WNIPT
April 2015 vol.28 no.10
PP100007403

WHAT'S NEW IN PROCESS TECHNOLOGY

AUTOMATION + CONTROL + INSTRUMENTATION

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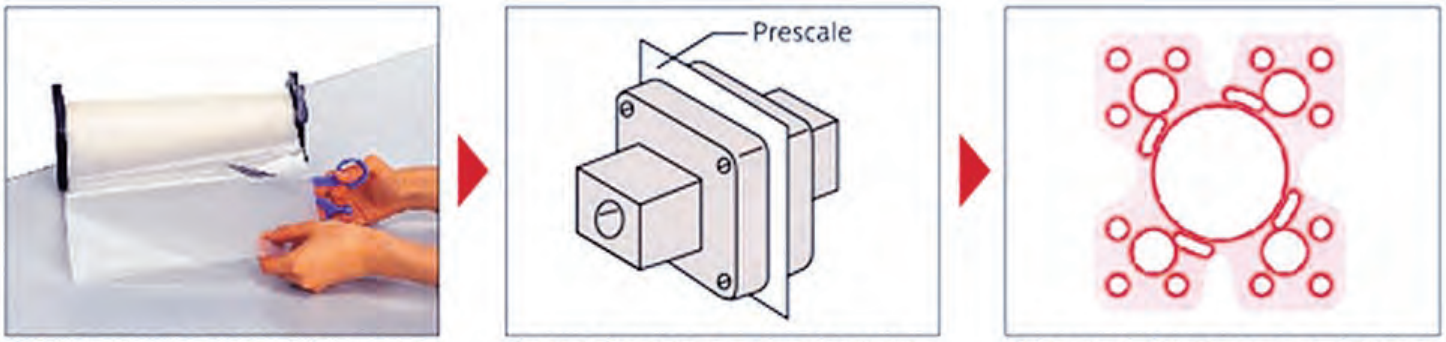


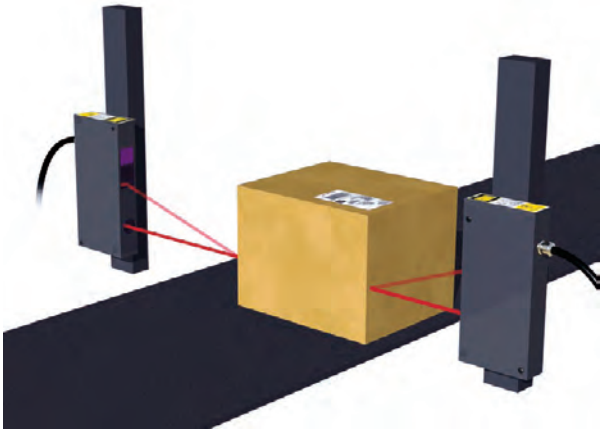
①Cut Prescale to desired dimensions

②Insert Prescale in desired location and apply pressure

③Remove Pressure and Prescale and you can now See and check the pressure and it's distribution

Pressure Distribution Measurement Films

Pressure transmitters



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WHAT'S NEW IN
PROCESS TECHNOLOGY
APRIL 2015

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ON THE COVER

Emerson introduces a series of 3D Solids Scanners for the continuous measurement of level, volume and mass of bulk solids and powders in large vessels, bins and silos. The new series uses acoustic measurement and 3D mapping technologies to provide accurate and reliable results even when measuring uneven or sloping surfaces under dusty conditions.

Rosemount 5708 Series 3D Solids Scanners provide highly accurate measurements of stored contents for improved process and inventory control. Unlike laser-based technologies that can take several hours to take measurements and require the process to be shut down, Rosemount 3D Solids Scanners provide continuous volume measurement with a high accuracy. They can measure practically any kind of material including difficult-to-measure fly ash and materials with a low dielectric that would challenge other technologies. The self-cleaning design requires low maintenance even when used in the dustiest environments.

Rosemount 3D Solids Scanners are suitable for measuring solids in silos, large open bins, bulk solid storage rooms, stockpiles and warehouses. The Rosemount scanner maps the uneven surface typically found in solids applications and can provide the minimum and maximum level, the total volume and a 3D visualisation of the surface.

Emerson Process Management
1300 553 051
EmersonProcess.australia@emerson.com
EmersonProcess.com/3dsolids

EMERSON
Process Management

TREATING SECURITY LIKE SAFETY

Mike Baldi, Chief Cyber Security Architect, Honeywell Process Solutions

Safety and security work hand in hand in the manufacturing automation arena. However, despite more and more sophisticated, frequent and costly cyber attacks, security still does not receive the same attention as safety. There is a growing need to elevate security awareness to the same level as safety - ensuring not only a safe, but also a secure manufacturing environment.

Let's face it - security awareness today suffers from an identity crisis at manufacturing facilities across the globe. Big, small or anything in between, there is a general lack of understanding of security best practices.

With reported cyber attacks growing by 600% since 2010, according to NSS Labs, security awareness among manufacturing organisations needs to grow to the point where best practices end up ingrained in workers' minds. That only makes sense as safety protects man against machines, while security protects machines against man.

Well known within security circles, cybersecurity awareness in the manufacturing enterprise remains nascent and needs to bust out and go mainstream within each organisation. But where does that awareness begin and how can a manufacturer get started on the journey towards security?

A decade ago, when most systems and business networks remained isolated from one another, security was relatively simple. The enterprise stayed connected to the internet but focused on keeping its network up, running and protected, while process control and safety systems remained isolated and really did not have to worry about web connections. However, in the name of progress and efficiency, the two networks became interconnected over time - a true sensor to boardroom communication. By the early 2000s, and especially after 11 September 2001, security professionals saw that safety systems and the control network, previously unguarded from any kind of security measures, needed protection. But getting industry leaders to understand and grasp that concept was akin to rolling a boulder uphill.

Stronger safety emphasis

The idea of safety, on the other hand, generated a strong following - especially after the disaster in Bhopal, India, when a methyl isocyanate gas leak occurred on the night of 2-3 December 1984 at the Union Carbide pesticide plant - leaving 3787 dead and 558,125 injured, according to the Indian government. In the years since Bhopal, process safety gained corporate importance and all manufacturers understood and respected all safety initiatives. Yes, manufacturers had to look at cost, but it was imperative that companies targeted safety. 'Safety First' initiatives began in full force.

Process safety programs focus on design and engineering of facilities, maintenance of equipment, effective alarms, effective control points, procedures and training. It was, and still remains, a vital area to protect a company, its people and the surrounding area from any kind of potential disaster.

When it comes to safety, in order to contain a complex process (such as an oil/gas operation, refinery, chemical plant, steel plant, and automobile manufacturing to name a few), a manufacturer must design and implement management systems to:

- **Understand the risk:** Predicting problems, including predicting the risk of possible accident/loss scenarios, establish the appropriate design and the right layers of protection to control risk to a tolerable level.
- **Control risk factors every day:** Controlling the original design by maintaining the established layers of protection and managing changes to the design using integrated management systems.
- **Analyse actual problems and determine weaknesses in the system:** Identifying weaknesses in design and management systems and weaknesses in risk understanding through root cause analysis of actual problems (losses and near-losses).

Security adoption lagging

At a basic level, security follows the same set of guidelines. Why, then, are more organisations not implementing security into their daily mindset as they are safety? Some of the top internal reasons are: people, training, no real corporate mandate and no business return on investment.

With security being the new kid on the block for process control, getting people to embrace how to integrate security into their everyday work life is an ongoing

education process. Teaching workers to not plug a thumb drive into a computer before checking to make sure it is free of any virus is just one example.

In essence, the lack of ongoing training is also a cause of not having automation professionals think of security on an everyday basis. In safety, manufacturers have ongoing training and standard operating procedures, but in security, there is not enough emphasis placed on total security worker education.

To talk security, there must be a solid business proposition behind why a manufacturer would decide to make the investment. Bringing the idea up to the executive suite that security is more of a business enabler that keeps the network and system up and running and productive and not just an insurance policy is important to generate awareness and send a strong message out to the company. After all, security is going to be an ongoing expenditure, not a one-time expense. Initially, there needs to be a risk analysis: what do you need to protect, what is the cost, what is the risk? Then there needs to be a way to quantify those numbers to assess the true benefit.

One of the advantages of safety, that is not as prevalent in security, is the concept of levels. With safety you have a very clear definition of safety integrity levels. A system must meet SIL 1 where there is safety, but at a basic level, through SIL 2, SIL 3 and SIL 4, which would be the most dependable. With security there is the concept of security assurance levels (SL), but it is not as prevalent and not commonly used throughout industry. Manufacturers are not yet demanding a security protection that guarantees SL 3.

Essentially, SL 1 would protect against a casual or coincidental attack and SL 4 would protect against an intentional attack using sophisticated means and extended resources. There are several values of SL within a solution. There is a targeted SL, which is where the user wants to be. Then there is an actual SL, which is the user's current status based on the existing implementation. There is a maximum attained, which is the maximum attainable SL with your current technology. The ideal situation is your targeted SL and your actual SL end up equal. SL levels are a part of the ISA99 security standard specification, which the international industrial control committee defined and accepted.

The problem is that an SL is harder to determine than an SIL because of the ever-changing threat scenario. The idea of an SL could be a positive in that it can make a security program much simpler. The SL concept remains relatively new, however, and there will need to be some time for industry to have it become part of its embedded culture.

Cultural mindset

Technology will not fix a problem unless the right processes and the right best practices are in place. Technology will help enable people to make the right decision, but the security culture has to be on a par with the safety culture in order to protect against a cyber attack. Even with multiple technology protective layers, users need to enforce a strong security culture that reaches every level - and it has to start at the top.

That is evolving. In the early 2000s, people were starting to become aware of the entire idea of security, and by around 2005, people talked about devices like firewalls that could protect them. But from that time until now, there has been an increase in awareness. The thought process is changing about installing applications and users are starting to think more about security. But is it happening quickly enough?

It is easy to understand why a manufacturer's mindset might be one of "we were never hit with a security breach before, so why should I install this complicated solution?" That mindset, while still common today, is starting to change - the idea of security being complicated and confusing is evolving into users knowing that they need to learn the basics to protect themselves without breaking the bank. One of the basic areas of uncertainty is manufacturers not understanding what they need to protect. While safety is very specific in what needs protecting, security has vast areas to safeguard. Attackers today are not necessarily looking for destruction. In quite a few cases, they were working in stealth mode in an effort to steal a company's intellectual property.

Take 'Night Dragon', for example. For well over two years, hackers were surreptitiously able to access oil companies' systems and steal information including financial documents related to oil and gas field exploration and bid negotiations, in addition to operational details of oil and gas field production SCADA systems. That attack emphasised the need for security to be strong from the field all the way through the enterprise.

With Night Dragon, attackers compromised the perimeter security through SQL injection attacks on extranet web servers, targeted phishing attacks aimed at mobile workers' laptops and took control of corporate VPN accounts. Several major oil companies were exploited by Night Dragon.

Standards set the tone

While it did take a long time to finalise them, safety often relies on adhering to a company's standards or industry standards like IEC 61508 and 61511. What is interesting to note - and something most manufacturers should keep a vigilant eye on - is just about 66% of safety instrumented systems in use today predate these standards. The same is true of security, as most control systems on the plant floor today were in existence long before cybersecurity became an issue.

Even though the IEC Safety Instrumented Systems (SIS) standards are not legal requirements, their growing acceptance as guidelines for industry best practice means that non-compliance may have very real liability implications in the event of an incident. And

WELL KNOWN WITHIN SECURITY CIRCLES, CYBERSECURITY AWARENESS IN THE MANUFACTURING ENTERPRISE REMAINS NASCENT AND NEEDS TO BUST OUT AND GO MAINSTREAM WITHIN EACH ORGANISATION. BUT WHERE DOES THAT AWARENESS BEGIN AND HOW CAN A MANUFACTURER GET STARTED ON THE JOURNEY TOWARDS SECURITY?

in some regions and industries, compliance already carries the force of law.

Purposely non-prescriptive in nature, the IEC safety standards outline a holistic methodology for managing every stage of a safety system's life cycle from risk analysis and design engineering through operations, management of change and decommissioning. Elements relevant to safety system performance assessment include adherence to accepted risk evaluation and mitigation methodologies such as process hazards analysis (PHA), hazards and operability (HAZOP) analysis, and layers of protection analysis (LOPA).

Industry and government absolutely mandate safety. Practitioners have to adopt safety under penalties or potential fines if they don't. In addition, in most cases standards are international, so in a global manufacturing environment manufacturers have to adhere to them. In theory, that means solid safety practices should be the same in the US as they are in Europe, Asia, Australia, South America and Africa. Everyone understands the standards and everyone ends up measured against the same standards, and there are penalties if they don't meet those standards.

These types of standards for cybersecurity could help drive awareness and implementation. Security standards are a big deal. In a world where attacks are fluid and changing, standards give a level of consistency. They are something you can measure against, especially if they undergo an external verification and end up certified.

In the security environment, there are a number of evolving standards with some more prevalent than others - like IEC 62443 (ISA99) and the WIB standard. The IEC 62443 (ISA99) series of standards has been in development for over 10 years and some parts are final. But there are other parts that are still a work in progress. The WIB standard, approved in 2010, is a standard that outlines a set of specific requirements focusing on cybersecurity best practices for suppliers of industrial automation and control systems.

Unlike safety, penalties for not adhering to security standards are non-existent, neither are there rewards for following them. Right now, with the exception of the North American Electric Reliability Corporation (NERC) in the US power industry, there is no real reporting requirement for security as there is for safety. NERC requires companies to follow their standards and if they don't, there can be significant financial penalties for noncompliance.

Does there need to be a major incident?

One fear from all ends of the manufacturing automation industry is there has to be some major incident, much like what happened in Bhopal, which will force companies to focus on and ensure their systems remain secure.

There have been quite a few incidents since 2010 - Stuxnet, which brought down an Iranian nuclear facility; Night Dragon; Flame, which was a cyber-espionage malware program targeting Middle East countries; Duqu, a computer worm discovered in September 2011 and related to Stuxnet; and Shamoon, a virus that wiped out 40,000 hard drives at one oil company last August - that have come in and knocked off various networks and inflicted damage.

While those incidents are just a few that raised awareness, the level of urgency that is needed to get manufacturers thinking about security in the same way as they do for safety is still lacking.

Raising awareness

Security protection is still in its infancy. But that does not mean the industry gets a free pass to ignore or hold off on securing their systems. The list of attacks and potential exposure goes on. Corporate data losses hit the highest levels this year since 2008 as companies need to improve data security strategies against a greater variety of more sophisticated IT attacks, according to one KPMG report. Former US Homeland Security Department Director Michael Chertoff told US oil and gas industry executives in Houston recently that the top threat their businesses face is from cyber attacks. Most companies, he said, experienced some type of cybersecurity event whether they know it or not. Energy companies are clearly in the crosshairs of cybercriminals as more than 40% of all reported malicious cyber attacks in 2012 ended up directed at them.

The risk is there for everyone, but by following a guide of best practices, providing mandatory personnel training and starting the task of undergoing risk assessments, manufacturers big and small can ward off intruders to keep their systems up and running so they can remain a profitable enterprise.

The basic need for security is to:

- increase plant safety
- reduce downtime
- reduce environmental and financial risk
- meet regulatory compliance
- connect the plant to the enterprise

In the end, manufacturers' main goal is to make product and not deal with anything that throws them off track. That is why they have to demand security in the products they buy. They have to make those demands to force vendors to certify the products in an accepted standard, but be willing to pay extra for a more secure solution. After all, if a vendor invests in security for their products and no one will pay for it, then it will be a slow rollout. In safety, it is clear manufacturers will invest in higher safety compliant systems that have an SIL certified rating.

Security, like safety was, is a culture change. Technology must include security and people have to embrace it. Security must start at vendors and work its way through the product life cycle, and it has to continue once it gets up and running at the manufacturer. It is a huge job and the industry is moving in a positive direction, but there is a long way to go.

Safety requires investing in resources to achieve it. Security is exactly the same. Security takes money and people to manage it, to implement it and to verify it is working. It is an accepted practice for safety. It is becoming an accepted practice for security.

