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WHAT'S NEW IN
PROCESS TECHNOLOGY
FEBRUARY 2017

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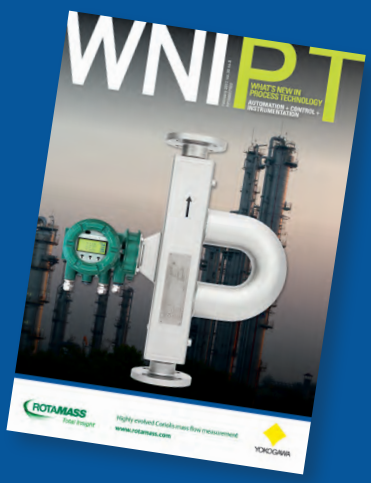
ON THE COVER



Yokogawa's ROTA*MASS* TI (Total Insight) provides total life cycle support to futureproof plants and reduce operational expenses throughout all phases of the product life cycle.

The Total Insight concept emphasises ease of use and reduced total cost of ownership. Incorporating an Expert Guide to provide simple, fast and user-friendly configuration, the meter can be set up and commissioned quickly. The Process Guard provides data logging and event management for proactive operation and diagnostics.

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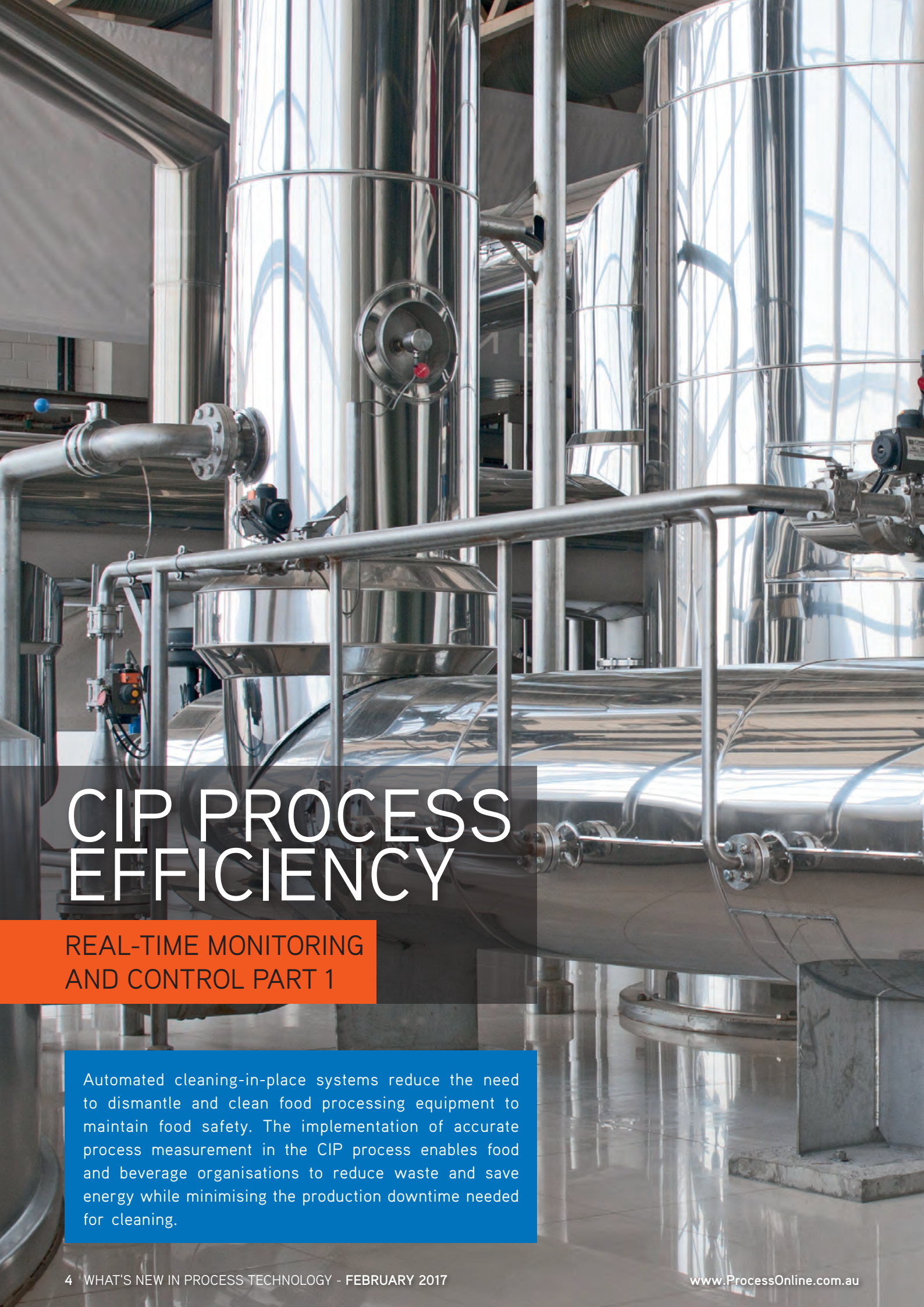

CIP PROCESS EFFICIENCY

REAL-TIME MONITORING AND CONTROL PART 1

Automated cleaning-in-place systems reduce the need to dismantle and clean food processing equipment to maintain food safety. The implementation of accurate process measurement in the CIP process enables food and beverage organisations to reduce waste and save energy while minimising the production downtime needed for cleaning.

In the food and beverage industry, the cleaning of process equipment is critical to ensure the health and safety of the consumer, as well as maintain the quality of the product. Proper cleaning is essential for the production of high-quality food products, especially those with extended shelf life.

Cleaning-in-place (CIP) systems are commonly found in many dairy plants, processed food plants, beverage plants and breweries — replacing manual strip down and cleaning of process equipment. The primary commercial advantage is a substantial reduction in the time that the plant is out of production and the ability to utilise more aggressive cleaning chemicals in a contained environment, which cannot be safely handled with manual cleaning. CIP has been defined[1] as:

"The cleaning of complete items of plant or pipeline circuits without dismantling or opening of the equipment, and with little or no manual involvement on the part of the operator. The process involves the jetting or spraying of surfaces or circulation of cleaning solutions through the plant under conditions of increased turbulence and flow velocity."

A CIP system typically consists of vessels for preparation and storage of cleaning chemicals, pumps and valves for circulation of the CIP chemicals throughout the plant, instrumentation to monitor the cleaning process, and vessels to recover the chemicals.

It should be made clear that CIP is a methodology for removing product residues from a process plant and is not a means of eliminating microorganisms from the system (sanitisation or sterilisation).

Fouling of process plant

A side effect of processing of any food product is the build-up of debris (soiling) on surfaces and in pipes, resulting in fouling of the process equipment — especially those elements of equipment in which the product is heated.

Water soluble	Alkali soluble	Acid soluble
Sugars	Fats	Mineral salts
Some salts	Proteins	Mineral oils

Table 1: Solubility of food debris.

When designing a CIP system, knowledge about the type and amount of soil, as well as its condition, is necessary. The main soil types are fats, proteins, carbohydrates (including various types of sugars) and mineral salts. Many of these types of soils are not water-soluble and therefore require the use of a cleaning solution.

Soils resulting from food processing can be complex mixtures, depending on the food being processed, and heat treatment can make them more difficult to remove. How long a plant should wait between cleaning cycles depends on the plant and experience, but generally waiting too long between cleans can mean having to dismantle the plant.

A good example of soil complexity is the type of soils found in a dairy plant: milk remaining in a pipeline; air-dried films of milk; heat-precipitated milk constituents (protein and milk-stone); fat; and hard water salts. In the case of UHT milk production, protein will be the predominant soil at temperatures of up to 115°C while mineral deposits are common at higher temperatures. Each type of soil will need a specific regime for removal.

CIP challenges for food and beverage processors

The challenge for an organisation producing food and beverage products is in finding the balance between maintaining clean equipment for food safety and product quality, and not losing excessive production time by overcleaning. Then, when cleaning occurs, the process needs to be optimised to minimise the use of energy and resources (water and chemicals). It is therefore necessary to monitor the CIP process in real time — an inability to do so leads to overcaution and results in wastage, not only in cleaning resources but also in production time.

Another aspect of the CIP process is the elimination of waste and the recycling of chemicals and water. Smaller plants often use a single-use system, in which chemicals and soil residue are disposed of, but in larger plants, such waste can be very costly. Larger multi-use CIP systems recycle and filter the waste to return at least some of the water and chemical back to the CIP storage for re-use.

Figure 1: Magnetic flow meters designed for sanitary applications.

> THE CHALLENGE FOR AN ORGANISATION PRODUCING FOOD AND BEVERAGE PRODUCTS IS IN FINDING THE BALANCE BETWEEN MAINTAINING CLEAN EQUIPMENT FOR FOOD SAFETY AND PRODUCT QUALITY, AND NOT LOSING EXCESSIVE PRODUCTION TIME BY OVERCLEANING.

Figure 2: A typical temperature sensor used in CIP processes.

It is also now common for large processing plants to process their own wastewater in order to meet environmental regulations, so efficient CIP processes and recycling are also important to reduce the cost of waste processing.

The CIP cleaning process

Adhesive forces that hold the soil on a surface need to be broken to make the impurities leave the surface. To achieve this, there are four parameters involved in the cleaning process:

- Mechanical force
- Thermal force
- Chemical force
- Contact time

These processes all require energy (thermal, kinetic and chemical) applied over sufficient time in order to achieve the removal of the soil and carry it away. They are not independent, and changing any one parameter can affect the other three. For example, lowering the cleaning temperature may increase the contact time required — and therefore also the quantity of water and chemicals — and result in greater energy consumption overall.

Mechanical action

The shear forces created by the water or cleaning solution flow are the mechanical forces that help remove the soil. Nozzles increase the effective pressure and shear forces by concentrating the flow and effectively impacting the surface to be cleaned 'harder'. Making effective use of spray nozzles means setting the flow rate such that the nozzles work most effectively.

In cleaning pipes, turbulent flow is necessary to create shear forces inside the pipe. Typically a flow velocity of greater than 1.5 m/s is necessary to cause turbulent flow. The use of a high velocity and turbulence also improves cleaning efficiency in small dead legs, eg, at instrumentation points or sample valves.

Research has also shown that flow velocities that are too high (greater than 2.1 m/s) are not beneficial, so pumping the solution to a higher pressure simply wastes energy for no greater effect.

The volume flow rate necessary to achieve a flow velocity between 1.5 and 2.1 m/s will depend on plant design — in particular, pipe diameters and choice of nozzles.

Instruments for monitoring flow rate

Accurately measuring flow rate with a flow meter makes it possible to ensure that optimal pressure is maintained at spray nozzles, and that turbulent flow in pipes is sustained, without overpumping and wasting energy. For this reason, and depending on the design of the CIP system, flow meters may be required at multiple points in the system.

Measuring process liquid flow can be accomplished by any number of flow measurement technologies. In a CIP application, flow measurement should ideally be achieved by an instrument that is minimally intrusive in the CIP flow, is not affected by cleaning

Pipe Diameter	Flow (l/h)	Volume (litres/100m pipe)
25.0 mm	~ 2,070	~ 40
38.0 mm	~ 5,100	~ 99
51.0 mm	~ 9,600	~ 184
63.5 mm	~ 15,400	~ 287
76.0 mm	~ 22,500	~ 408
101.6 mm	~ 40,200	~ 748

Table 2: Typical flow and volume for different pipe diameters at turbulent flow[2].

chemicals and does not lose accuracy when there is turbulent flow.

The requirements of flow measurement in the CIP system (sanitary, accurate over a wide range of flow rates, unobtrusive and robust) can all be fulfilled with the use of a magnetic flow meter. Flow rates of cleaning chemicals are generally twice the velocity of the product, so a sensor with a full bore design will ensure that no added pressure drop occurs in the system, meaning that energy costs associated with increasing flows and pressures are kept to a minimum.

The accuracy of a typical magnetic flow instrument used for CIP is unaffected by large flow variations and the accuracy of the instrument should be guaranteed over a turndown of 1000 (0.01 to 10 m/s). Since the magnetic measurement principle is virtually independent of pressure, density, viscosity and temperature, it is ideal for monitoring in the extreme conditions found in CIP (cold, low-viscosity water up to high-temperature chemicals and high-density/viscosity products).

Magnetic flow meters are readily available that meet all guidelines for sanitary applications, such as 3-A and EHEDG.

Temperature

Molecules move faster at an elevated temperature and therefore the effectiveness of a cleaning process is increased with increased temperature, due to higher molecular energy. As a general rule, a plant should be cleaned at the same temperature as it has been processing the food. Contrary to what might seem intuitive, however, ever higher temperatures are not necessarily effective. If a higher cleaning temperature is used, then reactions in the soil layers — such as denaturation of proteins — may occur, making the soil harder to remove.

Type of chemical	Temperature range	Equipment to be cleaned
NaOH	60-80°C	Milk collection tankers, tanks and pipes
	70-90°C	Milk pasteurisers
	90-140°C	UHT plants
HNO_3	60-65°C	Tanks, pipes, milk pasteurisers
	80-85°C	UHT plants

Table 3: Cleaning temperatures for dairy processing equipment[3].

Table 3 shows cleaning temperature ranges for some dairy processing equipment.

Rinsing will also occur at different temperatures, with an initial flush being in the 40–60°C range, the post-alkaline rinse being a hot rinse and the final rinse being cold.

Instruments for monitoring temperature

Temperature sensing should occur at two places in the CIP system: at the initial water heating point, to manage feedback for the water heating process, and in the CIP return to confirm the temperature of the wash and rinse are correct.

The real-time temperature of the wash solutions will also be necessary to compensate for correct calculation of chemical concentration from conductivity data.

Temperature sensors that come in contact with CIP cleaning solutions should be of a hygienic compatible design: 3-A or EHEDG to ensure cleanability is met. They are generally constructed with 316L stainless steel wetted parts. A compact thermometer that utilises a Pt100 (Class A) sensor element for measurement is the most appropriate. Additionally, a device with a Pt100 4-wire connection eliminates errors caused by the resistance of the sensor feed cables. A built-in transmitter in the device converts the Pt100 input signal into the 4–20 mA signal.

Modern temperature sensors use a new kind of thin-film sensor element that is soldered directly into the sensor tip. The thin-film design improves upon previous generation sensors, as its performance is not affected by vibration that is commonly found on CIP systems. Soldering the thin-film sensor directly onto the tip also results in extremely fast temperature response as it ensures ideal heat transfer from the process to the sensor element. A side benefit of fast temperature response is that it can be used to compensate for the change in conductivity based on temperature by taking the 4–20 mA value directly into the conductivity transmitter. This ensures fast determination of the conductivity and concentration values derived from the conductivity instrument, saving both time and money.

In Part 2

In Part 2 of this article, we will examine in detail the monitoring of cleaning solution concentration using conductivity sensors and other important CIP parameters.

