Efficiency in footprint and performance comes with SMC’s water/chemical compact diaphragm pump. Requiring no priming when wet or dry, yet still maintaining impressive performance throughout its extended service life – a perfect fit for detergent, reagent, flammable and coolant liquid for all machines.

Up-time efficiency improvements are realised with the release of the VXB Series angle seat valves. Designed with air, water and steam capability and delivery of up to five million cycles, the VXB is the ideal solution for applications including temperature control, hot water systems, industrial washing machines, sterilising and cleaning equipment.

In critical cooling or cleaning applications a low pressure loss, digital flow switch will prevent any run dry scenario.

Footprint efficiency is guaranteed with options of integrated and remote sensor types with a single product for use across multiple fluids - including deionised water and ethylene glycol to temperatures of 90°C.

Large chiller, cooling tower and process water will require temperature and flow measurement to ensure efficient plant operations and extended up-time on critical processes. A compact and complete solution, the 250 L/min (Max), PF3W series will provide you with confidence that the processes are protected and so is your up-time.
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Information, mobility and visibility: the value proposition for the IoT in manufacturing

Fluke’s Performance Series infrared cameras are built for performance with features that help easily and quickly identify problems before they become expensive failures. Users get improved resolution that delivers the right image quality needed to make the proper diagnosis. Fluke’s new Performance Series cameras offer up to 2.5 times more pixels and 70% better D:S, compared to the Fluke Ti1XX infrared camera. The choice of manual or fixed focus options reduces the amount of time it takes to get an in-focus image.

Image quality is everything when it comes to quickly analysing infrared images. Operators need the right level of detail in their infrared image to pinpoint specific areas of concern. Fluke Performance Series IR cameras blend visible light and infrared images using patented IR-Fusion technology to capture a clear 5 MP real-world picture of the target. Users can also blend at different preset levels and add picture-in-picture (PIP) to capture an incredibly revealing hybrid image.

Using Fluke’s infrared cameras with the Fluke Connect® app offers the ability to share inspection results and authorise next steps from the field; organise measurements by asset in one location with EquipmentLog™ history; and securely connect and collaborate with others to share images in real time via ShareLive™ video calls.

For a demonstration or more information on the Performance Camera range or Fluke Connect, contact Fluke Australia on 02 8850 3333 or email auinfo@fluke.com.

Fluke Australia Pty Ltd
www.fluke.com.au
TRENDS IN SCADA
NEW TECHNOLOGIES AND ADAPTIVE PROCESSES

As SCADA operations face increased demand for cost reduction and enhanced efficiency, the spotlight is on enabling new capabilities, and it’s in new technology and adaptive processes that SCADA teams are focusing their efforts.
he SCADA Australia 2015 conference, held in May, highlighted four technology trends in particular that have gained increased traction, with specific examples shown of how organisations are adopting new technology and changing their operational and corporate processes accordingly.

New Online Remote Networks (NuROns)

High-speed communication hubs are being developed to empower organisations with greater asset control. The combination of design know-how and communications networks is the key to real-time monitoring and asset management.

Victoria’s South East Water replaced its digital radio system with a high-speed IP-based communications hub with 3G and 4G cellular modems, as well as DSL direct links. Wireless HSPA machine-to-machine (M2M) routers also now facilitate remote monitoring and control of thousands of sewage pump units.

Complementing the fixed assets, the low-powered sensor system is all about pressure, quality and flow monitoring within the network, in order to identify and predict leaks before they burst. It is essentially a battery-powered, centrally controlled network deployed across a wide area, in which data is collated and routed back to the SCADA system for analysis.

By integrating this IP communications backbone with the existing infrastructure, South East Water will eventually conduct a digital residential meter rollout. Specific network assets like pump stations can then become bases for digital metering collector points.

For the first time, the organisation will be able to know where water and sewage are actually flowing and when it’s occurring. This will also translate to important customer benefits, such as providing consumers with information of consumption rates based on accessible and real-time information, due to the automatic leak detection capability.

Andrew Forster-Knight, group manager — intelligent systems at South East Water, says: “We’re not doing this for the next one or two years, but well up to the next 15 years and possibly beyond. However, because of that forward-thinking approach, you’ve got to start considering what sensor technology will be out there in 10 years’ time; what the requirements will be; what predictive elements will be attributed to assets; and how the network will manage them.”

South East Water’s NuRON investment highlights the important crossroad between technology and process. By adapting the SCADA system to accommodate new technology, the organisation is harnessing a strategic advantage for long-term asset management.

Multisystem interoperability

The introduction of IEC 61850 is an example of wider industry efforts to address the number of available vendor systems.

At Victoria University in Melbourne, the first Zone Substation Simulator Centre (VZSSC) will soon open — a project that will revolutionise interoperability for technicians to isolate generic object-oriented substation event (GOOSE) signals.