Honeywell Process Solutions
www.honeywell.com

Security best practices

- **Assess existing systems:** Understand what you have and your exposure
- **Document policies and procedures:** Know what you have to do and when you have to do it
- **Train personnel and contractors:** Everyone has to be on the same page
- **Segment the control system network:** Define zones and conduits
- **Control access to the system:** Allow certain access privileges
- **Harden the components:** Lock down functionality of components
- **Monitor, maintain system security:** Remain vigilant and keep up to date

RADAR INSTRUMENT FOR BULK SOLIDS

The VEGAPULS 69 radar level instrument for bulk solids operates at a frequency of 79 GHz, which allows improved focusing of the transmitted signal. In containers and silos with many internal obstructions, this enhanced focusing helps reduce the influence of background noise. This means that reliable measurement is more possible even with complex internal structures.

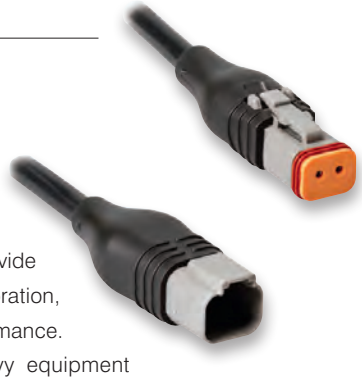
Updated microwave components allow the sensor to detect even the smallest of reflected signals. Even products that until recently were very difficult to measure because of their poor reflective properties (such as plastic powders or wood chips) can now be measured with very high reliability. This considerably extends the application range for radar technology in the bulk solids industry and opens up new application areas as well.

With a measuring range of up to 120 m and an accuracy of ±5 mm, the sensor has sufficient performance capability even for the out-of-the-ordinary tasks, such as level gauging in mine shafts or distance measurement on conveyor systems. Despite its large measuring range, the sensor is also a suitable solution for small hoppers or containers; the different antenna designs enable the optimum solution to meet the application needs.

Completely unaffected by dirt and build-up, the lens antenna guarantees maintenance-free operation even in harsh environments.

To make set-up and commissioning easier, an intelligent app for smartphones has been developed. It allows quick and easy alignment of the sensor on a swivel holder.

VEGA Australia Pty Ltd
www.vega.com/au



DEUTSCH CONNECTORS

To reduce installation time and increase reliability of Deutsch connectors, Turck has developed its Deutsch DT series of overmoulded connectors for the mobile equipment industry. The newly designed connectors provide longevity in demanding environments where shock, vibration, cold temperature, moisture and oils can affect performance.

Deutsch connectors are widely used in the heavy equipment sector, and Turck developed its two-wire, pin and socket DT connectors to address the environmental needs of the industry. The overmoulded design, TPE jacketing and IP67 rating provide additional reinforcement, abrasion and oil resistance, and good performance in a ready-to-use solution. The connectors are suitable for wiring harness assemblies in vehicles, agricultural and construction equipment, or any application which requires a cost-effective, quick-disconnect solution.

Turck's Deutsch DT series connectors feature a fully encapsulated rugged overmould which is IP67 rated. The cable performs well in low temperatures with a -40°C cold bend rating, and is sunlight resistant and Oil Res II rated.

Turck Australia Pty Ltd
www.turck.com.au

SAFETY SENSOR

The RSS260 safety sensor combines the successful detection principle of RFID technology and a high switching distance in a compact design.

The various actuators allow optimal integration of the safety sensors in the surrounding architecture of removable, hinged and sliding covers and doors. All variants offer a high level of tamper resistance as the RFID-based sensor technology permits individual actuator coding.

In the basic version, the sensor accepts any suitable RSS260 family target. A second version for increased tamper resistance only responds to an individually assigned target, and the teaching process can be repeated any number of times. Finally, there is a third version available for the highest level of tamper resistance which only accepts the target presented at initial power-up.

In addition to the standard actuator that is suitable for assembly on the normal aluminium profile systems, additional actuator designs can be selected. There is an extremely compact rectangular target and a flat, elongated actuator that is suitable for design-oriented machines and plants as well as for being mounted on polycarbonate safety gates.

Another feature includes the ability to connect up to 31 RSS260 safety sensors in series and evaluate them with a single safety module without compromising the safety level and the diagnostic capability. This also applies when combining the RSS260 with other Schmersal electronic safety switching devices like the solenoid interlocking AZM300 and light curtains such as the SLC440.

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

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RS

LINEAR POSITION TRANSDUCERS

The RDP Electronics DCV series of LVDT linear position transducers are suitable for applications where a 0-24 VDC power supply is used.

The DCV series is powered from 24 VDC and has an isolated 0-10 V output. This enables easy and secure integration into most industrial applications. Users can simply use the common 24 VDC power supply on the system and connect the 0-10 V output to the monitoring device.

The operating principle of LVDT type transducers (linear variable differential transformer) is probably the most robust and reliable position sensor type available. The strength of the LVDT sensor's principle is that there is no electrical contact across the transducer position sensing element, which ensures clean data, infinite resolution and a very long life.

The series of displacement transducers is available in either unguided, captive or spring-return versions.

ADM Instrument Engineering Group
www.admtech.com.au

RH AND TEMPERATURE SENSOR

The I7000 Hygrosmart relative humidity and temperature sensor provides highly reliable and accurate measurements of the key parameters for ensuring food is kept fresh and in good condition.

The sensor is accurate to ±2% RH and to ±0.2°C, and it gives long-term stability with less than 1% RH drift over a year to maintain the ideal storage conditions over time. The robust sensor's small size makes it easily interchangeable. It has a simple plug-and-play system, which means that users can maintain the accuracy of their RH and temperature measurements in the storage units themselves. The easy procedure, which is comparable to changing a light bulb, takes only few minutes and is cost efficient.

The end user saves time and money through using the I7000. All the I7000 modules are supplied from Michell fully calibrated, with a traceable calibration certificate.

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

OPERATOR INTERFACE

The Allen Bradley PanelView Plus 7 Standard operator interface is available in screen size options ranging from 4″ to 10″. Widescreen formats are also available for the 4″ and 9″ screen options.

Plant operators can take advantage of the mobile capabilities of the PanelView Plus 7 Standard terminal to monitor data from anywhere on the plant floor using a tablet, smartphone or other mobile device. Virtual network computing (VNC) connectivity also supports secure application monitoring on mobile devices from remote locations.

Machine builders can save projects to the PanelView Plus 7 Standard SD card, eliminating the cumbersome process of configuring the same project for multiple machines. Users can save their operating system, network configuration, data logs, recipes and other files to the SD card to quickly restore operations in the event a terminal needs to be replaced. Operators also can access saved diagnostics, including messages, alarms and warnings, to better troubleshoot problems and support proactive maintenance activities.

New installation clamps support fast, simple terminal installation and removal without the use of tools. This reduces installation and maintenance time, and minimises the risk of overtightening and damaging the terminal during installation.

The PanelView Plus 7 Standard terminals provide connectivity to one controller and up to 25 screens and 200 alarms along with ATEX Certification. These features complement the Allen-Bradley CompactLogix 5370 programmable automation controllers and work with the FactoryTalk View Machine Edition (ME) software from Rockwell Automation.

Rockwell Automation Australia
www.rockwellautomation.com.au

Safe activation and deactivation
This universal device can be used for either the energise-to-safe or de-energise-to-safe operation modes, as you wish. This makes it suitable, e.g. for pump controllers or extinguishing systems.

Safe control of back-up systems
Equipped with wide range input voltages in the monitoring circuit from 24V AC/DC to 230 V AC/DC, the relay is designed for individual use, e.g. in back-up systems or the overfill prevention devices of tank farms.

Safe monitoring of furnace firing systems
The feed-in of fuel must be interrupted as soon as the boiler plant reaches any safety criterion limits. The SAFESERIES offers you a safety switch-off for the feed-in of fuel to furnace firing systems up to safety integrity level SIL 3.

Weidmüller

Functional safety for process applications

SAFESERIES SIL relays handle reliably in critical situations

When dealing with the core elements of a system with a large risk potential, it is especially critical to have the best system solution in place. Our SIL relays reliably switch off your systems in critical situations – and they have all been accredited.

Their integration into distributed control systems (DCSs) is even better, with an input filter that makes the SIL circuit immune to the test impulse which is typically used by a DCS. You will also benefit from simple maintenance: fuses are accessible from the outside and can easily be changed. You can see the status of the safety and the monitoring devices clearly on the displays mounted directly to the device.

All devices are accredited though certification by the internationally recognised TÜV-NORD group – for secure process applications around the globe ... Let's connect.

www.weidmuller.com.au

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Emerson Process Management

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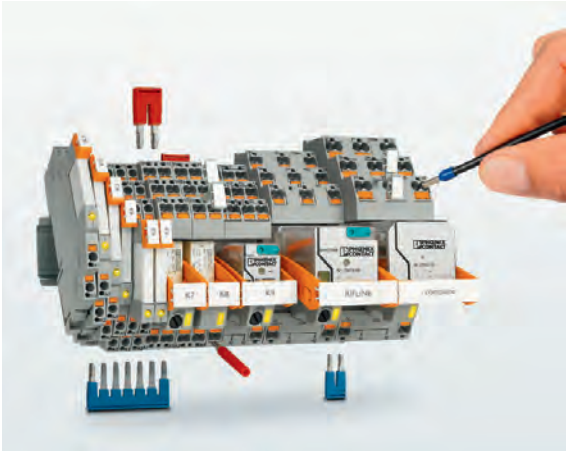

RELAY SYSTEM

Whether isolation, multiplication or amplification signals are required, the field of application of the RIFLINE industrial relay system ranges from coupling and timer relays to a replacement for small power contactors.

Phoenix Contact Pty Ltd

http://bit.ly/1x79D3Y

HIGH-PRESSURE INDUCTIVE SENSORS

The high-pressure CRS series offers users a sensor for cylinders with an operating pressure rating of 3000 psi.

Turck Australia Pty Ltd

http://bit.ly/1MDHXa8

TURBIDITY METERS AND COLORIMETERS

The optek inline turbidity meters can be specified to measure turbidity, haze, clarity and optical density, while the optek colorimeters are suitable for many real-time measurements for improved process control.

AMS Instrumentation & Calibration Pty Ltd

http://bit.ly/1GJAWkk

M2M TECHNOLOGY

NetComm Wireless Limited and Vodafone have added the Vodafone MachineLink 3G Plus to the Integrated M2M Terminals range, offering an alternative for unconnected machines that need a larger selection of interface options. Developed by NetComm Wireless to facilitate the uptake of machine-to-machine (M2M) across a wide range of industries globally, the Vodafone MachineLink 3G Plus enables M2M connectivity in areas such as health care, agriculture, vending, point of payment and energy.

Vodafone's second annual M2M Adoption Barometer found that M2M adoption has grown more than 80%, with over one-fifth of companies actively using the technology. The Vodafone MachineLink 3G Plus is expected to advance this growth by allowing businesses to upgrade from legacy serial connectivity to IP connectivity with access to a broader range of connection choices.

The Vodafone MachineLink 3G Plus is a 3G pentaband modem and router with built-in GPS, offering compatibility with Vodafone or Vodafone M2M partner networks worldwide, and the Vodafone M2M Global Platform. The device supports multiple communication protocols and interface options with features including Ethernet, Serial (RS232/422/485), I/O and USB 2.0 ports. Designed for flexible customisation, the Vodafone MachineLink 3G Plus features an embedded software development kit (SDK) and open source Linux OS to support unique business functions.

Vodafone

www.vodafone.com.au

SAFETY SENSOR SWITCH

Utilising wear-free RFID technology, the RSS16 safety sensor by Schmersal is a high-end solution to overcoming the limitations of electromechanical devices.

The product shares its dimensions with the AZ16 electromechanical safety switch. With the addition of Schmersal's RFID technology, the RSS16 gives users the option of three levels of protection against defeat.

The basic version will accept any actuator of the RSS family. Users can teach an actuator to work with the one device, and teaching can be repeated any number of times with a delay time between teaching cycles. The third and highest level of tamper resistance will only accept the actuator presented at the very first power up of the device.

The device can be approached from three sides, providing a high level of flexibility when integrating into the surrounding construction. The robust safety sensor can be used as a magnetic door stop and latch up to 60 N, allowing the designer to forego the use of a separate stop and latching device. Users can connect up to 31 devices in series monitored by a single safety module, all while maintaining CAT4 or PLe

The product can be used in existing AZ16 applications, with the ability to offer increased tamper protection but still keep to a 1:1 replacement.

Control Logic Pty Ltd

www.control-logic.com.au

RUGGED TABLET PC

The PWS-870 is a 10.1″, fully-rugged tablet PC with an Intel Core i3/i5/i7 processor. It is designed specifically for field services such as public safety, utility, inspection and construction. It is built for rugged use, drop-tested, military-certified and completely integrated. The user experience is optimised with PWS-870's high-brightness, multi-touch, sunlight-readable screen.

The system is customisable to meet targeted needs with the latest advanced communication options, including 4G LTE and 802.11 ac.

The PWS-870 is IP65 and MIL-STD-810G certified. It is drop-tested at 3.3 m, and the integration of accessories into the main unit (like 1D/2D barcode scanner) makes the entire system resilient to damage from shock, drop or vibration. The glass is second-generation Gorilla Glass and the 10.1″ display has options for high brightness (800 cd/m^2), capacitive touch, sunlight-readable use, as well as for a digitiser pen.

Built in to the system is 4G LTE communications, offering fast and secure data communications. The unit also has 802.11 WLAN in all its specs: a/b/g/n and the latest ac version. In addition there is Bluetooth 4.0, and full GPS. Other features of the PWS-870 include a built-in dual camera (front and back), a 1D/2D barcode scanner, NFC and RFID.

The PWS-870 also includes two USB 3.0 ports, one USB 2.0 port, an audio jack and an HDMI connector, and the hot-swap battery feature allows for up to 11 h of continuous operation.

Advantech Australia Pty Ltd
www.advantech.net.au

REMOTE VALVE ACTUATOR CONTROL

The Rotork Remote Hand Station enables safe and secure local monitoring and control of Rotork IQ3 actuators installed in inaccessible locations.

The company's solution provides the user with an exact duplicate of the actuator's own monitoring and control interface, at a distance of up to 100 m from the valve. Power for the station is supplied by the actuator, with which the unit shares all the benefits of the same IP68 double O-ring sealed environmental enclosure. There is no need for expensive cabling; standard comms wiring suitable for the operating environment is all that is required between the actuator and the station.

The user can remotely operate, interrogate and configure the actuator using the company's handheld setting tool with its secure wireless Bluetooth link. Retaining all of the actuator's functionality, the device presents an identical window into the process, showing diagnostic data including the valve torque and usage profiles along with service logs and facilitating real-time analysis directly at the unit.

Alternatively, information from the actuator data logger can be downloaded and transferred to a PC for analysis using Rotork Insight2 diagnostic software to enable valve maintenance requirements to be identified and anticipated.

Designed for wall- or pole-mounted installation, the device is available with explosion-proof certification and can also be equipped with a vandal-proof cover to prevent unauthorised interference.

Rotork Australia
www.rotork.com

OPC UA SERVER SOFTWARE

Moxa has released the MX-AOPC UA Server, an automation software solution that helps users facilitate efficient, seamless SCADA device data management. It is the company's first OPC UA software solution that addresses big data challenges related to the industrial Internet of Things.

Using the server, engineers can take advantage of a cohesive and secure data exchange and control framework that enables instant alarms, real-time updates and efficient logging of historical data, allowing for both timely risk prevention and maintenance responses.

The product inherits Moxa's Active Tag technology and supports the Modbus protocol for polling data. Engineers can connect edge devices to a SCADA system and the active tag technology minimises data size, which is a common challenge for big data applications. The inherent flexibility and security of the server make it a suitable choice for meeting the evolving needs of big data analysis.

The product is claimed to be the first OPC UA server for industrial automation that supports both push and pull communication.