References

1. Romney A (ed) 1990, *CIP: cleaning in place*, Society of Dairy Technology, Cambridge.
2. Tetra Pak, *Cleaning in place: A guide to cleaning technology in the food industry*.
3. *op cit.*

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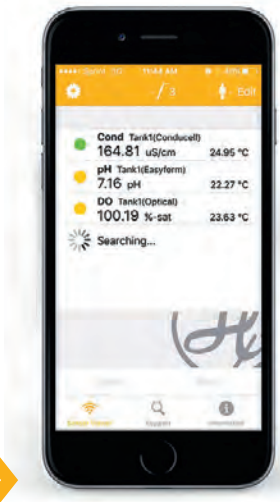

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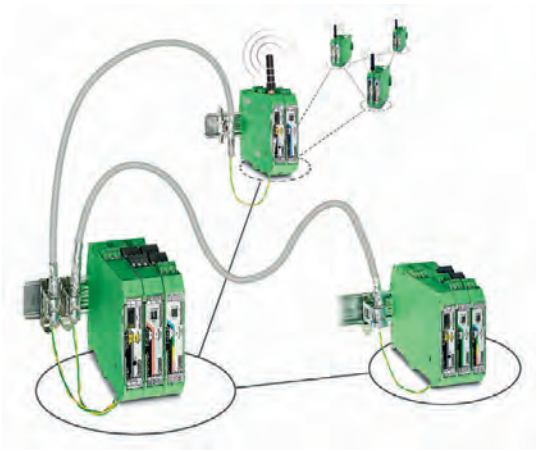

WIRED AND WIRELESS I/O SYSTEM

Phoenix Contact has upgraded its cable-based Radioline RAD-RS485-IFS stations to accommodate both wireless and cable-based modules to deliver far greater flexibility and choice for users requiring a highly reliable I/O system.

The Phoenix Contact Radioline RAD-RS485-IFS's newly combined cable-based and wireless operation delivers simple and flexible distribution of I/O signals between all devices. Digital, analog and temperature signals can be transmitted reliably and securely throughout the network.

Further, in addition to a mixed operation with a wireless system, the RAD-RS485-IFS communication modules can be operated as a multipoint multiplexer through a dual-wire RS485 connection or as a standalone application in a Modbus/RTU master.

The upgrade includes an extended operating temperature range from -40 to +70°C making the Radioline RAD-RS485-IFS system suitable for use in harsh industrial conditions.

The modular nature of Radioline RAD-RS485-IFS ensures that modules can be replaced quickly. The system can also be expanded at will and with considerable ease. Its wired and wireless capability further empowers the user so that they can tailor the network to meet their specific needs.

The wireless Radioline system transmits across the licence-free frequency range of 2.4 GHz to ensure reliable communication and to support flexible network structures and various operating modes. This also allows for the reliable implementation of large networks with up to 250 stations and distances of several kilometres between adjacent devices.

For added security, the Radioline system includes built-in safeguards against data manipulation. These include package authentication, a proprietary protocol and optional AES data encryption.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

LARGE VISUAL NOISE MONITORS

The SoundEAR XL is the largest in the family of visual noise monitors and noise level recorders from Sound Safety available in Australia and New Zealand.

The SoundEAR XL is a big sign suitable for big locations. In workplaces where noise exposure can vary or be intermittent it is sometimes difficult to decide whether hearing protection is required.

The SoundEAR XL leaves nothing to chance. When noise levels exceed a preselected level a large red silhouette of a head with ear muffs is illuminated. Employees can then take hearing protection steps or move away from the noise.

The SoundEAR XL is both dust and water resistant. At about the size of an A2 poster, the product is designed to be seen easily from long distances and is suitable for large factories, workshops, aircraft hangers and other industrial settings.

With the optional USB SoundLOG added, real-time 24 x 7 x 365 day noise exposure readings can be collected. This data can be used to provide reports on noise levels generated and employee noise exposure levels. In a noisy environment the SoundLOG and included software provide a complete picture of noise conditions, whether in an industrial, hospital or entertainment setting.

If the source of noise needs to be indicated in a different location, an optional microphone can be connected via cable up to 10 m from the SoundEAR XL display.

Sound Safety
www.soundsafety.com.au

CHROMATIC CONTROLLER

The Micro-Epsilon confocalDT 2471 HS is a fast confocal chromatic controller for measuring displacements, distances and thickness in the glass and electronics industry. These parameters can be measured rapidly at 70 kHz with high precision on diffuse as well as reflecting surfaces.

The active exposure regulation feature in the CCD array enables accurate, fast surface compensation on difficult changing surfaces during dynamic measurement processes. The controller offers powerful measurement characteristics, enhanced optical components and operates with an integrated light source, reducing maintenance and purchase costs. Due to a user-friendly web interface, the entire configuration process of the controller and sensors is carried out without using any additional software. Data output is via Ethernet, EtherCAT, RS422 or analog output.

Key features include an adjustable measuring rate from 100 Hz to 70 kHz, multipeak measurement up to six peaks and storage of up to 20 calibration tables for different sensors.

Bestech Australia Pty Ltd
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INTEGRATED SERVO MOTOR

Tolomatic's ACSI integrated servo motor with ODVA-conformant EtherNet/IP features a keyed add-on profile (AOP) and a full suite of add-on instructions (AOI) for easy, seamless integration into Rockwell Automation PLCs. The ACSI servo motor controller creates an all-in-one (motor/drive/controller) electric actuator solution for single-axis applications.

Available in two sizes (NEMA 23 and 34), the ACSI servo motor control features easy-to-use operating modes such as digital I/O index moves, analog position (0–10 VDC or 4–20 mA) and Modbus/TCP.

The EtherNet/IP implementation is based on an I/O assembly object that does not require a motion axis from a Rockwell Automation motion PLC. This allows any number of ancillary axes of motion to be added in without increasing the cost of the PLC by adding additional motion axes. The dual-port Ethernet implementation allows for any network topology: star, daisy chain or ring, enabling many drives to be controlled by a PLC or master controller via EtherNet/IP and Modbus TCP.

The ACSI is designed to be controlled from a PLC or master controller via 24 VDC digital I/O, 0–10 VDC or 4–20 mA analog I/O, EtherNet/IP or Modbus TCP.

Integrating the drive and controller into the servo motor saves space on the machine by eliminating the drive box. Designed for easy-to-use, cost-effective servo control, the ACSI is suitable for replacing pneumatic cylinders and automating other axes of motion.

Additional features include a standard IP65 rating, industry-standard M12 connectors, dual Ethernet ports with LED indicators and a USB programming port.

Pneumatic Products

www.pneumatics.com.au

SUPPLY CHAIN SOFTWARE FOR MMM

Schneider Electric has announced its first release of SimSci Spiral Suite, a software solution for unified, enterprise supply chain management focused specifically on the mining, minerals and metals (MMM) industries.

According to a 2016 research study conducted by Deloitte, mining companies constantly seek operational improvement as the shift to productivity and supply discipline continues. Historically, MMM organisations have used a combination of point solutions within various departments, such as planning and scheduling, and operations. Experts typically produce complex custom reports for the next step in the supply chain. Not only does this time-consuming process rely on a handful of tool experts, but it can also lead to miscommunication of key data and impede collaboration.

MMM businesses can now take advantage of SimSci Spiral Suite's architecture, which has been developed from the ground up as a single unified solution reaching across the pit-to-port supply chain. Specifically designed to eliminate the costly inefficiencies arising from legacy point solutions, SimSci Spiral Suite maximises the value of collaboration across the enterprise.

The aim is to provide a solution that enhances collaboration, better explores opportunities, reduces operational risk and reduces the gap between planned, scheduled and actual results.

SimSci Spiral Suite is available for the MMM industries from 30 September 2016, giving businesses a way to optimise performance and maximise profitability across the end-to-end supply chain.

Schneider Electric

www.schneider-electric.com.au

HIGH-FREQUENCY CT PROBES

Hioki 3274 high-frequency current probes are suitable for connection to oscilloscopes and Hioki waveform recorders. Applications include industrial electronics, inverters, electronic ballasts, switchmode power supplies, etc.

Users can select from a range of CT-style probes for frequencies to 100 MHz and currents to 500 A. There are four models to choose from: DC to 50 MHz (30 A); DC to 100 MHz (30 A); DC to 10 MHz (150 A); and DC to 2 MHz (500 A).

Features include insensitivity to external magnetic fields to 400 A/m, very small rise times and high signal-to-noise ratio. The Hioki probes can be powered from Hioki waveform recorders or from FET probe oscilloscope power supplies. In addition, the probes can also be powered from Hioki 3269 power supplies (four probes) or Hioki 3272 power supplies (two probes).

Power Parameters Pty Ltd

www.parameters.com.au

PAC SYSTEM

The PACSystems RXi by GE Automation & Controls is an industrial computing platform designed to deliver compact, rugged, high-performance computing capabilities to run HMI/SCADA, historian and analytics applications, enabling improved real-time control of operations and better integration into plant-wide systems.

With a choice of dual-core to quad-core Intel processors, the RXi IPC has multiple Gigabit Ethernet interfaces and industrial-grade high-speed SSD storage, or optional larger hard disk storage. The core of the RXi IPC architecture is GE's rugged COM Express modular CPU platform incorporating thermal monitoring technology. Utilising passive cooling techniques, it provides a high-performance, fanless industrial computing platform that can operate in the harshest environments.

Using all industrial-grade components in its fanless design, all aspects of the RXi IPC have been engineered for reliability, performance and lower TCO.

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

COMPRESSOR

To cater for growing demands from customers for compressed air systems with minimum power consumption in the performance range from 110 to 160 kW, Boge Compressors has released the S4. It owes its gain in efficiency to the effilence IntegrateDrive, BOGE's first air-end to feature integrated gears.

The large-scale design of the compressor provides high delivery rates with low power consumption. The level of energy consumed by the S4 compressors is lower by as much as 8%. The integrated gears are hermetically enclosed and the drive is protected from high levels of ambient dust. The result is a long service life of over 35,000 operating hours.

At 69 dB(A), the S4 is 7 dB(A) quieter than the previous model. Other benefits are a low residual oil content in the compressed air, minimal pressure losses and a long service life for the separating element. It can be used in environments that are sensitive to noise. No additional sound insulation is required for the structure.

The focus control 2.0 control system is designed to anticipate operating states and automatically adjusts to the temperatures and pressure levels that occur. Ready for Industry 4.0, the system makes it possible to simultaneously monitor the operating states and maintenance intervals of up to four compressors, allowing the user to take full advantage of the potential offered by the system. When maintenance is required, there is easy access to components via the removable service doors on two sides of the screw compressor.

Boge Compressors Ltd
www.boge.net.au

NZ expertise shines in new beverage processing plant

As the global demand for new and innovative beverages is entering a new age of lower sugar, greater convenience and higher value we are beginning to see more and more companies pushing the boundaries of what was once considered traditional beverage production techniques.

In early 2015 Australian-based Multipack, a contract beverage processing and packaging company, wanted a new beverage processing plant to produce a new coffee creamer for a major US manufacturer along with various other products. Multipack contacted Thermaflo for the design, fabrication, installation, automation and commissioning of a multipurpose beverage processing plant.

The plant was designed to process a wide range of beverages of various viscosities with up to 75% solids. To ensure the system ran smoothly and could handle the demanding duties, Thermaflo staff spent a lot of time developing the design. Once the design had been finalised the system consisted of two scraped surface heat exchangers, two tubular heat exchangers and three different sets of holding tubes which were all controlled by a PLC and HMI touch screen. This allowed for flexibility in the process as the various recipes and parameters were saved within the PLC.

At the beginning of the process, product is transferred via a progressive cavity pump from the product mix tank through to the pasteuriser's balance tank where it is level controlled. From the balance tank, product is then pumped through the tubular heat exchanger for preheating, utilising an onboard electric hot water system.

From the preheater, product is transferred to a scraped surface heat exchanger, where the product is heated further to achieve the heating setpoint. Following heating the product is transferred through a set of holding tubes. The length of the holding tube can be set prior to starting production — this is achieved by connecting the appropriate pipework to adjust the holding tube length, which in turn sets the holding time (the time it takes product at the set flowrate to traverse the holding tube).

Once the product has progressed through the holding tubes, the temperature is recorded before reaching a divert valve. If the desired product temperature is not met the product will be diverted back to the pasteuriser balance tank for further processing via the automated diversion system. When the product temperature setpoint is reached the divert valve will automatically change the product flow forward again for further processing. After the holding tubes the 'heat treated' product is cooled via two cooling sections; the cooling system consists of a tubular pre-cooler heat exchanger that utilises a closed cold water loop running at 20°C. This pre-cools the product down approximately 20°C. From there product is transferred to a scraped surface heat exchanger where it is further cooled to achieve the cooling temperature setpoint using 7°C chilled water.

After the cooling section the product is sent to a pasteurised product tank where it remains until it is forwarded to a filler for bottling and packaging.

The system is all mounted on a stainless steel skid frame, which allowed for a much simpler installation once the skid arrived on-site. This also allowed Thermaflo to set the plant up in its workshop in Palmerston North, New Zealand, to carry out the pre-commission prior to shipping.

This project has definitely been a one of a kind that has surpassed both Thermaflo's and the client's expectations.

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While the challenges you face in our industry may be complex and change throughout the cycle of a project, it is likely that your ultimate goal remains constant: run a profitable, safe and sustainable operation. With that in mind, it's important to partner with a local team that can assist you achieve these goals through services designed to minimise downtime, stabilise maintenance costs and help modernise plant assets.

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- Improved maintenance knowledge
- Optimised system performance
- Improved equipment reliability

Optimised plant assets

- Extended asset life
- Improved inventory integrity
- Improved component standardisation
- Reduced number of assets

Improved financial performance

- Reduced maintenance expenses
- Avoided downtime costs
- Reduced operational costs
- Increased return on assets
- Increased working capital

NHP Service Capabilities

NHP offers a range of on-site field service solutions to suit a wide range of needs. Whether your need is for installation and commissioning, migration, emergency breakdown or lifecycle services, NHP technicians are placed in strategic locations throughout Australia and New Zealand to respond to your needs.

Preventative maintenance

All products have a finite lifespan. When products do fail, it can lead to costly repairs or production losses. This service makes it possible to predict failures before they occur, ultimately, extending the lifespan of products. Our service team can discuss your site requirements with you and develop a suitably structured maintenance program to suit your budget and contingency requirements.

Commissioning and startup

Our field commissioning and startup services are available to assess application demands and configure products in accordance with your project requirements. Pre-commissioning and witness tests can be accommodated prior to dispatch.

Retrofits and upgrades

With retrofit solutions available to facilitate the installation for a range of products and brands, as well as customising solutions

to suit specific requirements, NHP can work within your existing switchboard environment to provide a cost-effective solution. The NHP retrofit solutions have been designed according to relevant Australian standards and recognised industrial practices, ensuring the controlled removal of products that are obsolete and potentially dangerous.

Emergency breakdown

NHP service provides 24/7/365 protection, ensuring that your assets continue to work for you. Our service technicians and engineers are on call and are equipped to minimise downtime.

Reliability evaluations

Our technicians have the technical knowledge and hands-on experience to evaluate your installed base and provide you with a report on the detected factors that impact the reliability and lifecycle of your equipment. To complement this evaluation, our technicians are qualified to advise on solutions that will best rectify identified problem areas that are reducing your efficiency and increasing your costs.

Training

In addition to our comprehensive range of formal classroom training sessions, NHP technicians and engineers can provide private one-on-one training at your site. Our field service training capability includes equipment operation and maintenance related to your site install base.

NHP Service Team

NHP's philosophy of people doing business with people has always rung true, and today NHP has the most extensively located team in the industry, made up of dedicated staff that are on-call and easy to access. Our team of technicians hold tertiary and trade qualifications, and regularly participate in supply line partner training programs to ensure our services are completed in line with manufacturer specifications. Equipped with comprehensive product knowledge, our technicians are committed to delivering best practice in electrical services, while providing an exceptional customer experience.

