

WINIPT

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WHAT'S NEW IN
PROCESS TECHNOLOGY
AUTOMATION + CONTROL +
INSTRUMENTATION



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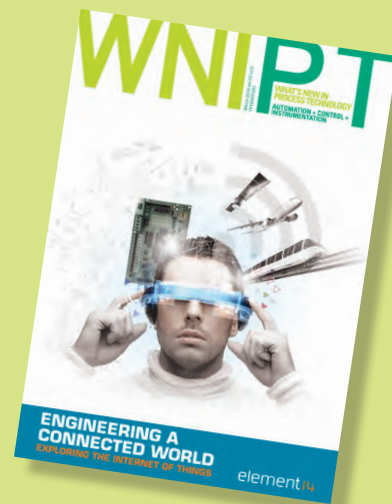
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WHAT'S NEW IN
PROCESS TECHNOLOGY
MARCH 2016

ON THE COVER



CONTENTS

- 4 Meeting emerging challenges in manufacturing with lightweight robotics — Part 1
- 8 New products
- 10 Hot products online
- 14 The future of control systems and Industry 4.0
- 21 Mobile robots for the aerospace industry
- 34 Enabling mobility in network monitoring
- 42 Preventing, detecting and mitigating pipeline commodity releases — Part 2
- 50 The future of IIoT and unleashing enterprise potential

The Internet of Things is here and more engineers than ever are optimising their designs for an increasingly connected world. Transportation, health care, agriculture, machine-to-machine communications and entertainment are segments that are already reaping an information harvest that was unimaginable 10 years ago. By the year 2020 it is predicted that there will be over 50 billion connected 'things' worldwide.

In a recent study conducted with over 3500 element14 Community members, it was found that on average 31% of consumers in Australia, France, Germany, the UK and the US agree that the more devices in their home that connect to the internet, the better. This figure more than doubles to 71% for consumers in both China and India.

In this increasingly connected world, element14 is committed to pushing the boundaries of today's electronics landscape by stocking a range of new product solutions and services with capabilities set to inspire innovation and support engineers from design through to production.

The Internet of Things is a hot topic due to its potential to revolutionise new functionality and capabilities outside of existing products, and many companies and product designers are rethinking their traditional business. Understanding IoT's significance and potential is becoming an integral part of research and application development. Don't get left behind — visit element14.com today.

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MEETING EMERGING CHALLENGES IN MANUFACTURING WITH LIGHTWEIGHT ROBOTICS

PART 1





Advances in mechanics and controls are enabling the practical and economical application of lightweight robotics for manufacturing on an increasingly broad scale.

Today's global marketplace has changed, and continues to change, the dynamics of manufacturing. The speed of business is accelerating, competition has increased dramatically and competitors are as likely to emerge from across the globe as around the corner. Consumer expectations for product consistency and quality have reached unprecedented levels. No quarter is given for where and how goods are manufactured; quality is today's de facto universal standard, regardless of place of product origin or consumption.

For those manufacturers who have moved facilities abroad to leverage lower labour costs, the realisation is rapidly dawning that maintaining high-quality products using manual production methods is not a sustainable, long-term strategy. Further, the need for high levels of productivity is escalating as greater opportunities and surprising demand emerge from new markets, while the volatility of demand across all markets makes it difficult to predict and plan for. Labour itself is problematic, less from a cost perspective than from demographics and capability. Indeed, increasingly sophisticated manufacturing processes need a skilled workforce that simply doesn't exist in the numbers employers need to fill new positions, particularly as older skilled workers retire.

Add to this mix the powerful movement towards mass customisation. The once prevalent high volume, low mix model of manufacturing is rapidly giving way to lower volumes and higher product mix. Companies involved in the production of specialised components and products for industrial customers are challenged with producing small lot sizes efficiently and meeting high quality standards consistently while being cost competitive.

To operate effectively in this environment, manufacturing agility is key. The large, centralised production plant is becoming a dinosaur. The factory of the future will be small, flexible, movable and local — one of the ironies of rampant globalisation is that it ultimately leads to a return of local production.

In this competitive landscape, manufacturing equipment must meet certain essential requirements:

- Easy to set up and implement into production operations (ideally portable).
- Flexible.
- Cost effective.
- Highly reliable.
- Fast.
- As compact and lightweight as possible.

Pursuit of these requirements has helped drive the development of the lightweight robotics and desktop automaton solutions increasingly prevalent in today's manufacturing automation. By providing scalable and modular functionality in increasingly agile and compact packages, these solutions are dramatically changing manufacturing by enabling automation on a smaller and more flexible scale, and helping achieve the responsiveness necessary to compete in today's rapidly changing global markets. Among the tasks and processes for which lightweight robotics technologies are now employed are:

- Feeding, screwing, and mounting small components.
- Setting adhesive points.
- Electronic testing, such as approach to contact points, and resistance tests.
- Flexible positioning of workpieces and components.
- Logistics and storing operations.
- Sample preparation, dispensing, transport and distribution in medical diagnostics.



Figure 1: The Barrett WAM arm.



Figure 2: The Mitsubishi PA10 arm in action.

What is a lightweight robot?

Lightweight robots are particularly designed for transportability, and interaction with previously unknown environments and humans. Robot mobility combines the requirements of a lightweight design with high load-to-weight ratio (close to the 1:1 ratio) and high motion velocity (tip velocity of 6 m/s). Moreover, collaborative robots that interact with humans and in unknown environments require sensing and control capabilities to enable skilful, compliant interaction.

Structural and control considerations

Lightweight metals or composite materials are used for the robot links. In fact, the design of the entire system is optimised for weight reduction in order to enable the mobile application of the robotic system.

In order to increase performance and safety of the arms, additional and sometimes variable mechanical compliance is introduced into the joints of some lightweight collaborative robots. Within the lightweight robot concept, a strong emphasis is set on robust performance as well as active safety for the human and the robot during their interaction.

Compared to standard industrial robot control, the following aspects are of particular importance:

- Extensive use of sensor feedback from the environment, including vision, force-torque sensing at the end-effector and

in the joints, tactile sensing, as well as distance and proximity sensors.

- The control implementation is not limited to position control, but also includes the interaction forces in the constrained directions using methods such as impedance control. In this way, instead of prescribing a position or a force, the dynamic relation between the two is prescribed, while the actual force and position resulting during interaction also depend on the environmental properties.
- Position control has to compensate for the effects of the inherent robot elasticity (such as vibrations or steady state position error) to ensure the performance of positioning and trajectory tracking.
- The robot needs control strategies that allow detection of unexpected collisions with the environment or humans, and to be able to react in a safe manner. In some lightweight robots, torque sensors in each joint play a key role for so-called 'soft robotics control'. These sensors allow the implementation of most of the aspects described above with high accuracy and performance.

Today, two principal types of lightweight robots are being produced: those with compliance and those without. Originally, manufacturing robots were caged: for humans to interact with them, parts were fed from outside the cage. Today's compliant lightweight robots have no need for such barriers — humans can be side by side

with them because of built-in sensors that detect human presence and ensure safety, so workers can interact with them even when the robot is active. Other robots have lightweight structures, but without the sophisticated sensing capabilities of compliant robots, workers cannot directly interact with them while the robot is active.

Good examples of lightweight robotics commercially available today include the Barrett WAM arm, the Mitsubishi PA10 arm, the KUKA LBR iiwa, the DLR MIRO robot and the Festo EXCM planar surface gantry.

The **Barrett WAM arm** is a cable-driven, lightweight arm that has actuators placed at the base of the manipulator to reduce the total moved weight. The joints are back-drivable due to its low reduction ratio.

The **Mitsubishi PA10 arm** is a lightweight redundant arm that weighs 38 kg with a payload of 10 kg. The PA10 is ideal for precise manipulation tasks because of its back drivability, precise positioning capabilities and zero backlash afforded by its harmonic drive transmission (HDT).

The **Kuka LBR iiwa** is a trailblazer for totally new forms of cooperation between humans and machines. The robotic innovation with sensory capabilities for safety, fast teaching and simple operator control opens new areas of application in the vicinity of humans that were previously off-limits for robots.

The **DLR MIRO** is the second generation of versatile robot arms for surgical appli-



Figure 3: The KUKA LBR iiwa (intelligent industrial work assistant).



Figure 4: The DLR MIRO demonstrating robotic surgery.

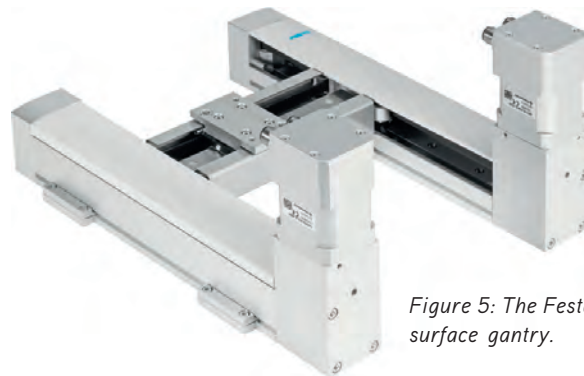


Figure 5: The Festo EXCM planar surface gantry.

cations. With its low weight of 10 kg and dimensions similar to those of the human arm, the MIRO robot can assist the surgeon directly at the operating table where space is limited.

The Festo EXCM is a compact planar surface gantry that can approach any position within its working space. The robot's recirculating toothed belt moves the slide within a two-dimensional area (x and y axes). Fixed motors are connected to the slide, and the moving mass remains low because of the parallel-kinematic drive principle. The ready-to-install system allows fast positioning at speeds of up to 500 mm/s and repetition accuracies on the order of ± 0.05 mm. This makes a compact solution suited to applications such as sample handling in medical and research laboratories and small parts assembly, and emerging technologies such as printed electronics production and 3D printing.

Challenges in manufacturing

Operations are generally categorised in two production models: high volume, low mix (long runs with relatively few part changes) and low volume, high mix (short runs with frequent part changes). Originally, it was only high-volume operations that were automated; however, as noted above, the trend in manufacturing is towards mass customisation, which means lower volume and higher mix. Therefore, successful manufacturing operations need to be leaner,

more agile and operate at higher efficiencies than ever before. This is doubly true as the speed of product introductions accelerates. Furthermore, the medical research, laboratory and other industries are increasingly working with ever smaller parts and precise processes. Automation must be able to work on these small scales.

That being the case, significant challenges in automated manufacturing processes remain:

- **Part presentation:** Parts are often presented in bulk and need to be channelled so that individual components can be consistently presented and handled in the assembly process. Manual methods significantly affect throughput and therefore some type of automatic feeding method or robotic handling is required.
- **Machine access:** Access to the machine tool for set-up and tool changes is critical. Automating the machine tool adjustment reduces downtime and eliminates any safety and product consistency issues that could arise when making adjustments manually. In simple systems, automatic adjustments are accomplished with the use of an integrated motor; in more complex arrangements, flexible robotic handling systems are used.

- **Process rates:** In all machining operations, shorter load/unload time is important; in fact, in smaller part, shorter cycle operations, it is critical.
- **Space and layout considerations:** Most production equipment is positioned for manual operations and to maximise machine density. Creating operational space for a robot to load and unload parts can be difficult, especially if safety fencing is required.
- **Cost:** In many countries, robotic automation has primarily been justified based on labour reduction. This is typically coupled with a short-term view of return on investment.

In Part 2

With the trend towards adaptive, low volume, high mix manufacturing, the current automation technologies designed to work with high volume and minimal change, while efficient, are no longer flexible enough to meet the challenges of globalisation and the need to meet the rapidly changing needs of the market. In Part 2 of this article we will examine how lightweight robots help alleviate these challenges.

Festo Pty Ltd
www.festo.com.au



ROBOT CABLE RETRACTION SYSTEM

The igus Triflex RSE system is a cost-effective retraction system for robotic arm applications, automatically guiding energy supply systems and supply hoses.

The lightweight Triflex RSE system automatically retracts cables and hoses, and prevents looping of the cable carrier. This allows power, media and data to be supplied safely to the end of the robotic arm.

The RSE system is based around the maintenance-free igus DryLin linear bearings. The cable carrier is guided through the moving carriage, allowing for a retraction stroke of up to 60 cm. A durable elastic cord automatically retracts any slack, preventing loop formation within the system. The system also features integrated adjustable attachment plates, allowing the system to be mounted close to the robot, making it a space-saving and affordable solution.

Triflex RSE was designed for use with the Triflex R line of cable carriers from igus, which are available in a variety of styles and diameters. A large range of mounting options is also available, allowing the system to be fitted to a variety of robot models.

Treotham Automation Pty Ltd
www.treotham.com.au

FIBRE SENSOR AMPLIFIER

The Banner Engineering DF-G3 discrete long-range fibre amplifier has increased sensing power for difficult detection challenges in printing, packaging and electronic assembly. It has dual digital displays and is designed for use with both plastic and glass fibre-optic assemblies.

The DF-G3 can sense more than 3 m with opposed mode fibres or more than 1 m with diffuse mode fibres. The extra power provides increased detection reliability for dark targets at long range and enhanced detection sensitivity when using specialty fibre assemblies for large area and small part detection applications.

The DF-G3 is available with a single discrete output or two dual discrete outputs. The dual discrete outputs can be independently taught to trigger at different intensity values, which is good for correct part-in-place or error-proofing, bottle down, and edge guiding applications.

Users can also set up the sensor remotely via a multifunction input wire that can be configured to control the LED, gate the amplifier's output, remote teach the amplifier or set up a robust crosstalk avoidance ring with up to seven amplifiers to solve dense sensing point applications.

With expert Teach and Set functions, the DF-G3 ensures optimal gain and threshold for all applications, but especially for low-contrast applications at long detection range. Users also have full control over all operating parameters, including threshold, light or dark operation, output timing functions, gain level and response speed.

The DF-G3 provides stable detection in industrial lighting environments, and the sensor's level action fibre clamp ensures stable, reliable and trouble-free fibre clamping.

Turck Australia Pty Ltd
www.turck.com.au



HISTORIAN SOFTWARE BUNDLE

The Wonderware Office Bundle, from Schneider Electric Software, streamlines the ability to access and interpret operations data, bringing 'big data' benefits to more users. The solution's easy installation and native connectivity to plant floor and business applications enable management to easily create key performance indicators by visualising and analysing data in near real time from a wide array of devices and sources.

Wonderware Office Bundle helps plant managers and executives make better informed business decisions using easy, on-demand access to historian data and analytics. It consists of Wonderware Historian, Wonderware Historian Client, Wonderware InTouch Access Anywhere and Wonderware SmartGlance.

The foundation of the system is Wonderware Historian. A high-capacity process data historian, it can collect information from any industrial data source to scale — from small to enterprise-wide applications. Tight integration with Microsoft Office enables management to use familiar tools to gain deeper insights into operations to identify operations or process improvement opportunities.