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Proline Promag 400

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Proline Promag 400 is the specialised electromagnetic flowmeter for all applications in the water industry. The Proline transmitter offers time-saving local operation via an integrated web server without additional software and hardware. Furthermore, with the integrated Heartbeat Technology™ a flowmeter verification is possible at any time.

What is it?
Heartbeat Technology™ provides continuous or on-demand diagnostics, monitoring and verification to ensure your flowmeter is functioning correctly, independent of process and ambient conditions. This unparalleled self-monitoring capability offers complete flexibility to plan proof-testing and other maintenance with minimal effort and exposure of personnel.

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CASE STUDY

Ensuring security for networks of the future

Today's company networks comprise hundreds of devices: routers for directing data packets to the right receiver, firewall components for protecting internal networks from the outside world and network switches. Such networks are extremely inflexible because every component, every router and every switch can carry out only the task it was manufactured for. If the network has to be expanded, the company has to integrate new routers, firewalls or switches and then program them by hand. That's why experts worldwide have been working on flexible networks of the future for the last five years or so, developing what is known as software-defined networking (SDN). It presents one disadvantage, however: it is susceptible to hacker attacks.

Researchers from the Fraunhofer Institute for Applied and Integrated Security AISEC in Garching, near Munich, have been working on how to make SDN secure and how SDN and all related components can be monitored.

One of these components is visualisation software, which displays the network's individual components and depicts in real time how the various applications are communicating with the controller. "We can show how software influences the behaviour of different components using the controller or, in the case of an attack, how it disrupts them," said Christian Banse, a security expert at AISEC.

But how exactly does SDN work, and why is it so vulnerable to attack? "In the future, the plan is for a central control unit to tell the many network components what to do. To put it simply, routers, firewalls and switches lose their individual intelligence - they only follow orders from the controller," said Banse. This makes a network much more flexible, because the controller can allocate completely new tasks to a router or switch that were not intended when the component was manufactured. Plus, the tedious task of manually configuring components during installation is eliminated because components no longer need to be assigned to a specific place in the network - the controller simply uses them as needed at the moment. Manufacturers have begun offering the first routers and switches that are SDN-compatible and have the necessary flexibility. "With all the hype surrounding the new adaptability made possible by a central control unit, SDN security has been neglected," warned Banse. "That's why we're developing solutions to make SDN more secure from the outset, before such systems become firmly established." In the future, networks

AISEC researchers can monitor every component in software-defined networking. (Pic: © Fraunhofer AISEC)

will be controlled solely by a central controller - Banse sees this as a problem, because it might provide the perfect loophole for attackers to access the entire network. "On top of that, a whole set of new applications are being developed for SDN - for instance, for firewall components or routing," said Banse. "We have to make sure that these applications are reliable." It would be disastrous if, for example, outsiders were able to gain access to the company network using software installed accessing the controller.

That's why Banse and his colleagues started off by analysing the interaction of all SDN components to identify vulnerabilities. "You have to precisely define how deep into the network a new application is allowed to go, for example. Otherwise the stability and security of the network is not guaranteed." So far, there are no sufficient security standards for communication among individual SDN components, but AISEC researchers are lobbying hard for an international standard. In addition to their visualisation solution, Banse and his team are also developing technical means for preventing unauthorised applications or malware from gaining access to SDN systems. They are developing ways to monitor if an app really carries out only the task for which it was intended. If it performs unplanned or undesirable activities, ie, malware, it is rejected and blocked by the system.

Fraunhofer-Gesellschaft
www.fraunhofer.de

NEW PRODUCTS

PORTABLE HUMIDITY METER

The Testo 635-2-HPD is a portable humidity meter fitted with a high-pressure dewpoint probe and is suited to taking measurements in compressed air systems. It is available to rent from TechRentals. The fitted probe has a range of -60 to +50°C and 0-100% RH. The illuminated display shows relative, absolute and degree of humidity, as well as enthalpy, temperature and dewpoint values for difference, minimum, maximum and mean.

The 635-2-HPD features a protection class of IP54 and storage for 10,000 measurement values. PC software for archiving and documentation of data is provided.

TechRentals
www.techrentals.com.au

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THREE-PHASE DRIVES

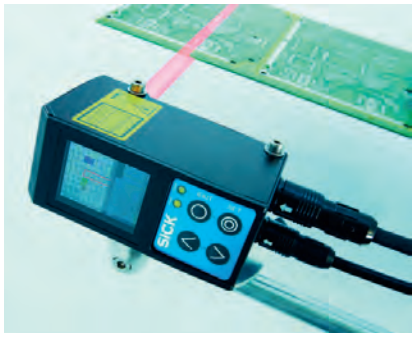
The ABB MotiFlex e180 range of three-phase drives can be used without additional hardware in many types of applications - with many different control system architectures, communications and motor feedback schemes.

MotiFlex e180 is an all-new design, and offers a flexible upgrade path from the previous e100 models. Nine drives offer a choice of continuous power outputs up to 90 A, and peak outputs up to a maximum of 120 A. Four different continuous/peak output level and time combinations can be selected for each of the nine power levels, providing great scope for matching drive performance to specific applications.

At the heart of the drive's flexibility is a universal ethernet communications capability. The drives may be software-configured for EtherCAT, Modbus TCP, Ethernet/IP or Powerlink based systems - with further options in development. The drives also support many different forms of feedback including incremental and digital absolute encoders with different output formats, resolvers and the new generation of Hiperface DSL encoders which combine motor power and feedback in a single cable and offer significant cost savings on cabling and installation time for companies building large multi-axis systems.

The drives feature dual-channel support for safe torque off (STO) functional safety, conforming to PL e SIL3. Each drive also comes with a range of built-in I/O including six digital inputs, two fast-latch inputs, four digital outputs, two analog inputs and an analog output, a high-power relay output, and a PTC sensor for motor thermal protection.

ABB Australia Pty Ltd
www.abbaustralia.com.au



2D DISTANCE SENSOR FOR PROFILE MEASUREMENT

The Profiler 2 is claimed to be the first 2D distance sensor of its type designed as a single device. Profile measurement, evaluation, display and control panel are accommodated in a single robust housing made of durable shock-resistant plastic and with an enclosure rating of IP67.

In the processing industries, the angle and bending radii of sheet metal, aluminium or plastic profiles can be very precisely measured. Inspection of the length and height geometries of circuit boards and board assemblies are also a typical area of use for the Profiler 2 in the electronics industry. The sensor is claimed to permit reliable web edge control during the processing of continuous materials such as paper or non-woven materials.

The sensor's functional principle is based on a two-dimensional triangulation process. A fine and bright laser line is projected onto the surface of the target object within a measurement range of between 75 and 125 mm and is then mapped on a CMOS receiver element. The Profiler 2 converts the profile-dependent height shifts of the line on the object to highly precise x- and y-coordinate measurement values, so that a resolution of 2 μm is achieved in the z-axis.

SICK Pty Ltd
www.sick.com.au

PORTABLE HYDROSTATIC LEAK TESTER

The Aussie BB100HTP is a compact 100 bar hydrostatic tester for detecting leaks and checking the integrity of water pipes.

The tester consists of a high-pressure triplex pump that is easy to service and maintain. The pump is powered by a heavy-duty 2.2 kW four-pole, single-phase electric motor.

The machine features a double-gauge and double-valve system that enables the pressure to be locked off in the line after pressurisation. Both the pump and line pressures can be monitored continuously and simultaneously.

The testers are equipped with a variable pressure regulation valve. The user sets the pressure the kit is required to reach. Once the system has reached the testing pressure, the operator locks off the valve's isolating the test piece. After a mandatory period of static test, the operator can clearly see if pressure has been maintained.

The testers are built tough, with simple instructions and safety features incorporated. They come fitted with safety valves that protect both the machine and operator in the event of an accidental pressure spike.

The machine has a variety of other uses, including testing boilers, pressure vessels, pumps, valves or fire mains. A gun/hose kit, which enables the machine to double as a washdown unit, is available as an optional extra.

Australian Pump Industries Pty Ltd
www.aussiepumps.com.au

Connected to Quality

STAUFF Connect
Tube Fitting Technology by STAUFF

STAUFF is one of the leading manufacturers and suppliers of pipe components and hydraulic accessories worldwide.

STAUFF Connect tube connector range offers superior performance, as well as lower assembly and operating costs suitable in a broad range of mobile and industrial applications.

In addition to STAUFF's comprehensive tube connector range made of steel, consisting of 24° cutting ring connectors, connectors with 24° sealing cones and O-ring, 24° welding cones and 37° flare fittings, STAUFF now offer a range of BSP stud fittings with an optional **60° cone seat** for hydraulic hose connection.

STAUFF 60° seated fittings

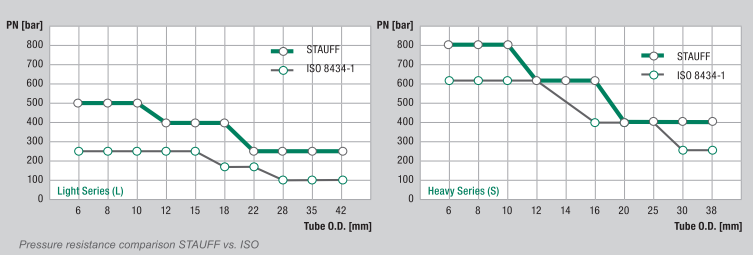
STAUFF 60° seated fittings are equipped with a 60° conical bore according to BS 5200 and ISO 8434-6 on the male stud end as a special STAUFF Connect design feature, and therefore can also serve as hose adaptors; allowing the direct, compact, and space-saving connection of rigid and flexible tubing.

Metal-to-metal sealing of the conical surface of the fitting body and the corresponding surface on the mating hose connector makes these connections perfectly suitable when adapting tubes to hose in hydraulic and lubrication applications. STAUFF offers a range of 60° conical bore fittings for all commonly used metric tube sizes (from 6mm to 42mm) and thread sizes (from G¼" to G1¼").

Increased Operational Safety

All STAUFF tube connectors are designed for the safe and leak-free connection of metric tubes with diameters of 4-42mm.

The dimensions and designs of the connectors comply with the latest version of the standards DIN 2353 and ISO 8434-1. With 800 bar for selected types and sizes, the pressure resistance of the components clearly exceed the standard requirements with an operating pressure of quadruple the safety factor unless otherwise stated.



Pressure resistance comparison STAUFF vs. ISO

Pressure resistance

Consistent use of high quality materials for forged and turned parts provides for maximum operating pressures, which clearly exceed ISO/DIN requirements (generally with a safety factor of four times).

Our Sign for Quality

Tube Fitting Technology by STAUFF

24° tube fittings and accessories made from carbon steel complement the extensive range of original STAUFF components for fluid power applications developed and manufactured by STAUFF.

Due to the careful selection and processing of materials, pressure ratings as defined in the DIN/ISO standards can even be exceeded; the premium Zinc/Nickel coating sets a new benchmark in terms of corrosion protection.

Experience outstanding product quality, increased operational safety and reliability for your machines and equipment, and the advantages of single-sourcing all hydraulic pipework components from the manufacturer.

Outstanding Corrosion Protection

STAUFF Connect tube connectors quality zinc / nickel surface exhibits a high quality shine with a low tendency to contact corrosion in conjunction with metals such as aluminium, excellent wear resistance due to high plastic deformability (ductility), and can be easily painted.

Due to the high quality zinc / nickel surface, tube fittings from the STAUFF Connect range provide corrosion resistance above and beyond conventional standards - even after transport, processing and assembly of the components. Therefore more than **1200 hours** resistance are guaranteed against red rust / base metal corrosion in salt spray testing in accordance with DIN EN ISO 9227. This significantly exceeds the highest corrosion class K5 requirement defined by the VDMA, the Association of German Mechanical and System Engineers in standards sheet 24576.

The coating is free of hexavalent chromium (VI) and thus ELV, REACH and RoHS compliant, therefore is safe to handle.

STAUFF®

Contact STAUFF for more information
www.stauff.com

TOP TIPS FOR SPECIFYING VFDS

Joe Kimbrell, Product Manager, Drives, Motors, and Motion Control, Automation Direct

Variable frequency drives can reduce energy consumption, improve real-time control and lengthen motor life. Selecting the right one for your application requires asking the correct questions.

The primary function of a variable frequency drive is to vary the speed of a three-phase AC induction motor. VFDs also provide non-emergency start and stop control, acceleration and deceleration, and overload protection. In addition, VFDs can reduce the amount of motor startup inrush current by accelerating the motor gradually. For these reasons, VFDs are suitable for conveyors, fans and pumps that benefit from reduced and controlled motor operating speed.

A VFD converts incoming AC power to DC, which is inverted back into three-phase output power. Based on speed set points, the VFD directly varies the voltage and frequency of the inverted output power to control motor speed. There is one caveat: converting AC power to DC - and then back to a simulated AC sine wave - can use up to 4% of the power that would be directly supplied to a motor if a VFD were not used. For this reason, VFDs may not be cost effective for motors that run at full speed in normal operation. That said, if a motor must output variable speed part of the time and full speed only sometimes, a bypass contactor used with a VFD can help maximise efficiency.

Consider your reasons for choosing a VFD

Typical reasons for considering VFDs include energy savings, controlled starting current, adjustable operating speed and torque, controlled stopping, and reverse operation. VFDs cut energy consumption, especially with centrifugal fan and pump loads. Halving fan speed with a VFD can lower the required horsepower by a factor of eight, as fan power is proportional to the cube of fan speed. Depending on motor size, the energy savings could pay for the cost of the VFD in less than two years.

Starting an AC motor across the line requires starting current that can be more than eight times the full load amps (FLA) of the motor. Depending on motor size, this could place a significant drain on the power distribution system, and the resulting voltage dip could affect sensitive equipment. Using a VFD can eliminate the voltage sag associated with motor starting and cut motor starting current to reduce utility demand charges.

Controlling starting current can also extend motor life because across-the-line inrush current shortens life expectancy of AC motors. Shortened life cycles are particularly prominent in applications that require frequent starting and stopping. VFDs substantially reduce starting current, which extends motor life and minimises the necessity of motor rewinds.

The ability to vary operating speed allows the optimisation of controlled processes. Many VFDs allow remote speed adjustment

using a potentiometer, a keypad, a PLC or a process loop controller. VFDs can also limit applied torque to protect machinery and the final product from damage.

Controlled stopping minimises product breakage or loss, as well as equipment wear and tear. Because the output phases can be switched electronically, VFDs also eliminate the need for a reversing starter.

Select the proper size for the load

When specifying VFD size and power ratings, consider the operating profile of the load it will drive. Will the loading be constant or variable? Will there be frequent starts and stops, or will operation be continuous?

Consider both torque and peak current. Obtain the highest peak current under the worst operating conditions. Check the motor FLA, which is located on the motor's nameplate. Note that if a motor has been rewound, its FLA may be higher than what's indicated on the nameplate.

Don't size the VFD according to horsepower ratings. Instead, size the VFD to the motor at its maximum current requirements at peak torque demand. The VFD must satisfy the maximum demands placed on the motor.

Consider the possibility that VFD oversizing may be necessary. Some applications experience temporary overload conditions because of impact loading or starting requirements. Motor performance is based on the amount of current the VFD can produce. For example, a fully loaded conveyor may require extra breakaway torque, and consequently, increased power from the VFD.

Many VFDs are designed to operate at 150% overload for 60 seconds. An application that requires an overload greater than 150%, or for longer than 60 seconds, requires an oversized VFD. Altitude also influences VFD sizing, because VFDs are air cooled. Air thins at high altitudes, which decreases its cooling properties. Most VFDs are designed to operate at 100% capacity up to an altitude of 1000 m; beyond that, the drive must be derated or oversized.

Be aware of braking requirements

With moderate inertia loads, overvoltage during deceleration typically won't occur. For applications with high-inertia loads, the VFD automatically extends deceleration time. However, if a heavy load must be quickly decelerated, a dynamic braking resistor should be used.

When motors decelerate, they act as generators, and dynamic braking allows the VFD to produce additional braking or stopping torque. VFDs can typically produce between 15% and 20% braking torque without external components. When necessary, adding an external braking resistor increases the VFD's braking control torque - to quicken the deceleration of large inertia loads and in frequent start/stop cycles.