Why Choose NHP

No matter how good a product may be, it is nothing without dedicated people to support that product, and at NHP we're solely committed to servicing the needs of our customers. We bring together quality products with local knowledge and expertise to deliver best practice services from concept design through to installation and after-sales service, including project management.

A partnership with NHP will provide you with:

- Access to an extensive local stock holding
- A seamless combination of local technical support backed by around the clock service
- A specialist team of professionally qualified project management, design and engineering professionals
- A premium level of customer service and attention to detail no matter how big or small your project

To find out how NHP can help you provide a more profitable, safer, and sustainable operation please visit nhp.com.au/more/fieldservice.

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

NEW PRODUCTS

PERSONAL NOISE DOSE METER

The Brüel & Kjær 4448 personal noise dose meter assesses noise exposure in the workplace, informing users of the level of hearing protection required. It is available to rent from TechRentals.

The cable-free meter simultaneously measures all relevant parameters required by Noise at Work standards. It can be used in hazardous environments such as mining and petrochemical facilities, where only certified equipment can be legally used.

It features 180 h logging storage, including LAeq and LZpeak. It also has an auto-calibration function and a rechargeable battery with an operation time of 28 h.

An LCD display shows battery and memory status and a dB alarm LED indicates dangerous noise conditions. A kit of three includes a Type I calibrator.

TechRentals

www.techrentals.com.au

PANEL PC

The Aplex ARCHMI-932 industrial all-in-one HMI computer is housed in a fanless silver aluminium case that provides IP65 front panel protection and is only 70 mm deep.

The ARCHMI-932 Series is supplied with an internal 32″ full HD 1920x1080 resolution LCD and projected capacitive touch screen making it suitable for operator panel and HMI control applications.

The ARCHMI-932 Series features a built-in energy-efficient Intel Core i5-6300U processor with up to 16 GB of DDR3L memory. Two accessible internal 2.5″ hard drive bays are provided for system and data storage. Rear I/O connections include two COM ports, four USB 3.0 ports, two Gigabit Ethernet ports, audio line-out and mic-in. Internal expansion slots allow two full size Mini-PCIe cards to be installed. The ARCHMI-921 requires a 90–264 VAC power source and can operate in temperatures ranging from 0–50°C. It can be panel or VESA 200 mounted, allowing the panel PC to be ergonomically positioned for operator convenience.

The ARCHMI-932 is compatible with Windows operating systems allowing it to support a wide range of off-the-shelf and custom-developed industrial applications. For applications requiring a smaller screen size, ARCHMI Series Panel PCs can also be purchased with screen sizes ranging from 7″ to 21″.

Interworld Electronics and Computer Industries

www.ieci.com.au

ULTRASONIC SENSORS

To help engineers improve sensor operations, Turck has introduced six line extensions to its ultrasonic sensor range.

Ultrasonic sensors are suitable in applications with demanding requirements, such as long sensing ranges; non-metallic, irregularly shaped or transparent targets; wide sensing areas; and when dust or oil films are present. Ultrasonic sensor products include: M30 barrel sensors with a 6 m sensing range; 18 mm barrel sensors with side-sensing transducers; CP40 and CK40 sensors with updated housings; compact sensors for retroreflective applications; IECEx-approved sensors for hazardous applications; and compact sensors with NPN outputs.

Turck's updated ultrasonic sensors are available in a variety of housing styles with multiple feature sets to solve difficult applications. The rectangular packages of the CP40 and CK40 product families offer sensing ranges up to 2 m with either a single digital output or a digital and analog output. The barrel-style family offers 18 and 30 mm barrels with either a single digital output, dual digital outputs or a digital output and an analog output. The digital and analog output version offers the advantage of IO-Link capabilities, making parameterisation, diagnostics and replacement easy.

Turck Australia Pty Ltd
www.turck.com.au

ETHERNET SWITCH

Red Lion's N-Tron 7506GX series Industrial Ethernet switches feature six ports, gigabit connectivity, SD card backup and jumbo frame support. The 7506GX is therefore suited to high traffic applications such as security, video surveillance, manufacturing, mining, oil/gas, solar/wind generation as well as water and wastewater.

With an operating temperature range of -40 up to 80°C, the 7506GX also features built-in surge protection of 16 kV for every port.

Compatible with multiple brands of PLCs and protocols, the 7506GX includes one-click redundant ring set-up for self-healing ring topologies of 30 ms with full health status and port breakage detection as standard. The smart switch automatically self-configures multicast traffic settings without user input for the best management of EtherNet/IP. It additionally supports CIP messaging allowing seamless integration of switch monitoring direct to HMIs and PLCs through preconfigured templates. All systems include N-View software for fast interrogation of network health and port traffic information down to the packet level for performance monitoring.

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

SINGLE-ENDED AND DIFFERENTIAL VOLTAGE MEASUREMENT

CHOOSING WHICH METHOD TO APPLY — PART 1

Bruce Cyburt, Senior Design Engineer, Acromag, Inc.

The difference between single-ended and differential voltage signal measurement is a subject that is not always fully understood. The focus of this article is to try to make the difference clearer and provide tips on achieving the best results.

Voltage is defined as a difference in electric potential between two points and is a measure of the potential for current flow in a conductor or circuit. You can measure voltage two ways: single-ended or differentially. Depending on your application, the integrity of your measurement system can depend greatly on which approach you choose.

This two-part article looks at important aspects of single-ended and differential voltage measurement, and offers some insight on why it might be better to choose one method over the other. It will also dispel some of the myths and misconceptions of voltage measurement and show how to correctly apply earth ground to these connections.

Single-ended input voltage measurement

A single-ended input measures the potential of one point with respect to a fixed common reference (signal return or a reference voltage offset from signal return). Its chief feature is two input connections with one of variable potential and one of a fixed potential. If the single-ended input has multiple channels, then each channel measures one potential with respect to signal return (Figure 1a), or a common fixed reference (Figure 1b).

We are being careful to discern input Return from earth ground, as Return may or may not also connect to earth ground. In Figure 1b, we see that the low input or minus lead could be fixed to a common reference point other than measurement Return. That is, the single-ended input might reference to a 'pseudo-ground' or positive voltage offset from Return. This is often the case where a single-ended amplifier happens to be powered from a single positive supply, but is still able to convert negative input signals by positively biasing its fixed reference lead (some TC and RTD input circuits will do this, and also some single supply bipolar A/D converters).

Because a single-ended input measures the potential difference between one point and a common fixed reference, and because this common is a known reference generally shared with other channels, single-ended inputs save connectors and space. You can get twice as many single-ended input channels in the same space as for differential inputs. Single-ended inputs are also easier to install and analyse (only two connections are made). This measurement scheme works best applied to signals that share a common connection or return. It is, however, not appropriate where one of the two points of measure is not a signal return or

A WEAKNESS OF SINGLE-ENDED INPUTS IS THAT ALTHOUGH THEY CAN SUPPORT MORE CHANNELS IN LESS SPACE THAN DIFFERENTIAL INPUTS, EACH INPUT IS MORE SUSCEPTIBLE TO NOISE COUPLED INTO THE CIRCUIT, INCLUDING NOISE COUPLED FROM A LESS-THAN-IDEAL COMMON CONNECTION.

common reference between channel circuitry. Likewise, it cannot be applied to separate outputs that do not share a common connection in any lead (unless their respective measuring inputs are separate and isolated).

One example of a single-ended input that you may be familiar with is that of most oscilloscopes — each scope channel measures voltages relative to a shared reference point, usually earth ground. Because single-ended inputs measure one potential relative to a fixed common reference, it is also important to keep the polarity of your single-ended input straight. Get this wrong, and you might inadvertently short your signal by flipping the polarity of your input (unless the input source is isolated). Contrast this to a differential input which is more forgiving, because both of its input connections can be offset from circuit common and the measurement of one point is made relative to the other, not to a common reference point.

A weakness of single-ended inputs is that although they can support more channels in less space than differential inputs, each input is more susceptible to noise coupled into the circuit, including noise coupled from a less-than-ideal common connection (single-ended inputs have little or no common mode rejection). Briefly, because a single-ended measurement is taken as the voltage difference between one variable signal and a fixed common reference, and noise in the circuit will mostly be on the variable signal lead with the opposite lead normally tied to a relatively stable reference point, there is no benefit from common mode rejection for any noise present on the positive lead of a single-ended input (only normal mode rejection applies). This means that some portion of the noise will be passed through the single-ended input with the signal and possibly amplified.

Some applications for single-ended or return-referenced measurement include:

- Measuring an output voltage where one connection is already tied to a fixed common reference potential or return.
- Where the input signals have higher level full-scale spans greater than 1 V, due to poor noise rejection.
- Taking measurements over short distances, generally less than 3 m.
- Where it is necessary to accommodate many channels in a small space (less wiring, simpler).
- Where the emphasis is on lower cost (fewer connectors and less wiring required) or higher channel density.

Single-ended voltage measurements are not recommended where the output to input coupling is made in a noisy environment with high EMI and RFI, or where the coupling cable is not shielded.

A single-ended measurement myth

There is a misconception that single-ended inputs do not handle bipolar signals or signals below 0 V. This may have arisen because single-ended is sometimes confused with the term unipolar, or from the condition that occurs when the output polarity of an earth grounded single-ended signal is swapped relative to the mating input polarity, which can short the output via earth ground if the input return happens to also be earth grounded. Single-ended inputs do convert negative signals equally as well as positive as long as you keep your signal polarities straight.

In general, it is best to use earth grounded return referenced single-ended inputs (or optionally differential inputs) to measure non-grounded or floating signal sources. Likewise, it is best to use non-earth grounded return referenced single-ended inputs (or

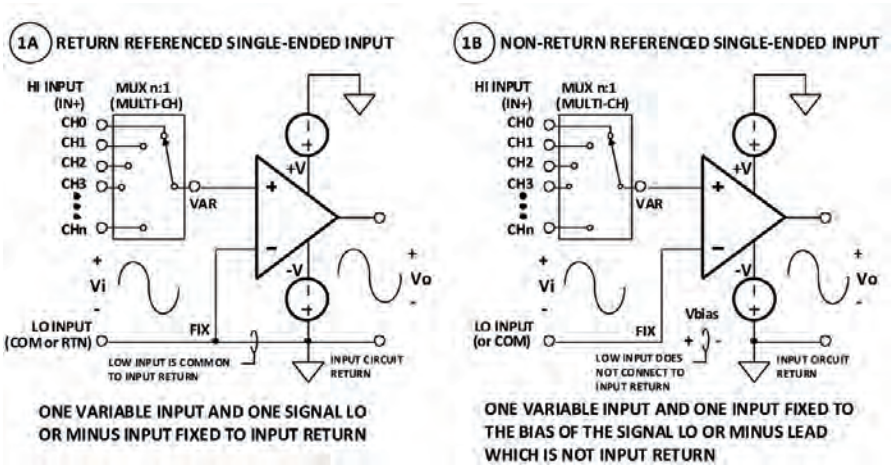


Figure 1: Simplified multichannel single-ended input.

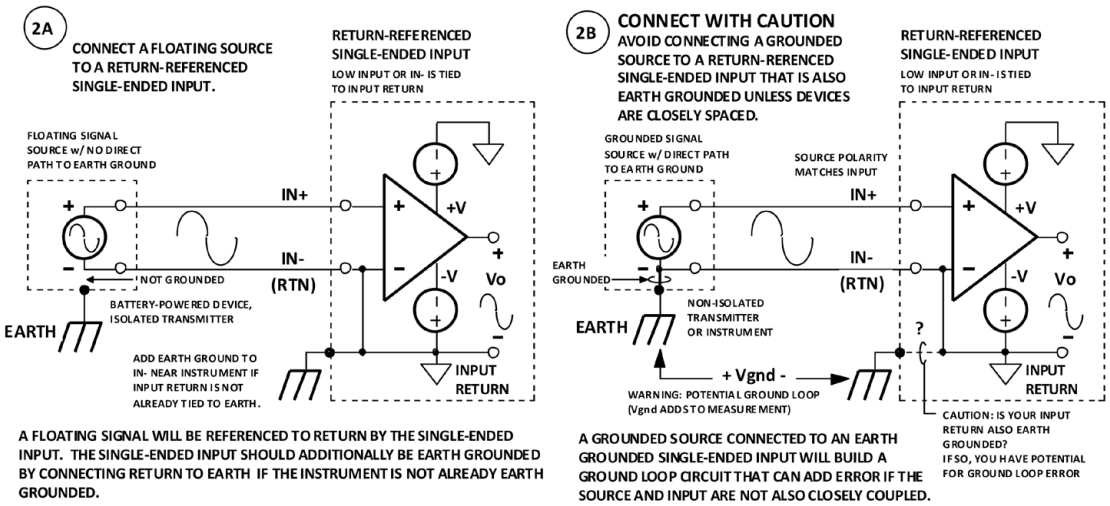


Figure 2: Simplified return-referenced single-ended input connections.

optionally differential inputs) to measure earth grounded signal sources as illustrated in Figures 2 and 3. But in both cases, you should avoid making more than one connection to earth ground in a circuit to avoid creating a ground loop current which can offset your measurement. A single-ended input may or may not connect its return to earth ground, so you need to additionally be aware of how your measurement system is wired. A non-earth grounded or isolated output signal cannot be left to float in the case where a single-ended input is not earth ground referenced. Likewise, an earth grounded output may build a ground loop if connected to an input circuit that is already connected to earth ground elsewhere.

Don't forget to earth ground your signal

The connection of earth ground to the I/O is sometimes a source of confusion, because a valid measurement can usually be made without connecting earth ground.

Instrument instructions generally recommend that your input signal be additionally tied to earth ground if the signal is not otherwise earth grounded (this is usually made at IN- , GND, RTN or COM of your circuit). But in most cases, the circuit will continue to measure properly with or without adding an earth ground connection. This leads some technicians to ignore this recommendation, which could lead to measurement error or even damage the equipment. While it is true that single-ended inputs do not normally float because one input is typically signal return and most circuits will exert a weak pull on their inputs to return, inputs can still be made to float in the presence of high levels of EMI.

In Figure 2a, a floating single-ended signal source is best connected to a single-ended input with an earth ground connection made at the single-ended input return. If the return-referenced single-ended input does not already connect earth ground to its negative lead as shown, then earth ground is best applied to IN- near the instrument.

A potential problem can arise when an earth grounded signal source is connected to an earth grounded single-ended input as shown in Figure 2b, which can produce ground loop currents that may offset the measurement. While not recommended, this is primarily an issue where the coupling distance extends out to and beyond 3 m and the earth grounding points are not the same or are spaced far apart.