Wonderware SmartGlance provides a simple app for fast access to KPI reports on plant conditions from any mobile device. Instead of waiting for batch reports or only receiving daily reports, managers using the bundle can access timely information when they need it.

Schneider Electric Industry Business
www.schneider-electric.com

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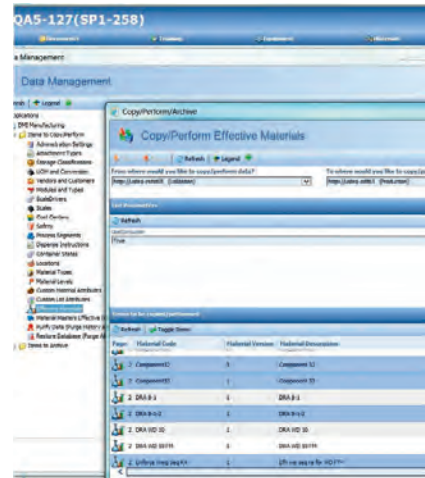
ON WWW.PROCESSONLINE.COM.AU THIS MONTH

MANUFACTURING EXECUTION SYSTEM

The Syncade Suite manufacturing execution system has been enhanced with improved features for life science manufacturers.

Emerson Process Management

<http://bit.ly/1WorHOP>



STAINLESS STEEL FACED SENSORS

Turck has announced four 2-wire, DC stainless steel faced sensors with an extended sensing range.

Turck Australia Pty Ltd

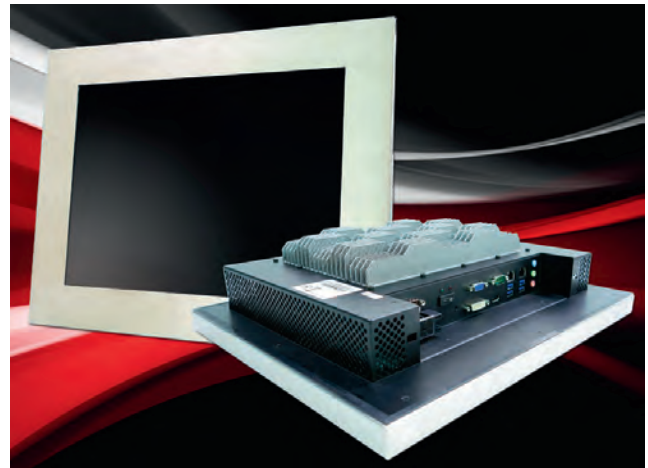
<http://bit.ly/1KSP7L0>

PROCESS CONTROLLER

Cerlic has released a 24 VDC version of its centralised BB2 controller that is fully retrofittable to replace the line-powered version.

Control Components

<http://bit.ly/1TmSBb8>



PANEL PC

Perfectron's LIF Series fanless rugged panel computer design has an Intel CPU onboard and supports a wide-range operating temperature range of -30 to + 60°C.

Backplane Systems Technology Pty Ltd

<http://bit.ly/1TmVokK>

see the light

hazardous area LED lighting



Control Logic proudly presents LED light fittings by R.STAHL for use in Ex Zones 1, 21, 2 and 22 suitable for all gas, dust and other hazardous environments.

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DP THERMAL RANGE EXPANDER

The process control industry is often challenged with harsh operating environments where existing technology does not meet measurement needs.

The Rosemount 3051S thermal range expander with UltraTherm 805 oil fill fluid enables pressure measurements by direct-mounting a diaphragm seal system to processes that reach up to 410°C without requiring the challenging impulse piping or heat tracing used in traditional connection technology.

In applications where ambient temperatures drop below ideal operating conditions, system response time becomes slow, resulting in delayed process pressure readings. Traditionally, this problem is solved by using heat tracing, which is costly, maintenance intensive and difficult to install. By using the thermal range expander dual fill fluid seal, the Rosemount 3051S high static differential pressure transmitter can measure pressure at high process and low ambient temperatures.

Emerson Process Management Aust P/L

www.emersonprocess.com.au

WEB-BASED VISUALISATION SOFTWARE

PASvisu is web-based visualisation software designed to provide for simple configuration and optimum visualisation so that users can easily achieve a convenient, comprehensive overview of a plant, locally or via remote access.

PASvisu utilises HTML 5 so it can be viewed in any common web browser application allowing automation projects to be visualised on PCs, smartphones or tablets. Being based on HTML 5, it is futureproof and platform independent, and accelerates projects by allowing set-up simply via drag-and-drop using CSS style themes. Using a genuine web server/client functionality also minimises downtime.

PASvisu is currently designed for visualisation of automation projects utilising the PSS 4000 automation system. PASvisu is linked to a PAS4000 project once and will automatically update if any changes are made to the automation project.

Pilz Australia Industrial Automation LP

www.pilz.com.au



MINIATURE DC SERVO

The Faulhaber 1727...CXR series miniature DC servo has a powerful neodymium magnet that gives the graphite-commutated motor a high power density with a continuous torque of 4.9 mNm. It generates this power in a housing that is 17 mm in diameter and 27 mm in length. The operating temperature range is -30 to +100°C.

The 1727...CXR can be combined with encoders and with precision gear-heads from a coordinated product range. It can also be optionally actuated with the SC 1801 speed controller or the MCDC 3002 motion controller for speed control or positioning.

The compact dimensions of the 1727...CXR and its performance data suggest a wide range of potential applications. This motor is suitable for high-performance servo drives in automation and robotics, and also for applications in hand instruments.

ERNTEC Pty Ltd

www.erntec.net



MOBILE HMI PANELS

The second-generation Siemens SIMATIC HMI Mobile Panels feature engineering and design that make them easier to hold. As a result, the panels available in 7" or 9" widescreen display with wired connection to Profinet can be used efficiently over a long period of time.

For applications requiring mobile operation, operators are presented with a bright display for high-resolution graphics that are clearly visible on plant and workshop floors. With 16 million colours and 40% more display area than previous models, more complex graphics are possible for operators, avoiding the need for frequent page switching. The display's dimming feature is easily adjustable for differing conditions.

Process screens are designed in the TIA Portal engineering framework with WinCC Comfort V13. With the Style Editor, it is possible to create and centrally change customised graphical 'themes' for screen objects, depending on customer preference.

Safety solutions are efficiently implemented using the unit's safety variant, equipped with an illuminated emergency stop button. The compact terminal box requires two-thirds less space than previously; it can be simply screwed to the outside of the control cabinet door and fully wired from the inside.

The SIMATIC Mobile Panel can be mounted just about anywhere in the plant, by making the panel's terminals available at convenient operator locations.

Siemens Ltd

www.siemens.com.au

WATER-IN-OIL SENSORS

The AquaSensor AS 3000, with its integrated digital display, is used for the online detection of water in oils, particularly as a sensor for condition monitoring. It also measures the temperature of the operating fluid. The instrument has a switching output and additional output that can be configured as switched (PNP) or analog (4–20 mA or 0–10 V).

Models are available with and without an IO-Link communication interface. The IO-Link interface enables bidirectional communication between the device and the control, allowing parameterisation and cyclical transmission of process and service data.

The version with IO-Link according to specification V1.1 has been specially designed to connect sensors in automation systems. Its typical fields of application are machine tools, handling and assembly automation, intralogistics and the packaging industry.

The 4-digit display rotates in two planes for optimal alignment.

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AMS



THE FUTURE OF CONTROL SYSTEMS AND INDUSTRY 4.0

Scott Moffat, Managing Director, Pilz Australia Industrial Automation

The move to Industry 4.0 will bring with it many advances in efficiency and productivity, but also many changes in the way industrial processes work.

Recently, there have been many articles written on the next industrial revolution, known as 'Industrie 4.0' – the German approach to smart manufacturing. It is the German vision for the future of manufacturing, one where smart factories use information and communications technologies to digitise their processes and reap huge benefits in the form of improved quality, lower costs and increased efficiency.

Coupled with the Industrial Internet of Things (IIoT) – where industrial devices are connected to each other via the internet – the sheer volume of real-time data (big data) this will create means Industry 4.0 will bring about a massive change to the way control systems function today. We will require factories, processes, plant and machinery all to be continuously adapted and optimised to suit the ever fast-changing requirements for manufacturing.

As one of 10 'Future Projects' identified as part of its High-Tech Strategy 2020 Action Plan, the German government is planning to invest over €200m, and when coupled with the investments of companies in the German private sector – which are estimated at 10 times this figure – the German manufacturing industry is investing huge sums into Industry 4.0.

In Australia we should shortly start to see the control system changes as a result of this Industry 4.0 investment as German automation equipment manufacturers market and sell their Industry 4.0-ready products and solutions.

The move to distributed control functions

In a smart factory under Industry 4.0, control systems will be distributed across the entire plant or machine – rather than a centralised PLC with remote I/O that is common today. There could be multiple PLCs all talking to one another, each having its own program. From the software program these PLCs will see each other just like remote I/O, with no special set-up required to have everything in sync. HMIs will also act as controllers, processing their programs locally rather than sending information to a PLC – reducing the cycle times of processes.

Consider a traditional plant or machine, with one controller and many remote I/Os, as shown in Figure 1.

The 'brain' of the process lives in the MCC and all signals are sent between the remote cabinets and the brain, sometimes going

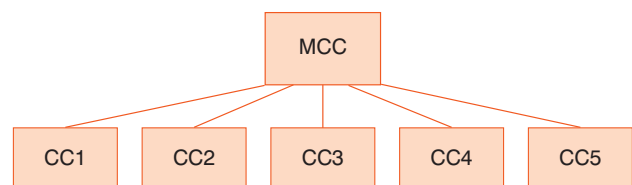


Figure 1: Traditional plant or machine with a single master controller.



© iStockphoto.com/Blaz Kure (www.e-design.si)

back and forth just between the one remote I/O and PLC — doubling reaction times.

In an Industry 4.0 system there is no ‘central hub’ as such (see Figure 2). The I/Os on the controller are processed locally, so there is no additional traffic on the network. Each controller talks to the others via an Industrial Ethernet protocol.

Real-time information from anywhere and everywhere

Visualisation and diagnostics will be possible anywhere, not just on a local HMI. With your smartphone or tablet you can interact and view the plant visualisation and access instant diagnostics, whether you’re on-site, at home or away for the weekend.

Traditionally, visualisation systems have used custom platforms for the visualisation, but this will be a thing of the past with web standards becoming the norm. HTML 5, CSS3 and JavaScript will be utilised, meaning standard devices used to view websites — a PC, Mac, tablet or smartphone — can be used to access the critical plant information and easily share it with all stakeholders.

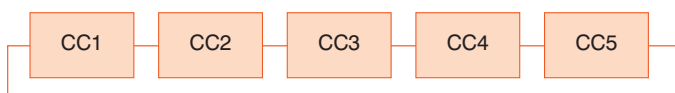


Figure 2: Plant or machine under Industry 4.0 with reduced overhead.

We will see the visualisation systems start to suboptimise pages — just like a browser, where it remembers your favourite pages, your history and automatically creates your own pages based on your viewing habits.

The ‘cloud’ will also enter the space of control systems — with large amounts of archived process data accessible from anywhere on the planet.

Software not hardware

In line with the digitisation that Industry 4.0 heralds, future control system functionality will be decided by software and firmware upgrades and be completely independent of hardware in the future. This will allow the user to purchase the control system hardware with limited functionality and as requirements increase they can continue to upgrade to add additional functionality as required — such as faster cycle times, additional communication interfaces etc.

Today manufacturers may have many versions of the same PLC with different memory capacities or cycle times. By allowing the user to determine the functionality of the hardware, this minimises the number of spares required and keeps maintenance costs down.

It also allows faster update times when new functionality is developed as you can have this functionality available as soon as you upgrade your firmware, in the same way as a smartphone.

Smarter devices

As devices become smarter and more capable, we will see more and more data associated with the devices stored locally. We are already seeing operational data, maintenance data and calibration data being stored locally on the device — no matter how small — which can be accessed easily by a variety of technologies such as near field communications (NFC) on your smartphone.

The next step is then to feed this data back into the manufacturing or maintenance processes so that suppliers can further refine and optimise manufacturing processes or maintenance techniques for the sensors, instrument or device.

Industry 4.0 protocols

As more and more data becomes available, more sophisticated protocols will be required to manage the entire data flow. Data for all the various devices and systems will need to be in a format recognisable by all, otherwise the data will be meaningless. This is a challenge for the entire industry as it moves towards agreeing on a common framework and platform for Industry 4.0 to operate with.

Security is also a big issue — with more and more devices connecting to the network and the internet, additional requirements for security will be necessary to ensure all of this data remains safe and secured. It is a fine line between allowing access to all that can use the data for meaningful purposes and securing it from those that don’t need it or shouldn’t have it.

Summary

With this extra data comes extra complexity and extra disorder; the challenge will always remain in turning this huge amount of data into meaningful information that you can use to digitise and optimise your processes.

But certainly adapting to — and implementing — the themes that Industry 4.0 introduces represents an investment in the future.

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



RFID PROCESSOR

RFID systems with various read/write distances and resulting frequency ranges are finding increasing use in modern production and assembly plants. Frequency-dependent use is now offered for the first time by the BIS V processor from Balluff.

Due to its compact processor unit, which is available for every commonly used bus system, up to four read/write heads can be connected. Both HF (13.56 MHz) in accordance with ISO 15693 and ISO 14443 as well as LF (40–455 kHz) read heads can be connected simultaneously from the front via plug-and-play.

In addition, UHF antennas for the short-range band will also be able to be integrated. A single controller type is sufficient for setting up a continuous RFID structure within a company — from unfinished parts delivery and manufacturing to shipping. This results in significant savings on hardware and installation for the user. Function blocks from many controller manufacturers allow the system to be up and running quickly.

Included as standard is an IO-Link master port for connecting IO-Link compatible sensors and actuators.

Many typical application areas are covered. For identification tasks for material flow control in production systems, the user can benefit from low hardware usage and low installation costs in areas such as conveyor systems in mechanical engineering, assembly lines, electric suspension systems or in the entire intralogistics field.

Balluff Pty Ltd
www.balluff.com.au

VALVE ACTUATOR

Rotork has introduced a new model in its IQ range of non-intrusive intelligent electric actuators. With an optimised combination of valve stem diameter acceptance and torque output, it is designed to facilitate the economical automation of valves and penstocks typically found in the water and effluent treatment industries.

The IQ19 actuator combines a stem acceptance of up to 51 mm diameter with torque output up to 135 Nm and output speeds up to 72 rpm. The combination meets the operating requirements of large numbers of penstocks, sluice gates and gate valves.

The actuator incorporates the full range of advanced reliability, functionality and asset management features, including a broad range of data logging capabilities.

Reliability is optimised by the IQ double-sealed IP66/IP68 watertight and temporarily submersible enclosure, which permanently protects internal electricians from the ambient environment, even during site wiring with the terminal housing cover removed.