Determine I/O requirements

Most VFDs can integrate into control systems and processes. Motor speed can be manually set by adjusting a potentiometer or via the keypad incorporated in some VFDs. In addition, virtually every VFD has some I/O, and higher-end VFDs have multiple I/Os and fully featured communications ports - these can be connected to controls to automate motor speed commands.

Most VFDs include several discrete inputs and outputs, and at least one analog input and one analog output. Discrete inputs interface the VFD with control devices such as push-buttons, selector switches and PLC discrete output modules. These signals are typically used for functions such as start/stop, forward/reverse, external fault, preset speed selection, fault reset and PID enable/disable.

Discrete outputs can be transistor, relay or frequency pulse types. Typically, transistor outputs drive interfaces to PLCs, motion controllers, pilot lights and auxiliary relays.

Relay outputs usually drive AC devices and other equipment with its own ground point, as the relay contacts isolate the external equipment ground. The frequency output is typically used to send a speed reference signal to a PLC's analog input, or to another VFD running in follower mode.

Typically, general-purpose outputs of most VFDs are transistors. Sometimes one or more relay outputs are included for isolation of higher-current devices. Frequency pulse outputs are usually reserved for higher-end VFDs.

Analog inputs are used to interface the VFD with external 0-10 VDC or 4-20 mA signals. These signals can represent a speed set point or closed loop control feedback. An analog output can be used as a feedforward to provide set points for other VFDs so other equipment will follow the master VFD's speed; otherwise, it can transmit speed, torque or current measurement signals back to a PLC or controller.

Select the proper control mode

VFD control mode choice greatly depends on the application. The three VFD control modes are volts-per-hertz (V/Hz), sensorless vector (sometimes called open-loop vector) and closed-loop.

V/Hz-type VFDs use the ratio between voltage and frequency to develop the operating flux to supply operating torque to the motor. Sensorless vector VFDs have accurate torque control over a wide speed range without having to use encoder feedback. Closed loop VFDs use encoder feedback to obtain motor speed and slip information.

V/Hz control is adequate for many applications such as fans and pumps. However, for applications that require greater degrees of speed regulation, sensorless vector or closed loop control types may be necessary. Applications such as paper mills, web printing presses or material converting require the added speed regulation that closed loop control provides.

Control mode comparison

	V/Hz	Sensorless vector	Closed loop
Operating complexity	Low	Moderate	High
Performance	Good	Good	High
Starting torque (typical)	50–175%	200%	200%
Speed regulation (typical)	±2%	±1%	±0.2%

Table 1: Comparison of control modes.

Understand your control profile requirements

Selecting the proper VFD control profiles is critical and depends greatly on the application. Control profiles to consider include acceleration, deceleration, ramp linearity, torque control, braking and PID. Most of these parameters are available on nearly every VFD type on the market, but PID may not be offered on very basic models.

These parameters are programmable and can be selected using the operator keypad or by digital communications. Understanding these parameters (and how they affect integration of the VFD into the process) is imperative; to this end, VFD user manuals typically provide the information required to select and program the right control profiles.

Know your communication options

Many VFDs have one or more built-in digital communication interfaces. Even the most economical models typically include a serial interface such as Modbus RS232/RS485. Ethernet and fieldbus communication are also options offered with many VFDs.

A digital communication interface can be used to connect the VFD to other devices that can function as a master device such as a PLC or PC-based controller. The master device can control the VFD with this interface instead of using the discrete and analog I/O. The master can also use this interface to monitor the status of various VFD parameters such as speed, current and fault status.

An RS232 connection is somewhat limited as the maximum RS232 network cable length is 15 m. Also, the RS232 interface is one-to-one, allowing connection of only one VFD to one controller. An RS485 network cable can span up to 1200 m and allows

> DON'T SIZE THE VFD ACCORDING TO HORSEPOWER RATINGS. INSTEAD, SIZE THE VFD TO THE MOTOR AT ITS MAXIMUM CURRENT REQUIREMENTS AT PEAK TORQUE DEMAND. THE VFD MUST SATISFY THE MAXIMUM DEMANDS PLACED ON THE MOTOR.

connection of multiple devices. Extra adapters may be required to make this type of connection.

An Ethernet interface provides a high-performance link between the control system and multiple VFDs. Some VFD Ethernet interfaces are even available with a web server that allows users to configure and control the VFD from any web browser. Ethernet-based protocols such as Modbus TCP/IP and EtherNet/IP take the guesswork out of VFD control over Ethernet and make set-up easy for non-IT users.

Don't overlook installation and operating requirements

VFDs generate a significant amount of heat. This heat can cause the internal temperature of an enclosure to exceed the VFD's thermal rating. Enclosure ventilation or cooling may be necessary to keep the enclosure temperature within specified limits. Ambient temperature measurements and calculations should also be made to determine the maximum expected temperature.

Operating precautions must also be considered. One should avoid running a standard induction motor at low speed for an extended period of time, as this can cause the motor temperature to exceed its rating due to limited airflow produced by the motor's fan.

When a standard motor operates at low speed, output load must be decreased. If 100% output torque is desired at low speed, it may be necessary to use an inverter-duty rated motor.

Don't use a contactor or disconnect switch for run/stop control of the VFD and motor as this reduces VFD life. Cycling the input-power switching device while the VFD is operating should be done only in emergency situations.

Beware of harmonics

Any nonlinear load, which includes anything with rectifiers, generates harmonics - including VFDs. If excessive, harmonics can overheat and damage equipment, transformers and even power distribution wiring.

Two types of filters can mitigate the harmonics associated with VFDs. Passive harmonic filters include AC line reactors and chokes. Reactors and chokes reduce VFD-related harmonics and line notching, and are recommended for all installations. They also protect the VFD from transient overvoltages, typically caused by utility capacitor switching. Active harmonic filters sample the harmonic current waveform, invert it and feed the inverted waveform back to the line to counteract harmonics. Some active filters also have dynamic braking circuits that allow motor deceleration to place regenerative current back on the AC supply line.

Output line, or load, reactors protect motor and cable insulation from VFD short circuits and insulated gate bipolar transistor (IGBT) reflective wave damage. They also allow the motor to run cooler by smoothing the current waveform. Output line reactors are recommended for operating non-inverter duty motors and applications in which VFD-to-motor wiring exceeds 22 m.

Direct Automation Pty Ltd
www.directautomation.com.au

Motors that meet efficiency standards and levels in Australia and worldwide

The use of energy saving solutions has significant economic and environmental benefits for Australian businesses, including reduced running costs and reduced carbon emissions. Improving the efficiency of equipment is also a key objective globally. That's why SEW-EURODRIVE has extended its DR series of electric motors – made to meet global efficiency standards. Around the world governments are mandating Minimum Energy Performance Standards (MEPS) for motors. In Australia, the government now mandates MEPS through the Greenhouse and Energy Minimum Standards (GEMS) Act 2012 legislation. The act creates a national framework for appliance and equipment energy efficiency. This means electric motors must meet MEPS efficiency levels and must be registered for sale and use before they can be sold in Australia. SEW-EURODRIVE supports the need for efficiency in motors, supplying electric motors that meet and exceed MEPS levels. MOVIGEAR® and DRU offer IE4 Super Premium Efficiency Levels, the DRN and DRP ranges offer IE3 Premium Efficiency Levels and the DRE offers IE2 High Efficiency Levels. To find out more contact an SEW product specialist closest to you on 1300 739 287 or visit http://energy-saving.sew-eurodrive.com/.

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SEW EURODRIVE

CASE STUDY

Simulation reduces time and cost for ABB Cranes

Millions of shipping containers pass through sea ports each year, carrying anything from machinery and auto parts to shoes, toys and frozen food. At modern ports, containers are unloaded onto docks and then moved to stacking yards where automatic stacking cranes and ship-to-shore cranes stack them until they are ready to be loaded onto trucks or train cars. Containers must be moved quickly and accurately without interference from other containers, cranes or vehicles. Any delays reduce profitability for the port, especially at large ports that move thousands of containers each day.

ABB Crane Systems is a supplier of automation and electrical systems for container handling and bulk handling cranes, including automatic stacking cranes and ship-to-shore cranes. They are notoriously difficult to control because they use long ropes, and small disturbances can cause the containers to swing. Even without any external disturbances, the motion of the container itself can produce oscillations. Today, these cranes are required to lift heavier loads at higher speeds and to greater heights than ever before; however, this size increase is making the oscillation problem even worse. These oscillations and their suppression have been widely recognised as a major efficiency bottleneck by the shipping industry. ABB Crane Systems wanted to develop improved automatic crane controllers capable of suppressing the swinging motion and hence improve their customers' operational safety and profitability.

ABB Crane Systems asked Maplesoft Engineering Solutions experts to develop a new high-fidelity model of the container and ropes of large automatic cranes. Once developed in MapleSim, the system-level physical modelling tool from Maplesoft, the model was then exported as a MathWorks Simulink S-function to be used in testing. With the dynamic behaviour of the ropes and container captured in the model, engineers at ABB Cranes were able to test their control strategies under a variety of scenarios and duty cycles. Since MapleSim allowed for the model structure to be quickly changed and the S-function regenerated, changes could easily be made in response to feedback from the operators.

The team at ABB Cranes uses MapleSim models for mechanical analysis, control algorithm development and to optimise operations. As a result, the engineers at ABB Crane Systems are able to improve the performance of their crane control systems, increasing container throughput for their clients.

"By using Maplesoft Engineering Solutions, we've saved our clients a lot of money while reducing our own development time from months to days," ABB Crane Systems Tech Manager, Motion Control and Automation Dr Jonas Ohr said. "Using MapleSim to develop the initial plant model was significantly faster than trying to develop it in Simulink alone, and the results were easily integrated into our toolchain. The Maplesoft Engineering Solutions team provided the expertise we needed to meet our project goals quickly and effectively."

Australian Scientific & Engineering Solutions
www.ases.co

NEW PRODUCTS

SHAFT SEAL FAILURE ALARM MODULE

ATC Diversified Electronics has introduced the Model SPM 120AAA single-channel shaft seal monitoring module for submersible pump motor applications.

Model SPM 120AAA provides early warning of possible motor shaft seal leakages and failures. When used as part of an effective, predictive maintenance strategy, the module can help reduce the risks of premature equipment failure and downtime over 10 million mechanical cycles and fifty thousand electrical operations. Offered with choices of both fixed and adjustable sensitivities, the device detects a pump motor shaft seal leak by sensing the position of a resistive float switch or pair of conductive probes installed within the seal cavity. When the resistance drops below the sensitivity rating and a possible leak is detected, the output relay energises and the LED illuminates to red. When the submersible pump seal fault condition is cleared, the output relay automatically resets. Units operate from a 120 VAC 50/60 Hz supply voltage.

The device is suitable for OEM submersible pumps; potable or wastewater sump pumps; industrial or municipal pump monitoring; control package manufacturing; and general industrial leak detection. Units are UL recognised and include a 10-year comprehensive product warranty.

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For more information, contact us on 137 222 or via email at mining.au@siemens.com.

siemens.com/sensors/mining

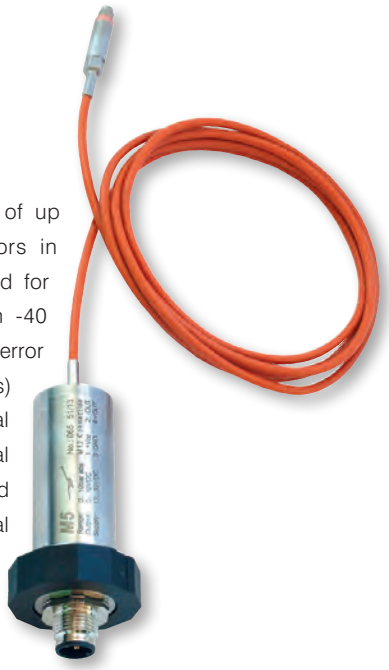
ULTRASONIC FLOW METERS

Sierra Instruments has upgraded its InnovaSonic ultrasonic transit-time flow meters for water and other liquid flow measurement applications. Working on the concept of efficiency in design, Sierra has redesigned its entire ultrasonic flow meter product line to use similar components and improve usability. This redesign allows the company to pass cost savings to its customers with improved precision measurement.

The 203, 205i and 210i have updated dual-function keys enabling users to set up their meter, run diagnostics and view flow and totaliser data with the push of a single button and without referring to the internal menus, easing field setup.

The InnovaSonic 203 is an economical flow meter offering a wide range of sizes and clamp-on sensors. The 205i is a more general-purpose flow meter for bigger pipes, with high accuracy and offering both clamp-on and insertion sensors. The 210i is a portable, battery-powered unit with a large colour display, supporting a wide range of pipe sizes.

Procon Instrument Technology
www.proconit.com.au

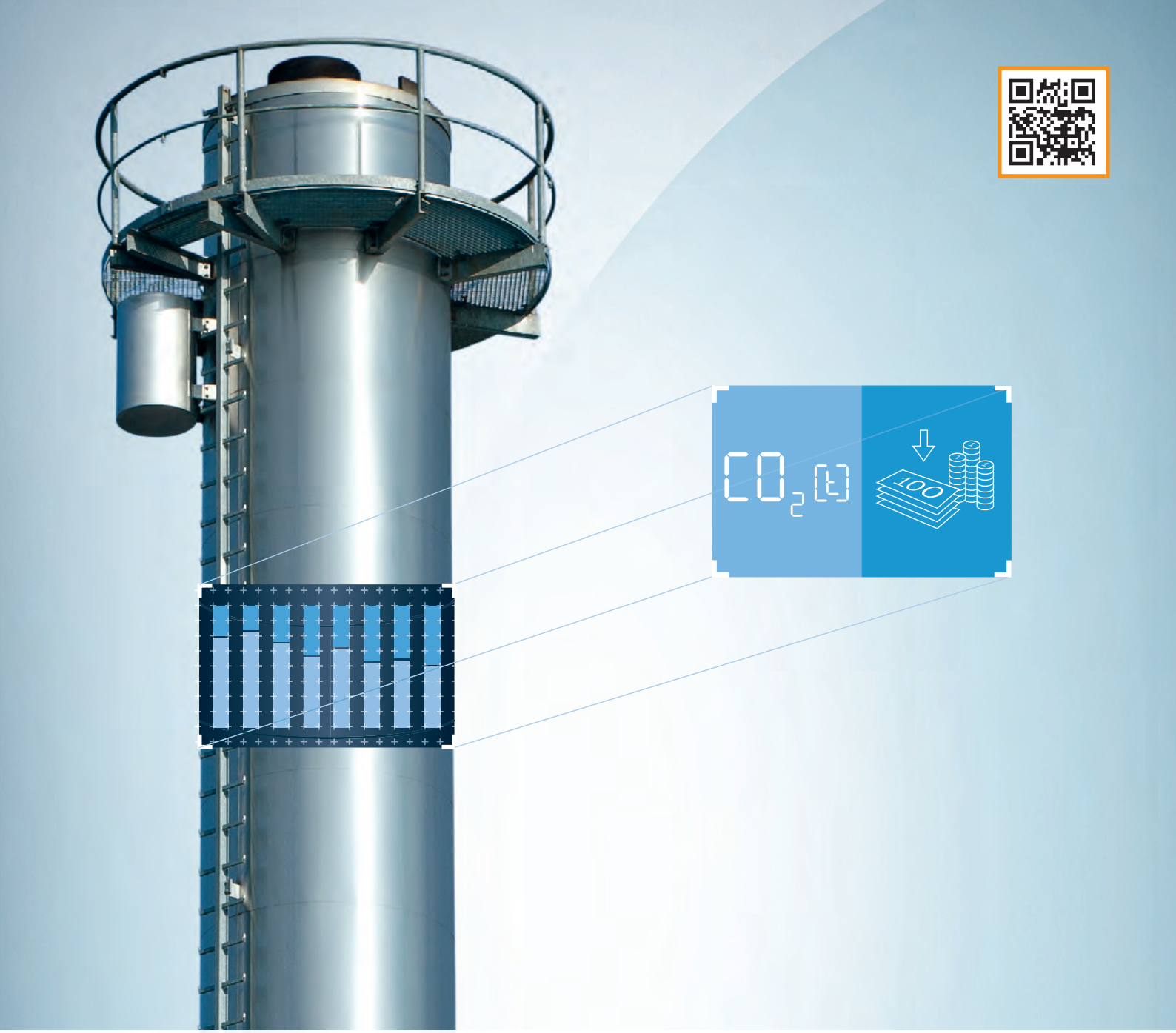


MINIATURE PRESSURE SENSORS

Capable of measurement rates of up to 50 kHz, the pressure sensors in the Keller M5 series are intended for operating temperatures between -40 and +180°C with a narrow total error band (including temperature errors) of ±1%. Without the remote signal converter, they come with a typical output signal range of 80 mV (based on a 1 mA supply) and an individual calibration certificate. The 3, 10 and 30 bar measurement ranges are available for absolute pressure measurements. Separating the pressure sensor and the signal converter enables measurements at close proximity, even in units installed in cramped conditions and exposed to high temperatures.