Another method is to add weak pull-down bias resistors to the input lead(s) of single-ended inputs that are not return referenced. The weak pull-downs add bias to keep the high-impedance inputs from floating. How you decide to handle this case will depend on your knowledge of the internal circuit and how the non-referenced input positively biases the signal LO or minus lead, whether you

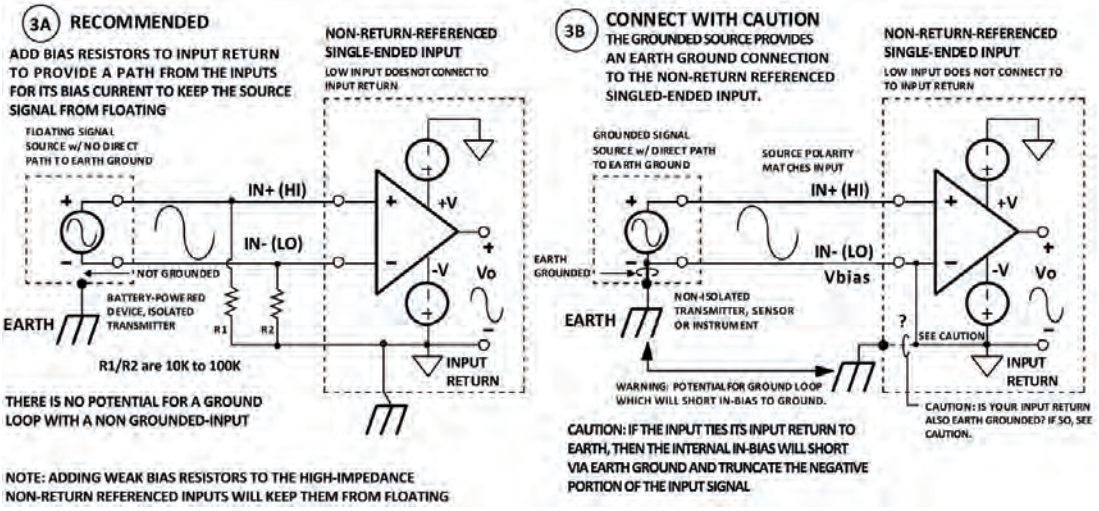


Figure 3: Simplified non-return referenced single-ended input connections.

have access to input return (does the instrument earth ground its return). If you do not have knowledge of the internal circuitry, adding weak pull-downs to its inputs as shown in Figure 3a will not usually be a problem, assuming you can connect to input return. Note that in many cases, the pull-down R2 added to the signal LO or minus lead can be omitted. This is because the non-return referenced single-ended IN- lead is usually positively biased above return by a voltage reference or diode to give a single-supply input circuit the ability to convert negative input voltages. Note that the minus lead bias supply is usually sufficient to keep the minus input from floating such that R2 may not be needed to pull IN- to ground and only R1 may be required. There is no potential for creating a ground loop in Figure 3a because the signal source is isolated and not earth grounded.

In Figure 3b, the grounded signal source provides earth ground to the input device via the IN- connection if the input return does not already connect to earth. If both devices are earth grounded (the input return also connects to earth), then the IN- signal LO lead's positive bias supply will be shorted via earth ground, possibly truncating the negative portion of the input range.

Beware of ground loops

Because single-ended outputs and single-ended inputs may both carry their common reference or signal ground in their signal LO or minus leads (sometimes denoted COM or RTN), and that reference may also be in common with earth ground to the equipment, there is a greater chance of creating a ground loop when making single-ended connections.

Instrument instructions will normally tell you to limit yourself to one earth ground connection in a non-isolated circuit in an effort to avoid generating a ground loop, but this is really only required when the earth ground connections are at different potentials which would push error current between them (not likely for closely spaced I/O). Be aware of where your output and input both connect to earth ground — if they each connect separately to earth, how far apart are their connections to earth? If the distance between the output and the input is larger than 3 m, or the distance between the earth ground points is large, you may have to introduce an isolation barrier between the signal source and the measurement device. The presence of isolation between the circuits will break the ground loop by allowing the earth grounds of each circuit (on each side of the isolation barrier) to be at different potentials (within the limits of the isolation rating).

In the absence of circuit isolation, limiting yourself to a single connection to earth ground can be difficult. Wiring diagrams normally assume that the local (input) earth ground and the remote earth ground (sensor or signal source) are at the same potential. To complicate matters, your equipment will typically recommend you have a local connection to earth ground at each piece of equipment for protection purposes. This can be a source of confusion in the sense that following the letter of the law appears to introduce more than one connection to earth ground. But what you really need to avoid is not having more than one earth ground connection, but having more than one earth ground potential. For short distances of 3 m or less, the remote and local earth grounds will be nearly the same potential and having two connection points to earth will not normally present a problem. If your signal source is earth grounded and the mating input is not, you should still earth ground the input and not rely only on the indirect common connection to earth ground via the output circuit. This is because of the potentially large inductance of the length of wiring for the input path to earth ground, even at distances less than 3 m, which will impede transient energy at the input from reaching earth ground and may damage your input circuit.

In Part 2

Single-ended measurement is done by measuring one potential with respect to a fixed common reference. In general, you may use single-ended measurement when there are only two output leads. In Part 2 of this article, we will examine differential voltage measurement, in which we are interested in the voltage difference between two points neither of which are necessarily a common reference.

Metromatics Pty Ltd
www.metromatics.com.au

REMOTE I/O MODULES

Control Logic now stocks the compact RSTi-EP remote I/O system by GE. Suited to Industrial Internet-enabled applications, it features an extended operating temperature range, enhanced diagnostics, plug-and-play connectivity and high channel density to simplify machine design and maintenance. It is also suitable for remote applications, especially those where I/O can be difficult to reach.

The product can accommodate up to 64 modules and 1024 I/O points per drop, from compact 11.5 mm I/O slices, helping to maximise limited cabinet space. By adopting a compact I/O system, it's possible to incorporate smaller cabinet sizes into user-friendly system designs.

The high-performance 4A system bus power supply makes it possible to power 64 I/O modules directly from the network adapter, saving on power feed modules and simplifying planning and execution. With the integrated web server and advanced diagnostics, failures in the system can be identified remotely.

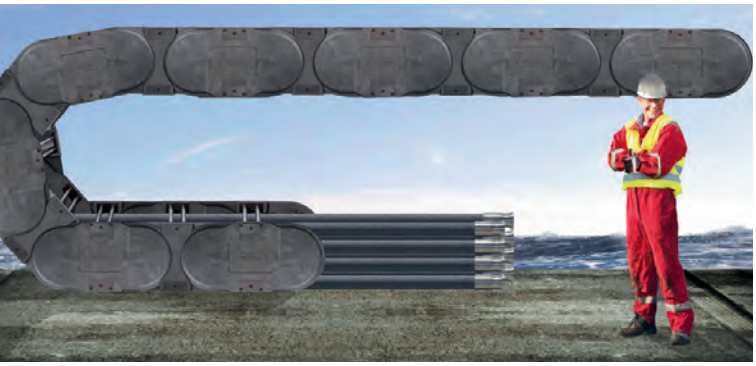
Control Logic Pty Ltd
www.control-logic.com.au

LARGE ENERGY CHAIN

The igus E4.350 energy chain was specially developed for offshore applications but is also suitable for other industries where oversized cables and hoses need to be guided and protected.

The plastic energy chain is said to be stronger than steel for its size and much lighter. It is also resistant to corrosion and weathering and unaffected by exposure to almost every type of chemical and petrochemical, as well as exposure to UV rays.

The large energy chain is made out of igumid ESD, making it suitable for use in areas where the ATEX or IECEx standard applies. The self-lubricating material requires no grease or oil on the joints throughout the working life, reducing or even eliminating the need for routine maintenance.



The product has a modular design and can easily be shortened or lengthened as required. It offers good rigidity and high load capacity during operation due to its tongue-and-groove design. It has a quiet, straight operation due to the inner/outer link design, plus stable opening crossbars at every link.

The dimensions include an inner height of 350 mm, inner widths of 400–800 mm, bending radii of 500–1000 mm and pitch of 470 mm. An interior separation system and mounting brackets can also be supplied.

Treotham Automation Pty Ltd
www.treotham.com.au

ETHERNET/IP LINKING DEVICE

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

The device makes it possible to include any automation device with Modbus TCP communication into an EtherNet/IP-based network architecture supporting over 8000 bytes of I/O data in total.

Contrary to an in-chassis module which is physically connected to the PLC, the EtherNet/IP to Modbus-TCP 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.

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.

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.

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WHERE IS AUSTRALIAN MANUFACTURING HEADING IN 2017?

What will be the main trends for Australian manufacturing in 2017 and beyond? Can we expect to see more 'smart' factories across Australia? Will more Australian businesses embrace automation and Industry 4.0 data exchange? Can we expect to see improvements in workplace safety?

The answer to all these questions is an emphatic YES.

Money is the smartest thing in the world and it can be a very accurate predictor of future trends. Huge amounts have recently been invested globally in the following technologies:

- Artificial intelligence (AI).
- Robotics: opening new markets including service industries.
- 3D printing: now being used widely in small volume and customised manufacturing — it will challenge and disrupt the traditional mass production model.
- IoT: data is becoming a key competitive advantage.

Australian manufacturers can expect a further breakdown of existing technology barriers. This includes:

- High-level programming languages to unify and simplify automation programming.
- Common communication protocols.

So what will this mean for Australian manufacturers?

It means IT professionals can enter the automation field more easily. This will create a huge talent pool and bring in more creativity and rapid changes. It also means site PLC standards will become unnecessary, opening the field for competition on true value.

And with advancements in technology and automation we can expect to see more manufacturing onshoring. More Australian manufacturers will follow the US lead and bring their manufacturing operations back to home soil.

Automation will bring with it reduced labour costs and higher productivity. Australian manufacturers can expect a reduction of the labour cost ratio.

With the growth in robotics and 3D printing in Australian manufacturing plants, labour costs are becoming less important in manufacturing. It's now more important to be close to customers and close to the source of raw materials. This

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presents more opportunities for developed nations like Australia.

China, a global leader in manufacturing, is now moving into a consumption-driven economy.

The transition has opened the door to great opportunities for not only Australian mining but also the food and beverage sector. And the recently signed free trade agreement (FTA) with China will create further opportunities.

But on the other side of the coin, manufacturers can expect increased competition from new players in other industries, especially ICT.

Companies like Tesla, Apple and Uber have disrupted the traditional marketplace with revolutionary ideas and sweeping changes. We can expect to see a new business culture and new skillsets with fast and aggressive changes.

In this environment fast learners will survive and thrive, while the 'resisters' will vanish.

Will automation cause widespread job losses? No. It will increase the demand for higher skilled and better paid jobs to replace lower end jobs.

Automation will give Australian manufacturers a competitive edge globally. It will mean access to a larger market and more business opportunities.

In the past, traditional industrial automation has not been an economically viable option for many manufacturers, but this situation is now drastically changing. Powerful modern control platforms can now help to reduce costs significantly. Such platforms can run configuration, programming, and simulation, controlling, monitoring and troubleshooting for all automation equipment including sensors, vision, PLC, VSDs, servos, temperature, safety and robotics — and in the past five years, the technology has improved dramatically.

Machine vision technology is also providing a key to the future. New machines can see things as well — if not better — than the human eye. In the past the human muscle was replicated in manufacturing technology, but now we're replicating the whole human.

While many plants are still using a standardisation model that was developed 20 years ago, automation technology is improving monthly. A fully automated processing plant with the latest technologies and lower engineering cost can potentially deliver improved productivity and yield while reducing costs. Australian manufacturers can look forward to 2017 and beyond with great anticipation.

**Henry Zhou was appointed General Manager of Omron Australia & New Zealand in April 2010. He joined Omron Australia as an application engineer in 1999 and later worked as a product manager of vision and RFID, NSW state manager and strategic planning manager. He has a degree in Automation Engineering from the Beijing Institute of Technology and an MBA (Management and Marketing) from RMIT University. Before joining Omron he was employed as a software engineer specialising in programming for SCADA systems.*

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POWER FACTOR CORRECTION CONTROLLERS

NHP has released the RL8 and RG8 power factor controllers for the automatic switching of capacitor banks.

With an easy-to-use interface, the RL8 and RG8 offer plug-and-play accessory modules providing flexibility to meet any application requirement, with options from master/slave configurations to contactor or dynamic switching of capacitor banks.

Features include IP65 front protection, network measurement values including harmonic measurement, step status information and defined alarms. Communication modules are available for RS485 or Ethernet Modbus connectivity for both RL8 and RG8 controllers.

The RL8 controller features eight relay outputs expandable to 14 steps, voltage and current THD up to 15th harmonic, two expansion slots and a built-in temperature sensor.

The more advanced RG8 controller features eight relay outputs expandable to 16 steps, voltage and current THD up to 31st harmonic, eight configurable user alarms, four expansion slots and a built-in temperature sensor. It also offers dynamic switching via a thyristor control module, advanced programmable I/O functions and master/slave functionality.

The RL8 controller will soon feature on NHP's PFCW, PFCE and PFCP power factor correction systems.

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

FIBRE COMPOSITE 3D PRINTER

Markforged has launched the Mark X fibre composite 3D printer, and can produce high-strength carbon fibre parts for both prototyping and manufacturing scale parts in mining, manufacturing, renewables, medical prosthetics and electronics/telecommunications applications.

In addition to the large print volume of 330 x 250 x 200 mm, the Mark X introduces a set of capabilities that include in-process laser inspection as well as a fine (50 μm) surface finish.

With in-process inspection for dimensional accuracy, the Mark X gives engineers and designers the ability to close the loop on production and ensure printed parts are exactly as designed. A laser sensor affixed to the print head will scan parts at any layer designated in order to measure whether critical tolerances are being met. In addition, the Mark X includes a high-precision build plate, encoders on the print head for high accuracy, silent stepper motors and a high stiffness Z-axis motor all for a high degree of part quality. The printer's footprint of 575 x 467 x 928 mm allows the printer to still fit neatly in a shop or office.

Emona Instruments Pty Ltd
www.emona.com.au

CONTROL SYSTEM

KEPServerEX V6 was designed to meet the connectivity challenges of the IIoT and Industry 4.0, making more information accessible to more clients while running enterprise-wide as an integrated connectivity layer or single standalone server.

It offers a number of enhancements, including enhanced multilingual support, a remote programmatic configuration API, native OPC UA technology, streamlined server licensing, deployment and maintenance, integrated security, and improved user experience.

In KEPServerEX V6, core components and key drivers have been localised into Japanese and German — enabling seamless user navigation and configuration for increased accessibility, safety and productivity for these native speakers, while the REST-based configuration API enables users to make remote programmatic changes to the KEPServerEX configuration via third-party or custom client applications.

To streamline the process of moving data between the device and application layers, the KEPServerEX OPC UA Client driver, OPC UA server interface and OPC tunnelling solution have been improved through the native development of OPC UA technology. It includes robust diagnostics and supports the high performance and scalability required in today's environments. KEPServerEX Version 6 also features an improved licence process that dramatically streamlines the steps needed to activate, maintain and manage all licences enterprise-wide, and the Security Policies advanced plugin has been integrated into the core server functionality and is now included with all licences.

An updated user interface streamlines project set-up, deployment and interaction for an improved user experience and enhanced product manageability.

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A rugged solution for wastewater

Deep in the heart of Texas, 50 km north of Austin, is historic Georgetown. The once sleepy town's population has almost doubled over the last 12 years to more than 52,000. According to Ron Marrow, Georgetown Utility Systems' transmission and distribution supervisor for SCADA, the rapid pace of growth has made providing utility services to the city an increasingly difficult task. He and his team are in charge of all communications and network connectivity across water, waste and electrical infrastructure. Thus, they've been heavily involved in ongoing upgrades to meet the needs of the city's soaring population.

For years, Georgetown Utility Systems used the 900 MHz radio spectrum with SCADA communications to monitor the operations of its water, sewage and electrical distribution systems. However, as Marrow explains, with a coverage area of more than 770 km^2, this presented reliability issues, particularly in the summer months.