Rotork Australia
www.rotork.com



IS PROGRAMMABLE ALARM TRIPS

Moore Industries has announced its SPA²IS programmable alarm trips with built-in intrinsically safe (IS) field connections. Now users in the chemical, pharmaceutical, petrochemical, oil and gas extraction and refining industries that monitor, control and measure signals in hazardous areas have an alarm solution that significantly reduces wiring, installation and maintenance costs. The SPA²IS is a combination alarm trip and temperature transmitter solution that includes built-in intrinsically safe field connections for current/voltage, RTDs and thermocouples.

Many industrial sites that have previously implemented explosion-proof or flameproof protection are now utilising a hybrid approach of both protection methods in their hazardous areas. Constructing or retrofitting IS solutions can be costly and instrumentation often requires the additional purchase of a separate Zener or isolating barriers and power supply.

For facilities that employ intrinsic safety measures the SPA²IS is a cost-effective and complete alarm solution that includes intrinsically safe field connections, which provides the necessary protection typically afforded by a galvanically isolated, intrinsically safe barrier. In addition, the SPA²IS cuts wiring and maintenance costs by enabling users to eliminate additional barriers and power supplies, which reduces space requirements and heat dissipation or cooling considerations in barrier marshalling cabinets.

The SPA²IS is powered by a universal AC/DC power supply and provides on/off control, warns of unwanted process conditions, alarms on rate of change and assists with or performs emergency shutdowns. It accepts a wide variety of signal inputs from transmitters and temperature sensors and provides dual- and quad-independent and individually configurable alarm relay outputs.

Moore Industries Pacific Inc
www.miinet.com





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WIRELESS DATA LOGGERS

Delta Ohm has released an additional series of loggers for the HD35 wireless data logger system.

The loggers cover parameters including solar radiation, soil temperature and WBGT index. These loggers supplement the existing range of relative humidity, atmospheric and differential pressure, wind speed and direction, illuminance (lux) and UV radiance, solar radiation, CO, CO₂, rain and acceleration loggers.

Additionally, a version is available for standard process sensors including PT100 and thermocouple temperature sensors, 4–20 mA and voltage signals.

All remote units have an integral memory of up to 74,000 readings and a secure robust wireless system with RF interference checking and automatic channel selection within the wireless operating band to ensure error-free transmission, as well as optional repeaters to extend the wireless range. Data is retained even after it has been sent to the base unit until the memory is full — the logger can then be programmed to stop logging or overwrite the older data.

An IP67-rated outdoor version of all data logger transmitters is also available.

Base units can handle up to 254 data loggers and versions are available with USB PC interface and an integral GSM module, RS485 and Modbus outputs, and a Wi-Fi version is also available with USB and Ethernet outputs utilising an existing Wi-Fi and local network.

Applications include the monitoring of storage for food and pharmaceutical products; environmental monitoring; laboratory and clean room monitoring; fridge and freezer monitoring; and industrial process logging.

W&B Instruments Pty Ltd

www.wandbinstruments.com.au



PLANNING AND DESIGN SOFTWARE

Aspen Technology has announced enhancements to aspenONE Engineering V8.8 software. Developed for firms in the oil, gas, refining, chemicals, mining, engineering, construction and other process industries, aspenONE V8.8.2 includes updates to the Aspen Economic Evaluation and the Aspen Exchanger Design and Rating (EDR) product families.

The latest release of Aspen Capital Cost Estimator (ACCE) software includes the annual Cost Basis update for 2015, which is integrated into the entire Aspen Economic Evaluation suite. ACCE V8.8.2 software allows users to quickly estimate the total cost of equipment, labour and related services in new markets and locations, and to independently evaluate engineering and construction (E&C) and vendor quotations, using cost data that reflects market changes over the past year. Designed for use throughout the estimating life cycle, ACCE creates value and mitigates risks for potential and current projects by incorporating project scope changes and managing costs early on in the design process, aligning E&C and owner-operator expectations and work processes.

Aspen EDR software V8.8.2 conforms to the latest versions of design codes, including the American Society of Mechanical Engineers (ASME) and European standards. Aspen Shell & Tube Mechanical design calculation output forms have

been redesigned to appear in the same style as current international design codes, streamlining compliance requirements. The inclusion of the 2015 Cost Basis updates in the latest release produces realistic cost estimates for more competent bids and faster, informed project decision-making.

Aspen Technology Australia Pty Ltd

www.aspentech.com

PANEL PC

The TPC-1881WP is the latest 18.5" touch panel PC from Advantech and features the ability to use all 10 fingers simultaneously to control all aspects of an application. The 16:9 ratio and 15.6" HD display also has an integrated 7H hardness anti-scratch glass screen, meaning that it can be touched by workers carrying tools without fear of damage.

The TPC-1881WP also features the Intel 4th Generation Core i3 1.7 GHz processor with 4 GB DDR3 RAM, which makes multitouch operation even smoother while providing greater power efficiency and faster processing to process large amounts of data and 3D files.

In line with Advantech's dedication to producing modular technology for greater flexibility, the TPC-1881WP features a comprehensive mini-PCIe iDoor Technology slot to enable users to easily add a wide range of functionality such as isolated digital I/O, fieldbus interfaces, 3G/GPS/GPRS/Wi-Fi communication and MRAM to the panel computer.

The application-ready computer includes PanelExpress, WebAccess and SUSIAccess as a bundled software solution and also offers a remote control and recovery function.

Advantech Australia Pty Ltd

www.advantech.net.au





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LINEAR ACTUATORS

The Thomson PC-series electric linear actuators are claimed to offer the highest precision and power density of any actuator in their class. They are suitable for continuous duty applications.

Traditional pneumatic actuator systems operate continuously, usually at 10–15% efficiency, and have the high maintenance costs of compressors and air leaks. The high-efficiency ball screws in the Thomson PC-series offer efficiencies of over 80% and only use energy when needed. In many applications, converting from pneumatic to

electric actuators can generate energy savings which exceed the cost of the new actuator within a year.

The actuators offer flexibility for machine designers who often need to change set-ups to run different processes or products. Changing velocity profiles or end stops can be done quickly with electric actuators.

The series is suitable for food processing and packaging, material handling and factory automation applications where high reliability, accuracy and 100% duty cycle operation are required. They have an IP65 rating and smooth exterior profile, making them suitable for washdown applications.

The actuators are available in small sizes of 25, 32 and 40 mm and have square sizes of 34, 45 and 55 mm respectively, but deliver as high as 6000 N of thrust force. They feature stroke lengths of up to 1200 mm and conform to ISO 15552 for mechanical interfaces and adapters.

Users can easily mount their own motor using the Thomson RediMount systems for fast and reliable installation.

Treotham Automation Pty Ltd

www.treotham.com.au

PHOTOELECTRIC SENSOR

The 46C-VarOS object sensor is a retro-reflective photoelectric sensor that, unlike normal sensors that detect selectively, detects objects over a 50 mm band area. In packaging systems and intralogistics, the object sensor detects objects in the light-band with various sizes and shapes as well as surfaces with openings.

In the past, multiple sensors and considerable work was necessary for this purpose. Adjustable sensitivity levels and automatic sensitivity readjustment (ALC) make these sensors suitable for harsh environmental conditions — even stretch-wrapped or shrink-wrapped objects are reliably detected. The special lens design claims to enable reliable detection over the entire 50 mm light-band width in two adjustable sensitivity levels (8 and 12 mm).

The housing has a robust construction with an IP67 protection rating. The sensor housing provides multiple mounting options for easy installation.

Leuze electronic Pty Ltd

www.leuze.com.au



BALL BEARINGS

The Schaeffler FAG Generation C deep-groove ball bearings are claimed to offer 50% less noise, 35% less friction and reduced energy consumption compared with conventional technology. In addition to reducing maintenance factors, the single-row bearings also eliminate dust ingress where required in machinery used in challenging environments.

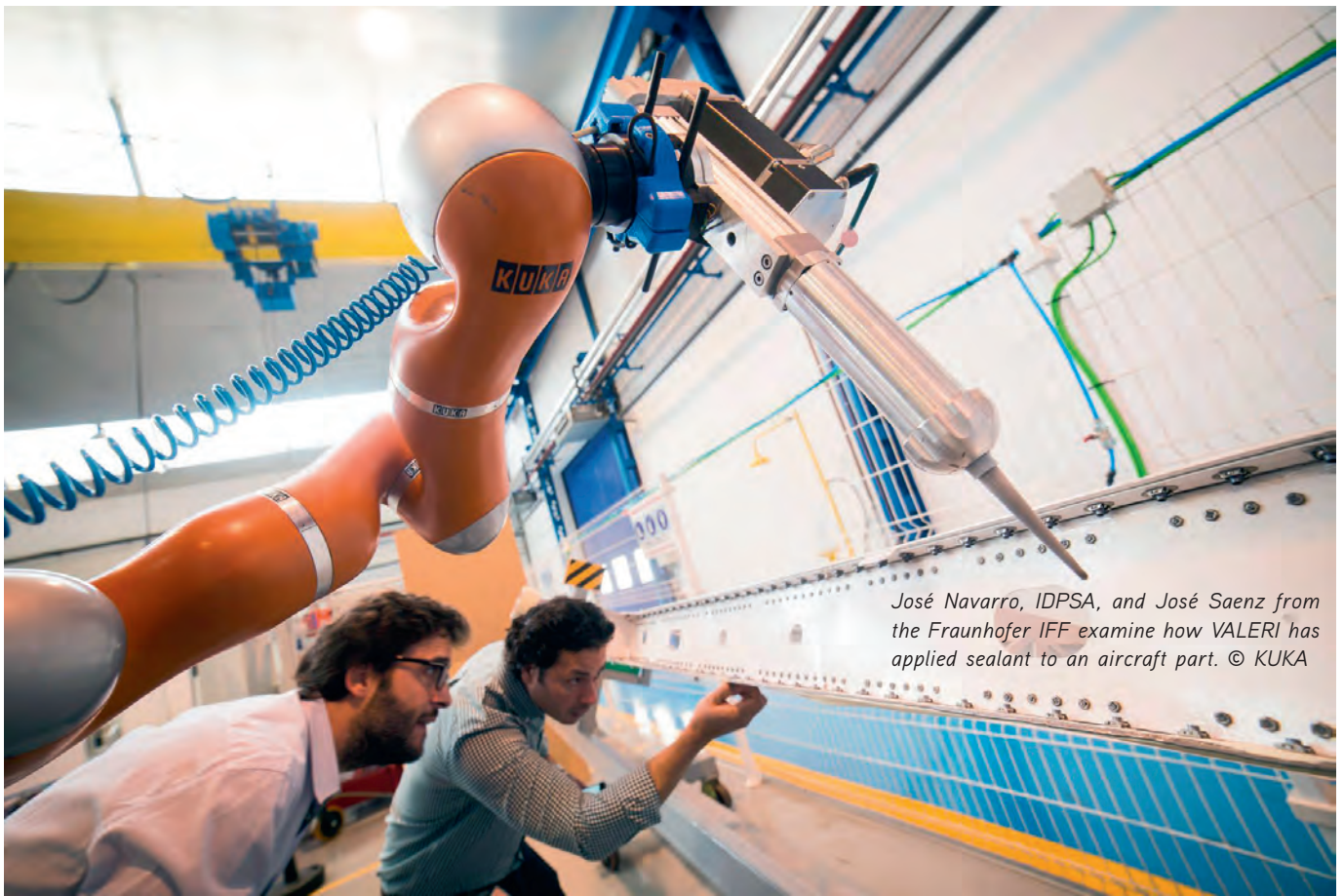
The self-retaining bearings — standard models of which can be used in an operating temperature up to 120°C (unsealed) and -30 to 110°C sealed — are suitable for applications where reliability, avoidance of downtime and environmental issues are important.

Applications of the bearings (in size ranges from bore diameters 10 to 50 mm) extend from electric motors used in the resources and energy areas — including conveyor idlers, winches, lifting equipment and drives — through to manufacturing, construction, food and beverages and primary processing applications, such as HVAC, refrigeration, fans, power tools, washing machines and agricultural machinery.

The deep-groove ball bearings generate low friction, so they directly enhance the efficiency of smaller industrial electric motors — the capacity of which are largely determined by power loss of their bearings. Other features of the ball bearings include optimised raceways to reduce friction; a choice of robust riveted steel cage or polyamide cage with good sliding and wear characteristics for high speeds; and a seal concept that significantly improves bearing operating life.

Schaeffler Australia Pty Ltd

www.schaeffler.com.au



José Navarro, IDPSA, and José Saenz from the Fraunhofer IFF examine how VALERI has applied sealant to an aircraft part. © KUKA

MOBILE ROBOTS FOR THE AEROSPACE INDUSTRY

The aerospace industry is showing how the factory of the future may be done. In the VALERI project, European researchers and industry partners have demonstrated that mobile manipulators — mobile industrial robots — are fully able to work side by side with human colleagues. The robots in this project are applying sealant to aircraft fuselages and inspecting aircraft parts.

Coordinated by the Fraunhofer Institute for Factory Operation and Automation IFF in Magdeburg, experts specifically aimed to automate manufacturing jobs that can be hazardous to health or are extremely monotonous and physically strenuous. They also want to have jobs with many steps that recur throughout the aircraft manufacturing process performed by one single mobile robot in the future. Robots will not replace skilled labour — rather, they will simplify their work and assist them in their jobs.

Researchers in the VALERI project (Validation of Advanced, Collaborative Robotics for Industrial Applications) established the technical conditions for humans and robots to work next to each other. Taking the application of sealant to aircraft fuselages and the inspection of parts as model tasks, they demonstrated at Airbus DS facilities in Seville that protective barriers will no longer be needed in future manufacturing facilities.

Humans and robots can work right next to each other, maybe even on the same part, and still act autonomously. The project partners also added a second inspection sensor to the VALERI robot

system to additionally demonstrate the flexibility of the system for use in other manufacturing industries. The experts are breaking new ground with VALERI, making their vision for human-robot collaboration and the aerospace industry reality and getting one step closer to Industry 4.0.

The industrial end users Airbus DS and FACC, the industrial robotics manufacturer KUKA Robotics GmbH, systems integrator IDPSA, and the research partners PROFACTOR GmbH and PRODINTEC were involved in the VALERI project. The project was funded by the European Commission with €3.6 million under the European Union Seventh Framework Programme (FP7) 'Factories of the Future'.

More flexibility

Humans work on large parts in a stationary production cell in manufacturing. Over a period of days, several shifts of workers assemble and inspect the parts. Specialised, stationary robotic systems are not cost effective in such a manufacturing environment. This is expected to change in the future: a mobile robot will be performing similar tasks at several workstations. This is why the VALERI system needs to be more flexible than traditional, stationary industrial robots.