The centre simulates 22–66 kV substation environments (specifically a two-transformer zone substation with dual MV buses), control and protection schemes using the IEC 61850 technology standard for the automation and control designs.

While a breaker and a half configuration will define the subtransmission side, the protection and control set-up will encompass a specific X and Y protection scheme.

And to ensure automation is fully embedded with the centre as one facility, MicroSCADA PRO synchronised with an RTU system will be integrated. As it is designed in line with IEC 61850 requirements, it will work in harmony with compliant intelligent electronic devices (IEDs) and tools.

VZSSC can provide practical knowledge on the concept and application of IEC 61850, marking an important move to greater interoperability. With completion of the centre due in just a few months, Victoria University will house a world-class, state-of-the-art training facility.

Several of the centre’s key features include:
- unit protection
- distance protection
end-differential form
• distribution and subtransmission bus protection
• joggle protection
• feeder relays
• capacitor banks and capacitor step controllers
• backup protection.

All of these features are integrated with the ethernet infrastructure, RTU systems, SCADA back-end and the actual remote SCADA control centre (a dedicated room set up next to the main simulator).

Graeme McClure, principal engineer — protection, control & automation at AustNet Services and consultant on the project’s development explains: “Relays were provided by GE and ABB, whilst Siemens supplied the ethernet equipment and Doble Engineering donated the testing facilities. Weidmuller provided the hook-up equipment and ASC delivered the fibre-optic technology. Many vendors have customised their own packages without IEC 61850 compatibility, which is why the centre is a crucial step forward for interoperability.”

Stray signals can easily trigger other relays to operate and cause a system-wide blackout. But technicians will be able to isolate GOOSE signals while running the main zone substation system simultaneously in the centre.

Analytics and business intelligence

The opportunity to harness real-time data is driving SCADA systems to align with predictive analytics, but not necessarily from new smart meters or sensors. Sydney Water has incorporated a customised business intelligence solution to expose 34 LAN-based SCADA systems to corporate users. The aim was to integrate plant data into one new central server and transfer it to the enterprise data warehouse.

In terms of governance, the central SCADA changes and the plant SCADA are all situated within the Hydraulic System Services unit; the rest is IT.

The project enables improved access to available data and long-term analysis. Technical Services was appointed as one of the main user groups at Sydney Water to provide feedback on accessibility. This unit is designed to improve all of the processes — both chemical and biological — in the treatment plants.

Feedback had initially indicated difficulty accessing data, so the main project team enabled automatic export in real time to centralise the database location. The aim was to change the set points and tune the PID loops dynamically, based on other parameters within the process that could be the demand or inflow.

According to Mirek Januszek, SCADA standards and technology manager at Sydney Water: “It’s often the case that IT limitations in water utilities present a bottleneck that hinders extraction and analysis of disparate data. By streamlining data capture, storage and analysis, we can pave the way for system efficiency optimisation. Rather than deploying new smart meters or sensors, we’re relying on existing data streams to enhance energy management and get insight into energy flows.”

Automatic statistical analysis has enabled Sydney Water to quickly respond to anything unusual within plant processes. For most of the critical processes, they analyse the averages and add or subtract three standard deviations, then generate trend data.

When the trends exceed those standard deviations, it automatically produces a report that goes to the appropriate people via email. There are also applications relating to comparing plant-to-plant performance, because the organisation’s strategy is exposed to all of the data — all of the business processes in one database.

As a result, Januszek’s team can potentially check which plants with similar processes are performing better and link automatically to other databases — also within the business intelligence system.

Server virtualisation

Maintainability and security are two factors driving a shift to virtualising SCADA systems and operational servers. When it comes to automation systems at large processing plants, there are often many automation servers which run 24/7. They usually consist of HMI servers, OPC data servers, historian servers, domain controllers, SQL servers, development servers and many more, which function as a data centre for the automation infrastructure.

PT Vale’s mine operation in Sorowako, Indonesia, initially had approximately 40–45 automation servers and PC applications which looked after the automation function for the monitoring and control of the main processing plant. Now they have been virtualised, there are only two high-performance

Figure 1: NuRON interface. Image courtesy of South East Water.
servers performing the same functions. As a result of the changes to the automation data centre, PT Vale has made approximately 50% in capital cost savings.

Under the guidance of Indin Hasan, process plant control & automation engineer at PT Vale, server set-up and maintenance have been designed to ensure the servers operate effectively at all times. But it is by no means an easy task to streamline the automation system. And it can be very expensive on capital and maintenance costs (such as power and cooling systems).

“Traditional servers running a single operating system never fully utilise the available resources (both CPU and RAM). At best, if you’re using a physical server, only about 30% of the resources will be utilised effectively,” he explains.