To avoid any reduction in the piezoresistive pressure sensor's broad dynamic range of 50 kHz, the measurement signal is not digitised. Instead, the purely analog signal path is adjusted in real time via the compensation electronics, which are fully controlled by a microprocessor. This ensures the output signal, amplified to 0-10 V, retains the full dynamic range of the sensor signal. The measurement system, consisting of the pressure sensor and signal converter, undergoes an end-to-end calibration at the factory once the customer-specific parameters have been determined. In addition, the operating temperature range of -40 to +125 °C for the remote electronics satisfies the demands required by engine test benches, for instance.

Bestech Australia Pty Ltd
www.bestech.com.au



GHG-CONTROL: MEASURE RATHER THAN CALCULATE GREENHOUSE GASES

THIS IS SICK

Sensor Intelligence.

GHG-Control is the in-situ solution to measure CO_2, CO or N_2O emissions – and the direct method for determining annual greenhouse gas emissions. The accurate measurement of the complete system ensures total uncertainties of less than 2.5% – without complicated calculation methodologies of single source streams. For more information please visit www.sick.com/ghg-control or call 1800 334 802 (Tollfree).

PRESSURE CALIBRATOR

The DPI 611 handheld pressure calibrator from GE Measurement and Control is a fully self-contained pressure test and calibration system combining pressure generation, signal measurement and loop power to provide all the convenience of the Druck DPI 610/615 but it is half the size, twice as accurate and easier to use. The DPI 611 is the fourth generation in the DPI 600 family, which was first introduced in 1984.

The DPI 611 is 50% smaller and 33% lighter than the DPI 610, creates 95% vacuum and generates 0-20 bar/300 psi in less than 30 s. Pressure measurement is twice as accurate as before and electrical accuracy is three times better.

The simplified touchscreen design of the DPI 611 pressure system combined with carefully selected materials and high tolerance machining produces efficient pressure generation and precise control.

Procedures generated by calibration management software such as GE's 4SIGHT can be downloaded to the DPI 611. These procedures are presented as a list of work orders, and when selected, each one will configure the DPI 611 to calibrate a specific device. The procedures run automatically and all the user has to do is set the pressure. The data is recorded digitally ready to be uploaded to the management software. Using the DPI 611 with automated procedures significantly reduces the time taken to calibrate a device, from typically 40 min to less than 10 min including the time to set up.

Thermo Fisher Scientific
www.thermofisher.com.au

POWER SUPPLY RANGE

Weidmüller has released its PRO range of switched-mode power supply units, known as the PROeco, PROmax and PRO-H.

The PROeco models are available in single- and three-phase units, with a choice of 12, 24 and 48 V models. Suitable for use in field cabinets, flat distributor boxes or compact series machines, the PROeco series provides up to 93% efficiency and minimal no-load losses. They have an MTBF value of more than 500,000 h.

The PROmax switched-mode power supply units have been designed for demanding applications in mechanical and plant engineering, light process applications and marine engineering. The range includes single- and two-/three-phase models and output voltages of 5-48 VDC are available. They also feature MTBF values exceeding 500,000 h, while start-up temperatures of -40°C make them particularly robust. The units can deliver continuous power of up to 120% at temperatures up to +45°C and high output peaks up to 300% ensure safe operation.

The PRO-H family is suitable for special applications in power stations and chemical, pharmaceutical and process industries where reliability is absolutely critical. The single- and two-phase wide-voltage power supply models provide a high MTBF - up to 1.8 million hours - for a long, reliable service life. Robust and durable, the units are both shock and vibration proof and are suitable for use in explosive risk zones.

All three models of the PRO range of power supplies work in a wide temperature range from -25 to +70°C.

Weidmuller Pty Ltd
www.weidmuller.com.au

IR CAMERAS WITH ARTICULATING LENSES

With a full 180° articulating lens and 5.7″ touch screen, the Fluke TiX560 and TiX520 infrared cameras let thermographers easily navigate over, under and around objects to preview and capture images more easily. The cameras are suitable for predictive maintenance, R&D, oil and gas, and utility applications where flexibility and high resolution are essential.

The 5.7″ LCD touch screen is claimed to be the largest in its class, with 150% more viewing area compared to a 3.5″ screen. The large screen lets thermographers quickly identify issues while still in the field, as well as easily edit images directly on the camera.

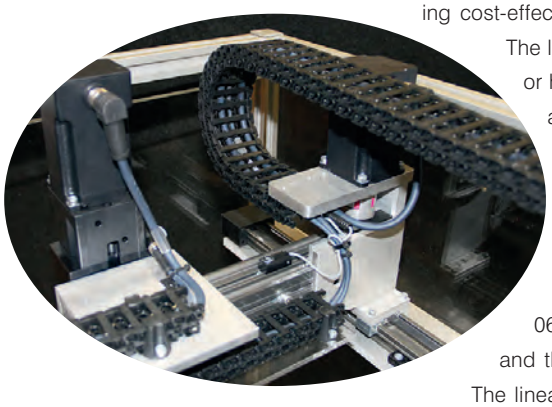
SuperResolution mode boosts resolution four times. The normal 320 x 240 (76,800 pixel) resolution of the images captured increases to 640 x 480 (307,200 pixels), revealing greater detail to better identify problems that might have been missed with lower resolution cameras. Optional telephoto and wide-angle lenses add versatility to meet a wide variety of applications. To ensure consistently focused images, the cameras feature LaserSharp Auto Focus, which uses a built-in laser distance meter to pinpoint the target and accurately calculate and display the distance.

The cameras also feature Fluke IR-Fusion technology, with picture-in-picture, full visible light and AutoBlend modes for easier identification and reporting of problems. Onboard analytics let users adjust or enhance images right on the camera. Also included is Fluke SmartView software, which provides a suite of tools to view, optimise, annotate and analyse infrared images and generate reports.

Fluke Australia Pty Ltd
www.fluke.com.au

LUBRICANT-FREE LINEAR DRIVES WITH MOTORS

igus is now offering its linear actuators with polymer bearings, complete with motor. Currently, the small motor range covers stepper motors in sizes NEMA17 and NEMA23. The motors are optionally available with an encoder and/or brake. Stepper motors are a good accessory to the DryLin linear drives due to their outstanding cost-effectiveness, precision and simple operation.



The linear axis DryLin E SAW-0630 with NEMA 17 motor is driven via a trapezoidal or high helix thread lead screw. Numerous pitches from 1.5 to 15 mm are available. The drive lead screws are supported by ball bearings. The lead screw nuts are made of tribologically optimised iglide high-performance polymers and provide freedom from lubrication over the entire stroke length, and the entire life of the bearing.

Almost all the components used for the ready-to-fit linear unit are made from plastic and aluminium, meaning the system is lightweight. The SAW-0630 is suitable for simple lubricant-free format adjustments, feed movements and the handling of components.

The linear guide itself, based on the maintenance-free DryLin W system, comprises a bearing housing and tribologically optimised polymer gliding film for low friction and wear. The design makes a flexible and modular structure possible, making assembly easy.

There a numerous design possibilities to choose from, with 12 rail profiles available, single and double rail options and the choice between individual bearings or complete slides. The guides are also available as linear axes with a toothed belt drive.

Treotham Automation Pty Ltd
www.treotham.com.au

ETHERNET/IP BUS COUPLER

Belden has introduced an addition to Lumberg Automation's fieldbus system - the LioN-Link EtherNet/IP bus coupler. The bus coupler makes updates easy as a result of its flexible interface with industrial networks running EtherNet/IP protocols.

The single I/O module supports diverse field wiring designs, numerous configuration options and long-distance connections. Its standardised wiring components also provide high flexibility.

The LioN-Link system provides simplified connection options between the entire fieldbus system and the fieldbus independent I/O modules, which are lightweight and use limited space. Software is integrated into each bus coupler, allowing communications with a web server as well as access to real-time data and diagnostics across the entire manufacturing process. Each bus coupler connects up to 30 I/O modules distributed through two lines, with a maximum of 15 devices per line. The lines can extend up to 100 m.

Belden Australia Pty Ltd
www.belden.com

HANDHELD PRESSURE CALIBRATOR

The Crystal Engineering HPC40 Series calibrator is designed for process control applications, such as verification or calibration of pressure gauges, transducers, transmitters, pressure switches and safety valves. It is suitable for pressures ranging from vacuum to 15,000 psi with accuracy of 0.035% of reading for all ranges.

The HPC40 Series is fully temperature compensated from -20 to 50°C and can typically replace several gauges or calibrators. The calibrator's large, full-colour display combined with its updated user interface makes the HPC40 Series easy to use - its single-layer user interface has no deep menu structure, allowing tasks to be performed quickly and intuitively.

The HPC40 Series can be used as an individual calibrator or combined with AMETEK pressure generating products into a complete ready-to-use calibration system.

Transtek Pty Ltd
www.transtek.com.au

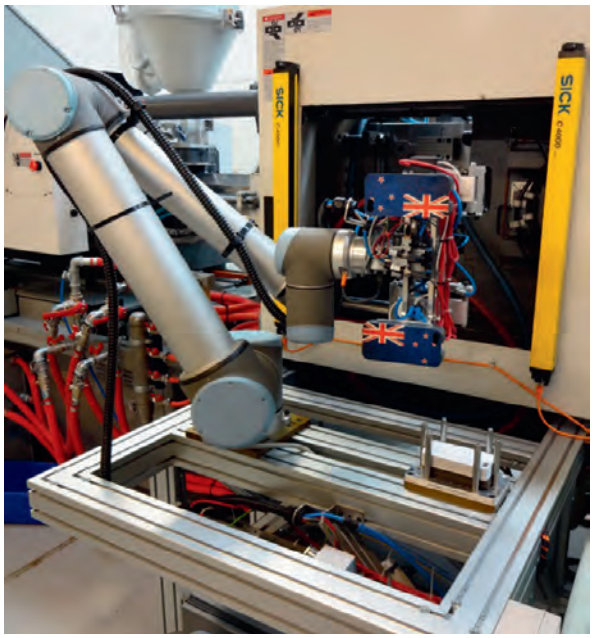
CASE STUDY

Cobots perform in-mould labelling for NZ plastics company

High labour costs and geographic remoteness have meant that to be competitive in global markets, New Zealand manufacturers have needed to apply new, innovative technologies to their production processes to deliver products to market faster, cheaper and with the highest level of quality.

To solve part of that problem, Talbot Technologies deployed two of Universal Robots' UR10 industrial robot arms to perform in-mould modelling, transfer moulding and co-moulding tasks on the company's Christchurch production line. Since the installation of the first UR10 in 2013, Talbot Technologies has already reported increases in productivity, reliability, quality and cost savings.

Talbot Technologies is an integrated technical plastics manufacturer and solution provider that works as a design, development and production partner across a wide range of industries, for companies across the globe. Like so many NZ companies it has been trialling various technologies aimed at providing high-quality output at a lower cost.



According to Steve Wilson, executive director of Talbot Technologies, the business required a flexible, easy-to-program five-axis robot for a particular type of application.

"We conduct complex in-mould labelling which has quite a few components and a fixed rail robot simply doesn't have the capacity or the versatility to deliver the type of results we need. After extensive discussions with Design Energy, we agreed that the style of robot offered by Universal Robots would best suit our requirements," Wilson commented.

"We had looked at other robots; however, the strong ROI combined with its reliability and versatility made the UR10 a more desirable value proposition for us overall. Another important factor in our decision was in knowing we had the support of Design Energy, who has all the capability of systemising the robot to our particular application," said Wilson.

There are many important factors to consider when investing in new technology - including the safety of staff.

"The safety of our employees is paramount. The collaborative nature of the UR10 means our employees and robots can work on the production line together and share the workload of tasks - without the threat of injury," said Wilson. In contrast to traditional industrial robots in the market, Universal Robots' small and lightweight robotic arms are able to work safely alongside staff (subject to a risk assessment). The UR10 robots comply with the ISO standard for Collaborative Robots, never exceeding a force of more than 150 N. The robots are also equipped with a 'stop-force' safety feature that automatically stops the robot from operating when it is subject to substantial resistance.

Another major factor to consider when investing in a new technology solution is its level of complexity. According to Wilson, "One of the most appealing aspects of Universal Robots' new generation of industrial robots is they no longer require specialist knowledge to operate. Our technicians can quickly and easily learn how to program and operate the robots, saving the business a great deal of time in the implementation phase and in repurposing the robots to carry out different tasks."

The UR10 can be completely reconfigured and deployed for any number of tasks in a matter of hours. The programming is very intuitive, combining a graphical user interface with a teach function - enabling the operator to simply grab the robot arm and show it how a movement should be performed. The user-friendly interface then allows staff to drag and drop the routines to do their programming - with functionality very similar to an iPad.

In the past, Talbot Technologies relied heavily on manual handling of products and in some cases utilised rail robotic technology. However, due to the company's rapid growth, Wilson needed to streamline the production process to help drive efficiencies in workflow.

"The UR10s have enabled us to combine functions that occurred off-machine and on-machine, and others which happen either prior or post production - helping us to better streamline the process flow," Wilson said.

When asked what appealed to him the most about the Universal Robots UR10, Wilson was quick to acknowledge the technology's compactness, ease of programming, as well as value for money and the short payback period on return.

"At the moment the main cost reduction is gained through an improvement in quality. We always get exactly the product output we want with repeatability and without error, which has provided a solid return on our investment.

"We expect to see a full return on investment within 12 months from implementation, which for us provides significant cost-saving benefits that can be used elsewhere to expand our rapidly growing business. We are planning on adding additional functions to what the robots currently do, which will make other downstream processes obsolete and provide further return as we go forward."

Wilson said that Talbot Technologies was expanding exponentially and the workers displaced on the manual labelling process had been redeployed in other areas of the operation, which offered further productivity benefits.

Universal Robots
www.universal-robots.com

ELECTROMAGNETIC SAFETY LOCKS

Comitronic BTI has developed a range of interlocking devices suitable for hostile environments, especially in the food processing industry. The Comitronic BTI Supermagnet is an electromagnetic safety lock for machine protection which holds the doors or casing closed in harsh environments.

One of the features that distinguish the Supermagnet lock from other interlocking devices is the fact that it locks without power, providing permanent safety. If there is a power cut or a cable cut, the Supermagnet will still keep the door closed.

Supermagnet is available in two versions: the 'with power' version or the 'without power' version that works when the power supply is switched off. The second version consumes only 40 mA, even when it is closed.

If used with a safety module, the Supermagnet can attain a performance level up to Category 4 PLe. Supermagnet's magnetic holding force of 20-100 kg protects users from accidental opening which would stop production and thus lead to loss of time. The magnetic holding is strengthened by Supermagnet's floating 360° counter-plate, which ensures good contact with the magnets even if the door is loose.

The Supermagnet's casing is available in polycarbonate or in stainless steel. The stainless steel version is mirror polished to IP68.

Another feature of all Supermagnet versions is a 50 cm pigtail cable, which allows users to place the M12 connector in a protected position. The Supermagnet is laser etched and mechanically stamped, ensuring that all product and traceability information is permanently available.