Complex challenges

The project focused on three model jobs: applying sealant along a groove, subsequently inspecting the sealant and inspecting braided

carbon parts. While the first two applications are closely related, the VALERI consortium selected a third application to demonstrate the system's overall flexibility. The robot is able to change tools, and programming it to execute entirely new operations is done quickly and intuitively.

Individual technologies, highly integrated system

At the outset of the project, KUKA modified an existing omniRob robot to have a reach suitable for the range of tasks planned. This included adding a rotatable linear axis atop the mobile platform, thus giving the robot 12 degrees of freedom and a reach comparable to that of a human. Such a hyper-redundant system necessitated coordinating all of its motions — real mobile manipulation — so that the VALERI robot could be programmed intuitively and could perform all of its tasks.

The researchers from the Fraunhofer IFF in Magdeburg developed tactile sensors and a camera-based workplace monitoring system as safety technologies for direct human-robot collaboration. The tactile sensors detect contact and the robot stops before biomechanical thresholds are reached. The researchers had determined the maximum allowable robot speeds beforehand. The data is extremely important for the global robotics community and will aid in the validation of collaborative robots with power- and force-limiting safeguards, with tactile sensors being used for haptic interaction

with the robot. User studies have confirmed that haptic interaction, which essentially requires operators to give the robot a push in the direction in which it should move, is very intuitive to use.

The workplace monitoring system consists of a time-of-flight camera combined with three stereo camera pairs. It tracks a tool's movement and creates a virtual safeguarded zone around it. The robot stops if a human or object enters this safeguarded zone, thus preventing any collision.

The experts from IDPSA developed the tool that applies sealant and integrated it in the robot controller, thus making it possible to closely coordinate the application of sealant with the robot's speed and orientation. Sealant is now applied along curved and flat trajectories significantly better.

The research organisation Prodimtec adapted and integrated a camera-based tool that localises parts. The camera captures 3D point clouds and uses CAD matching software to identify and localise parts. This enables VALERI to locate and work on parts, which are sometimes on rollers and not always in the same spot in the factory. Profactor also developed and integrated two other tools, which the VALERI robot can use to inspect the applied sealant and braided carbon parts.

Fraunhofer Institute for Factory Operation and Automation IFF
www.iff.fraunhofer.de



Field power supply

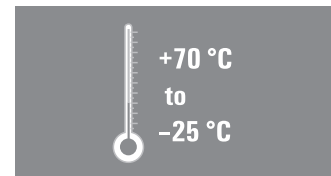
Loop powered transmitter input using the inbuilt 24VDC field power supply.

High process reliability

The high level of galvanic isolation of 4 kV at 300 V rated voltage guarantee safe operation.

Versatile application options

The ACT20P-WavePak functions over a large temperature range and can be used reliably in an extremely wide range of application areas.



Weidmüller

NEW

Analogue Signal Conditioner ACT20P WavePak

The one stop solution for process signal isolation

Weidmüller's ACT20P WavePak analogue signal conditioner provide the required 4kV galvanic isolation between the sensing device & control system that you need to protect against transients & ground loop error in process control measurement. The ACT20P WavePak also provides the option with 24Vdc power for loop powered transmitters and voltage-to-current signal conversion with high accuracy of 0.05%. Find out more on this analogue signal conditioner from the new family ACT20P range, providing you secure signal instrument connections for your machinery construction and process automation. Let's connect.

www.weidmuller.com.au

LINEAR DISPLACEMENT TRANSDUCERS

The Balluff Micropulse BTL6 Profile PF transducer linear displacement system with VARAN real-time Ethernet interface tolerates a lateral offset and vertical offset between the sensor system and moving magnet of up to 15 mm, simplifying integration and installation. Since it can detect two motions at the same time, then functions such as 'close/open mould' and 'eject part' on injection moulding machines, for example, can be monitored in parallel. This represents significant advantages from both a technical and economic point of view.

The transducers offer contactless operation, provide an absolute output signal and can detect the precise position of one or two axes. Due to the rugged IP67 full aluminium housing, no additional protection measures are necessary.

Balluff Pty Ltd
www.balluff.com.au



CANBUS SWITCHES

ICP Electronics Australia has released the ICP DAS I-2534 4-port CANbus switch and I-5534-M 4-port industrial CANbus switch in a metal casing.

The I-2534 and I-5534-M are both CAN switches used to establish a connection among four CAN bus subnetworks. The I-2534 and I-5534-M extend the CAN working distance and are specially designed for integrating four CAN networks and solving the problems of using a star topology. They are not only used as a CAN bridge, but also have more powerful features.

The upgraded firmware features a CAN-ID mapping mechanism to modify the received CAN-ID before process forwarding. Users can configure the CAN-ID mapping table. When the I-2534 and I-5534-M receives the specific CAN-ID, the CAN-ID will change to the corresponding CAN-ID by the mapping table before it is transmitted to other CAN ports. When CAN devices transmit the same CAN messages, the I-2534 or I-5534-M change them to another CAN-ID by the CAN-ID mapping mechanism.

Each switch offers four CAN communication ports, with a TJA1042 CAN transceiver, and is compatible with CAN Specification 2.0A and 2.0B, as well as the ISO 11898-2 standard. Various switch-selectable baud rates up to 1 Mbps are supported, as well as a user-defined rate.

The CAN Bus Route Path and CAN Filter are configurable. Each CAN Channel has a frame buffer for up to 100 frames and supports a frame rate of up to 2500 fps.

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



FIREWALL ROUTERS

Backplane Systems Technology has announced MPL's range of firewall/router products specifically designed for industrial and defence applications where security, quality, reliability, low power consumption and long-term availability are key.

Possible applications are in remote monitoring and maintenance, secure communication in automation, and defence. The main features are wide-range 8-36 VDC power supply, fanless operation, operating temperature range of -40 to +85°C, three Gigabit Ethernet ports (RJ45, M12, D38999 or fibre), open frame, standard or MIL housing up to IP67 (wall, flange or rack mounting). There is the option of the integration of a managed switch,

an mPCIe port for WLAN, GPRS etc, and EN50155 Class Tx (+85°C) certification.

MPL's capability to offer copper ports as well as SFP ports for various fibre optical solutions makes the product universal. In addition, the unit provides an external available USB connector and a microSD memory card slot, allowing easy logging or configuration capabilities.

The devices can be supplied pre-installed with an adapted version of OpenWRT (www.openwrt.org). This Linux-based embedded distribution provides all functionality required for operation as an IPV4 and IPV6 firewall and router. Most of the configuration of the firmware installed can be done using a web-based interface. For more specialised requirements, a console-based configuration utility is available.

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





ETHERNET I/O MODULE

Providing a variety of digital I/O functions, the ICP DAS ET-2260 is an IP-based Ethernet I/O monitoring and control module. The module can be remotely controlled through a 10/100 Mbps Ethernet network by using the Modbus TCP/UDP protocol, making the ET-2260 module easy to integrate within HMI, SCADA and PLC-based systems.

The ET-2260 provides six wet contact digital input channels and six Form A electromechanical relays. With two Ethernet ports, the ET-2260 allows for daisy-chain connections, enabling flexibility in locating devices, easy installation and lower infrastructure costs. It features 8 kV ESD protection, 4 kV EFT protection, 3 kV surge protection and 3000 VDC I/O isolation to enhance noise protection capabilities in industrial environments. Each input channel can be used as a 32-bit counter. The power-on value and safe value of the relays are configurable.

The module can be used to create DI to DO pair connection through Ethernet. After configuration, the ET-2260 module can continuously poll the status of the local DI channels and then write to the remote DO devices via the Modbus/TCP protocol.

It is equipped with removable terminal block connector for easy wiring in industrial applications and features a powerful 32-bit ARM MCU. Operating temperature range is -25 to +75°C.

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

DISTANCE MEASURING SENSORS

The ODS 10 and HT 10 distance measuring sensors are designed to reliably detect objects and measure distances with an operating range of up to 8 m (diffuse reflex) or 25 m (reflective tape), with a resolution of 3 mm.

The devices have high tolerance with respect to the angle of incidence, the colour, surface structure and brightness of the reflective material. As a result, they even detect different materials, such as wood or matt surfaces as well as glossy metal, under varying environmental conditions. They are also suitable for dark (black) materials and objects that are not aligned correctly or are moving at a great speed.

Highly visible status indicators, large control buttons as well as the OLED display assist with step-by-step commissioning and diagnosis at the press of a button. The compact housing (dimensions 25 x 65 x 55 mm) with integrated recesses for M4 screws/nuts and flexible connections make the device easy to use even when space is tight.

Leuze electronic Pty Ltd
www.leuze.com.au



MINIATURE PHOTOELECTRIC SENSORS

Balluff's R01E stainless steel flatpack photoelectric sensor, with its IP69K rating, is suitable for harsh-duty and washdown applications. These sensors offer diffuse versions with ranges up to 100 mm, polarised retroreflective versions with ranges up to 1 m, and through-beam sensors with ranges up to 2.2 m. With a precise, uniform visible red light beam, alignment is easy and objects are reliably detected. Connections are made by cable or M8 three-pin quick disconnect.

The R01E sensors are suitable for applications, such as packaging machinery, assembly machinery, materials handling, small part detection, error proofing and general-purpose automation. All R01E sensors offer reverse polarity and short circuit protection, and a choice of PNP, NPN, NO and NC outputs.

Balluff Pty Ltd
www.balluff.com.au





NON-CONTACT LEVEL INSTRUMENTS

Emerson Process Management has enhanced its range of level measurement devices with updates to the Rosemount 5708 Series 3D solids scanner and the 5402 radar instrument.

The Rosemount 5708 Series 3D Solids Scanner, which uses acoustic measurement and 3D mapping technology to provide continuous level and volume measurement, is now ATEX/IECEX certified for installation in areas with potentially explosive atmospheres, often found in solids measurement applications. An updated mounting adaptor also allows the device to be installed within electrostatic precipitator (ESP) hoppers. By using its 3D visualisation capability to map out the surface of the fly ash that builds up in the hopper, operators can optimise the process, reducing cost, risk and wear and tear on the hopper.

Emerson has also introduced full SCADA integration support for the solids scanner. Users can now seamlessly integrate 3D visualisation of the surface level into Emerson's Ovation or DeltaV distributed control systems.

The Rosemount 5402 now has a purging connection to prevent clogging of the antenna in applications with very dusty environments, and the existing self-cleaning function on the Rosemount 5708 can now be complemented with a PTFE-coated antenna which helps extend maintenance intervals even further.

For remote solids applications or where there is no existing cable infrastructure, both the solids scanner and the Rosemount 5402 non-contact radar, which provides bulk solids level measurement for applications with smaller-sized vessels, can now be connected to a WirelessHART network using a Smart Wireless THUM Adapter.

Emerson Process Management Aust P/L

www.emersonprocess.com.au

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**CONDITION MONITORING
INTERFACE MODULE**

The CSI-B-2 condition monitoring interface module is another element in the HYDAC condition monitoring concept which connects the sensor level with the interpretation level. It is an all-purpose electronic instrument for converting the HSI signal from HYDAC SMART sensors into a standardised PC signal. Using the HYDAC CMWIN PC software, it is possible to read the data and measured values of the connected SMART sensor directly.

The long-term memory can be read, plus adjustments can be made and parameters set on the connected sensor, the setting options depending on the particular sensor. The unit offers DIN rail mounting and has a protection class of IP40.

The HSI signal can be converted either into an RS232 or an RS485 signal. The product can be connected to any PC via the RS232 interface and possibly an additional standard RS232/USB adapter. The RS485 interface and appropriate additional coupling modules can also be used to connect to higher-level control or bus systems.

HYDAC International
www.hydac.com.au

SAFETY SWITCH

The Euchner CTP safety switch offers guard locking and safe guard lock monitoring. It combines the principle of operation of electromechanical safety switches with transponder-coded safety engineering.

The safety switch is suitable for use where a high performance level and a locking force of up to 2600 N are required. It can be used for direct connection to safe control systems and for the series connection of up to 20 devices, depending on the version. Due to its robust housing with metal head and IP69K degree of protection, the product can be employed for almost every industrial use.

The safety switch achieves category 4/PLe, according to EN ISO 13849-1, and meets all the requirements of EN ISO 14119 due to the transponder technology. Monitoring outputs and a diagnostics output can be connected directly to the PLC, and it has a comprehensive diagnostic function.

The safety switch has an LED indicator with all the relevant information on the front panel so users can see the status of the device instantly. It is small, easy to mount on the safety guard and compatible for mounting with existing safety switches.

Treotham Automation Pty Ltd
www.treotham.com.au



COMPRESSORS

The HSD.3 series rotary screw compressor systems are suitable for applications that require large volumes of quality compressed air with a small footprint. Two self-contained compressors are both installed within a single housing that is no larger than a single compressor.

System availability is optimised, with each compressor section operating independently from the other. This means that performance can be precisely adjusted to suit requirements and idling can be kept to an absolute minimum.

The design uses standard components and simple 1:1 direct drive systems. The drive motor and the compressor block are linked via a maintenance-free coupling, avoiding the transmission losses associated with gear-driven units.

Due to minimised internal pressure losses, the flow-optimised Sigma Profile screw compressor block and the inclusion of an IE4-rated drive motor, the rotary screw compressors offer improved specific power, which further contributes to the overall efficiency. The series can also be fitted with the Sigma Frequency Control (SFC) drive.

The units are controlled and monitored independently via two Sigma Control 2 controllers. Using the master-slave function, the controllers are able to precisely match the performance of each compressor to suit current compressed air demand.

With sound pressure levels as low as 71 dB(A), the series is available with total drive power of 360 to 500 kW and working pressure of 3.5 to 15 bar, with combined free air deliveries from 42.5 to 85.2 m³/min (fixed speed drive) and 52 to 85.4 m³/min (SFC drive) at 50 Hz.

Kaeser Compressors Australia
www.kaeser.com



Crude oil pipeline operator solves flow measurement problem

A regional light crude pipeline operator in the mountain states of the US was looking for an economical, accurate method to measure crude inventory flow within its pumping stations. The pipeline operator specialises in transporting partially processed crude to other lines or main terminals.

Accurate flow measurement is essential to the cost-effective operation of pipelines. While highly precise, and often expensive, flow meters are required to perform custody-transfer measurements for payment purposes, there are also intermediate process measurement points within pumping stations, for example, that can be served with less expensive technology.

When oil is moved over distances via pipelines, pumping stations maintain product throughout as it travels. The flow rate and volume must be monitored to optimise pump operation and throughput to the end destination at a terminal, refinery or point of custody transfer as well as serve as early warning for leak detection.