"Whenever it got hotter than 32°C, communications from a remote wastewater lift station would fail," he said. "So we'd have to send a technician to take data readings every four hours, to make sure nothing was overflowing."

Another issue was the star topology of the city's radio network. "All the remote radios were transmitting back to one central radio," added Marrow. "If that central radio went down, so would all our communications."

To alleviate that concern, Marrow and his team deployed a redundant 1 Gbps fibre ring network, with the intention of using its multimegabit bandwidth to eventually enable video surveillance, VoIP and remote on-demand Wi-Fi hotspots for field workers. However, before these services could be implemented, the team had to contend with a more immediate issue: cost-effectively connecting the remote water treatment stations with the city's new fibre ring.

Because in-ground fibre costs up to $16,000/km, extending the city's ring to its wastewater lift stations was not economically feasible. After evaluating several options, the project team decided to employ broadband wireless — more specifically, 802.16e WiMAX — using the 4.9 GHz spectrum. WiMAX over the 4.9 GHz band would provide the range needed to reach the stations, but it did require licensing from the Federal Communications Commission (FCC) and accompanying paperwork that Marrow had no idea how to start.

To build out the fibre ring, the Georgetown team deployed scores of RS900G Layer 2 switches from Ruggedcom, a range of harsh environment communications solutions from Siemens. The RS900G is a fully managed Ethernet switch that provides dual fibre-optic Gigabit Ethernet ports with Gigabit uplink ports and 128-bit encryption. "We already had 200 Ruggedcom devices in our network, so it only made sense to keep all the WiMAX components in the family too," said Marrow. "After all, they had earned their Ruggedcom name by holding up to the harsh conditions of our central Texas summers."

In working closely with the Georgetown team, Siemens personnel became aware of the issue of extending the fibre's broadband throughput to the remote sites. The WiMAX technology itself also presented line-of-sight challenges, as wastewater lift stations were in low-lying areas amid Georgetown's rolling, tree-covered terrain. To address these issues, Siemens recommended Alpha Omega Wireless, a Siemens-certified industrial wireless solution provider based in Austin.

The Ruggedcom point-to-multipoint 4.9 GHz WiMAX solution provides reliable access to the data gathered in the remote water treatment stations and has saved the expense of a wired connection.

Alpha Omega Wireless compiled a detailed set of requirements from which the company's experts developed a Ruggedcom point-to-multipoint 4.9 GHz WiMAX solution, as well as a comprehensive deployment and commissioning plan. The company also processed all the paperwork needed for the city's FCC licence to use the 4.9 GHz spectrum, saving Marrow and his team weeks of time.

"The Ruggedcom system has worked flawlessly," said Marrow. In addition to eliminating the need to dispatch technicians to wastewater lift stations to log data by hand, Georgetown saved hundreds of thousands of dollars in capital costs by not having to lay fibre in the ground out to the remote sites. The result has been an extremely reliable, future-ready, high-bandwidth wireless network.

Overall, Marrow explains that one of the biggest benefits of working with Siemens and Alpha Omega Wireless was their expertise and collaborative approach to the project. "They worked seamlessly together," he said. "Through it all, my team and I felt like our backs were covered. No matter what issues might arise, we knew the two companies would respond as one."

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INTEGRATED STEPPER MOTORS

JVL Industri Elektronik A/S has announced NEMA23 integrated stepper motors based on the latest technology and an advancement of the previous designs, incorporating customer feedback.

The integrated motors have an RS485, an optional CANopen or an industrial Ethernet interface as well as an easily programmed motion controller. All the necessary electronics in a stepper system are integrated in the motor. Step resolution is high at 409,600 steps per revolution, resulting in smoothness and silent running.

The user can choose between top or rear end-mounted M12 connectors. The MIS23 motors come in three different sizes and two different motor types — three with standard high-torque stepper motors and two versions with ultrahigh-torque stepper motors with 40% higher torque.

The motors can be operated as stand-alone units or controlled from a PLC or PC. The eight I/Os can be individually configured as digital input, digital output or analog input. It is possible to communicate with systems via, for example, Modbus RTU or CANopen.

The MAC motor standard protocol that is supported makes it possible to connect up to 254 other JVL integrated motors. The MIS23 series allows connectivity to all industrial Ethernet interfaces such as Profinet, EtherCAT, Powerlink, EtherNet/IP, Modbus TCP and SERCOS III.

Speed precision for the stepper motors is 0.01 rpm, while acceleration precision is 1 rpm/s. They can operate from a wide supply range of 7–72 VDC, with motor current of 0–6 A RMS and 8.5 A peak.

Motion Technologies Pty Ltd
www.motiontech.com.au

PLC PROGRAMMING SOFTWARE

IDEC Corporation has announced Version 8.2.2 of its WindLDR PLC programming software, a PC-based platform used to program IDEC's FC6A MicroSmart PLC. The software can also be used to program IDEC's entire line of PLCs.

IoT capability is provided by custom web pages which can be configured for remote monitoring and control. Web pages are created with the built-in Web Page Editor using simple drag-and-drop functionality, with no HTML programming required. When used with the MicroSmart FC6A PLC, these web pages are stored in the PLC, which also functions as a web server. Email and text notification functionality are also available.

WindLDR is an icon-driven programming tool designed to make programming IDEC's controllers simple and intuitive with either ladder logic or Script, the latter similar to the C programming language. The Script language can be used to create more complex programs, particularly those with multiple subprograms and custom function blocks. Even without ladder logic programming experience, programmers can use the built-in editors, shortcuts and debuggers to quickly configure programs.

WindLDR also allows editing and downloading of programs while the PLC is still in Run mode. This function allows users to write new values to counters, timers and registers at any time without switching between editor mode (used for programming) and monitor mode.

A built-in simulation mode also provides a means to test and verify the functionality of ladder programs without having to download the program to an IDEC PLC.

IDEC Australia Pty Ltd
www.idec.com/australia

X-RAY FLUORESCENCE ANALYSERS

The Olympus Vanta is designed to bring the latest X-ray fluorescence (XRF) capabilities to a wide and diverse range of industries. The Vanta range includes the M series, C series and L series, and has been developed to work in harsh environments. The primary applications for the Vanta come from the mining and exploration, manufacturing, oil and gas, scrap metal and precious metals industries.

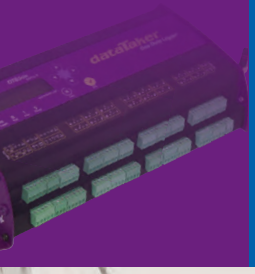
The Vanta range incorporates upgraded electronics, enhanced signal processing and increased incoming X-ray count rate. The range has been designed to survive MILSPEC 1.2 m drop tests and the Vanta L and C series have IP65 rating, while the Vanta M series has been given an IP64 rating. They also support the option of an internal fan to cool the unit and permit operation where the ambient temperature is as high as 50°C.

With its lightweight, handheld design, the Vanta range features rubber overmoulding to protect the analyser and an ergonomic grip for comfortable operation, while the detector shutter feature gives an extra layer of protection to the sensitive detector to potentially prevent costly repairs.

The Vanta utilises Olympus's Axon technology that yields enhanced XRF signal processing for accurate, repeatable test results. The resolution possible with the unit is claimed to approach fundamental, theoretical limits, enabling the Vanta to clearly separate crowded spectral peaks. This feature is important for the quantification of light elements in alloy or geochemical samples and precious metals.

The latest models include features such as two optional cameras, integrated GPS and an automatic time/date stamp.

Olympus Australia Pty Ltd
www.olympusaustralia.com.au



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THE POWER OF MOBILITY: CREATING A SMARTER WORKFORCE IN THE FIELD

John Cameron, General Manager

The right mobility solution gives the whole organisation the ability to manage the workflow seamlessly and keeps all operational elements connected.

Today, the ultimate goal of field service excellence is to respond quickly to business and customer needs. Whatever they may be, it takes four criteria to meet this goal: be on time, allow enough time to do the job, have the right skills and bring the right equipment.

For the mobile technician, an increased importance has been put on their role in the overall success of the organisation, as they are quite often the only interaction a customer will have with the business.

This has led to the search for new ways to empower technicians and equip them with the right tools that allow them to excel at their jobs, through improved communication, collaboration, data sharing and integration.

Research from Aberdeen Group in 2014 found that 82% of field service organisations identified mobility as a strategic initiative for the service operation in the future, as a tool to empower the field with real-time intelligence to make decisions and resolve issues to better serve the customer.

Companies that understand how to strategically leverage mobility solutions stand to drive efficiencies, improve service and benefit from a more profitable bottom line.

With field-based work becoming increasingly complex and time-sensitive, more and more businesses are beginning to focus on the proliferation of mobile solutions, integrated with back-end field service solutions, to help manage field operations and provide the mobile workforce with the real-time knowledge needed to make better, more intelligent decisions while in the field.

The Internet of Things (IoT)

The Internet of Things (IoT) has huge potential for the field service industry. It enables devices that are equipped with sensors, hardware and software to be networked together through the internet, where they can communicate with one another and send and receive data.

Machine-to-machine (M2M) technology is already helping field service companies to find out about issues before they occur through this development but the IoT is said to go beyond M2M

and represents the 'next generation' for field service, connecting not just with machines but with systems, people and other things.

For example, IoT allows field service companies to gain greater insight into the status and health of their assets remotely, enabling a smarter approach to proactive and preventive maintenance.

Sensors can be integrated into their devices in the field, which can yield a huge amount of data on diagnostics, measurements, temperature and overall conditions, all of which is instrumental in preventing equipment failure, scheduling maintenance and improving safety. The same principle applies for condition-based maintenance. Businesses will be able to become better at it as they will have access to more and better information in the first place.

Mobile apps

There are a number of different approaches a business can take in order to create a mobile application strategy, one of the most common being to develop them internally with mobile app development tools.

At its core, mobile applications provide technicians with the ability to share, store and view job data while out in the field, offering them a virtual link to the back office that helps to inform and empower them.

Having full visibility of a field operation is a key success factor, and mobile applications that can offer visibility into the status, location and performance of field assets (technicians, parts, equipment, etc) help technicians considerably in getting to the right place at the right time with the information they need to do their job correctly the first time.

A number of mobile applications on the market today also provide added value to the field worker by enabling them to easily locate and contact nearby co-workers if they need assistance on a job or require advice on solving a problem. By having the tools to work more collaboratively, resolution is more likely to be reached first time, helping to increase worker productivity and effectiveness.

The plethora of information offered through mobile applications can include previous work history of jobs and upcoming work details. For example, if a technician is en route to a site, a quick look at service history on a mobile phone can inform them of previous failures of the equipment before their arrival. This is vital information that can help the technician approach the customer or site with more care, helping to maintain a high level of customer service and be prepared for difficulties that may arise.

Furthermore, when a technician reviews and accepts a job within a mobile application, the mobile device's navigation tool can help them find the most efficient route, helping to reduce fuel consumption and travel time. From a service perspective, the technician can then pull up the site details and call personnel to confirm when they will be arriving on-site.

Mobility solutions: what to choose?

There are a multitude of mobile devices on the market today that help technicians get to the right place on time, fix the problem the first time and move on to the next task. The problem field service organisations face is choosing the right technology for their field-based workers.

Ruggedised devices continue to evolve as mobile technology improves and have proven successful in helping field workers to complete their daily tasks. Such devices can be used in the harshest of environments and enable scanning packages, diagnostics, checking customer records, invoicing and delivery confirmation, among other tasks.

As the lines between consumer and business technology continue to merge, non-rugged tablets and smartphones have also broken into the field service marketplace. Tablets tend to be larger than smartphones and therefore engineers and technicians may find it easier to view and input job details. On the other hand, smartphones offer the portability factor.

The 'bring your own device' debate has received much coverage in the service sector and has arguably been dubbed as being the

> COMPANIES THAT UNDERSTAND HOW TO STRATEGICALLY LEVERAGE MOBILITY SOLUTIONS STAND TO DRIVE EFFICIENCIES, IMPROVE SERVICE AND BENEFIT FROM A MORE PROFITABLE BOTTOM LINE.

only way forward for businesses looking to compete effectively and offer the most efficient customer service and increased employee satisfaction.

Simply, bring your own device (BYOD) refers to employees having the ability to connect their own technical devices — such as smartphones, laptops and tablets — to their company's network instead of using a device owned by the company.

Uptake of BYOD had been relatively slow in the field service industry but recent years have seen an influx of workers bringing their own personal devices into their work environment to use in their everyday jobs — and the advantages, both to the organisation and the employee, are significant.

For the field service organisation, it creates new opportunities for the business by increasing the number of tech-savvy and mobile-application users in the workforce. For the employee, they have taken a personal choice to use the technology and are familiar with it. This in turn will lead to increased satisfaction and productivity while eliminating the need for technical support and training costs for the business.

Mobility solutions: capturing the insight

When a field service organisation deploys a mobile strategy, the wealth of data captured around technician performance, customer data, vehicle location, work order status, etc is not enough to make intelligent business decisions. It is how that data is analysed and turned into usable information that is what will really make a difference. For this reason, data captured through mobile devices must be tied into other systems within the organisation's technology infrastructure — if not, it will get lost. Indeed, Aberdeen Group found the top strategic action for 62% of best-in-class field service organisations to be to improve data integration between the field and back-office systems.

Aberdeen Group's research also found that best-in-class field service organisations are 49% more likely than peers to integrate data from mobile devices with back-end systems, such as ERP and CRM. This integration will then allow other departments, such as sales, marketing and engineering, to benefit from the field insights captured and maximise its value.

For example, customer and equipment data has the ability to spark insights into opportunities around new products and services, which benefit the organisation in creating new revenue opportunities. This interaction also helps customers get access to products and services that will help improve their productivity and business goals. Service is ultimately a partnership between the customer and the organisation and, without the use of captured data, the opportunity to evolve will be lost.

Ultimately, having a mobility strategy in place allows for better empowerment, data sharing and collaboration out in the field. For the field worker, they are provided with the best possible support and are able, themselves, to make use of the real-time information and knowledge to make the right decisions while on the move. As a result, they are better positioned to resolve issues first time and deliver the best service they can.

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Combustible silicon powder for Li-ion batteries conveyed safely

The future of lithium-ion (Li-ion) batteries found in laptops, phones, hybrid cars and other applications may be taking shape at a UK start-up. Nexeon Ltd has built a plant at its headquarters in Abingdon, Oxfordshire, to produce a silicon anode it developed that significantly improves the energy density and operating life of Li-ion batteries.

Nexeon's technology replaces conventional carbon/graphite anodes (the negative electrode terminal) in Li-ion batteries with a proprietary silicon formulation structure that increases the energy density of the cell and addresses inherent expansion issues of silicon.

"The market for improved lithium-ion anodes is enormous globally, as they are found in consumer electronic devices such as smartphones, tablets and laptops. The largest emerging market is electric vehicles, where demand is expected to triple," said David Bent, production director at Nexeon.

A critical part of producing the silicon anodes involves transferring precise amounts of silicon powder and other ingredients from a bag dump station to a slurry tank for mixing in an aqueous solution, using a dilute-phase, Pneumati-Con vacuum conveying system from Flexicon.

The transfer is dust-free and safe. "Silicon powder is combustible and can be explosive under the right conditions," said Bent. "Flexicon analysed the powder and developed the pneumatic system for it, including dust control and explosion protection measures."