Balluff Pty Ltd
www.balluff.com.au

INDUSTRIAL-GRADE NETWORKING DEVICES

Fortinet is introducing ruggedised products for industry with the FortiGate Rugged 60D and FortiAP 222C - networking, security and wireless devices purpose-built to meet the demanding standards of public utilities, oil and gas, mining, manufacturing and transportation industries that operate in harsh physical environments.

Distributed critical infrastructure is often located in places that are physically inaccessible, lack connectivity, are subject to intemperate climate or are otherwise constrained by limited space. As a result, traditional security solutions intended for indoor environments are often ill-equipped to operate under duress or in harsh conditions.

Fortinet's rugged and outdoor products are industrially hardened appliances that deliver enterprise-class connectivity and security for critical control systems facing malicious attacks, as well as extreme weather and other demanding physical environments. Dedicated security appliances, expert security intelligence powered by FortiGuard Labs with an emphasis on ICS threats and systems, and consolidated wired and wireless networking combine to meet both the demanding security requirements and environmental conditions for customers.

Industrial control-specific capabilities, such as application awareness and protocol support, come in form factors designed in accordance with international substation automation standards IEC 61850-3 and IEEE 1613, with fanless, cable-less design. Integrating switching and wireless access delivers connectivity as well as security for automated systems, while strong remote configuration and management, as well as central monitoring and reporting, ensure high availability and demonstrated compliance capabilities.

WhiteGold Solutions

www.whitegold.com.au

DUAL INPUT TEMPERATURE TRANSMITTERS

The THZ³ and TDZ³ 2-wire (loop-powered) transmitters provide an isolated and linear 4-20 mA output proportional to input. They configure quickly and easily to accept a direct signal input from a wide array of sensors and analog devices including 14 RTD types and nine thermocouple types; resistance and potentiometer devices; and direct millivolt sources.

The dual sensor input allows the THZ³ and TDZ³ to offer backup and failover protection, with either of the sensors or inputs designated as the primary measurement and the secondary input acting as a backup sensor in case of a primary sensor failure. Additionally, by utilising this dual input capability, 15 THZ³ or TDZ³ transmitters can be multidropped on one digital HART loop to monitor 30 temperature points.

Another benefit associated with the dual input sensors includes average and differential measurement to average the two input measurements, or select either the differential (A-B or B-A) or absolute difference between the two inputs. High-Select and Low-Select features also enable the transmitter to designate either the highest or lowest input as the source for the analog output or PV. The THZ³ and TDZ³ offer an input-to-output analog accuracy of up to ±0.014°C and feature 20-bit input resolution with high input accuracy for all sensor types.

The THZ³ and TDZ³ transmitters are HART 7 compliant with exception-based reporting and dynamic variable mapping. They are HART and DTM programmable with user-oriented basic configuration for fast and accurate set-up.

Moore Industries Pacific Inc

www.miinet.com

PORTABLE VIBRATION MEASUREMENT

The VibraCorder from Dytran Instruments is designed for portable, 3-axis, static and dynamic acceleration measurements.

VibraCorder can be used to capture critical vibration data, solve problems and move product development forward. The VibraCorder's compact, lightweight, battery-operated, environmentally sealed package fits into tight spaces. Easily installed, user-configurable software optimises data collection, and an internal accelerometer eliminates the need for external cable runs and complex signal conditioning, while built-in high-pull magnets allow for easy mounting to ferromagnetic surfaces.

The removable memory card plugs directly into a laptop or PC.

Metromatics Pty Ltd

www.metromatics.com.au

LASER CONTRAST SENSOR

The Banner Engineering Q3X laser contrast sensor has the ability to detect up to 2000 events/s, providing high-speed, reliable detection of parts, tools, pallets or registration marks with small contrast differences. The Q3X has a small laser spot and is a suitable sensor for reliable part presence, tool-in-place or broken tool detection in stamping and machining centres.

Featuring speeds as fast as 250 μs and a sensing range up to 300 mm, the Q3X is also suitable for high-speed packaging and detection applications of small targets, such as registration marks on packaging, or verifying placement of black gaskets and O-rings on machined metal parts.

Featuring an angled, three-digit display of signal intensity, the Q3X provides high visibility of operating conditions from multiple angles. For an intuitive user set-up, the Q3X has two tactile buttons conveniently located below the display.

Designed with robust nickel-plated zinc die-cast housing, the Q3X provides good performance, even in environments with exposure to cutting fluids and oils. Sensors are also rated to IP67, IP68 and IP69K for enhanced protection to water submergence and high-pressure washdown.

Micromax Pty Ltd

www.micromaxsa.com.au

INDUSTRY 4.0: A NEW ERA

Martin Krueger, Rainer Drath, Heiko Koziolek, Zied Ouertani, ABB Corporate Research

A new era of industrial innovation is upon us. Referred to as the fourth industrial revolution, the deeper meshing of the digital world with the world of machines holds the potential to bring about a profound transformation of industry worldwide.

The world is on the threshold of another industrial revolution - this one a result of the convergence of the global industrial system with the power of advanced computing, analytics, low-cost sensing and new levels of connectivity permitted by the internet.

The industrial revolution began when manual labour was replaced with mechanical power, starting late in the 18th century with the invention of the mechanical loom.

This revolution continued to develop in stages over the next 150 years, with further mechanisations and through the combination of steam and water power. The second stage dates to the emergence of electrification and automation. At every stage, productivity accelerated sharply beyond that stage which had preceded it.

The third, and most recent, industrial revolution stage began in 1969 with the first digital and freely programmable control systems, which replaced the traditional hardwiring of analog logic and control programs. This stage built the foundation of today's automation pyramid and modern process control systems and has continued right up to the present day. An overview of these industrial revolutions is presented in Figure 1.

The next industrial stage

The arrival of the internet in the consumer world in the 1990s brought unprecedented change to daily life: social networks, online TV and almost instant access to huge amounts of information.

A similar revolution is now expected in industry, as government and industrial consortiums around the world see a trend of increased utilisation of internet technology in industrial production systems. Devices in the production environment are increasingly being (wirelessly) connected to each other and a network - whether a private network or the internet. Eventually industrial production systems will be capable of autonomously exchanging information, triggering actions and controlling each other more independently.

The working groups developing this new concept are widely diverse, so the description of the concept, and even its name, varies. For example, the name Industry 4.0 (Industrie in German) was conceived by a German-led working group, while in the United States a similar initiative is called Industrial Internet[1,2]. Both initiatives are based on technologies associated with the Internet of Things (the ubiquitous connection of all devices to the internet) and cyber-physical systems, a combination of physical objects

and software systems. The initiatives mark efforts aiming to prepare global industry for what is expected to come.

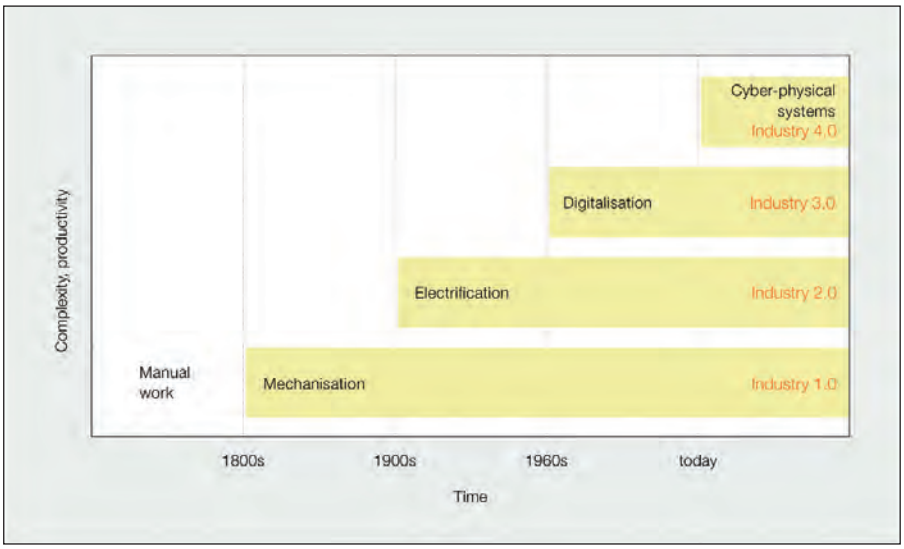


Figure 1: Industrial revolutions and enabling technologies.

Technical drivers for Industry 4.0

A number of technical developments are driving the efforts of Industry 4.0[3] (see Figure 2). Communication infrastructure will become ubiquitous throughout industrial production facilities as it becomes cheaper and readily available. This network availability builds the basis for tasks such as data acquisition, engineering, operation, maintenance and advanced services.

Once a network is in place, more devices, machines, facilities and plants will be connected, either on the internet or on a private company network. All connected physical objects will be represented by data objects in the network. As a result, these data objects form a second virtual identity within the cyber-world, the cyber-physical objects. These objects will be easy to locate, explore and analyse and will hold information about their functionality as well as their requirements.

Devices, machines, facilities and plants will be able to store knowledge about themselves beyond the physical representation and directly at the data object in the network. Each will publish updates on their current status, history, related documentation or technical requirements in the network. Such information can then easily be updated by the device's owner, service technician or parent system.

As part of a cyber-physical system, intelligent algorithms and embedded software will be able to explore these new data sets to generate value-added services that would not have been feasible or economical before (Figure 3). This field is a topic of ongoing research[4], but, from today's perspective, remote or data-driven services mark the first steps toward these new services.

The increasing level of integration of cyber-physical objects in an internet-technology-enabled network will inevitably lead to higher levels of information processing. This will then open new doors for widely known concepts from the consumer market to enter the business-to-business market, such as plug-and-play (like plugging a USB mouse into a computer, with drivers being automatically downloaded from the web and always kept up to date) or plug-and-produce (such as exchanging an old device with an equivalent new one which then functions automatically, without the need for manual engineering, commissioning or servicing).

Cyber-physical systems have been present in the business-to-consumer market for some time. One application of the concept is the purchasing of fuel by consumers from German petrol stations. Fuel prices are submitted to a central data repository, where all stations are represented as data objects in the network. The value of

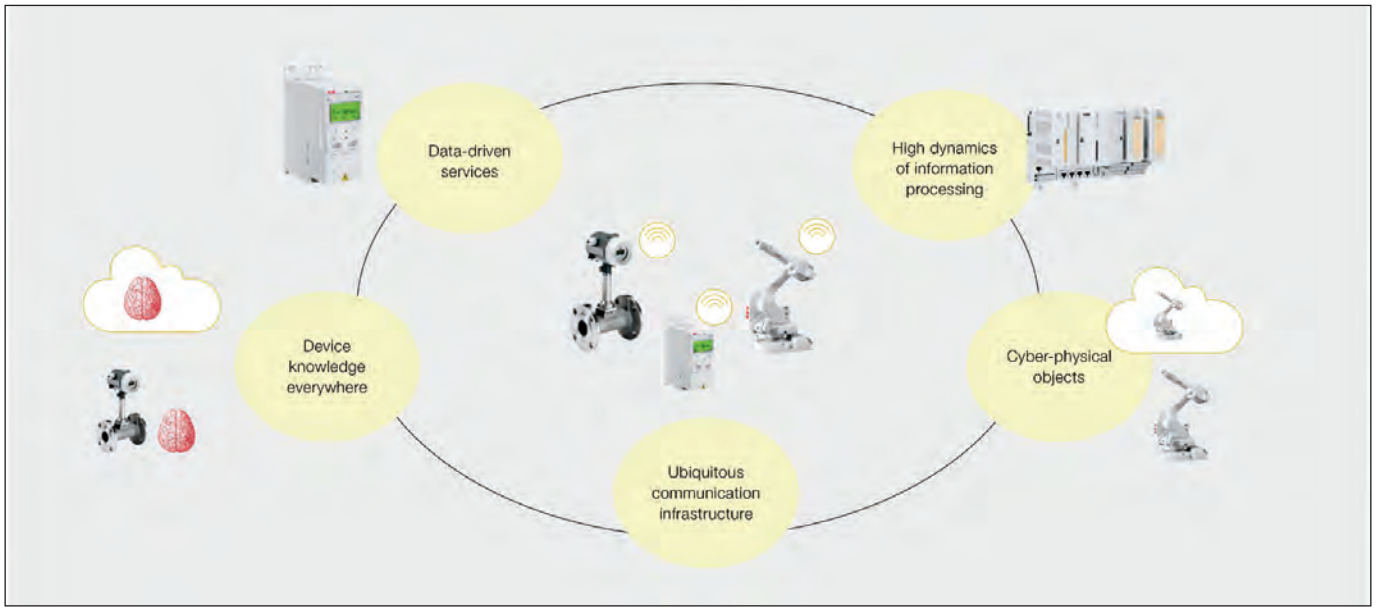


Figure 2: Technical drivers for Industry 4.0.

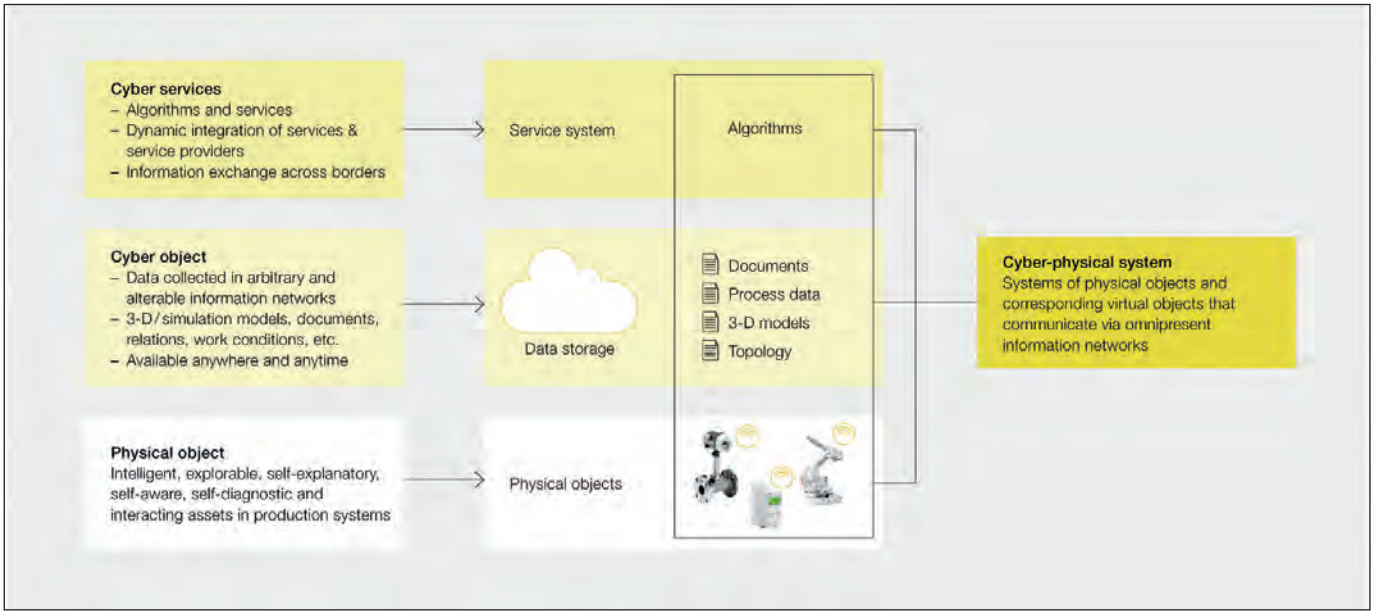


Figure 3: Cyber-physical system.

isolated data objects alone is minimal. However, with the advances of mobile technologies and smartphone applications, millions of users can now make informed decisions for purchasing fuel by consulting the current prices at their individual locations. In this example, the architecture of the cyber-physical system breaks down in the following way: the physical object (petrol station), the cyber part (the data object with prices) and the software layer (the smartphone apps).