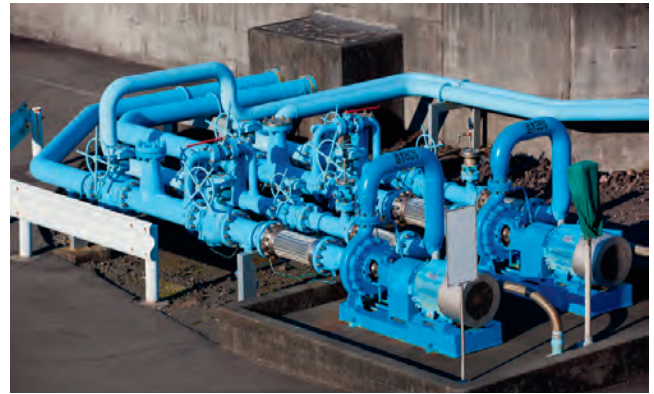
The regional pipeline company's process engineers were searching for a low-cost, but accurate flow measurement solution for internal inventory monitoring at its pump stations. There were no custody-transfer requirements and so a flow meter with an accuracy of $\pm 0.5\%$ was deemed suitable.

The light crude in the pipeline had already passed through heaters/treaters or main separators, which left it devoid of gases, water or other constituents that would disturb the specific gravity (SG) of the oil. In this region, the oil has an API gravity rating of 40 or above.

The light crude in the pipeline featured a viscosity of 2–8 centipoise (cP). With various pipeline sizes from 6 to 8", the liquid velocity varied between 0.3 and 4.9 m/s. Flow meters are mounted at both the pump suction and discharge lines.

The engineering team reviewed several flow meter technologies, including Coriolis, differential pressure, positive displacement and turbine. While all the technologies do measure flow, the team needed to find the specific one that would be the best fit in the crowded pumping station environment. They also needed to look at installation requirements, maintenance and instrument life with a total lifecycle cost perspective to find the most cost-effective solution.

When the pipeline engineering team contacted McCrometer, the company's applications group suggested the V-Cone flow meter. Featuring a self-conditioning flow technology, the V-Cone flow meter offers a low-installed cost, low-maintenance and highly reliable measurement solution for light crude pipeline pumping station applications. Its no-moving-parts, high-reliability design offers safe, highly stable measurement.



The V-Cone meter offered significant cost savings in light crude pipeline pumping station applications with complex or crowded equipment layouts. It utilises a centrally located intrusion that redirects the flow to the outside of the pipe and conditions the flow by reshaping the velocity profile — all but eliminating the need for straight pipe runs. It requires straight pipe runs of only 0–3 pipe diameters upstream and 0–1 pipe diameters downstream. This smaller footprint, requiring up to 70% less straight pipe without being affected by flow disturbing equipment up or down stream, is more compact than any other differential pressure meters.

The V-Cone flow meter is a differential pressure meter. The principle of operation is based on Bernoulli's theory of conservation of energy — as the cross-sectional area changes, so must velocity. By placing the cone in the pipe, the cross-sectional area is reduced, forcing velocity of the fluid to increase. As velocity increases, pressure drops, and it is that pressure drop that can be measured and used to determine the fluid flow rate. As the fluid moves past the cone, very short vortices are formed that result in a low-amplitude, high-frequency signal with high stability. The V-Cone maintains $\pm 0.5\%$ accuracy and $\pm 0.1\%$ repeatability over a 10 to 1 turndown and the cone conditions the fluid such that there is relatively low permanent head loss.

The low permanent head loss achieved by the V-Cone meter results from the shape of the cone itself, which minimises energy losses commonly caused by areas of low flow, cavitation and erratic flows. Each V-Cone flow meter is sized to meet desired application requirements and may be specifically designed to have high or low head loss. Regardless, the overall energy consumed by the meter is minimised because of its inherently efficient design characteristics.

More about the benefits of V-Cone flow meters can be read online at: <http://bit.ly/1XHj7LN>

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GAS ANALYSER UPGRADE KITS

Michell Instruments has released four kits that will enable users to upgrade their existing general-purpose XTP601 oxygen and XTC601 binary gas transmitters into fully functioning analysers with the minimum of fuss and at a fraction of the cost of buying a new unit.

Although the XTC and XTP601 series transmitters are both cost effective and reliable, Michell discovered that some customers realised that they actually needed the added functionality of an analyser. The kits were developed to assist them to upgrade their units in the field and obtain the desired functionality.

While sharing the same specifications for range, accuracy and reliability as the transmitters, the thermo-paramagnetic XTP and binary gas XTC analysers incorporate an HMI, which allows users to view, interrogate, change settings and calibrate the unit in-situ. This is all available via the display and through-the-glass capacitance buttons on the front of the unit, making operation and interrogation of the units easy to carry out.

The upgrade kits are available for the general-purpose (non-hazardous area) versions of the transmitters. The kits contain everything that is needed for a properly trained and competent technician to convert the transmitter easily in less than half an hour and without the need for specialist tools.

AMS Instrumentation & Calibration Pty Ltd

www.ams-ic.com.au

DC-DC CONVERTERS

PULS DC-DC converters are designed for use where stabilised control voltages are required, in battery-powered or mobile applications. They are also used to provide galvanic isolation to avoid earth loops or to restore control voltage at the end of long cable runs to compensate for voltage drops.

PULS DC-DC converters are available in a wide range of voltages with output voltages ranging from 5 to 56 VDC and input voltages ranging from 12 to 300 VDC, with current ratings up to 10 A.

With efficiencies as high as 95% and operating temperatures of up to 70°C, cabinet cooling requirements are greatly reduced. Also, as many of the models have 20% power reserves available continuously at up to 45°C there is often no need to upsize to handle overload conditions.

The converters are lightweight and compact, reducing cabinet size and stress on the DIN rail.

Control Logic Pty Ltd

www.control-logic.com.au



PANEL PC

The IEI Integration PPC-F12B-BT is an industrial metal-bezel panel PC powered by the Intel Celeron J1900 Quad-Core SoC that can support up to 8 GB DDR3L SO-DIMM RAM.

It features a 10.4" LCD screen and a robust ultraslim aluminium front bezel equipped with a 5-wire resistive touch screen. This full-function LCD panel PC features multiple I/O options including two Gigabit LAN ports, two USB 3.0 ports, two USB 2.0 ports, an RS232 port, an RS232/422/485 and an audio connector.

The PPC-F10B-BT meets the IP65 rating providing resistance to dust and liquid ingress, as well as one full-size and one half-size PCIe Mini slot for expansion opportunities, and a 9-30 VDC wide range power input.

ICP Electronics Australia Pty Ltd

www.icp-australia.com.au

3D VISION SENSOR

The TriSpector1000 is a 3D vision sensor, which, due to its simple configuration, can carry out inspection tasks standalone and without any programming.

It is ideally suited to use in quality control systems in the consumer goods and packaging industry, where it can count and position objects, measuring their volume and thickness. However, it is also suited to measuring volume in the food industry and monitoring the integrity of totes including contents, completeness and emptiness.

The TriSpector1000 creates 3D images of moving objects directly on the product line, for example. It uses laser triangulation to capture height profiles, which it uses to generate a 3D image of the object. A configurable object finder and analysis tools are applied to the 3D image in the TriSpector1000 directly. The higher-level control system can access the results of these analyses via simple switching outputs or an Ethernet network. Depending on the object size, the TriSpector1000 with its three different fields of view can be used for a variety of applications.

Intensity data improves 3D navigation and allows the system to check for the presence of labels, printed patterns or object rotation. The device has a large field of view and can re-use stored settings, meaning that it can be replaced quickly. The rugged IP67 metal housing with plastic windows ensures that the sensor has the necessary protection for use in harsh conditions, such as in the food industry.

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WIRELESS CONTROLLER

The Banner Engineering Sure Cross DXM100 industrial wireless controller is designed to facilitate communications for Ethernet connectivity or Industrial Internet of Things (IIoT) applications. Available with an internal Sure Cross DX80 wireless gateway or a multihop data radio, this Modbus communications device reliably connects local wireless networks with the internet or host systems.

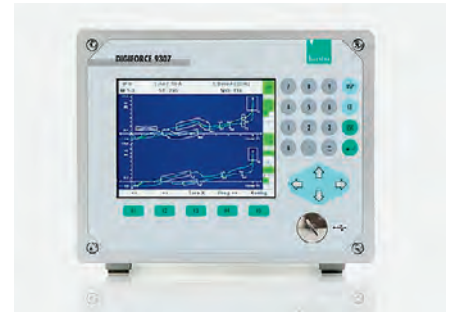
To satisfy multiple application requirements, the DXM100 controller offers several wired and wireless connectivity options to easily share data between local and remote equipment. The cellular modem option eliminates the need for IT infrastructures to connect remote equipment, while the integrated Sure Cross wireless radio option enables Modbus connectivity to equipment.

Banner's DXM100 wireless controller includes a logic controller with easy programming options for simple operation and guaranteed control. It can be programmed using action rules and ScriptBasic, allowing freedom when creating custom sensing and control sequences. The DXM100 also allows for secure email and text messaging for alarms, alerts and data log files.

The DXM100 incorporates several automation protocols into its system, including Modbus RTU, Modbus TCP and EtherNet/IP. The controller also features onboard universal and programmable I/O ports for simple connection to local sensors, indicators and control equipment.

Designed with an interactive, programmable user interface consisting of an LCD screen and four LED indicators, operators can quickly access system status and set-up, view selected events or data and perform site surveys.

Turck Australia Pty Ltd
www.turck.com.au



UNIVERSAL PROCESS CONTROLLER

The DIGIFORCE 9307 universal process controller offers a high-performance hardware and software architecture for monitoring press-fit and joining operations, torque and process curves, plus spring and switch testing, including resistance measurement, signal testing and leak detection.

It offers simultaneous monitoring of two synchronous processes and up to 128 measurement programs for a large variety of parts. A high measurement accuracy of 0.05% is possible at a sampling rate of 10 kHz, with ultrafast evaluation and data transfer for dynamic measurements, along with independent and variable start/stop logic, and customisable I/O control signals.

Flexible process integration is possible due to Profibus, Profinet, EtherNet/IP, EtherCAT, USB, ethernet and RS232 interfaces. A large number of evaluation elements are available, including windows, thresholds, trapeziums, envelope curves and freely definable mathematical operations. Intelligent signal sampling allows combinations of Δt , Δx and Δy .

Bestech Australia Pty Ltd
www.bestech.com.au



OPTICAL SENSOR FOR GLOSSY SURFACES

The Glare sensor is specially designed to recognise and differentiate objects on the basis of their gloss in order to control production processes. It analyses the spatial distribution of reflected light using Delta-S technology, which allows the sensor to determine the gloss level of flat object surfaces and to differentiate between objects of differing gloss levels.

The measurement result is transmitted to the process controls either via two digital switching outputs or IO-Link. Several operating modes are available, making the Glare sensor suitable for a range of different applications. The combination of intelligent signal evaluation algorithms, the multisensor arrangement and sensitivity adjustments ensure increased operational safety in industrial applications.

The Glare's IO-Link interface enables the sensor to be integrated into the machine controller, featuring automatic, process-oriented configuration and online diagnostics.

SICK Pty Ltd
www.sick.com.au



TAPE EXTENSION SENSORS

ASM has introduced the POSITAPE range of linear sensors, which take the basic principle of a standard manual tape measure and re-engineers it to provide an electronic output.

ASM has made significant improvements by utilising a 10 mm wide and 0.08 mm thick, flexible stainless steel tape as the measuring element for this linear sensor. Unlike wire-based sensors, the life of the tape is unaffected when using multiple direction-changing pulleys for those difficult-to-reach places. Its flat smooth surface prevents ice and material build-up, making it suitable for harsher climates and environments where mechanical linear sensing devices are often prone to failure.

At the heart of the sensor is an ASM PRAM non-contact, absolute position, multiturn encoder with onboard signal conditioning. With the sensing element electronics fully encapsulated and magnetically coupled to the drum arrangement, the POSITAPE range of sensors provides high durability.

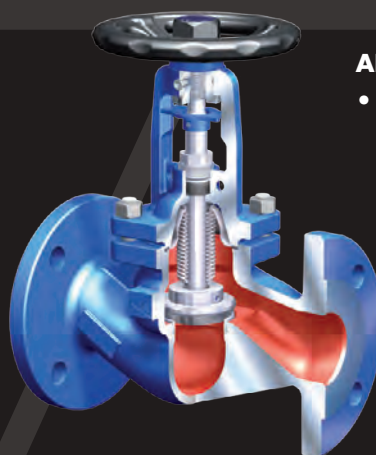
This improved system enables ASM to offer a standard linearity of 0.10% or 0.05% as an option, within a wide range of compact housings. Many forms of analog and digital absolute outputs are available and include SSI and CAN bus options to meet today's industry requirements.

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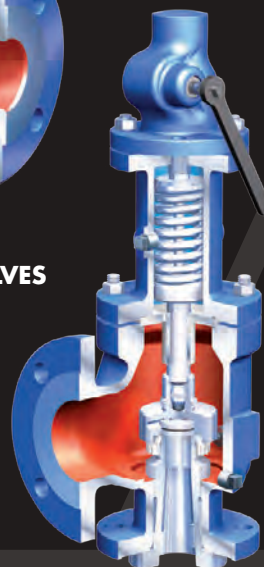


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HIGH STATIC DP TRANSMITTER

The Rosemount 3051S high static differential pressure transmitter is designed to provide reliable flow measurement in high-pressure applications with pressures up to 15,000 psi (1034 bar). As processing applications increasingly operate in conditions with extreme pressures and temperatures, operators must vigilantly monitor equipment integrity and stability in order to prevent failures, safety hazards and decreased production.

In industries such as offshore and onshore oil and gas and power generation where pressures can exceed 10,000 psi, it is critical that instrumentation be robust enough to provide accurate measurements on a consistent basis. The transmitter's SuperModule platform and coplanar design reduce potential leak points by 50% compared to traditional designs, ensuring the highest differential pressure measurement accuracy, field reliability and safety.

Emerson Process Management Aust P/L
www.emersonprocess.com.au

CABLES FOR OFFSHORE APPLICATIONS

Belden is now offering a complete cabling solution for harsh offshore and shipboard environments. The MarineTuff Offshore and Marine Cables range includes Industrial Ethernet, fibre optics, control, instrumentation, variable frequency drive (VFD), data bus, and electronic and audio cables, all specifically engineered and certified for oil and gas applications.

In the past, companies may have been forced to compromise between safety features and physical toughness in their choice of cabling. The MarineTuff family, however, delivers both. The design combines a thermoset low smoke zero halogen jacketing solution with built-in physical ruggedness. For the most demanding environments, bronze braid and continuously corrugated aluminium armouring are offered as standard options.

In addition to the unique combination of available jacketing and armouring options, MarineTuff cables are designed to withstand varying environmental challenges, including extreme temperature changes and exposure to moisture, dust, oil and solvents. They meet or exceed critical, third-party certifications and standards required by oil and gas companies, including Det Norske Veritas (DNV), American Bureau of Shipping (ABS), IEEE 45, IEEE 1580 and UL 1309.

