future of Corporate Health — Current Trends and Future Direction**, Debra Villar, Director, Complete Corporate Wellness
- **Mitigating Heat Stress — Lessons learnt from 2017**, Dr Matt Brearley, Managing Director, Thermal Hyper Performance
- **Non-Conforming Building Products and Safety Law**, Katherine Morris, Norton Rose Fulbright
- **Legal Approaches, Safety Culture and Human Factors in the Aviation Industry**, John Ribbands, Barrister and Aviation Human Factors Specialist, ALAANZ.

Exhibitors confirmed include major corporate sponsor myosh Safety Management Software; technology partner Riskware, RISSB, Mix Telematics, Retailquip, QHSE Integrated Solutions, Bureau Veritas, A-Safe Australia and Converge International.

Held concurrently with the trade show,

Safety in Action presents three high-profile conferences focusing on Safety Strategy, Leadership and Culture, Workplace Wellness and Return to Work. With over 350 delegates and 70+ speakers and the conferences running in adjacent rooms, delegates will be able to switch sessions and plan a track to suit their requirements.

- **When:** 5–6 September 2017
- **Hours:** Tue: 10 am–6 pm; Wed: 10 am–4 pm
- **Where:** Melbourne Covention & Exhibition Centre
- **Web:** Register at www.safetyinaction.net.au

ETHERCAT ENCODER

ELAP has released a standalone EtherCAT interface encoder. With a built-in certified EtherCAT interface, it is fast and easy to integrate into a range of applications such as I/O systems, drives, sensors and actuators, reducing system cabling and simplifying network architecture.

This design has several mechanical interface options and has easy installation and maintenance features. A set of four LED indicators shows operational status while in motion, which aids installation and allows for improved confidence in the field. With an IP67 rating and an operating temperature up to 70°C, harsh environments are supported.

The combination of the MEM-BUS EtherCAT with ELAP encoder technology offers a flexible number of nodes and network topologies, giving freedom in system architecture. Slaves are automatically addressed, and this reduces system feedback lag. The smart encoder has a range of settable parameters that allow for flexible operation, including counting direction for bidirectional applications. The measuring steps per revolution can be adjusted up to 13-bit resolution, which can allow for system commissioning and tuning. The total measuring length in steps and speed resolution can also be manipulated to give added flexibility.

Motion Technologies Pty Ltd

www.motiontech.com.au

AS I SEE IT

THE EVOLUTION OF INDUSTRIAL CONTROL SYSTEMS

The PLC (programmable logic controller) has been the mainstay of manufacturing since its inception in the 1970s. PLCs were the first foray into computerisation by manufacturing and ushered in what is now considered to be the third quantum shift in industrialisation, Industry 3.0.

The idea of having a small programmable computer was highly appealing as it offered numerous advantages over the hardwired relay logic circuits that had previously been used. The main advantage was the ability to make functional changes quickly, just by downloading a new program. PLCs quickly proved themselves to be highly reliable workhorses, and their flexibility and relatively low cost soon saw them used across a wide variety of industries.

The 1980s saw the dramatic rise of personal computers. Their usage surged as their power increased and cost reduced. Manufacturing experienced similar increases in the uptake of PCs. They were (and still are) used extensively in areas like PLC programming, SCADA and many other applications.

PLCs also developed during this period but at a much slower rate compared to the rest of the computer world. All the main PLC vendors preferred to design their own ASICs (application-specific integrated circuits) and use CPUs that were generations older than what was available. Yet despite their superior computing power, PCs were almost never used to execute control tasks. Control was considered the domain of the PLC for some very good reasons.

Reliability is an imperative for manufacturing, as even a small amount of downtime affects production costs significantly. PC architectures, and especially the ubiquitous Windows operating system, were deemed too unreliable for industrial environments. Furthermore, control applications demand real-time performance — particularly motion and robotics. But Windows was never intended for deterministic response times. It was instead built for desktop applications, which required an open, versatile multitasking environment. However, this openness is also its Achilles heel as it allows viruses and other rogue programs similar access.

PCs are now entrenched in manufacturing — their openness, flexibility and sheer computational power are seen as highly desirable for industrial environments. Hardware improvements, particularly in CPUs, have made them vastly more stable than previous generations, and their programs have seen enormous development, making them very effective in manufacturing.

While the fundamental issues relating to Windows not being specifically designed for industrial control environments remain, there is nevertheless a renewed push to integrate proper control functionality with a Windows-based PC, so as to enjoy the benefits of both worlds.

The answer, and next logical evolutionary step, is an industrially hardened PC with Windows running concurrently with a real-time operating system. Separation of the operating systems must be complete, as it's paramount to maintaining openness and versatility, while at the same time ensuring reliable and real-time performance. Each operating system executes in its own CPU cores and is stored on a separate solid-state drive.

This would be an all-in-one, state-of-the-art industrial control system — one that would indeed be ready for Industry 4.0, with the IIoT, big data, robotics and whatever else is around the corner.