Industrial demands

The introduction of communication and internet technologies into industrial production has tremendous potential to increase productivity and flexibility, but it also raises concerns - in particular for plant owners, who combine investments, know-how, production capabilities and profit in their plants. Among the current visions of Industry 4.0, the value propositions still need to be identified. To create a sustainable acceptance of the next industrial revolution, some practical requirements need to be fulfilled:

- In order to protect investments, new technology needs to be incrementally introduced into existing production facilities, making sure not to disrupt the existing machines and technology.
- To maintain stability internet technologies must not disrupt production, neither through network outages nor through intended remote access to assets.
- The access to plant-specific data must be carefully controlled by the plant operator. Write access to production-relevant assets, machines and facilities needs an additional audit to cross-check the validity of the intervention in the context of the running production.
- As always, security is a vital aspect. Unauthorised access to data and services needs to be prevented to ensure information security and to control critical aspects of the production facilities.

Furthermore, production systems in general have stronger requirements on non-functional properties - such as availability, real-time capability, reliability, robustness, life cycle, productivity and cost - compared with IT systems in other markets.

Integration topology

To facilitate the further development of Industry 4.0 an integration topology has been adopted by the German Industry 4.0 initiative[5], initially developed by ABB. The topology will allow an incremental introduction of new technology and production processes.

The core of the integration topology is the separation of the established production network from the new Industry 4.0 network (Figure 4). From the technical aspect, the separation can be implemented by either physically separated networks or logically separated networks within existing ethernet-based networks. As shown in Figure 4, the green production network symbolises an automation system that fulfils the industrial requirements on availability, reliability, sustainability and security. The yellow Industry 4.0 network enables new services and provides added value to the user. The production is not dependent on the Industry 4.0 network; therefore, failures of the network will not interrupt production.

In the first step of an implementation of the topology, assets, devices, production lines and factories are connected to the Industry 4.0 network with read-only access (yellow markers). Authenticated participants can read, for example, device IDs, diagnostic data, parameters or production data. This data will form the foundation of future Industry 4.0 value-creation processes. In a second step, write access will be introduced with an approval instance to avoid unintended effects on the running production.

The data of the yellow Industry 4.0 network is collected in a private, secure storage system. Access to this data is controlled by the data owner, ie, the plant operator. Publication of this data to the Industry 4.0 services system is controlled by interfaces and permission systems. Added value can be created - either by services within the private data system, or through third-party services within the Industry 4.0 services system.

This integration topology addresses the industrial requirements of investment protection, system stability, controllability and data security issues. The German Industry 4.0 steering committee has published this topology under the Industry 4.0 umbrella[5].

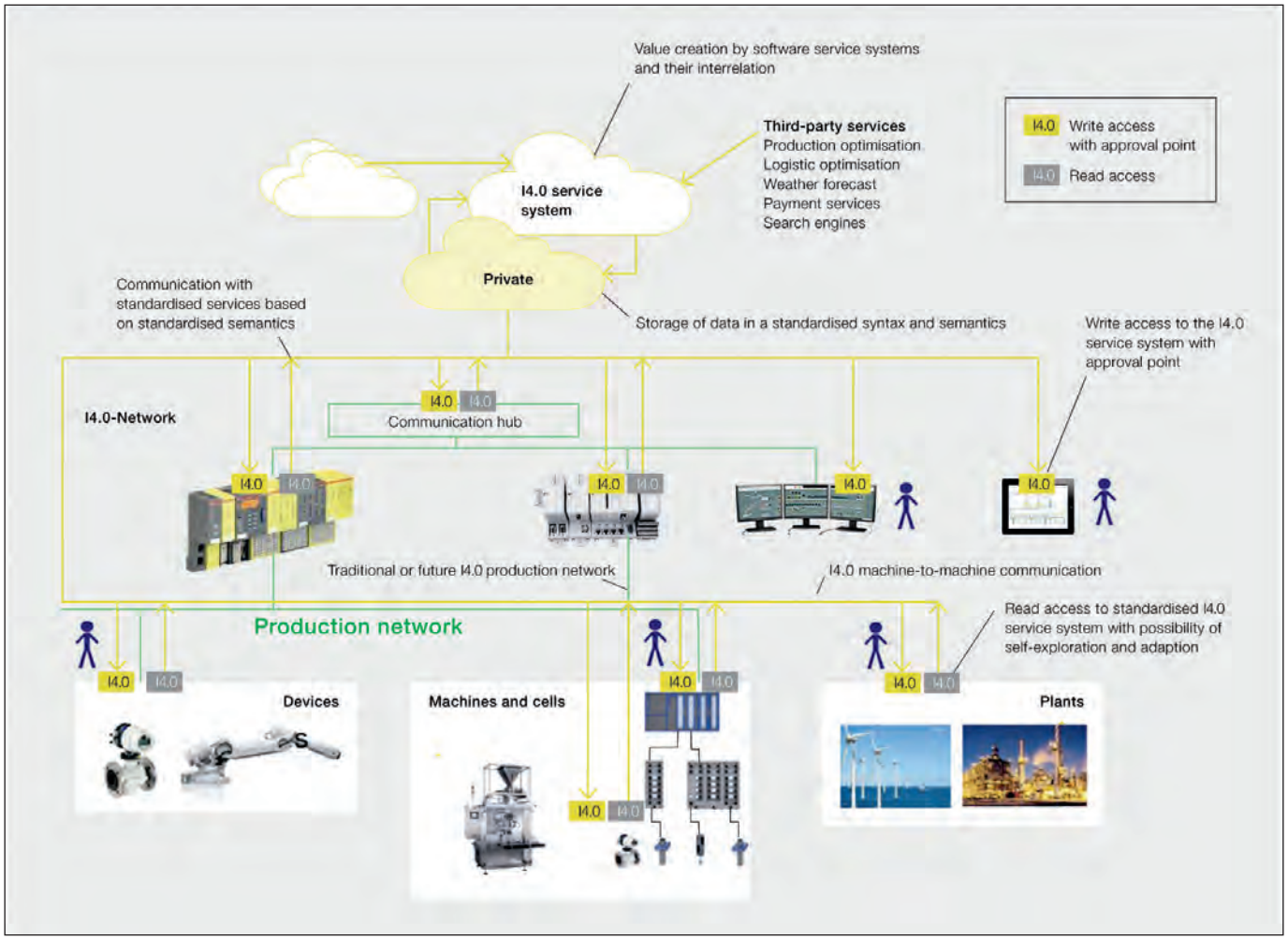


Figure 4: Integration topology for Industry 4.0.

What is needed

Many components comprising the fourth industrial revolution are not new. Cloud technology, network devices, communication interfaces and data-driven services are well established in many markets. However, in order for the next stage to move forward, a number of agreements and principles need to be established, such as:

- Cross-vendor agreement of standardised syntax and semantics to identify, collect and store data;
- Cross-vendor agreement of standardised services based on standardised interfaces, communication and semantics;
- Introduction of principles such as (for example) self-exploration or plug-and-explore to facilitate cross-vendor value creation;
- Availability of services to create added value from the cross-vendor availability of data;
- Interlinking of services with other third-party services;
- Availability of data throughout the value chain and supply chains in real time;
- Dynamic, partly autonomous adaptation of production services to changes in environmental parameters (such as plug-and-produce for replacement devices or update of software during continued production);
- Reorganisation of production processes to systematically exploit data and services.

This new industrial revolution is a phenomenon that will flourish. The key to bringing added value to the customer lies in better understanding the requirements for standardisation enabling the interaction of Industry 4.0 technologies. It is also important to investigate application cases in different industrial ecosystems to confirm the potential of the trend[5].

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NEW PRODUCTS

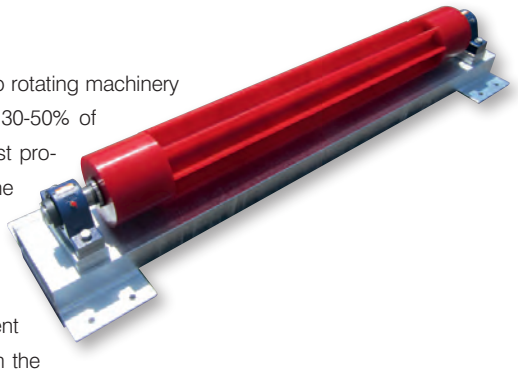
INTEGRATED BULK MATERIAL HANDLING AND PACKAGING SYSTEM

National Bulk Equipment has introduced an automated bulk material handling and packaging system built on the NBE integrated construction and controls infrastructure. The complete process sequence, including pallet/base supply; slipsheet pick-and-placement; bulk material infeed; packaged contents densification; NTEP-certified weighing; and finished-package accumulation conveyance operates on the paired, process-specific structural framework chassis. All automation and control functions are centralised in a single, menu-driven HMI to enable standardised and system-wide data reporting. The NBE automatic pallet dispenser phase eliminates manual handling of pallets. The pallet stack, delivered by forklift, is conveyed into the dispenser where the stack is automatically formed and each pallet is aligned and staged to advance into the slipsheet dispenser. The slipsheet dispenser magazine can hold up to 1133 kg of sheet. Sensors and automated controls guide the dispenser lift carriage along horizontal and vertical flanged cam rollers to provide pick-and-place of up to 30 slipsheets/h.

The bulk bag filling stage of the system uses a cantilevered fill head/bag hanger carriage design with pneumatic actions to bring the fill head and rear bag hooks to well within the operator's reach. The 8 GPM hydraulic lift carriage easily and safely lifts bag capacities up to 2000 kg. The NBE NTEP-certified hang-weigh system provides valid, accurate and repeatable weighing of the bulk bags to an accuracy of ±0.05% of the 2000 kg bag weight. The NBE bulk bag densification platform uses a 3g high-speed, low-intensity vibration to settle material in the bag to a dense, stable and safe load.

Mercer Technologies
www.mercerstainless.com

DEWATERING IDLER



It has been estimated that the maintenance costs to keep rotating machinery such as conveyors working effectively can account for 30-50% of total operating costs. This figure does not include the lost production time accrued in downtime for stoppages to fix the conveyor and install replacement parts. The Kinder & Co K-Wrapper dewatering idler is a preventive maintenance tool engineered to extract excess water on conveyor belts surfaces which, if left moist, can lead to belt misalignment as well as the conveyed material slipping or spilling from the belt. Uncontrolled loss of product can lead to a major safety hazard.

The dewatering idler is made from long-lasting and corrosion-proof polyurethane and has a low tension effect on belt cleaning. The belt-friendly product is available for all belt widths and is suitable for reversing conveyors, as well as high-speed conveyors. Once installed and swapped into place with a current idler, the device requires no reactive maintenance.

Kinder & Co Pty Ltd
www.kinder.com.au

PICK-AND-PLACE ROBOT

The Delta-3 robot from Omron is designed to achieve up to 200 cycles/min and can be synchronised with multiple conveyors to perform on-the-fly pick-and-place operations.

At the core of the robot's architecture is the Sysmac NJ Machine Automation Controller (MAC). In the past, robots were controlled exclusively by dedicated robot controllers. A machine architect can now decide to control a robot in exactly the same way as all other parts, from one control system, by using Sysmac Studio software. Now it is possible to integrate machine control, vision, HMI, safety and robotics in the one controller.

The NJ501 uses EtherCAT as the motion network. The control system calculates Delta-3 kinematics in a few microseconds and achieves top performance regarding the number of robot cycles and repeatability. Up to eight Delta robots can be controlled by one Sysmac NJ controller.

There are three types of Delta robot arms - available as Washdown, Delta and Mini Delta robot. The NJ controller offers a response time of 2 ms when controlling eight Delta robots or 1 ms when controlling four robots.

The Delta-3 robot has three arms and is programmed to pick and place low weight (1-3 kg) loads quickly. There is also an optional fourth arm for workpiece orientation.

The Delta-3 robot rotates through 360° and can work in an envelope of about 1100 mm. The machines are low maintenance, with no major parts to be replaced for at least 10-15 years if serviced regularly.

Omron Electronics Pty Ltd

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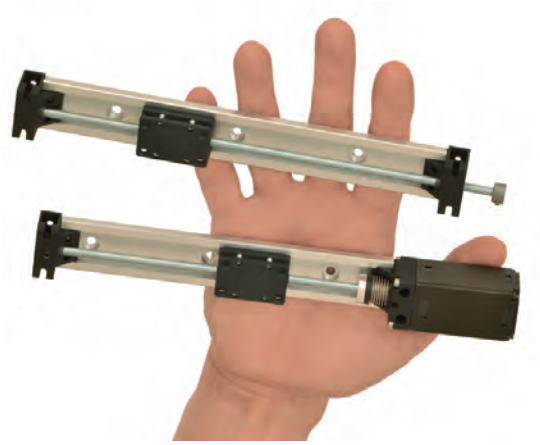

MINIATURE LINEAR DRIVE

The DryLin SLN-27 from igus is a small, lightweight and lubricant-free system for positioning small loads that comes with an optional NEMA 11 certified motor. Developed specifically for simple handling tasks in confined spaces, the high-performance miniature linear drive offers design flexibility for positioning small loads.

The DryLin SLN-27 miniature linear axis is based on the DryLin N27 linear guide system. The linear rail of both the N27 and SLN-27 is made of durable anodised aluminium. The plastic carriage has high wear resistance and is also maintenance-free, self-lubricating and corrosion-resistant, providing a 'fit-and-forget' solution.

With dimensions of 22 x 28 mm, the product is suitable for low-load sensor adjustments and feed mechanisms, as well as lightweight handling tasks such as those found in laboratory equipment and camera inspection machinery.

Lightweight plastics and aluminium make the device very robust. The carriage is driven by a 5 mm trapezoidal or high-helix thread lead screw and is available in a range of pitches from 0.8 to 5 mm. The lead screw nuts are made of iglide high-performance polymers which are optimised for lubricant-free operation over the entire stroke length, which can be a maximum of 250 mm.

The unit can be bought as a complete system with a NEMA 11 stepper motor, still achieving compact dimensions, and is made using stock components, individually configured to the required length. The company also offers a 'quick-fit' aluminium spacer and motor flange connection to fit a third-party NEMA 11 motor.

Treotham Automation Pty Ltd
www.treotham.com.au

CONTINUOUS INK JET PRINTER

The A520i continuous ink jet (CIJ) printer, from Domino, is a resilient printer designed for challenging production environments and comes wrapped in an IP55 marine-grade stainless steel cabinet, with IP66 sealed electronics enclosure. It incorporates the plenum airflow cooling system, which ensures the printer stays cool whatever the production environment.

The touch panel user interface (UI) is a separate component, which can be mounted either directly onto the cabinet or remotely to suit production line requirements and layout. The printer can also be controlled via any Windows interface already on the production line.

The product's i-Tech ink system is claimed to deliver the lowest measured consumption make-up on the market and low overall cost of ownership. The machine requires no service and minimal operator intervention due to the presence of CleanFill cartridges that can be changed while the printer is running, and the i-Tech Module containing the working ink and ink filters can be easily replaced in less than 10 min. This is all the maintenance the printer requires, and it's an annual task that can be performed by anyone.

insignia Pty Ltd
www.insignia.com.au

VIBRATION METER

The Fluke 805 FC vibration meter is a portable, multifunction vibration screening tool that provides quantifiable information on the bearing and overall health of motors and other rotating equipment, and shares that data in real time via Fluke Connect.

The product is suitable for frontline mechanical troubleshooting teams that need repeatable measurements of rotating equipment to make imperative go/no-go maintenance decisions. The meter automatically saves vibration data wirelessly to Fluke Connect cloud storage so authorised team members can view all of the measurement data for each asset with the Fluke Connect app on their mobile devices before they leave the inspection site.

The handheld device measures overall vibration from 10 to 1000 Hz and provides a four-level severity assessment for overall vibration and bearing condition. It detects peaks in the vibration signal readings of roller bearings from 4000 to 20,000 Hz, and uses a proprietary algorithm to interpret severity to determine if the bearing is going bad. It features an infrared sensor that automatically measures surface temperature and displays it along with the vibration reading for a broader understanding of machine health.

The unit has a sensor tip design that minimises measurement variations caused by device angle or contact pressure. This reduces operator error and improves the accuracy and repeatability of quick vibration screening. The meter also provides a severity scale for both overall vibration and bearing condition readings, delivering more information than typical vibration pens.

Fluke Australia Pty Ltd
www.fluke.com.au

PANEL PC

The IEI Technology PPC-F24A-H81 Series panel PC is based on the Intel H81 chipset. Powered by an LGA1150 Intel Core i7/i5/i3 Pentium or Celeron processor with up to 65 W TDP, this panel PC series can support up to 16 GB DDR3 SO-DIMM.