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COMPRESSOR WITH INTEGRATED DRYER

Kaeser Compressors has launched an updated version of its DSG-2 dry-running rotary screw compressor range. The Kaeser DSG-2 RD series include an integrated i.HOC rotating dryer, able to efficiently achieve pressure dew points as low as -40°C.

With the i.HOC rotating dryer, the heat that is a by-product of air compression is used to regenerate the desiccant. The heat is essentially available for free, as no additional energy is required to power the drying process and the dryer takes advantage of the entire quantity of available heat. As a result, low-pressure dew points can be achieved even in challenging conditions, such as low pressure, high temperature or low load operation.

The integrated Sigma Control 2 compressor controller manages the entire process, controlling the radial blower and drum drive of the i.HOC integrated rotation dryer. Regardless of the operating conditions or the required air delivery volume,

the controller automatically adjusts accordingly to ensure consistent production of pressure dew points down to -20°C and, under special conditions, down to as low as -40°C.

The DSG-2 RD series dry-running rotary screw compressors with i.HOC are available air- or water-cooled, with drive powers ranging from 90 to 200 kW, and provide free air deliveries for the complete package at a working pressure of 13.1 to 28.6 m³/min. Variable speed models are also available, with drive motors from 110 to 200 kW and free air deliveries for the complete package at a working pressure of 8.5 to 30 m³/min.

Kaeser Compressors Australia

www.kaeser.com

SYSTEM DESIGN SUITE

Rockwell Automation has added three applications to its Rockwell Software Studio 5000 development environment to help engineers speed up development of automation systems. The applications, along with the Studio 5000 Logix Designer application released in 2012, bring more functionality together into one environment to help improve automation design productivity.

The Studio 5000 Architect application is the central point within the Studio 5000 environment where users can view the overall automation system; configure devices such as controllers, HMIs and EOIs; and manage the communications between the devices. It also exchanges data with other Studio 5000 applications and third-party electrical design tools to simplify the development experience.

The Studio 5000 Logix Designer application is the design and maintenance software for the Allen-Bradley Logix5000 family of controllers and is used to configure discrete, process, batch, motion, safety and drive control. It simplifies the design process by providing an application-centric view of code; enhanced workflows for more efficient re-use of content; and collaborative tools that make it easier for multiple people to work together.

The Studio 5000 View Designer application is the design and maintenance software for Allen-Bradley PanelView 5500 graphic terminals. It provides an intuitive, modern design environment that helps users easily build contemporary systems. It enhances integration between the control system and operator interface to improve programming efficiency and run-time performance.

The Studio 5000 Application Code Manager speeds up system development by helping users build libraries of re-usable code that can be managed and deployed across their entire enterprise.

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ENABLING MOBILITY IN NETWORK MONITORING

Yiwei Chen, Moxa Product Manager

Mobile devices are now more common in the workplace than ever before. Modern mobile apps now allow industrial network operators to monitor and troubleshoot their networks while on the move.

Engineers face different challenges during each stage of the industrial network management life cycle. During the installation stage, manual device configuration and testing is time-consuming and prone to human error. During the operation stage, engineers are required to monitor network status in real time and minimise system downtime. During the maintenance stage, engineers often face long labour hours doing firmware upgrades or configuration changes on multiple devices. During the operational stage, being able to quickly identify where critical network issues occur is essential. To help minimise the total cost of ownership, engineers are always on the lookout for new industrial network management tools that can help them overcome all of these challenges.

Industrial network management software is usually installed in the control room or is sometimes integrated with an existing SCADA system. But when you're out of the control room or on the move, you could miss important messages such as network changes or errors, and fail to respond quickly enough. With the number of devices connected to industrial networks continually increasing, the ability to monitor and maintain a network at any time and from any location is becoming more crucial for reliable and smooth network operation.

Current statistics show that globally, the number of mobile users is now greater than the number of desktop users, and we can

expect this global trend to expand into the industrial automation workplace. In fact, since engineers joining the workforce today are accustomed to using mobile devices in their private life, it is only natural that they would want to use the same devices to simplify their work life.

A mobile monitoring tool can help with the challenges of industrial network management and keep operators informed of network status, even when on the move.

Major challenges in industrial network management

Managing a network can be a complex and often extensive operation, especially for industrial networks, and being able to monitor and manage devices is essential to ensuring that the network is running smoothly. However, with evolving business operations, operators are often on the move, making it difficult to stay informed of, or quickly respond to, status changes in the network.

When doing regular maintenance or troubleshooting at a field site where many network devices are deployed, engineers often face the daunting task of identifying specific devices hiding among a multitude of identical devices. Even with proper labelling and hardware placement, it can still take time to obtain the status information of a specific device on-site. As a result, faulty devices cannot be swapped out as quickly as desired.



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With the development of mobile networking tools, engineers can now improve operational efficiency and maximise network availability.

Why mobile network monitoring?

Like their enterprise counterparts, automation engineers can now access their operational applications from mobile devices by installing an appropriate network monitoring app. The mobile network monitoring app is usually a client software tool designed to work in tandem with the network management software installed in the control room.

Figure 1 illustrates how a typical mobile app for network monitoring works to keep users informed of their network's status. The app connects to the software server over an intranet or the internet to access network status in real time. In addition, if the network is updated, the network management software server will send a push notification via the Apple cloud or Google cloud to alert the app user.

Mobile networking empowers operators

A mobile network monitoring app should support the following three features to ensure that monitoring a network from a mobile device is worth the effort: real-time alerts, real-time network checks, field device location.

Real-time alerts

With a mobile network monitoring app, operators can receive notifications of events pushed to their mobile devices. These real-time alerts allow administrators to take action immediately in response to critical events, even when they are out of the control room. For

example, once an alert is received, they can contact maintenance engineers to do on-site troubleshooting and consequently reduce system downtime.

Instant network checks

A mobile network app allows users to check the status of a network in real time. After the user logs in to the app, it will inform them as to whether or not the network is operating normally. The app will also display detailed information of a specific network device, keeping network administrators in the know while they are on the move or out of the control room. Information, such as a device's IP address, MAC address, location and firmware version can be viewed from the app. For example, if an engineer receives an alert for a link-down event, they can readily access the information needed to determine which port is faulty.

Finding field devices

In certain scenarios, it could take a long time to manually search for a specific device from racks and racks of similar devices. In addition, if automation engineers need to access the parameters or settings of a specific device for on-site troubleshooting, they would need to physically connect the device to a laptop computer using a web console or CLI (command line interface), or physically read the MAC address or serial number printed on the device, and then check the information with the computer. Either way, the engineer could end up spending much more time than would be necessary if the same information could be checked using a mobile device.

To make the task easier and more efficient, mobile network monitoring apps now usually come with a function that allows users to quickly find a particular device, and even view detailed device information.

For example, each network device could be encoded with a unique QR code based on its MAC address. If the mobile phone app supports a built-in QR code scanner, engineers can scan the device's QR code on-site to pull up information about that device, without needing to boot up a laptop computer or entering a device ID manually.

An example case

To ensure that a network operates reliably, industrial network management software is usually installed in large-scale networks in mission-critical industries, such as transportation, mining, and oil and gas. What these industries have in common is that they usually involve a geographically dispersed network infrastructure.

The power of mobile network monitoring in such distributed applications can be illustrated with a success story from a railway application that uses a fibre Ethernet backbone built for data transmission between several stations located across a wide area. Since the application involves multiple control rooms spread over some distance, the industrial network management software and the mobile phone app can help engineers access network status in real time and then respond quickly, thereby greatly reducing system downtime.

This high-speed railway operator built a fibre Ethernet backbone for data transmission between its operations management centre and other railway stations to ensure high network availability. The

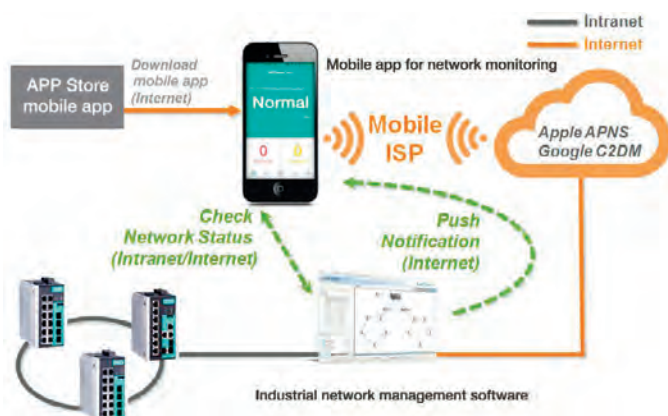


Figure 1: A mobile phone app for network monitoring usually works as the client of the main network management software.

customer used approximately 30 industrial rackmount switches to connect to the pre-existing Layer 3 networks, and used an industrial network management suite across the network management life cycle — for installation, operation, maintenance and diagnostics.

The railway operator's network administrators recounted that they sometimes needed to leave the control room for patrol inspections within and around the remote stations. Since a network management system was already installed in the control room, and there was a supporting mobile app they could install, they could

easily check the latest network status from their mobile phones. The dashboard design of the app made it easy for engineers to tell whether the network is operating under Normal, Warning or Critical condition. In one notable incident, an IT engineer received a push notification about a downed link while away from the control room, used the app to determine where the broken link was located and also connected to the network management server to determine the cause. After determining the cause, the engineer contacted on-site staff immediately, allowing them to get the network link back up and running as soon as possible.

Conclusion

The use of effective network management applications can help industrial network operators accomplish tasks efficiently during different stages of the network management life cycle. With the changing business environment and improvements in mobile device technology, a mobile app for network monitoring allows administrators to be efficient, effective and responsive when monitoring and maintaining an industrial network.

Using a mobile app for network monitoring, operators can view device and network status and receive real-time alerts from their mobile devices while on the move. In the field, administrators can quickly search for any device and view that device's detailed configuration parameters with the click of a button.

Madison Technologies
www.madisontech.com

ACTIVE FILTERS

Schneider Electric has announced the AccuSine PCS+ and AccuSine PFV+ active filters.

AccuSine PCS+ is an active filter that stabilises electrical networks, providing fast harmonic cancellation, power factor correction and load balancing. It exceeds all harmonic standards worldwide and is claimed to be the only harmonic filter in the world to have THD(I) or THD(V) set points (it provides 3% THD(I) when 3% impedance and filter output is greater than 50% of its rating). Unlike passive filters, the product cannot be overloaded and is best applied as a system-wide solution to provide a dynamic output that adjusts as the load changes.

Also now available is AccuSine PFV+, an active reactive current compensation system. The system provides high-speed dynamic, stepless power factor correction and load balancing of electrical networks with lagging or leading power factors. With a faster response time (1/4 cycle), the product is an alternative to detuned or antiresonant capacitor banks.

A faster response time allows AccuSine PFV+ to correct additional power quality problems, such as flicker created by loads internal to the facility. In addition, the product has infinite resolution of correction versus capacitor banks that have discrete steps. This results in greater precision and accuracy, without voltage spikes caused by stepped capacitor bank changes.

Both AccuSine PCS+ and PFV+ feature flexible, multifunction designs that offer top or bottom cable routing and are more compact than previous models. Both feature electronic displacement power factor correction, stepless response for power factor correction, mains current balancing and VAR injection.

Schneider Electric Industry Business
www.schneider-electric.com



One year on, world-first wave energy project in WA a great success

Since February 2015, renewable wave energy has been supplying electricity to the Western Australian power grid, in a world-first project utilising grid integration and process control technology from ABB.

The Perth Wave Energy Project (PWEF) — a \$32 million undertaking developed by wave energy technology developer Carnegie Wave Energy — is the world's first commercial-scale wave energy array that is connected to the grid and has the ability to produce desalinated water. The application relies on Carnegie's patented CETO Wave Energy Technology — an underwater system utilising buoys and seabed pump units moving with the motion of the passing waves for electricity generation.

CETO was developed, tested and refined at Carnegie's state-of-the-art Wave Energy Research Facility located at Rous Head in Fremantle, Western Australia. The PWEF has allowed Carnegie to commercialise CETO, with the company's first power revenues through the sale of its zero-emission electricity coming from the Department of Defence for its HMAS Stirling naval base, also located on Garden Island.

Following a rigorous tender process, ABB Australia was selected to design and construct the power generation and control system elements of the project, and worked with Carnegie to devise a specialised 'shaft-to-wire' solution to convert wave energy to renewable, grid-quality electricity.

ABB and subcontractor teams collaborated to develop the system, which encompasses process automation, electrical generation and grid integration. They were responsible for the design, manufacture, test, delivery, installation and commissioning of the solutions. ABB also provided all onshore process instrumentation, such as pressure and temperature sensors.

The shaft-to-wire solution interfaced PWEF's hydraulic circuit to an 11 kV microgrid via standard three-phase ABB induction generators, ACS800 variable speed drives and a ground-mounted 415/11000 V transformer.

ABB's Symphony Plus platform was used for primary process control and monitoring. For the HMI, the team supplied Symphony Plus Operations. For scientific analysis purposes, high-speed data acquisition was achieved with National Instruments (NI) cRIO hardware and Citadel database technology. The ABB and NI systems shared a considerable amount of data using Modbus communications.

The PWEF utilises submerged buoys, which move up and down with the passing waves. These buoys are connected to hydraulic cylinders by a flexible tether, thereby creating a pumping action. This is used to circulate a special environmentally friendly hydraulic fluid between the onshore and offshore components of the plant.

The hydraulic pressure onshore is used to rotate a hydraulic motor, which in turn rotates an electrical motor. When the hydraulic motor rotates the electrical motor, ABB drives configured in regeneration mode are able to generate electricity.



Designing the control logic used in the project and connecting the NI system to the Symphony Plus system, however, was a first for ABB, and the entire control system for the PWEF was a world-first application.

Since commissioning in January 2015, the project has been a success for both ABB and Carnegie, with the trial plant winning a Clean Energy Council (CEC) Innovation award in July — as well as garnering much attention on the world stage.

Carnegie Wave Energy Chief Operating Officer Greg Allen said the company was pleased to have collaborated with ABB on this world-first application.

"We chose ABB, confident they have the expertise required to cover the range of disciplines for the success of our development," Allen said. "ABB's technology and past experience integrating renewables into microgrids, along with their knowledge of process control and communication systems, made ABB the perfect partner for this important project."

The PWEF reached a significant milestone in June this year, with cumulative operating hours of the three installed CETO 5 units exceeding 10,000 hours. This milestone was not only significant for Carnegie and the PWEF, but also addressed the industry challenge of survivability and reliability in harsh ocean environments.

According to Allen, the size of the global wave resource is estimated to be large enough to meet between 20% and 200% of the world's electricity demand.