The first step in transporting the powder is manually emptying bags of silicon powder and additives into the bag dump station mounted on a floor hopper. A bag tray support provides a work surface for the operator to stage, clean and open bags. A dust collection system integral to the bag dump station draws airborne dust through two cartridge filters, as reverse pulse jets automatically clean the filters and return accumulated dust to the hopper.

The powders flow from the bottom outlet of the floor hopper through a pickup adapter into the two-stage pneumatic conveying line. The first vertical section rises 90˚ from the hopper outlet and connects to the second horizontal section, which runs from the silicon unloading area to the main processing area. The receiving hopper empties into a slurry make-up vessel.

A side channel blower downstream of the filter receiver atop the receiving hopper provides a vacuum that pulls the material through the pneumatic line, improving dust control. The fully enclosed system transfers the silicon

powder virtually dust-free. Since the system operates under vacuum, even if the integrity of the enclosed system is unintentionally compromised the silicon powder will remain within the conveying system. The filter receiver separates the silicon powder from the airstream before the powder enters the receiving hopper. Like the bag dump station, it has a reverse pulse jet system that automatically cleans the filter cartridges at timed intervals. The filter receiver is isolated in a safe area and protected with an explosion relief panel designed to exhaust the energy associated with an explosion without causing a catastrophic failure of the filter receiver. At the bottom outlet of the receiving hopper, a pneumatically actuated slide gate valve discharges the silicon powder into the slurry tank.

One set of load cells beneath the floor hopper at the bag dump station, in combination with load cells beneath the filter receiver, sends signals to the PLC which automate the delivery of a predetermined amount of powder to the slurry vessel. A low-level sensor near the bottom of the floor hopper signals the PLC to stop the conveyor until more material is dumped into the hopper in order to achieve the total batch weight. On the receiving hopper, a high-level sensor signals the PLC to stop the conveyor if the hopper is about to overflow in case of a system malfunction.

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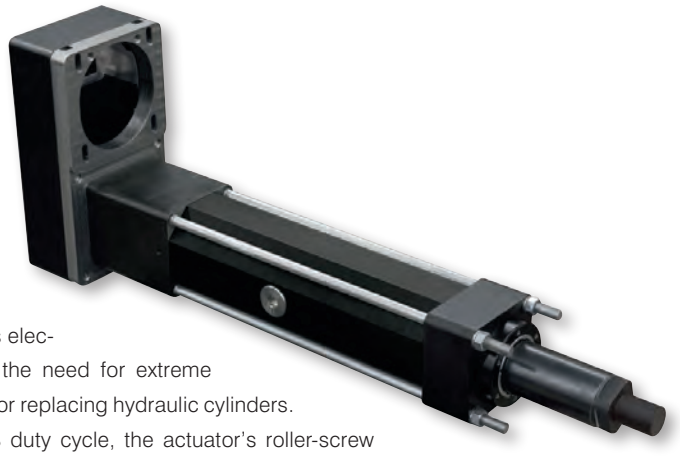

EXTREME-FORCE ELECTRIC ACTUATOR

Tolomatic's RSX hydraulic-class electric linear rod actuator meets the need for extreme forces and is a suitable choice for replacing hydraulic cylinders. Designed and tested for 100% duty cycle, the actuator's roller-screw drive ensures long, consistent life. Applications include pressing, punching, stamping; riveting, fastening, joining; injection moulding; and sawmilling.

The Tolomatic RSX family of hydraulic-class actuators will be capable of 222.5 kN or higher. The initial offering, the RSX-096, is capable of 135 kN. The actuator's heavy-duty construction includes tie-rods and Type III hardcoat anodised aluminium or zinc-plated steel. A standard anti-rotate feature prevents the rod from rotating without external guidance. Rated IP67, the actuator resists water from a light washdown and dust from outdoor environments. The RSX actuator is also designed and rated for extreme conditions including cold-weather operation.

The Your Motor Here feature allows for servo motors and gearboxes up to 215 mm frame size. Additional features include an access port for relubrication to maximise service life and a breather/purge port to prevent ingress into the actuator.

Pneumatic Products
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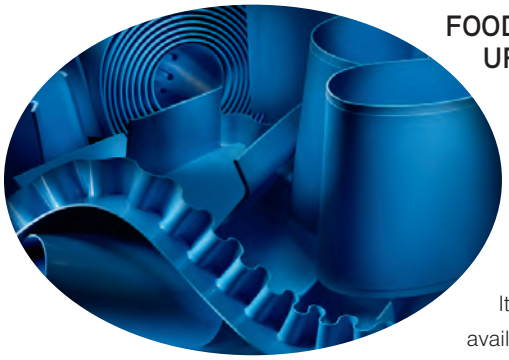

FOOD-GRADE URETHANE BELTS

Working closely with the Rydell Beltech team, Gates has developed a range of drive system solutions for the Australian food processing industry.

Gates Mectrol food-grade urethane belts sit at the core of the range. Its stable base belt construction and availability of multiple tooth configurations means that production managers have a wide range of custom options to suit their requirements.

The design produces 43% less surface area that requires washdown when compared to traditional plastic modular belts, according to the company, meaning that the belts are faster and easier to clean.

All belts are appropriate for clean in place (CIP) cleaning protocol, providing savings in water consumption and labour costs. The PosiClean food-grade urethane belts reduce downtime, wastewater and maintenance costs with CIP capabilities, as well as being resistant to elongation. According to the company, every foot of 24″ wide plastic modular belting replaced with PosiClean results in more than 2000 L of water savings per year.

The CenterClean food-grade urethane belt is suitable for troughing due to having a row of 75 mm-wide teeth in the centre of the belt. It is reinforced with Kevlar belt tension members, which not only prevent elongation but also stabilise the belt across its width.

Gates Australia Pty Ltd
www.gates.com/australia

PROCESS SIMULATION

Schneider Electric has announced the availability of SimSci SimCentral for Process Utilities, a software platform to manage how processes are engineered across their entire lifecycle.

Simulation tools used by process engineers in the oil and gas, refining, utility and chemical industries trace their origins to legacy architectures, operating systems and user interfaces, but the next generation of workers expects modern, scalable and easy-to-use solutions with technology they now take for granted — high-speed internet access, mobile devices, touch screens and virtual reality.

SimCentral for Process Utilities is a process simulator built from the ground up. Claimed to be the first platform designed to take full advantage of current web and cloud technologies, SimCentral delivers a modern user experience that embraces the expectations of the next generation of workers, helping to accelerate adoption.

Key features of SimSci SimCentral for Process Utilities include unified lifecycle simulation — in which a model can be taken through all stages of the plant lifecycle, including across design, training and operations — and improved ease of use. Expanded problem-solving is afforded by an intuitive model writing environment that unlocks new operations and equations.

With SimSci SimCentral for Process Utilities, a 'continuously solved' approach is possible whereby changes to input variables can directly update all output variables. An advanced design accommodates public or private cloud computing environments to scale performance speed as needed, providing faster calculation speed.

Collaborative engineering has also been enhanced — users can concurrently work on the same model across regional time zones, departments or other organisations.

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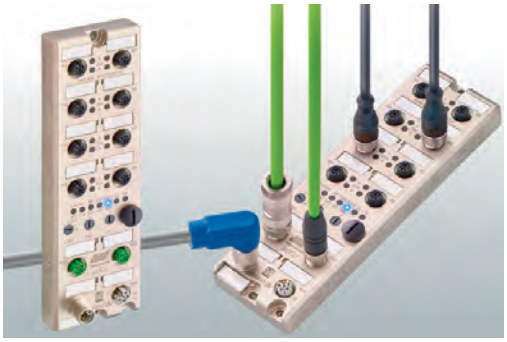
EXPANDED I/O RANGE

Belden has added connectors, cordsets and modules to Lumberg Automation's LioN-Power system. The updated range gives teams field-level solutions that enhance performance, while saving space and allowing them to take advantage of new technologies for IIoT. There are six additions to the LioN-Power range.

The LioN-Power µDCU (micro distributed control unit) is designed to make one-device automation possible by combining the capabilities of a field I/O with a programmable logic controller (PLC), with multiprotocol support for Profinet, EtherNet/IP and EtherCAT.



LioN-Power Multiprotocol I/O Modules add EtherCAT support to the line's existing support for Profinet and EtherNet/IP. They also feature a universal 16 digital I/O module option that give users the freedom to adjust the modules to any I/O configuration to meet the various needs of their systems.

LioN-Power IO-Link Masters are fieldbus-independent, multiprotocol modules that ensure consistent, intelligent communication between programmable logic controllers and smart devices that is necessary for IIoT.

LioN-Power Hybrid I/O Modules combine power and data transfer with multiprotocol support in combination with M12 Hybrid technology. Their space-saving interface reduces the number of cables needed, in order to simplify installation, and makes replacing modules easier.

LioN-Power M12 Hybrid Connectors provide one interface that simultaneously transfers power and Fast Ethernet data. They have undergone rigorous testing, making them the first M12 hybrid connectors to receive UL 2238 certification.

Lumberg Automation has also added a screw design option to its line of LioN-Power M8 5-pole B-coded Cordsets. This option adds stronger mechanical resistance and high-pressured water protection up to IP69K.

Belden Australia Pty Ltd
www.belden.com

SOFT STARTERS

Control Logic has introduced a range of soft starters from ABB adding updated functionality such as inline and inside delta connection and support for most major communication protocols.

Like direct online and star-delta starters, soft starters are used to start and stop motors in full-speed applications. The PSTX range combines many years of research and product development and eliminates problems associated with motor starting and stopping including electrical surges, spikes and high inrush currents.

There are three types of current limit on offer including standard, dual and ramp to provide full control of the motor during start-up. With advanced features normally associated with a VSD, the range includes torque control, slow speed forward and backward jog along with automatic pump cleaning and limp mode for continued operation in the event of a loss of one SCR.

The PSTX is available in various sizes with rated operational currents of 30 to 1250 A.

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

PORTABLE NON-CONTACT FLOW METER

The GE Panametrics PT878T is a portable, non-contact liquid flow meter using transit-time principle. Available to rent from TechRentals, the instrument comes equipped with a thickness gauge and two sets of transducers — one 12.5 to 50 mm and the second 50 to 600 mm in diameter. The clamping fixtures enable the measurement of flow rates and volume in pipes with temperatures ranging from -20°C to 210°C.

The flow meter is a lightweight and easy-to-use instrument that effectively measures through multiple materials, including plastic, metal and concrete-lined pipes. It can measure the flow of liquids ranging from pure water to dirty materials including raw sewage and slurries. The unit includes a USB port and the display comprises a large LCD screen that produces easy-to-read trend data in alphanumeric and graphical formats.

Accuracy is typically 1% and a built-in data logger can store over 100,000 data points. The measurable flow velocity range is 0.03–12.2 m/s and readings for velocity, volumetric, energy and totalised flow are available.

TechRentals
www.techrentals.com.au

NEW PRODUCTS

THERMAL-MAGNETIC CIRCUIT BREAKER

The E-T-A type 4230-T is a thermal-magnetic circuit breaker, it's designed as a standard miniature circuit breaker (MCB) with current ratings up to 63 A and a width of 18 mm per pole for rail mounting.

These single-pole and multipole thermal-magnetic MCBs are built in accordance with EN 60947-2, UL 1077 and UL 489 for DIN rail mounting with toggle actuation, visual status indication and high rupture capacity.

A positively trip-free snap action mechanism ensures reliable switching behaviour. A range of trip characteristics, add-on modules and high short circuit breaking capacity of up to 10 kA make 4230-T suitable for a variety of AC applications in mechanical engineering.

A number of add-on modules are available as options, such as an auxiliary contact module that can be used as a signal contact and is operated with the actuation of the MCB. There is also a fault indicator module that sends a signal when the MCB is tripped by a failure, but not when switched on or off manually. A working current module allows for remote tripping of the MCB and signalling whether the MCB was tripped electrically or manually.

E-T-A ElectroTechnical Applications Pty Ltd
www.e-t-a.com.au

DIAGNOSTIC SMARTPHONE APP

The FactoryTalk TeamONE app for iOS and Android smartphones is designed to seamlessly connect to the technology that manufacturers adopt during their digital transformation. The app boosts team productivity by enabling users to collaborate and share knowledge, view live production diagnostics, interact with machine alarms and troubleshoot devices.

By offering near-instantaneous incident and device data, plant floor, engineering and IT workers can collaborate as a team to quickly solve problems. From their smartphones, employees can choose from the variety of modules with the FactoryTalk TeamONE app to directly view information from devices or see the high-level health status of any EtherNet/IP device. This information is shareable across the app's collaboration and troubleshooting modules with other trusted team members. Once issues are resolved, learnings can then be flagged, saved and searched for the next time an incident arises.

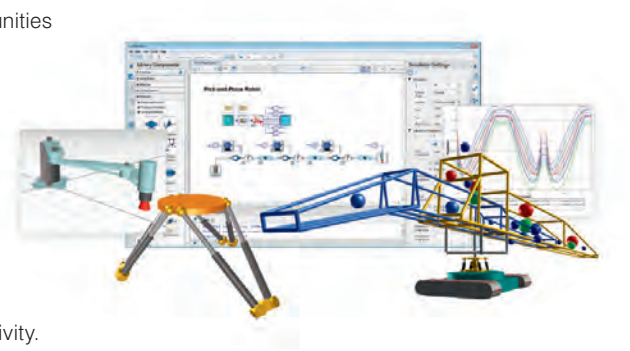
The app is a smart node. Rather than act as a client that connects to a server, the app's device modules communicate directly to devices on the network for live data viewing. When secure cloud access is available, the modules sync with other trusted team members.

The initial release, known as the FactoryTalk TeamONE Free Edition, includes eight modules: Incident, Device Health, Teamboard, Knowledgebase, Connect, Pinboard and Chat, Connect and Trend. It can be downloaded from the Google Play or Apple app stores. In the future, FactoryTalk TeamONE Standard Edition will be offered on a yearly user-based subscription.

Rockwell Automation Australia
www.rockwellautomation.com.au

SIMULATION SOFTWARE

Maplesoft has released MapleSim 2016.2, a system-level modelling and simulation platform used by engineers to reduce development time and gain insight into system behaviour. The latest release provides tools that increase engineering design productivity during model development, as well as significant additions to toolchain connectivity that offer even greater cross-tool compatibility and opportunities for co-simulation.



To support engineering design productivity, MapleSim 2016.2 provides live simulations that let engineers see results as the simulation is running so they can track progress and investigate unexpected results immediately. Other improvements include a 3D overlay for comparing simulation visualisations, which makes it easy to see changes in the behaviour of the model under different conditions, and tools for revision control that facilitate large projects involving multiple engineers working on the same model.

The release also includes significant enhancements to toolchain connectivity. In addition to exporting models to the internationally recognised FMI standard, MapleSim now also supports direct import of models created in other FMI-compatible software for both model exchange and co-simulation. Models exported by FMI-compatible modelling tools can be easily imported into MapleSim and used like any other model or subsystem. In this way, engineers can immediately leverage models developed using other software while taking advantage of the modelling and analysis tools of MapleSim when developing their system-level designs. For dynamic models involving multiple simulation tools, MapleSim now allows engineers to seamlessly connect models that run in other tools into their MapleSim system-level simulations.