To address these problems, his team has implemented virtualisation technology to reduce the number of hardware servers and cut both capital and maintenance costs. This has paved the way for a series of important benefits, such as robustness or continuous availability, by protecting a virtual machine with a copy. When this feature is enabled, a secondary copy of the original or primary virtual machine is created. All actions completed on the primary virtual machine are also applied to the secondary one. If the primary virtual machine becomes unavailable, the secondary machine activates immediately.

A virtual server is run on an isolated set of file systems. There is technology available to enable migration of powered-on virtual machines from one physical server to another with zero downtime, continuous service availability and complete transaction integrity. Therefore, periodic maintenance will not interrupt the automation servers’ operation.

Thin Client technology has also been implemented to address the high maintenance costs and failure rates of 76 HMI PCs in operation across the processing plant. The Thin Client is a virtual desktop technology in which all the computing process activities of the HMI clients are conducted by servers situated in an independent clean room. Results of the computing are subsequently delivered via an ethernet network (PCoIP) to the Thin Client device — which doesn’t require a cooling fan or moving parts such as hard disks and CD-ROM drives.

“Capital cost for replacing the entire HMI client set-up to Thin Clients is reduced by 25%. Failure rates have reduced by more than 95%, because the equipment no longer requires a cooling fan or moving parts — subsequently reducing fine dust entry and damage due to vibration,” said Hasan. Preventive maintenance man hours have also decreased by 90%.

The SCADA Australia conference brings together a cross-industry selection of SCADA professionals to present, analyse and debate innovations in SCADA and DCS. It is held annually in May. More information can be found at: http://www.scadaaustralia.com.au/default.aspx.

SCADA Australia Conference www.scadaaustralia.com.au
SCADA SOFTWARE

Schneider Electric has upgraded its StruxureWare SCADA Expert ClearSCADA software platform.

Improvements include an enhanced WebX user interface — so that process information is available through any device with HTML5 cross-browser support for trends, alarm lists, event lists and queries. Integration of telemetry hardware has also been extended using Realflo software, a flow measurement application, now including support for Realflo Liquids 6.91, plus native support for well-known third-party flow computers via an updated oil and gas EFM driver suite.

A substantial increase in security features includes enhanced user account security, auditing of the system security through a dedicated security event list and dedicated security logging queries.

By providing remote configuration capabilities and collecting data from multiple ClearSCADA systems into a central enterprise repository, ClearSCADA software helps reduce costs while providing crucial, business-relevant data across all operational levels.

The combination of templated configuration and object-based architecture simplifies scalability for oil and gas as well as water/wastewater installations, while also establishing a relevant system for the entire system life cycle.

Schneider Electric Industry Business
www.schneider-electric.com

ETHERCAT/PROFINET I/O GATEWAY

The IP67-protected EP9300-0022 EtherCAT Box from Beckhoff connects Profinet RT networks with EtherCAT I/O modules, enabling local installation in the field. This extends the higher-level network — entirely without the use of a control cabinet — with a subordinate, high-performance and ultra-fast I/O solution. The telegrams are transferred from Profinet RT to EtherCAT and vice versa, so that the EtherCAT Box modules can be integrated seamlessly. The shock- and vibration-resistant sealed EP9300 EtherCAT Box is connected to Profinet via a decoded M12 socket.

The three EtherCAT Box series — EP, EQ and ER — provide a range of IP67 I/Os which can be installed directly in the field. The range includes standard digital I/Os and modules with special integrated functions, such as stepper motor modules or modules for more complex measuring tasks.

The EtherCAT Box I/Os are available with different housing types to meet the requirements of a wide range of industrial applications. The EP series with plastic housing is suitable for moist, dirty or dusty conditions in general machine construction, in assembly applications or in semiconductor and logistics environments, for example. The EQ module series, with its stainless steel housing and IP69K protection, is designed for applications in the food, beverage, chemical and pharmaceutical industries. The modules from the ER series have a particularly robust, fully sealed die-cast zinc housing, making them suitable for harsh industrial and process environments, such as pressing systems and metal foundries, or automotive environments and robotics applications where weld spatter resistance is a key requirement.

Beckhoff Automation Pty Ltd
www.beckhoff.com

RUGGED INDUSTRIAL TABLET

The RTC-900B rugged tablet computer has been designed to meet the IP65 and MIL-STD 810G standards, making it resistant to moisture, dust, shock and vibration.

The RTC-900B features an Intel Atom E3825 1.33 GHz Dual Core processor with 4 GB of DDR3L memory. A 10.1″, 1280 x 800, 350 nits LCD with a capacitive multitouch screen provides the user interface. Onboard communication includes WLAN 802.11b/g, Bluetooth 2.1 and an optional 3G modem module.