"Human population and load centres tend to be located near coastlines, making grid connection relatively easy. Carnegie is focused on developing projects in commercially attractive markets such as remote islands," Allen said.

A much longer and more detailed version of this article can be read online at: <http://bit.ly/1VIm1yB>

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STAINLESS STEEL PHOTOELECTRIC SENSORS

The Banner Engineering M18-4 self-contained photoelectric sensors feature a robust IP69K-rated 316 stainless steel housing. The heavy-duty 18 mm metal barrel sensor is suitable for harsh industrial environments where abrasive chemicals and ingress fluid are present. Built with advanced ASIC technology, the DC-operated M18-4 sensors are also resistant to fluorescent lighting and offer a high level of crosstalk avoidance.

Featuring a powerful and bright visible red emitter beam, the M18-4 allows for easy alignment and set-up. For added ease of use, the M18-4 sensor also offers a highly visible output, and dual-function power and stability indicators. The indicators comprise one green and two yellow LEDs. Solid green indicates power is applied and the sensor is ready, while green flashing specifies a marginal sensing signal. The two bright yellow LEDs, visible from both sides of the sensor, indicate the output is conducting.



To accommodate diverse applications, the M18-4 is available in opposed, polarised and non-polarised retroreflective, diffuse and fixed-field sensing modes. For increased flexibility, diffuse models offer a robust 250° sensitivity potentiometer. A wide operating temperature range of -40 to +70°C ensures optimal performance for diverse applications.

Turck Australia Pty Ltd
www.turck.com.au

PHOTOMETRIC CONVERTER

The optec Haze Control 4000 photometric converter is designed to operate with the optek DTF16 (11°/90° scattered light sensor) and additionally with AF16 or AS16, visible (VIS) or near-infrared (NIR) based sensors, and has been specifically engineered for high-precision haze (turbidity) measurements.

The menu-based software is easy to use and configure and includes adjustable signal damping, 16 linearisation tables and advanced calculation capabilities. An integrated data logger captures vital process information for quality assurance and plant control records. This data is easily transferred to a PC via an RS232 port.

The graphic display can show absorbance, turbidity and concentration in real time and in any unit of measure such as EBC, FTU, ppm (DE), NTU, ASBC and Helms. These measurements may also be displayed as text, bar graphs or trend values. A factory zero point is implemented for the scattered light sensors.

A secondary user zero for additional offset is included, as well as a slope and shift adjustment. This manual adjustment can be used to compensate for long-term, process-related disturbances.

AMS Instrumentation & Calibration Pty Ltd
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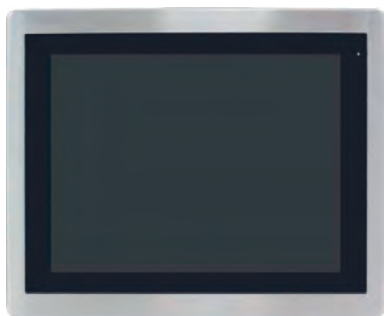
AIR MASS FLOW MONITOR

The weber inline vent-captor type 3302.1- is a compact air mass flow monitor for industrial applications and is suitable for installations requiring small diameter pipework.

The operating method is based on the calorimetric principle and this, in conjunction with its completely resin encapsulated electronics module, makes the inline vent-captor a rugged, shock- and vibration-proof device in an IP65 rated housing.

The weber 3302.1- is for use in small pipe sizes, is temperature compensated and has been specifically designed for low flow rates and pressure conditions up to 10 bar. The inline vent-captor has a high accuracy setpoint that is adjustable between 0.5 and 20 m/s.

Automated Control Pty Ltd
www.automatedcontrol.com.au



STAINLESS STEEL PANEL PC

The APC-3794 Series stainless steel waterproof panel PC is totally sealed to IP65/IP69K specifications on all sides. All external I/O, including the DC power input, serial, Ethernet and USB ports use M12 waterproof sealed connectors.

The APC-3794 Series combines an embedded PC and a 17" 350 cd/m² LCD in a thin stainless steel enclosure measuring 432 x 358 x 58.8 mm. The APC-3794 Series uses an Intel Celeron N2930 1.83 GHz processor and supports up to 4 GB of 1333/1600 MHz DDR3 memory. The 17" LCD provides a maximum resolution of 1280 x 1024 pixels and can be supplied with either a projected capacitive or resistive USB touch screen. Rear-panel waterproof sealed I/O connectors are provided for two USB 2.0 ports, two COM ports, an RJ45 LAN port and DC input power. An optional additional USB 3.0 or USB 2.0 port is also available.

Interworld Electronics and Computer Industries

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PLC WITH WEB SERVER

Panasonic has added a built-in web server feature to its FP7 programmable logic controllers, available in firmware version 3.30 or later CPU units with built-in Ethernet.

The FP7 has a range of system information available as a default in the CPU unit, so that all that is required to access this data is a network connection and a web browser. The default view gives access to PLC status items such as system register settings, operation history and PLC errors.

For access to collected data or control program variables, Panasonic's Control Web Creator is a graphics creation tool that allows users to easily design web content that is published by the FP7. Content can be accessed by arranging web components such as switches, lamps and meters on the screen and setting the properties. Content will be linked to the information in the PLC without needing any knowledge of HTML. Screens that are set up as desired by the user with Control Web Configurator are uploaded to the FP7, then, as with the default web page, the information in the FP7's internal web server can be monitored on a browser.

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CONTROLLER

Rockwell Automation has expanded its Allen-Bradley ControlLogix family of controllers to enable faster system performance and support the growing use of smart devices in manufacturing and industrial operations. The ControlLogix 5580 controller provides up to 45% more application capacity and includes an embedded 1 GB ethernet port to support high-performance communications, I/O and applications with up to 256 axes of motion. The product selection process is easier with the ControlLogix 5580 controller because users can now select the appropriate

model using the total number of ethernet nodes required. A single controller can support up to 300 ethernet nodes.

The controller also supports enhanced security as part of a defence-in-depth approach to help protect facilities, assets and intellectual property. The controller incorporates advanced security technologies and software features, such as digitally signed and encrypted firmware, change detection and audit logging.

As with other Logix controllers, engineers can use the Rockwell Software Studio 5000 design software to configure the ControlLogix 5580 controller and develop all elements of their control system. Data can be defined once and then easily accessed and re-used across the entire Studio 5000 environment to speed system development and commissioning.

Rockwell Automation Australia
www.rockwellautomation.com.au



AIR-AIR HEAT EXCHANGERS

Using ambient air for the thermal management of electrical enclosures is the most economical and energy-efficient method of cooling. However, in many applications the ambient air can be contaminated by dust, liquid or gases. This means the components inside the enclosure can become defective or damaged if contact occurs with contaminants in the environment. The use of a filter fan is therefore no longer possible under these conditions.

The Pfannenberg air-air heat exchangers are designed to be a solution for these environmental conditions. Due to careful design, a complete separation of the internal and external airflow is made possible. The interior of the enclosure is hermetically separated from the atmosphere, meaning harmful dust and fluids can't cause any damage to the sensitive electrical components inside.

Because of the sealed nature of the heat exchangers, no maintenance schedule is necessary, saving on costly service contracts or maintenance shutdowns. Installation can be handled by a single service technician in as little as 3 min due to the design of the fastening system, providing significant savings on labour costs.

An integrated thermostat looks after the running costs by ensuring the heat exchanger is only operational when cooling is required.

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STAINLESS STEEL PANEL PC

The AEx-P526 Series ATEX EN 60079-15 certified stainless steel panel PC is designed for Group 1 Zone 2 hazardous areas that may be exposed to gases or vapours. In addition, the AEx-P526 is totally sealed to IP65 specifications on all sides making it suitable for use in hose-down environments. All external I/O, including the DC power input, serial, Ethernet and USB ports, use M12 waterproof sealed connectors.

The AEx-P526 Series combines an embedded PC and a 15" 400 cd/m² LCD in a thin fanless stainless steel enclosure measuring 399 x 324 x 63 mm. It uses an Intel Atom D2550 1.8 GHz processor and supports up to 4 GB of 800 MHz DDR3 memory. The 15" LCD provides a maximum resolution of 1024 x 768 pixels. Rear panel waterproof sealed I/O connectors are provided for two USB 2.0 ports, two COM ports, an RJ45 LAN port and DC input power. An internal 2.5" SATA2 drive bay supports HD or SSD storage while internal SD and Mini PCIe slots are provided for system expansion.

The AEx-P526 Series is designed to provide a long-term, reliable computing solution for hazardous mining and industrial process control applications, marine environments and food processing plants where sanitised equipment is essential.

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

300 V BRUSHLESS DC MOTOR

A range of brushless DC motors designed to operate on a 300 VDC supply is now available from maxon motor Australia. From a diameter of only 32 mm, the unit is capable of power levels of 480 W, speeds up to 12,000 rpm and can operate submerged in oil at up to 200°C.



The 4-pole layout achieves a power density of under 2 g/W and is constructed of a laser-welded stainless steel case and flanges. Laser welding continues inside the motor with an encapsulated rotor and weld seams at the bearing seats and shaft collars. The motors bearings are left open without shields to allow for the flooding with oil.

Capable of withstanding high vibration and extreme pressures, the unit is suitable for oil and gas applications and subsea applications, and there are also variants for use in a vacuum.

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PREVENTING, DETECTING AND MITIGATING PIPELINE COMMODITY RELEASES

PART 2

Lars Larsson*

Pipeline operators are under severe financial and social pressure to avoid incidents that cause commodity releases. In Part 1 issues of pipeline design and management were examined, including external leak detection.

There is no optimal commodity release detection system for all pipelines in every environment. Each pipeline is unique and requires an individual evaluation. In Part 1 of this article the design and ongoing management of pipeline systems was discussed, along with external methods for the detection of commodity release. In this second part we examine internal (computational) methods, and the evaluation of such systems.

Detection

Internal-based pipeline detection

Internal-based pipeline detection looks at conditions inside the pipeline wall to discover commodity releases. More commonly known as computational pipeline monitoring (CPM), this methodology has been around for about 30 years and uses software that takes a variety of measurements available on the pipeline to establish what is happening within the pipeline.

The 2012 American Petroleum Institute (API) Recommended Practice (RP) publication 1130 defines CPM systems as systems that are internally based, utilising field sensor outputs that monitor internal pipeline parameters such as pressure, temperature, viscosity, density, flow rate, product sonic velocity and product interface locations. Which parameters are considered and how they are interpreted depends on the CPM method being applied.

The following is a brief description of the five CPM methods in use on pipelines today:

- **Line balance CPM techniques** measure the imbalance between the receipt and delivery volumes. The capabilities of its simplest form (meter in/meter out comparison) can be enhanced by correcting the meter readings to standard conditions and by compensating for changes in the line pack (amount of commodity actually inside the pipeline) due to temperature and pressure for each product in the pipeline.
- **Real-time transient model (RTTM) CPM** models all the fluid dynamic characteristics, including line pack, slack, shut-in and transients, under all pipeline flow conditions. This is a very detailed configuration with very fast calculations and the ability to model hydrocarbons in any phase. The RTTM software compares the measured data for a segment of pipeline with its corresponding modelled conditions.
- **Statistical analysis CPM** statistically evaluates pressure and flow inputs that define the perimeter of the pipeline in real time for the presence of patterns associated with a commodity release. A probability value is then assigned to whether the event is a commodity release or not. An alarm is generated if the statistical changes persist for a certain time period.
- **Pressure/flow monitoring CPM** examines the relationship between various sensors' outputs and applies an algorithm to determine if they indicate an anomaly. Essentially this CPM is what an operator does by nature, looking for unexplained large drops in pressure or flow, but there are applications that look for these anomalies to ensure these large changes are not missed.
- **The acoustic/negative pressure wave** technique takes advantage of the two negative pressure, or rarefaction, waves produced when the commodity release occurs and the integrity of the pipeline is compromised. This methodology requires installing high response rate pressure transmitters at selected locations on the pipeline.

These five CPM methods can be classified according to two different alarming principles underpinning their detection algorithm.

Conservation of mass methods work on the principle that whatever enters the pipeline must be equal to whatever exits the

pipeline, adjusted for change in inventory of the pipeline. The line balance CPM, real-time transient model CPM and statistical analysis CPM techniques can base detection on this method.

Signature recognition methods consider the relationship of system pressures or flows, or recognise anomalies in sensor outputs on the pipeline. The real-time transient model CPM, statistical analysis CPM, pressure/flow monitoring CPM and the acoustic/negative pressure wave CPM techniques can base detection on this method.

General considerations for evaluating CPM systems

No one single commodity release detection system is optimal for the entire range of pipelines operating in widely diverse environments. A comprehensive analysis is necessary to identify which CPM technologies and methods are best suited for the particular pipeline. A simple A-to-B pipeline route might have simpler operations than a pipeline with many active route connections and elevation changes, multiple receipt and delivery points, and reversible flow. The more complex the pipeline, the more flexible the CPM needs to be to handle all possible operational scenarios.

The following list of key factors to consider when evaluating a new CPM (or re-evaluating a legacy system) for its detection capability should be weighted according to their importance to any particular operation:

- Rate of false alarms and misses.
- Sensitivity to pipeline flow conditions such as transients, shut-ins, starts and stops.
- The impact of instrument accuracy and configuration accuracy.
- Personnel training and qualification requirements.
- Required response time.
- Accuracy and precision in estimating location and volume of release.
- Ability to detect pre-existing releases.
- Robustness/high availability.
- Initial cost/tuning costs/maintenance costs.

The most important goal in selecting a commodity release detection system is the ability to identify a commodity release quickly enough to mitigate the safety and environmental risk while also meeting the operator's overall business objective. This includes the potential value of product lost, the cost of clean-up and potential regulatory fines, potential detriment to surrounding environments, and the cost to reputation and potential impact on future projects.

Specific considerations for evaluating CPM systems

In addition to the overall general considerations that need to be taken into account when evaluating commodity release detection systems, some more specific aspects are applicable to particular pipelines. High consequence areas will have a significant impact on the evaluation, as well as the size of the release that is likely to need to be mitigated.

High consequence, or high risk, areas (HCAs) are defined as areas where a pipeline commodity release will have a significant impact on people, property, the environment or all three. HCAs typically demand higher levels of commodity release detection capability and sensitivity to mitigate the higher risk of significant consequences from a release.

Pipeline companies that have pipelines in such HCAs must conduct a more thorough risk analysis and employ additional commodity release detection measures to enhance public safety and protect property and the environment. Some of these measures can be summarised as follows:

- Automated data collection for over-short analysis.
- Integrated alarm and status information between connected pipelines.

Initiative	Duration	Technology
Recognise	5 minutes	Recognise a 50% flow change within five minutes.
Respond	5 minutes	A response to the rupture must come within five minutes of the recognition. Responses can be tailored to particular situations.
Report	20 minutes	A report must come within 20 minutes.