It features a 24″ LCD screen and a robust, ultraslim, aluminium front bezel, providing two types of touch options in resistive and projected capacitive. It also features two RJ45 LAN ports, two USB 3.0 ports, four USB 2.0 ports, a HDMI port, four RS232 ports, an RS422/485 port, a VGA port and a microphone connector.

The PPC-F24A H81 Series meets the IP65 rating providing resistance to dust and liquid ingress, and supports IEI's Remote Intelligent Solution, iRIS-2400, facilitating remote management and power control.

ICP Electronics Australia Pty Ltd
www.icp-australia.com.au

FIRMWARE UPDATE FOR WIRELESS GATEWAY

Emerson Process Management has used customer input to update the firmware for its Smart Wireless Gateways. Version 4.5 firmware will enable users to see and understand process information quickly, helping to make sound decisions and take needed action.

The firmware streamlines the wireless network interface, security set-up and field device configuration. It has a consistent look and feel and simplifies information presentation. Visual feedback and information filtering are built into the software to support fast navigation. NAMUR symbols and organised table views provide at-a-glance actionable information. Firmware version 4.5 will also give users quick access to field instrument diagnostic data for continuous monitoring of device health and the wireless network.

Emerson Process Management
www.emersonprocess.com.au

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WI-FI DATA LOGGER

The Series DW-WIFI Wi-Fi data logger measures and records up to 1,000,000 temperature or humidity readings, and shares the data with any PC or server on a Wi-Fi network. Software settings allow the user to set the high and low alarms, the sampling rate and the temperature scale.

If the Wi-Fi connection is lost, the sensor will continue to store any records until it can regain communication with the network. Stored data can be viewed at any time after the communications have been restored. Each data logger includes a wall bracket that allows the data logger to be mounted to any wall or flat surface. Configuration and logging software available for download from Dwyer's website. Applications of the Series DW-WIFI include environment monitoring, weather monitoring, and building or site monitoring.

Dwyer Instruments (Aust) Pty Ltd
www.dwyer-inst.com.au

MODULAR POSITIONERS

Most positioners would fail quickly when subjected to harsh environments such as extreme temperatures, dirty conditions and high vibration. Young Tech Company (YTC) has developed two smart positioners for these conditions.

The YT-3301 introduced the concept of isolating and detaching the sensing feedback portion of the positioner from the main control housing. The sensing unit accurately detects the position of the valve stem and provides a feedback signal to the main housing.

This dual unit design allows the operator to locate the precision electronics elements at a considerable distance from the valve environment, providing the best of both worlds - precision engagement at the point of valve movement and a clean, dry and ambient temperature for the electronics. This also facilitates mounting multiple control housings in close proximity for convenient and time-saving monitoring and adjustment of valves in the plant.

With the YT-3302 positioner, a third module, housing the driving components of the pilot valve and torque motor assembly, is mounted at an intermediate location between the remote sensing unit and the main control unit. As the sensing unit contains the most robust components and the control the most sensitive, this configuration delivers higher performance with increased positional accuracy.

Rotork Australia
www.rotork.com

CASE STUDY

Wastewater plant meeting compliance and productivity requirements

Hamilton City Council is responsible for the operation of the Pukete Wastewater Treatment Plant (WWTP) - Hamilton's only wastewater treatment facility. This plant services a region that has grown rapidly in recent decades to have a population in excess of 150,000. The WWTP is also developing, in its case to improve operational performance and maintain compliance with a changing government regulatory environment.

To comply with New Zealand Ministry of Health regulations, it is the responsibility of water treatment facilities to track, save and provide monthly reports on water production, intake and discharge levels. The standards also require that water treatment plants retain operating data for 10 years.

More than a decade ago, Rockwell Automation provided the council with the software suite for its previous SCADA system. However, the RSView32 system had become outdated over time and inefficient for compliance with modern-day regulatory requirements.

With its previous SCADA system, the council had often recorded data manually before transferring this information into Microsoft Excel spreadsheets for reporting. A faster, more accurate and automated reporting system was needed - one that could rapidly generate predetermined reports automatically for sharing with authorised groups.

"Our previous system was outdated and we required an upgrade to help simplify the process of complying with current water regulations in New Zealand," said Gary Pitcaithly, automation and electrical manager at Hamilton City Council. "Not only that, but we identified the potential for improving operational efficiencies at the plant by implementing an integrated system that aims to increase productivity and reduce downtime."

A key aim of the upgrade was to deliver a system with the ability to retain 10 years of data in a stable and reliable manner. At the same time, the system would need to provide operational efficiencies compared with the previous operating system, while also maintaining a secure environment only accessible by authorised stakeholders. To improve on this process, Hamilton City Council engaged Rockwell Automation to provide the latest versions of the FactoryTalk software suite as the integral element of an upgrade to its system.

"By upgrading to the FactoryTalk suite, the key benefits identified by council included superior reporting for compliance to government regulations; improved system reliability and stability; and reduced risk when contractors are on-site to undertake modifications or further expansions," said Prasad Nory, industry manager - South Pacific at Rockwell Automation.

Implemented in-house by Pitcaithly, Hamilton City Council upgraded the WWTP's system over six months to include the Factory View (SE), FactoryTalk Historian, FactoryTalk VantagePoint, FactoryTalk AssetCentre and FactoryTalk ViewPoint applications. The Rockwell Automation Customer Support and Maintenance team provided support to the council during the upgrade, particularly for the migration from Historian Classic to FactoryTalk Historian. The long-term storage and reporting capabilities required to comply with water standards are provided by FactoryTalk Historian and FactoryTalk VantagePoint. Data is stored in the historian server for the required 10-year retention period and is easily accessed for analysis and reporting purposes.

FactoryTalk VantagePoint is used by the plant to schedule and produce automatically generated reports providing information on periodical water consumption, discharge, intake, water quality and storage levels. FactoryTalk AssetCentre provides improved contractor control, change management and storage capabilities. Most importantly, the plant is now positioned to efficiently comply with water regulations in New Zealand.

The benefits of the Integrated Architecture solution will help the plant supply fresh drinking water and a clean environment to residents of Hamilton for many years to come. According to Pitcaithly, historical and reporting data is now available more quickly and accurately following implementation of the FactoryTalk suite, as the council had envisioned prior to the upgrade.

"The upgrade has delivered greater ease of use of our system throughout the WWTP," said Pitcaithly. "The new historian is superior in how it stores data and makes generating information for vital reports a much more efficient task to undertake.

"The VantagePoint software allows us to develop reports at will, whether it is for compliance to water standards or for other needs. These reports can then be published as web-based reports that are available for anyone authorised to view them."

Another key result of the upgrade has been the flexibility it has added for personnel operating the system at the WWTP.

"The FactoryTalk software suite has enabled our team to be more flexible with their time, as we are now able to edit or update reports as we go," continued Pitcaithly. "We now simply store our data directly into Historian and the data spreads directly from the PAC to a human interface. This data is incorporated into spreadsheets for us to interrogate, whether it is on a daily, weekly or monthly basis, to tell us if we've had a breach in turbidity or if chlorine levels aren't what they should be."

Rockwell Automation Australia
www.rockwellautomation.com.au

19″ PROCESS CONTROL PANEL PC

The APC-3983 Process Control Panel PC combines an Intel Atom motherboard with a 19″ 350 cd/m² TFT LCD in a fanless black steel enclosure measuring 470(W) x 389(H) x 67(D) mm. Fully sealed on five sides to IP65 specification and supplied with an IP42 splash-proof I/O cover, the APC-3983 is suitable for factory floor environments.

The PC includes an Intel Atom D525 1.8 GHz processor and 2 GB of memory in its standard configuration. Up to 4 GB of 800 MHz DDR3 SO-DIMM memory can be installed. One internal 2.5″ hard drive bay and an internal CompactFlash slot are provided for storage. An external CompactFlash slot can also be accessed. The sealed IP 65 LCD provides 1280 x 1024 resolution. An optional resistive touch screen can also be installed. External I/O includes 4x USB 2.0 ports, 2x COM ports, 2x RJ45 LAN ports, a 7-pin terminal block for digital I/O and remote power switching and a DC power terminal block. One COM port can be configured to supply 12 VDC on pin 9 allowing serial peripherals such as barcode scanners to be powered from the PC. The APC-3983 requires an 11 to 32 VDC power source and is designed to operate in temperatures ranging from 0 to 50°C.

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

TOC ANALYSER

Hach BioTector TOC analysers are said to provide maximum uptime and reliability due to a self-cleaning oxidation technology that easily handles difficult samples and reduces maintenance. Unlike traditional TOC analysers, the product eliminates build-up issues from salts, particulates, fats, oils and greases that lead to drift and high maintenance.

With continuous monitoring and real-time process control, plant operators can optimise their processes to lower overall plant operating costs. The analyser achieves precise results from both simple and demanding applications.

With two-stage advanced oxidation technology, the analyser handles challenging applications involving fats, oils, greases, salts, sludge and particulates. Its oversized tubing eliminates filtration and sample contamination. Minimal maintenance is required and there is no need for calibration or operator intervention between service intervals.

The BioTector provides cost savings in chemical dosing, waste reduction and optimised processes. Configurations are available for TOC, TOC/TN, and TOC/TN/TP.

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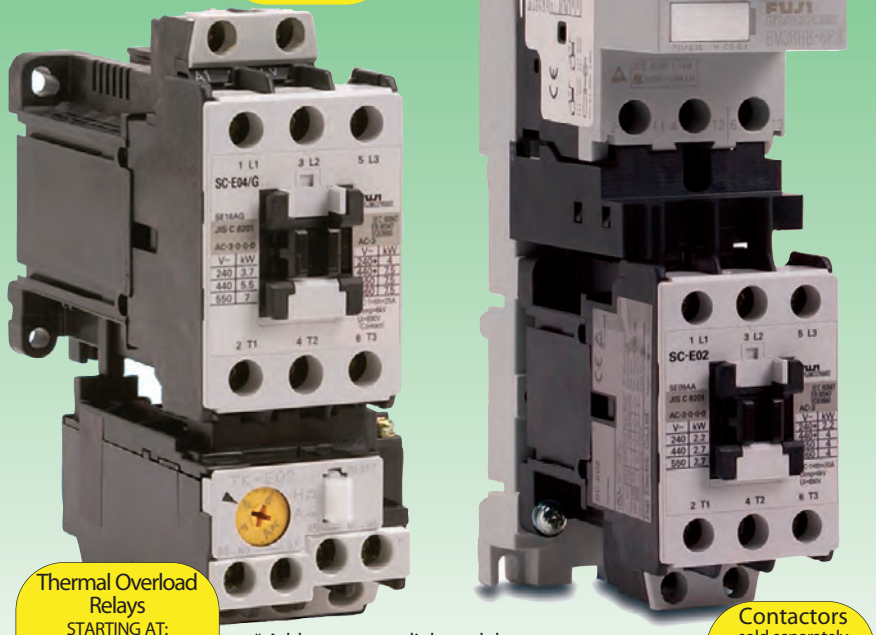

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VORTEX FLOWMETERS

The Optiswirl 4200 vortex flowmeter is designed for the measurement of conducting and non-conducting liquids, gases and steam. The device is targeted at auxiliary and supply applications in various industries, such as internal monitoring of energy flows for saturated and super-heated steam or hot water, and heat metering applications. Areas of usage also cover steam boiler monitoring, burner consumption measurement or compressed air network monitoring, including FAD applications.

In addition to gross heat calculation for steam, the flowmeter includes net heat calculation for steam and condensate (hot water). With one temperature sensor integrated as standard, the device can be installed as heat meter in the feed line directly connected with an external temperature sensor in the return line. The gross and net heat calculation can be fed into a DCS to support advanced energy management.

Temperature and pressure compensation options are available to enable calculation of standard flow volume under fluctuating pressures and temperatures (online density compensation). Both compensation functions are based on NIST standards (for gas) and IAPWS (for steam). Another advantage is that by combining three measurements (flow, temperature and pressure) in one 2-wire device, the line has to be opened only once for installation. In addition to the standard range, a version with integrated reduction of nominal diameter up to two sizes is available, as well as a remote version with a connection cable up to 50 m. A dual version with two independent sensors and two signal converters is also available.

Krohne Australia

www.krohne.com

AS I SEE IT

JUST RELAYS?

In today's changing process and control environment, we constantly see advances in instrumentation, control and processing equipment. Our young engineers and technologists have a veritable 'toyshop' full of technological wizardry from which to select for tomorrow's projects. What's more, the general quality of process and control equipment manufactured today is also considerably high. Yet, among all the technical know-how and sophistication there are some devices that remain misunderstood.

Relays are used in almost every installation, yet the level of understanding of these devices is surprisingly low. They are much ignored, sometimes maligned and often an unknown necessity in nearly all process and control systems. Poor knowledge of relays can lead to inappropriate product selection with negative consequences. Capacitive or inductive loads that were not taken into account during factory acceptance tests can result in burnt contacts or even contacts welded shut.

The selection of the most appropriate electromechanical relays is further hampered by the variety and diversity of relays available today. Many engineers and technicians are overwhelmed by choice and perplexed by the data available from manufacturers, which cannot be easily compared and assessed. Questions such as "Would gold relay contacts be better than silver in this application?" or "Does a high resistance coil result in noise immunity issues?" often go unanswered. However, to improve a system's reliability and safety, these are the very questions that require answers.

When selecting relays, the maximum current and voltage a relay can switch needs to be considered. Equally important are the relay's minimum switching values. It is at this stage that the selection of contact material is of utmost importance. Users should closely examine the requirements of their systems before deciding whether to choose gold plated, silver oxide, gold flash or another contact material as an error here could lead to switching faults, or worse, system failure.

The rapid growth in the availability of solid state relays in recent years has been made possible by advances in MOSFET technology. Equally impressive, but not surprising, is the uptake of solid state relays by engineers and technicians. They are increasingly specifying solid state relays because of their exceptional reliability. As they do not have contacts, solid state relays open up a whole new world of possibilities that can be achieved. High speed, long life and ultra-reliability all become possible once the limits imposed by mechanical switching are removed.

When investigating relays, engineers and technicians should also consider that relays not only switch an input signal or an output to a load, they also provide electrical isolation. This fact is often overlooked but is intrinsic to the design of both electromechanical and solid state relays. It is often the reason why a relay is used, especially when signals are sent to, or received from, the field. The isolation level should always be closely assessed to ensure the safety of a system is not compromised.

Relays are used in nearly every industrial application. However, users should not consider them as simply 'just relays' because of their ubiquitous nature. They are a critical component of the system and, therefore, an important part of any process and control application.

David Head has worked for Weidmüller Australia for the past 30 years. He is currently responsible for the company's Electrical Connectivity and Application Specific Products.

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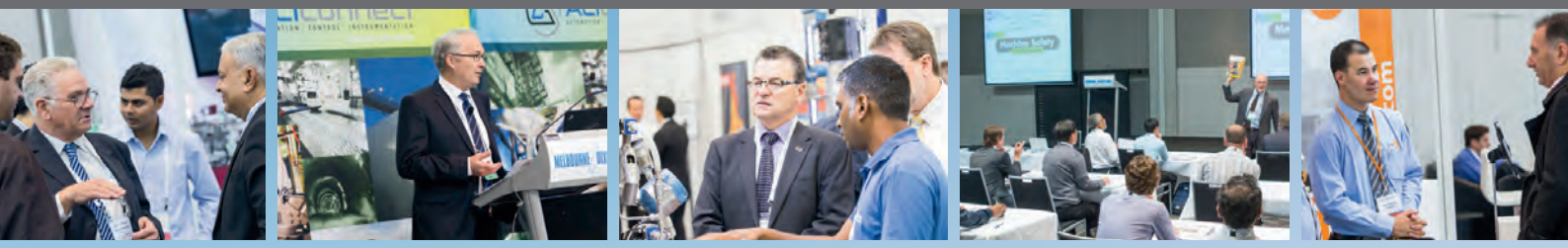

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