Harry Mulder is Marketing Manager for Omron Electronics and has been working with industrial control systems for almost 30 years. He has seen a great deal of change within the industry during this time but believes the recent developments have been the most exciting.

wfmedia
connecting industry

Westwick-Farrow Media
A.B.N. 22 152 305 336

www.wfmedia.com.au

Head Office
Cnr. Fox Valley Road & Kiogle Street,
(Locked Bag 1289)
Wahroonga NSW 2076
AUSTRALIA
ph: +61 2 9487 2700 fx: +61 2 9489 1265

Editor
Glenn Johnson
wnipt@wfmedia.com.au

Publishing Director/MD
Geoff Hird

Art Director/Production Manager
Julie Wright

Art/Production
Linda Klobusiak, Wendy Blume

Circulation Manager
Sue Lavery
circulation@wfmedia.com.au

Copy Control
Mitchie Mullins
copy@wfmedia.com.au

Advertising Sales
Industrial Group Sales Manager
Nicola Fender-Fox – 0414 703 780
nfender-fox@wfmedia.com.au

Nic Stear – 0432 637 817
nstear@wfmedia.com.au

Sandra Romanin – 0414 558 464
sromanin@wfmedia.com.au

Tim Thompson – 0421 623 958
tthompson@wfmedia.com.au

Subscriptions
For unregistered readers price on application.
If you have any queries regarding our privacy policy please email
privacy@wfmedia.com.au

Audited Media Association of Australia
cab

September 2016 total CAB audited circulation (Aust + NZ)
5,598 readers (73% personally requested)

Contact the editor

Printed and bound by SOS Print+Media Group
Print Post Approved PP100007403
ISSN No. 0819-5447

DIRECTAUTOMATION...Your answer to a tough economy

Asia Pacific Region

Industrial Controls ...we are able to offer the most practical industrial automation products at the industry's lowest prices.

Great Prices

Great Deliveries

Great Support

Productivity2000® Micro-Modular Programmable Controller
Great for simple installations using serial communication5 communications ports with the P2-550 CPU module - USB, Ethernet, EtherNet/IP™, remote I/O (GS drives), RS-232, RS-485.

Free programming software

ViewMarq LED message displays use the latest LED and communications technologies to display both critical and non-critical information to appropriate personnel

Free programming software

C-more micro HMIs provide operators with visual displays of system data for easy monitoring and control of automated systems. C-more Micro HMIs pack big features in a small package. Models are available in sizes from 3 to 10 inches, with touch or non-touch options, a variety of resolutions, and with serial and optional Ethernet communications.

Free programming software

Do-more controller CPUs contain the processing, memory and I/O interface needed in an automated control system. The Do-more H2 series PLC combines a high-performance CPU with our time-tested DL205 hardware to provide a dependable, powerful PLC with over 65,000 possible I/O points.

Free programming software

DIRECT AUTOMATION

ABN 53 168 014 248

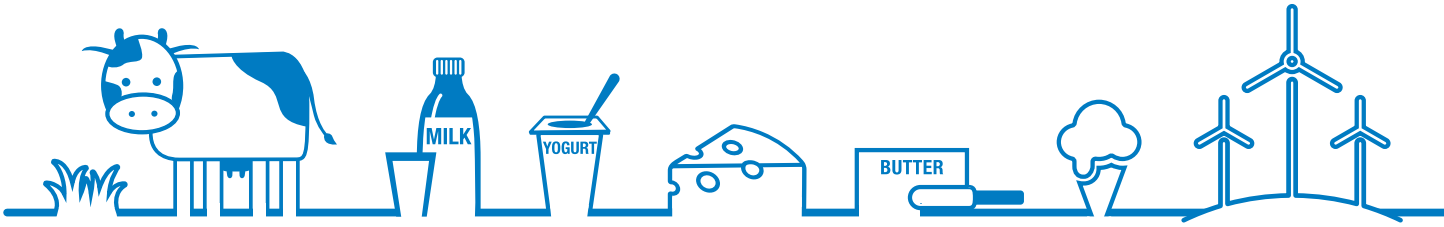
Direct Automation makes your job easier

Our prices are typically well below the list price of more traditional automation companies because of our business model and focus on efficiency and the majority of their products are stocked for same-day shipping.

Call Toll free 1800-633-040

web: www.directautomation.com.au
Mail: sales@directautomation.com.au

SMC Australia | New Zealand



SMC – Understanding your dairy production process – all along the line

At SMC we recognise that an ability to fully understand the challenges of any manufacturing process is the key to our future success. For this reason, we have developed specialist teams to work in key manufacturing industries throughout the world – our Industry Experts.

Our industry experts understand the important issues of continuous 24/7 operation, the latest food safety and hygiene regulations, CIP applications and environmental cleaning, clean room requirements and operator health and safety.

Let our Industry Experts help you realise your highest level of OEE (Overall Equipment Efficiency) to positively impact your bottom line as well as the environment.

Contact us for a free consultation. Let's discuss your unique requirements.
AU – 1800 763 862 or AUSales@smcanz.com
NZ – 0800 1320 762 or NZSales@smcanz.com

50 YEARS
SMC Pneumatics Australia
1967 - 2017

SMC®

www.smcworld.com
Global Leader in Pneumatics and Automation

#doyoureallyknowSMC

Join the conversation: SMC Pneumatics Australia | New Zealand Group