Australian Scientific & Engineering Solutions
www.ases.com.au

LEVEL TRANSMITTERS

The type 2290 and 2291 radar level transmitters from GF Piping Systems are suitable for the chemical process industry and water treatment. They can be used in challenging tank applications where other contacting or non-contacting measuring principles face limitations.

The level transmitter type 2290 combines all advantages of radar level measurement in a compact and economical unit. It is available in a variety of different materials to resist even the most corrosive environments. With its tank mapping function it is easy to block out objects like internal pipes, welding seams, stirrers or heating elements.

For tougher applications, the guided radar level transmitter type 2291 provides consistent measurement even in turbulent process vessels. The radar signal is sent down the probe assembly, eliminating the interferences caused by low dielectric liquids, heavy fuming, slightly conductive foams or internal tank obstructions.

Transmitter type 2290 is available with PP or PTFE antennas. Type 2291 can be delivered with either stainless steel- or FEP-coated rope, or stainless steel or PFA- or PP-coated rod. The transmitters are equipped with a large LCD display for clear visualisation and easy configuration. The communication can be either via HART or analog.

Georg Fischer Pty Ltd
www.georgfischer.com.au

CAPACITIVE DISPLACEMENT SYSTEM

The MicroEpsilon capaNCDT 6110 is a compact, single-channel capacitive displacement sensor system capable of thickness, coordinates, level, tilt and vibration measurements. It consists of a capacitive displacement sensor and controller and can be used for automation, test bench construction, laboratories, semiconductor production, etc. It is also adaptable for OEM applications — linearity, resolution, digital interface, cable length, housings and measuring range can be customised to suit specific applications.

The system features a compact and robust design, high-temperature stability, nanometre repeatability and a 9–36 V power supply. It can work with any conductive target. Static resolution is 0.01% FS, while dynamic resolution is 0.015% FS and linearity is better than 0.01% FS.

Bestech Australia Pty Ltd
www.bestech.com.au

LASER DISTANCE SENSOR

Banner Engineering has added flush-mount housings to its rugged Q4X laser distance measurement sensors. The flush-mount configuration offers a more compact housing to expand applications and increase mounting flexibility in constrained spaces.

The Banner Q4X offers high performance, ambient light resistance and durability, with reliable detection of sub-millimetre changes in distances ranging from 35 to 310 mm. Utilising a CMOS imager for reliable measurements, the Q4X offers dependable performance with highly reflective and multi-colour surfaces, or light-absorbing materials and low contrasts, such as black foams or rubber combined with black plastics or metals. With dual teach mode, the Q4X uses a combination of intensity and distance, making it suitable for error-proofing applications and reliable detection of challenging targets, such as clear packaging and transparent object detection without a retroreflector.

Banner Q4X laser distance sensors are available with discrete, analog (0–10 V or 4–20 mA) and IO-Link output options.

The robust Q4X housing is rated to IP69K with FDA-grade stainless steel and its rugged design resists mechanical impact, over tightening and extreme vibration. A highly visible, four-digit, angled display is easily viewed from multiple vantage points.

Turck Australia Pty Ltd
www.turck.com.au

STAINLESS STEEL CODE READERS

Leuze electronic has released its DCR200i camera-based code reader in a stainless steel housing for use in the food and pharmaceutical industries. The housings are made of high-quality V4A stainless steel (AISI 316L) and achieve IP69K, ECOLAB and CleanProof+ ratings. Glass or plastic window options are available. The DCR 200i is designed for fast decoding of 1D, stacked and 2D codes for equipment used in packaging systems, automation, robotics and production.

With its modular design, the DCR 200i is adaptable to the requirements of the application with respect to function, range and power, and offers a high reading performance with speeds of up to 6 m/s.

A configuration wizard is integrated in the WebConfig tool, accessible via an Ethernet interface. For simple applications, the DCR 200i is operated as a standalone device with an IP address in an Ethernet star topology — with the serial (RS232 or RS422) or with configurable four I/O ports. Set-up for the reading task can be done without a PC using the two buttons on the device and a smartphone app.

Selectable optic variants high density (N optics), medium density (M optics) and low density (F optics) cover reading distances of approximately 40 to 360 mm. The housing hood can be replaced for specific requirements: a polarisation filter (plastic housing) for the food industry instead of the usual glass screen or diffusor foils for the screen on the housing hood to minimise reflection.

Leuze electronic Pty Ltd
www.leuze.com.au

SUBMERSIBLE LEVEL PROBE

The Krohne OPTIBAR LC 1010 submersible level probe features a robust 316L stainless steel housing and a high overload-proof ceramic diaphragm for long operating life. For safe and easy cleaning on-site, the diaphragm is flush mounted. With a diameter of 22 mm, OPTIBAR LC 1010 can also be used in small vessels. It comes with preconfigured measuring ranges from 100 mbar to 10 bar, 10 kPa to 1 MPa, and 1.5 to 150 psi — customer-specific ranges are available on request. For versatile use from water to wastewater applications, OPTIBAR LC 1010 features ATEX and IECEx certification and a corrosion-resistant TPE cable that is also approved for use with potable water. Next to the electrical lines for the 4–20 mA output, the TPE cable houses an air hose to be used for differential pressure level measurement with closed vessels. With open vessels, the air hose can be capped for absolute pressure measurement. As options, the OPTIBAR LC 1010 can be provided with an integrated 3-wire Pt100 temperature sensor, or alternatively with HART 7 communication for convenient configuration.

KROHNE Australia Pty Ltd
www.krohne.com.au

FRACTIONATION SWITCH

For the natural gas liquids (NGL) fractionation process to work efficiently and safely, the operation requires early and reliable indication of when a relief valve leaks or lifts during an overpressure situation. The FLT93L Series FlexiSwitch from Fluid Components International (FCI) can be used to accurately monitor the pressure relief valves for escaping flow with its thermal dispersion technology flow sensing switch/alarm.

In this application, an inline configuration FLT93L is placed on DN15 and DN25 diameter pipes. The FLT93L switch detects leaking or seeping gas in the lines to alert the engineer to overpressurisation. For the system to work properly, the FLT93L must detect low flows and yet avoid issuing false alarms that could seriously impact plant operations.

The FLT93L switch is easy to install and set up: FCI's voltage output allows users to see into the process and accurately set the desired trip point. Flexible dual relays are settable by the plant technician for any combination of flow and/or temperature alarms.

The FLT93L switch's flow accuracy is ±2% of the setpoint velocity over a ±28°C temperature range. Repeatability is ±0.5% of reading.

A wide selection of standard and custom process connections can be provided. The electronic control circuit can be integrally mounted with the sensing element, or it can be located in a remote location. The standard enclosure is a coated aluminium alloy and is rated for NEMA Type 4X (IP67) environments. Global agency approvals for Ex installations are provided, and it is SIL 2 rated for reliability.

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

LOAD CELL

Futek's LSM300 precision load cell (also known as the Belt Buckle Load Cell) offers a lightweight design with an easy side-mounting feature, making it suitable for OEM applications.

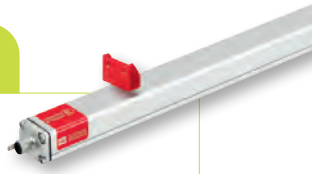
Utilised in both tension and compression measurements, the lightweight LSM300 weighs between 28 and 85 g. Its 4.572 cm length, 1.27 cm width and 3.556 cm height makes it a suitable load cell for small confined spaces. LSM300 comes in 2024 aluminium or 17-4PH stainless steel.

Additional design features include an in-built overload protector, which provides the unit with protection during installation of over 10 times the capacity needed. The LSM Series is also available with TEDS/IEEE1451.4 options that incorporate the calibration data to eliminate any data entry mistakes by the operator during installation. The LSM300 uses metal foil strain gauge technology.

The LSM300 can be modified or customised to meet individual requirements.

Metromatics Pty Ltd
www.metromatics.com.au

LINEAR POSITION SENSOR



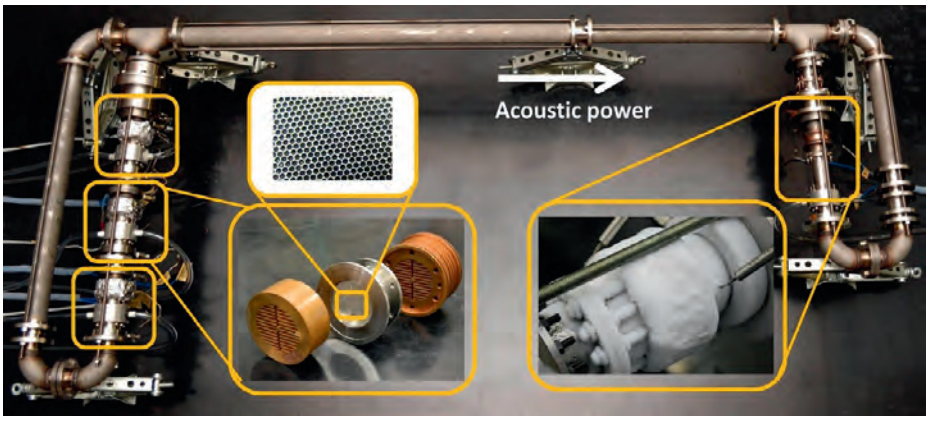
The MTS Sensors Temposonics E-Series EP2 position sensor provides high durability and precise position measurement feedback in harsh industrial environments. Measurement accuracy is tightly controlled by the quality of the waveguide. The compact and smooth aluminium profile offers flexible mounting options and easy installation. Moreover, the position magnet can travel along the entire flat housing profile. The EP2 is suitable for industrial applications including plastics moulding and processing, factory automation and packaging.

Flexible output options include analog voltage, analog current (use of multiple magnets is possible), CANopen, IO-Link and SSI. There is also a start/stop with sensor parameters upload function.

Stroke lengths available are from 50 to 3000 mm. Typical applications include plastics moulding and processing, packaging, stone and marble processing machines, as well as the glass and ceramics industries.

Thermo Fisher Scientific
www.thermofisher.com.au

Innovative refrigerator developed using multistage soundwave engine



Shinya Hasegawa and colleagues at Tokai University, Hiratsuka Japan, have developed a refrigerator (-107˚C) powered only by waste heat that generated soundwaves in an innovative multistage travelling wave thermoacoustic engine. The refrigerator produced the gas oscillations and refrigeration at a temperature lower than the boiling point of water and achieved a minimum cold temperature of -107.4˚C when the hot temperature was 270˚C. The findings are published in the *Applied Thermal Engineering* journal, November 2016.

The operation of thermoacoustic (TA) engines is based on the heating, cooling and oscillation of acoustic (sound) waves created by the thermal expansion and contraction of gases such as helium in enclosed dedicated cavities. The potential of TA engines for generating clean and renewable energy was demonstrated in seminal reports published in the late 1990s and early 2000s by researchers in the USA. Notably, these reports into the modern implementations of TA engines have led to increased worldwide research on the development of high-efficiency TA engines to convert heat into useful power.

Two of the main hurdles to the proliferation of this technology are:

1. High-efficiency systems operable at less than 300˚C as compared to the 400–600˚C range at the moment.
2. Robust design so that the systems could be used in a wide range of environments such as fishing boats and heavy industries.

Hasegawa and colleagues have designed a high-efficiency multistage thermoacoustic (MS-TA) engine, without moving parts, that operates at less than 300˚C (the temperature of more than 80% of industrial waste heat). The design of the MS-TA engine was based on finite element numerical analysis conducted by Hasegawa and his group.

"TA engines do not have moving parts, are easy to maintain, potentially high efficiency and low cost," said Hasegawa, an associate professor at the Department of Prime Mover Engineering, Tokai University. "My goals in this research are to develop TA engines that operate at less than 300˚C with more that 30% efficiency, and also to demonstrate a refrigerator operating at -200˚C at these low temperatures."

The TWTR consists of three etched stainless steel mesh regenerators installed at optimal positions (close to the 'sweet spot') within the prime mover loop and one fixed in the refrigerator loop. This configuration was designed to trigger thermoacoustic oscillations at lower temperatures and yield a refrigerator temperature of less than -100˚C.

The diameters of the regenerators ranged between 0.2 and 0.3 mm and their lengths were 30 to 120 mm, depending on location. Furthermore, the TWTR had heat exchangers in the form of parallel plates of copper (1.0 mm thick and 27.0 in length) with a 2.0 mm gap.

The thermoacoustic energy conversion of this design is determined by two factors: the ratio of the diameter of the flow channel and thermal penetration depth, and the phase difference between the pressure and cross-sectional mean velocity.

The overall performance of the TWTR system is expressed in terms of the coefficient of performance (COP) and given by the ratio of the cooling power to the total input heating power, that is, the sum of the heating power of each engine.

The COP increased as the temperature of the heat exchangers in the primer loop was increased and the maximum value of COP was 0.029 at 260˚C, and the corresponding cooling power was 35.6 W.

Furthermore, the researchers obtained gas oscillations at 85˚C — that is, lower than the boiling point of water — thereby opening up possibilities for applications of this technology for refrigeration and power generation using low-temperature waste heat in factories and automobile engines. Also, refrigeration (-42.3˚C) was achieved operating at 90˚C. Importantly, the efficiency of the Tokai University TA engine was 18% at -107˚C.

"The installation of multiple regenerators in vicinity of the sweet spot of the prime mover loop is a major advance in travelling-wave TA engines," said Hasegawa. "This configuration reduces the temperature for TA oscillations and improves cooling performance."

Following the successful development of the prototype system, the next step in this research at Tokai University is the development of practical TA engines with emphasis on contributing to environmental problems.

References:

1. Sharify EM and Hasegawa S 2017, Traveling-wave thermoacoustic refrigerator driven by a multistage traveling-wave thermoacoustic engine, *Applied Thermal Engineering*, vol. 113, pp 791–795.
2. Senga M and Hasegawa S 2016, Design and experimental verification of a cascade traveling-wave thermoacoustic amplifier, *Journal of Applied Physics*, vol .119, no. 20.

PAC SYSTEM

GE Intelligent Platforms has recently enhanced its PACSystems RX3i CPE330 CPU, which when combined with the latest firmware offers Profinet capability. This recent inclusion within the RX3i platform ensures GE solutions meet both local and distributed IO requirements. The CPE330 also offers Modbus TCP communications and dual gigabit Ethernet.

Third-party device compatible, the RX3i replaces proprietary networks with an Ethernet LAN and modern automation systems. OEM and system integrators have access to a solution that is not only standards compliant, but also improves connectivity, performance and profitability. Profinet is a key element in enabling future-ready platforms that are both open and flexible.

For mission-critical applications, the RX3i offers hot standby controllers for both dual and quad redundancy. Redundant Profinet for distributed I/O is also a key feature. With support for media redundancy protocol (MRP) at the hardware level, additional network devices are not required. More than 100 communication, motion and I/O modules are also available.

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

SLOW MOTION CAMERA

The X-Stream XS-720p slow motion camera by IDT offers continuous frame streaming via the PCI express 2.0 x4 interface with a sustained transfer speed of 1.75 GBps, making it suitable for high-speed applications including industrial and packaging inspection, microscopy, media, medicine, traffic control and surveillance.

The camera's flexible design has been implemented around two CMOS sensors with Global Shutter delivering over 1700 fps at full resolution (1280 x 720 pixels). The camera is compact in design, offers plug/record/play operation, requires no frame grabber and is suitable for desktop applications.