Table 1: The 3R's of detecting pipeline rupture

- Use of, or more frequent, operational shut-in tests.
- Additional instrumentation or the relocation of instrumentation.
- Application of, or tighter parameters on, pressure/flow deviation monitoring.
- Higher degree of data integration between operations support applications.
- Higher fidelity commodity release detection applications.
- A multi-tiered commodity release detection approach, where systems work independently of each other.

In terms of the size of the commodity release, API 1149 provides a methodology to determine the theoretical ability of a given commodity release detection application to detect a commodity release of a given size, based on the specifications of a given pipeline. Although an American standard, API 1149 is used around the world either directly or as a baseline for local regulations.

While commodity release detection systems do not necessarily need to achieve the lowest theoretical capability as determined by API 1149, pipeline companies can use the standard to weigh the cost of commodity release detection systems against the risk of undetected commodity releases. Further, API 1149 calculations can assist pipeline operators in determining the benefit of specific pipeline infrastructure enhancements to their commodity release detection capability. For example, it can be calculated what increase in commodity release detection sensitivity can be achieved by adding, replacing or upgrading instrumentation on the pipeline.

Although commodity release detection technology has advanced a long way in terms of detection time and detectable commodity release size, damaging pipeline ruptures and large volume release events have still occurred and have unfortunately been missed. In addition to individual companies taking initiatives to improve their commodity release detection capabilities using the strategies discussed above, the Association of Oil Pipelines (AOPL) has created a Leak Detection Rupture Monitoring project as part of its 'Pipeline Leadership Initiative' to develop additional strategies to continue improvements in detection of commodity releases.

A key area of improvement the initiative has identified is executing on the '3Rs': recognition, response and reporting. The AOPL has developed performance standards for the industry to follow in this area, with the target goal of 30 minutes for 3R execution (see Table 1).

Challenges with detecting commodity releases

The uniqueness of each pipeline creates many challenges that might look easy to overcome when selecting a commodity release detection system, but become critical factors for its successful implementation. When evaluating the needs and effectiveness of systems for detecting commodity releases, the following factors should be evaluated to determine their impact:



WHEN SELECTING A COMMODITY RELEASE DETECTION SYSTEM, IT IS IMPORTANT TO EVALUATE EACH PIPELINE INDEPENDENTLY

- Batched systems with multiple products, multiple phase products or reversible flow systems.
- Transient and steady state flow conditions, turbulent and laminar flow transitions.
- Step change product temperature gradients, elevation-induced hydraulic variations (such as over a mountain or under a shipping channel).
- Varying pipeline diameters, telescoping systems, restrictions, block valves, tees, relief systems, control valves and other unique physical characteristics.
- Multiple pump configurations, whether series, parallel, varying and multiple speed, electric and engine drives.
- Branch connections and multiple inlets, outlets and partial flow alignments.
- Slack line and product separation during static conditions.
- Physical properties and hydraulic characteristics of high volatile liquids (HVL) versus crude versus condensate versus refined products, all operated within a single SCADA console.
- Communication outages, variable signal scan and refresh rates, errant signal and data filtering versus non-HCA system variances.
- Human factors such as operator sensory overload and fatigue.
- Varying individual operating procedures.
- Employee turnover and limited training time for new operators.
- External and internal resource availability.

The degree to which any of these challenges will be mitigated is directly related to the CPM chosen for the pipeline. Others, such as human factors of operator overload and fatigue, will rely on the implementation of control room management, HMI and training best practices.

Mitigation

Minimising the impact of a commodity release is the third aspect of pipeline integrity. A release is normally classified as either major or minor. Major releases are emergency situations that result from a rupture to the pipeline that would have a negative impact on both the environment surrounding the incident site and the general public. These kinds of incidents require resources from pipeline operators, emergency response personnel and third-party agency agencies. A minor release is still regarded as an emergency from a process point of view but does not require a high level of alertness and mobilisation of resources.

Whether the commodity release is classified as a major or minor release, the following mitigation process phases would typically be followed:

- **Locate:** The time frame it takes until the physical location of commodity release has been confirmed could be a very short period if the release is found by a third party (eg, a farmer in

a field). However, location by emergency response teams could range from just minutes to a couple of hours in a worst-case scenario.

- **Recover:** Most of the critical decisions about the containment, routing or general management of the incident site are made within the first eight hours after the commodity release.
- **Cleanup:** This phase lasts until the incident site is fully cleaned up. This could take days, or even months, depending on the extent of the commodity release.

Conclusion

All pipeline companies in the world have as their primary goal and concern that the transportation of commodities be safe and reliable, while realising that commodity releases will continue to happen no matter how strong the prevention measures. Taking a holistic approach to commodity releases and not looking at prevention, detection and mitigation as independent and separate aspects of pipeline integrity benefits the pipeline company, the public in general and the environment.

Additionally, it is important to realise that there is no 'one size fits all' commodity release detection system for all pipelines in every environment. Each pipeline is unique and requires an individual evaluation. Pipeline operators need to weigh business objectives against their threshold for risk. The intersection of those points is where companies will find the appropriate commodity release detection solution. Different CPM methodologies and external commodity

release techniques provide potentially complementary commodity release detection capabilities, so different methods, or a combination of methods (a tiered approach), might be the right fit overall.

The following steps are suggested for taking a holistic view of pipeline integrity:

- **Step 1:** Evaluate the activities associated with prevention. Would any of these activities benefit from what is being done in the areas of detection or mitigation?
- **Step 2:** Evaluate detection activities. Is the level of sensitivity per requirements? Or would it be beneficial to upgrade or install a complementary commodity release detection system?
- **Step 3:** Evaluate the emergency response plan to see if there are any inputs from prevention and detection activities that potentially would be beneficial for emergency response personnel to know prior to their arrival at the incident site.

**Lars Larsson is a Senior Product Manager at Schneider Electric – Global Solutions. He holds bachelor's degrees in process automation from Telemark Technical College in Norway and control engineering from the University of Sheffield (UK). He is a certified Eur-Ing and has an MBA from the University of Durham (UK) to complement his 22 years of oil and gas pipeline industry experience. He has published multiple articles in global journals focused on pipelines.*

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MACHINERY HEALTH ANALYSER WITH ATEX/IECEX CERTIFICATION

Emerson Process Management's CSI 2140 Machinery Health Analyzer has now received ATEX and IECEx, Zone 2 certification, enabling the latest generation portable vibration analyser to be used in hazardous environments. The CSI 2140 collects all of the data required to assess a machine's condition in the shortest possible time so that the user can limit the time they need to be in hazardous environments.

ATEX and IECEx standards cover a range of technologies from power generation to marine energy and involve a detailed process of examination, testing and assessment of equipment intended for use in potentially hazardous areas.

Emerson's CSI 2140, which is already CSA approved for use in most industrial hazardous areas in the US and Canada, provides an early indication of bearing and gearbox defects before they can lead to machine outages. Its PeakVue signal processing methodology cuts through the complexity of machinery analysis to provide a simple, reliable indication of equipment health.

Emerson Process Management Aust P/L
www.emersonprocess.com.au

PRESS SAFETY LASER

Treotham is now supplying press-brake safety systems from Nuova Elettronica. The DSP laser is claimed to be a reliable type 4 safety device for press-brake machines. It protects the press-brake operator from the danger of crushing that can accidentally occur between the moving part of the machine and the fixed one. When an object enters the protection zone it is detected immediately, causing the interruption of the mobile part motion.

The DSP laser is easy to install and is economical. It can adapt to most press-brakes and it allows various possible configurations. It fulfils safety category SIL3, PLe, Cat 4 of AS 4024.1-2014 machinery safety standard and safety regulations EN61496-1/2 e EN12622.

Treotham Automation Pty Ltd
www.treotham.com.au



ETHERCAT SLAVE I/O MODULES



ICP Electronics Australia has expanded its range of EtherCAT slave I/O modules by adding three modules to the ICP-DAS ECAT-2000 Series. The ECAT-2052 features eight isolated digital inputs and eight digital outputs; the ECAT-2053 with has 16 isolated digital inputs; and the ECAT-2060 offers six isolated digital inputs and six relay outputs.

All the modules can be deployed in network topologies such as star, line or ring. The isolated input and output design protects the ECAT-2000 Series against harmful interference and environmental factors, with ESD protection of up to 4 kV for each channel.

The devices are EtherCAT conformance test tool verified and support distances between stations up to 100 m (100base-Tx). Daisy-chain connections are supported through two RJ45 interfaces. They also feature a removable terminal block connector and LED indicators for I/O status.

ICP Electronics Australia Pty Ltd
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IO-Link retrofit delivers rapid ROI

Schwartz GmbH, a German manufacturer of industrial heat treatment equipment, used IO-Link-enabled switching devices from Siemens to upgrade three furnaces it was building for a European customer, resulting in a significant increase in the equipment's functionality and uptime without cost increase.

Schwartz has been making heat treatment equipment for almost three decades. The company produces furnaces with multiple chambers, each of which is divided into several zones that must be monitored separately. The design requires an approach that makes it easy to track temperatures and quickly make adjustments. The Schwartz team chose to apply IO-Link with the intent of improving performance and reducing wiring overhead so that changes did not affect the overall cost of the machine.

As well as large savings in wiring costs, the redesign also led to a substantial reduction in the number of ammeters in the switchboard doors and current transformers in the cables for each system. Each of the zones in each of the furnace chambers is monitored with the help of the IO-Link-enabled current-monitoring relay from Siemens. The devices are directly plugged into the power contactor from below, saving corresponding space and wiring.

Their previous design used signalling contacts to indicate faults. The current version is based on three-phase current measurement, which offers the advantage that each phase failure is detected as soon as it happens. This is because with the star connection they selected, a phase failure would result in a drastic current increase in the remaining phases. "We now register [a phase failure] immediately with the new monitoring relays, and we can influence this right away in control terms and adapt the current flow," said Andreas Hollesch, head of electrical engineering. The approach delivers other benefits, as well. "It requires fewer openings in the switchboard doors. This means a higher protection class assessment according to the UL criteria, as required for deliveries to the US."

For best results, the furnaces need to bring the workpieces up to their processing temperature as quickly as possible. For this purpose, the 3-phase power contactors are switched via IO-Link capable function modules. Like the other IO-Link-enabled devices, these



are connected directly to IO-Link master modules mounted in SIMATIC ET 200S distributed I/O systems from Siemens. The distributed I/O communicates with the controller via Profinet.

The furnace system switchboard includes multiple IO-Link masters, each of which features four channels. Every channel, in turn, offers up to 2 bytes of input and output for cyclic data transfer or monitoring the switching and monitoring devices. One IO-Link device or one group of up to four individual contactor load feeders can be connected per channel. With regard to the compact power contactors for the zone heating systems, this means that although four contactors are connected via one IO-Link channel,

they can still be switched separately.

In addition to process safety, operational safety is also important in systems with a high installed-power rating. In the past, connecting several devices together side by side required the use of contacts. The 3SK1 safety relay allows each basic unit to host up to five expansion modules, connected via the backplane bus, with input on the left and output on the right. It's an approach that reduces footprint, components and cost while expanding functionality. The system monitors the status of the emergency-stop push-buttons in all parts of the system, as well as the protective doors of the enclosure. In addition, each individual zone door is tracked to determine whether it is open or closed.

Overall, the upgrade yielded better-controlled process equipment at a near-parity price. The additional expense of the digital components is offset by reductions in wiring, and added cost benefits will result from advanced diagnostics and reduced downtime. The result is a platform that delivers enhanced performance and improved levels of safety in a smaller footprint and for a lower cost. "As a result of the modernisation measure with IO-Link devices, we have achieved substantial process improvements for almost identical cost," said Hollesch.

A longer and more detailed version of this article can be read online at: <http://bit.ly/1QJdGwC>

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AS I SEE IT



THE FUTURE OF IIoT AND UNLEASHING ENTERPRISE POTENTIAL

Manufacturers, utility companies, oil refineries and other equipment-intensive industries have been using connected devices to monitor their operations for more than 20 years — whether it is smart sensors reporting changes in temperature or vehicle tracking systems to support logistics. But while a universal definition of the (Industrial) Internet of Things (IIoT) has yet to be agreed upon, what is clear is that its value has evolved, becoming greater as a result of new supporting technologies and frameworks.

In our experience, IIoT projects in 2016 are looking to vary immensely. While we have seen an abundance of customers using enterprise asset management (EAM) applications, embracing sensors in conjunction with software to proactively monitor, manage and maintain their equipment's health and performance, the majority of IIoT projects are still very much in their infancy, consisting of focus groups and pilots to test how these projects will work alongside existing business processes.

IIoT is an approach that presents an enormous opportunity for manufacturers and other equipment-intensive organisations. McKinsey predicts that the global economic value for the IIoT will reach \$11 trillion by 2020. Through collecting, analysing and processing sensor-generated data, companies can gain the kind of comprehensive, detailed insights that can drive down costs, or be wrapped up as customer offerings and new services, opening up new avenues of profitability and growth. Essentially it is not so much changes in just technology, but more a shift in the approach to becoming more insightful, proactive and agile in all areas of the business.

But for any of these opportunities to be seized and truly utilised, manufacturers need a combination of real-time (sensor-generated) data combined with cloud storage and powerful analytics. Only then can they achieve fast, intelligent business decisions that will drive the kind of insightful, proactive, agile culture needed to boost profitability and expedite global competitiveness — all of which are critical in today's environment.

This means that contrary to the hype, the key to seeing the true benefits of IIoT resides not in the sensors, but in the complete visibility and integration of the IIoT-generated data with other core business systems.

ERP is integral to the success of IIoT as it brings together sensor-generated data with EAM, PLM, CRM databases and unstructured data from across the business. Only through this level of integration, interpretation and contextualisation can cost savings be maximised, and value propositions be created and monetised.

For many, this means the current ERP system must be reviewed, and often replaced or upgraded in order to capitalise on this new opportunity. Any system implemented more than five years ago is unlikely to contain the level of flexible architecture, integration capabilities, social collaboration and intuitive user interfaces necessary to complete the advanced tasks in hand.

To make this process even more challenging, it seems that organisations are unclear about best practices and even who should be the person driving action — IIoT often lacks a consistent owner within businesses. Other challenges included a lack of necessary skill-sets; unclear benefits; cost; lack of business demand; lack of strategy; and not having the technical infrastructure in place.

IIoT is not something that can be bought off the shelf per se, and any vendor who claims this should be treated with caution. IIoT is an opportunity to embrace a range of new technologies to innovate and drive greater insight, proactivity and agility for manufacturers.



Jo-Anne Ruhl is the managing director of Infor Pacific, where she is responsible for the oversight of Infor's Australian and New Zealand sales teams. A 17-year industry veteran, Ruhl has also held various leadership roles across project management, consulting and sales.



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