Advanced features include frame-to-frame auto-exposure and motion trigger, and double-exposure for PIV users. The specially tuned Motion Monitor application operates the cameras with features that include always-on live, record while saving and on-demand playback from disk.

SciTech Pty Ltd
www.scitech.com.au

CONVEYOR BELT SPLICE SYSTEM

Flexco's Novitool Aero is a fast, easy-to-use assembly system for conveyor belts. The system is a means of splicing thermoplastic belt materials like PVC or polyurethane, which are used in the food industry and other applications. Belts are securely spliced in just seven to 12 minutes, depending on the material.

All of the components necessary for the welding process are integrated into the system. A built-in air-cooling system quickly cools the belt after splicing, speeding up the work and improving the quality of the splice. Conveyor operations have to be interrupted only briefly when repairs are necessary. The splice press is available in five different models ranging in width from 600–2100 mm.

There are separate controllers for setting the temperature, time and pressure generated by the built-in compressor. The splicing operation itself takes place automatically. The temperature controller has a scrolling display which navigates the user through the settings in clear text messages. With two quick-clamping bars it is easy to position and fasten the material in the press.

With the press, the user can achieve different splice temperatures for the upper and lower platen. This improves the quality of the splice for belts with fabric inlays or those with very thin thermoplastic coatings. The dwell time can be set to the exact second. Other convenient features include an automatic dwell time countdown and a preheating cycle. Preheating is stepped and controlled to provide better splice results with thicker or less heat-conducting belt materials.

Flexco (Aust) Pty Ltd
www.flexco.com.au

IECEx CERTIFIED TABLET

APC Technology is now offering an IECEx certified Windows 10 enterprise tablet to the Australian and New Zealand markets.

The intrinsically safe, Windows 10, Intel-based tablet has gained certification for ATEX and IECEx Zone 1 areas internationally throughout Europe, Africa, the Middle East and Asia Pacific. The device is also certified for UL 913 Class 1 Division 1 explosive areas of hazardous locations in the United States and CSA 22.2 in Canada.

Manufactured by Aegex Technologies, the Aegex10 intrinsically safe tablet is said to be the first Windows 10 enterprise device to hold global intrinsic safety certifications for HazLoc operations worldwide, where high concentrations of flammable gases, vapours or dusts are likely to occur in normal operation.

The intrinsically safe tablet brings Windows 10 capabilities into industries such as oil and gas, chemical, mining and pharmaceuticals, which operate in highly explosive environments. While most mobile devices are not permitted in highly volatile zones of hazardous locations because they could cause a spark, Aegex's 10.1″ tablet is certified intrinsically safe, or incapable of igniting an explosion.

APC Technology
www.apctechnology.com.au

DIGITAL COMMISSIONING TOOL

Maverick Technologies has announced the release of eStart, an app designed to keep projects on track by making commissioning more efficient and transparent. When outage windows become condensed, even the slightest inaccuracies in project tracking can have a major impact.

At the beginning of a start-up and commissioning project, Maverick uses eStart to digitally gather data and create loop folders to house all relevant instrument data and check sheets. Digital folder creation not only reduces documentation time but also keeps all electronic data at the technicians' fingertips, anywhere they are. In addition, eStart's Near Me feature uses GPS technology to locate nearby instruments and identify which stage of commissioning they are in to make loop commissioning more efficient.

eStart also offers users greater visibility into their commissioning projects. Every time a step is completed, the app automatically records the technician's name, date and time, giving real-time updates so it is always known how close the project is to completion. This way, if the schedule slips, users can proactively make adjustments to get back on track.

The eStart app is a fully integrated feature of Maverick's SureStart solution for start-up and commissioning.

ZI-Argus Australia Pty Ltd
www.zi-argus.com

CURRENT-LIMITING CIRCUIT BREAKERS

Industrial automation users can improve their short-circuit protection with an updated line of current-limiting, moulded-case circuit breakers from Rockwell Automation. The line expands the Allen-Bradley Bulletin 140G moulded-case circuit breakers and claims to offer more comprehensive, fast-acting, short-circuit protection.

The devices protect against overload, short-circuit and ground-fault conditions. They are current limiting and react to circuit overloads two to three times faster than standard circuit breakers.

The updated range can help engineers achieve higher short-circuit ratings in the control panel as a result of their current-limiting ability. In areas where there is a high fault, the current-limiting circuit breaker can reduce the energy let through by more than 50%. This current limitation results in less stress and potential damage to downstream components.

Rockwell Automation Australia
www.rockwellautomation.com.au

SANITARY DRUM TIPPER

Flexicon has released a portable sanitary open-chute drum tipper that features stainless steel product contact surfaces finished to sanitary standards and a washdown motor, providing a low-cost means of discharging non-dusty bulk materials from drums without cross-contamination.

A single hydraulic cylinder rotates the drum to 60° beyond horizontal, discharging material onto the product chute and into a receiving vessel. The wide diameter and polished surface of the chute allows contents of the drum to discharge freely regardless of particle size.

The unit accommodates drums of all popular sizes weighing up to 340 kg, and can discharge directly into process equipment or optional hoppers equipped with outlets for pneumatic conveying systems, flexible screw conveyors or tubular cable conveyors.

Mounted on castors with quick-action floor jacks for stable operation, the tipper can be rolled to various use points throughout the plant, eliminating the need for multiple units.

Non-product contact surfaces are constructed of carbon steel with durable industrial coatings.

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

TRACE MOISTURE TRANSMITTERS

Michell's Pura range of trace moisture transmitters was developed for applications where purity of gases is of critical importance and even trace amounts of moisture are considered to be a contaminant.

Based on Michell's ceramic impedance moisture sensor, the Pura is capable of measuring dewpoints between -120 and -40°C dewpoint, or, in terms of absolute moisture content, 1 ppbV to 126.71 ppmV. This focus towards drier measurements optimises the performance for applications such as semiconductor manufacture, where the near-total absence of moisture is crucial to quality.

The Pura is simple to install and easy to operate. An optional display is also available to create a highly accurate, yet cost-effective hygrometer. Routine maintenance is also simple as the Pura is also included in the Michell Instruments sensor exchange program. Effectively providing a lifetime warranty, the exchange program allows users to ensure their sensor is always calibrated, while keeping their process running.

As well as semiconductor manufacturing, the Pura range is also widely used in fibre-optic production, optical coating processes and industrial gas manufacturing.

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

EMBEDDED AUTOMATION COMPUTER

Advantech's latest UNO embedded automation computer, the pocket-size UNO-2271G, is the same width and length as a 2.5″ SSD but still includes the ability to expand its performance to meet application needs through six mounting solutions (stand, pole-mount, VESA, DIN-rail, wall-mount and vertical-mount) and over 30 iDoor modules.

The entry-level system includes enough features to perform basic functions; however, for increased functionality an additional module that accepts iDoor modules is recommended. Advantech's iDoor technology is a modular way of adding flexible functionality to a wide range of devices and gives system integrators the flexibility to choose the functions that they need without purchasing devices that have excess costs and functions that they'll never use.

The UNO-2271G has been designed for cloud-enabled HMI solutions and has integrated remote display technology that enables users to remotely control the UNO-2271G from mobile devices or other PCs via VNC.

For a more visual system, the UNO-2271G also supports WebAccess/HMI, visualised HMI runtime software that covers the whole range of HMI control and visualisation in machine industries through its high degree of customisation and its user-friendly interface. Combined with the remote display technology of UNO series models, operators can diagnose and control machines through VNC clients without being present on site. WebAccess/HMI software enables data transfer between units and the management system by providing over 450 PLC and controller communication drivers.

Advantech Australia Pty Ltd
www.advantech.net.au

LOGISTICS
IN THE ERA OF INDUSTRY 4.0

Volker Glöckle, Logistics Automation Industry Management, SICK AG

Digitalisation, networking, cloud computing, data security — the fourth industrial revolution is underway even with respect to logistics. Making logistics-related object properties available to all members of the supply chain makes possible a whole host of greater efficiencies. The prerequisite for this is a secure data space that is regulated and standardised across the board.

Logistics is one of the sectors that is set to benefit in particular from the possibilities of a secure data space. The reason for this is that logistics processes rely to a large extent on consistent and reliable data that is available promptly — and in particular, the data that comes from the properties of logistics objects.

Master data not yet available across the board

If you take a look at the current degree of automation, most handling and logistics systems work with an object ID such as a part number, the object geometry and the object weight. The properties of products, boxes, pallets or other load carriers are typically recorded in the inbound or outbound goods areas of logistics or sorting centres. Their availability over the entire supply chain is, however, limited by company boundaries, a lack of standards for storage and archiving, a lack of rules and regularity with respect to updates, and the sometimes manual and therefore error-prone recording procedure. As a consequence, material master data and object properties are currently only made available to the supply chain in a proactive manner on rare occasions — and particularly given the fact that questions regarding structure, language, rights of ownership and data security have yet to be clarified.

With regard to product changes, it is actually down to the manufacturers to deal with information technology matters. Only they know when and which data is to change with respect to their product, and are therefore the only ones who would be able to provide comprehensive information promptly. If the information is not provided, this can lead to major problems. For example, if a supplier changes the 'Content' object property to '10% more content' as part of a marketing campaign but fails to notify those responsible for logistics processing downstream, this can have a negative impact on automated handling and the logistics process. As a result, storage sizes and containers cannot be used as planned, incorrect storage space suggestions trigger stock transfers and shipping units vary in terms of size and weight. This example demonstrates why it will be necessary in the future to make such data available to all partners in a supply chain on a secure platform to enable them to optimise their specific processes.

Taking object information from local to global optimum

When it comes to modern logistics systems and processes, the requirements of throughput and flexibility seem to be difficult to reconcile at first glance. In order to better satisfy these in future, automation solutions are required that no longer simply ensure the local optimum — for example, for an automated warehouse — but that also provide a global benefit for the entire supply chain. This means that more object information will be required in the future and this will have to be available freely and promptly at every point in the supply chain.

Recording this additional information is, however, only one part of the task to be addressed. It is also necessary to have consistent standards for storing and archiving object data, even across company boundaries. This will at least involve standardising master data archives, rules for data changes, rules for real-time availability, the authenticity and rights of ownership of data and, above all, clearly defining data security. Companies will only make their own data available when they can be sure of the security of the data. The key requirement can be formulated as follows: how can a network that is designed for openness intentionally be made as secure as possible and yet remain accessible?

Increased process efficiency through a secure logistics data space

Having knowledge of more object properties enables more handling and logistics processes to take place. Once data such as the contents of shipping cartons or the loading pattern of a pallet has been recorded for the first time and is then securely available in a data space, it doesn't have to be gathered again several times along the supply chain, as has sometimes been the case until now. It is then

enough to verify the data prior to individual steps at a relatively low cost. Goods recipients can log into the cloud, view their shipments, such as the loading pattern of a pallet before depalletising unsorted pallets or the load carrier allocation for bin picking, and take proactive measures. This doesn't just open up new possibilities for value creation with respect to logistics, but also brings about new business models with high process complexity, such as in e-commerce, multichannel sales or far-reaching supply chains.

The architecture of this data space is being explored by organisations such as the not-for-profit association Industrial Data Space e. V., the Fraunhofer-Gesellschaft research organisation, the ZVEI German Electrical and Electronic Manufacturers' Association and a further 15 commercial enterprises. Together, they have set the objective of playing a part in the establishment of a secure data space both across Europe and worldwide. The association aims to enable companies from various sectors of industry and of different sizes to network their data with confidence.

From the sensor directly to the secure data space

The basis for this is intelligent sensor, system and software solutions that are already available today and which are able to collect both conventional master data as well as additional object properties at the required standard of quality, process these and make them available in the cloud.

At object and part level, this can be achieved by 2D/3D vision sensors, which enable barcodes, 2D codes, digits and characters to be identified or the geometric dimensions of an object to be recorded. In the next packaging aggregation stage, laser scanners determine the volumes and loading geometries of parcels, boxes and other totes. The height and width of pallets can be recorded with 3D vision sensors or light grids, for instance. RFID gates enable the loading of truck swap bodies to be detected automatically. The RFID antennas connected to an interrogator and an integrated web server provide a direct connection to the industrial data space.

New logistics services through digitalisation

The future of logistics is to be found in end-to-end digitalisation, which will enable new potential for creating value and new business models to be established. The recording, collecting, evaluating and supplying of object information with the aid of intelligent sensors delivers a wealth of data for this; however, its true value only comes to light when all partners involved in the supply chain are able to rely on security when supplying, sharing and accessing this data.

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AS I SEE IT

THE ROBOTS ARE DEFINITELY COMING IN 2017

I have a marvellous engineering book from 32 years ago entitled *The Robotics Revolution*, by Peter Scott. It gives fairly minimal mention about software, focusing more on the mechanical, electrical and control aspects. We can say today, without a shadow of doubt, that the robots are definitely coming — with an overwhelming focus on software and artificial intelligence.

Below are my suggestions on the top technology trends this year that will start to impact on you as engineering professionals working in the field of industrial automation.

Machine learning and artificial intelligence

Robots will continue to surpass and overtake what we as humans can do, especially in managing huge amounts of data — from autonomous driving cars, to drones, to traditional administrative tasks resulting in a hollowing out of middle-level jobs, with the robo-boss (yes!) becoming a reality for many today. Naturally, we need imaginative designers and engineers to create these devices.

The IoT and a super-interconnected world

Solid growth in connectivity with sensors (and actuators) although (as we can surely remember from the fieldbus wars) a lack of standardisation makes it all very fractured at present. By 2020, 25 billion sensor devices will be generating data (according to Gartner). How do we handle this volume?

Cybersecurity and cybercrime

I reckon most of us have been touched by virus attacks and assaults on our bank accounts and IT systems. Security must be built into everything we do, rather than as an afterthought. Digital thieves are smarter than ever and are proliferating at an alarming rate. We are under constant attack and need to be vigilant, especially with our industrial infrastructure now connected to the internet.

Smartphones becoming your primary tool

Smartphones and tablets have already become a key mobile tool in our homes and businesses and, indeed, in our industrial plants. I just wish the batteries would last longer. Have you used your smartphone to measure voltage and current yet?

Virtual and augmented reality

This is finally working. With the arrival of the Oculus Rift viewer and other related low-cost devices, one can get a brilliant virtual experience, which is especially valuable for training and entertainment.

Cloud computing

Cloud computing will be used widely in the industrial world. This will barrel along with greater emphasis where software will be centralised and easily accessible. This will reduce the need for IT expertise (such as networking) at each individual firm, as all fixes/configuration will be done at a central, cloud-based server. There are still enormous — and justifiable — concerns about protection of data in the cloud.

Drones or UAVs

These will be applied to business use more. Drone technology is growing strongly and will be allowed to make deliveries and perform other mundane public tasks.

An interesting comment from Cynthia Breazeal of MIT: "If you look at the field of robotics today, you can say robots have been in the deepest oceans, they've been to Mars, you know? They've been all these places, but they're just now starting to come into your living room. Your living room is the final frontier for robots."

All the best for a fabulous 2017 — I hope it meets all your expectations. Above all, stay healthy and maintain your happy personal connections.

Steve Mackay believes university engineering programs need to be strongly focused on industry. He has acted as the author or editor of over 30 engineering textbooks sold throughout the world. He is currently leading the first fully online accredited engineering college, with over 1500 students from over 120 countries attending a range of 30 certificates, 15 engineering diplomas, four engineering bachelor degree programs and six master of engineering programs.

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