Additional I/O includes a micro-USB 3.0 port, micro-HDMI port and a micro-SD card slot. Built-in features include a front 2 MP camera and a rear 5 MP camera, a G-sensor, light sensor, e-compass, GPS navigation, speaker and microphone. A high-performance, lithium-polymer, high-capacity battery provides 7 h of operation.

The RTC-900B is supplied with Windows Embedded 8.1 Industry Pro.

Interworld Electronics and Computer Industries
www.ieci.com.au
Flexible mounting options
Fastening can optionally take place on three different sides by means of direct mounting on the relevant machine component, or by using a mounting bracket or a groove profile. This allows for maximum flexibility during installation.

High flexibility thanks to unlimited approach options
The secondary side can be approached by the primary side from any direction. The connection is established as soon as both modules are positioned opposite one another. The connection remains stable even in the event of rotational movements.

High power density with maximum efficiency
For the first time ever, 240 W of power can be transmitted contactlessly via two especially small modules. Extremely low transmission losses translate into an efficiency level of up to 90 %.

Complete protection against humidity and dirt
Unlike conventional plug-in connections, which only provide IP 20 protection when unplugged and are therefore unprotected, FreeCon Contactless offers IP 66 – permanently. So, with FreeCon Contactless, contacting problems caused by dirt are a thing of the past.

FreeCon Contactless
Wireless power transmission up to 240 W
Let’s connect.

FreeCon Contactless enables reliable and contactless transmission of up to 240 W of power within a compact size and maximum efficiency. This unique product solution opens up completely new areas of application, since for the first time ever an automated process can be used to establish a connection which would previously have to be plugged manually. FreeCon Contactless can securely transmit power even in the case of rotational movements. Control can even be made directly via PLC, and therefore possible to switch 10 A without the need for an additional contactor.

For completely wear-free and efficient transmission of power, Weidmüller’s FreeCon Contactless innovates the field of connectivity once again. Let’s connect.
ENERGY HARVESTING TRANSMITTER
The Rosemount 3051S wireless pressure transmitter is the first Emerson wireless transmitter capable of utilising energy harvesting technology.
*Emerson Process Management*
http://bit.ly/1Nf16Bi

VIDEOSCOPE
The Olympus iPLEX UltraLite is designed to simplify industrial visual inspections where portability and access are an issue.
*TechRentals Pty Ltd*
http://bit.ly/1EyQANX

WIRELESS TOWER LIGHT
The TL70 wireless tower light provides monitoring and visual status indication where wired solutions are not cost-effective, practical or possible.
*Turck Australia Pty Ltd*
http://bit.ly/1TA4GFL

INTELLIGENT ENCODERS
This range of intelligent encoders can be used as incremental encoders, as counters or for rotational speed monitoring.
*Ifm efector pty ltd*
http://bit.ly/1fbn4aj
Compact, True-flat, Robust

Advantech’s TPC-51T series thin client touch panel computers are the latest of their type to use the Intel® Atom™ dual-core processor, which brings 2.7x multi-tasking and graphical performance improvements. It features the much heralded 'Door Technology, a truly flat seamless screen and multitude of I/O ports whilst being able to operate in a wide range of temperatures.

The series offers a better performance at a low cost, and also offers the advantage of decreasing the effort in transition by continuing to use the same cut-out dimensions of the last 10 years. Thus, allowing the TPC to be upgraded without changing the mechanics of the solution.

Learn more at www.advantech.net.au
**NEW PRODUCTS**

**SERIAL DEVICE GATEWAY**

The Aaxeon Technologies STE-6104C-T is a rugged high-speed gateway that allows almost any serial device to be connected to an ethernet network.

The product has flexible configuration options enabling it to be set up over ethernet by telnet, web browser, serial console or other utilities. It is packaged in a rugged metal housing for DIN rail or wall mount with a 9–48 VDC wide power input range. It has an operating temperature range of -40°C to 80°C for harsh environments.

The unit comes equipped with Virtual COM software that provides existing Windows-based applications to access a serial device by mapping to a remote serial server via ethernet. It is also used as a field device to connect ethernet through the TCP/IP protocol directly.

It is specifically designed for use with PLCs, HMIs, barcode scanners, data terminals, electronic kanbans, shop floor control systems and pick-to-light systems.

**Antaira Technologies**

www.antaira.com.tw

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**DIGITAL PRESSURE GAUGES**

Suitable for field applications as well as calibration laboratories and workshops, Crystal’s XP2i digital pressure gauges provide NATA-certified accuracy in a rugged and user-friendly unit.

Ranging from 7 bar (100 psi) to 690 bar (10,000 psi), the generation 3 models have a 32,000-point logging capacity at intervals from 1 s to 18 h. The ultralow-power (ULP) setting allows for logging for up to a year, and the pressure safety/pressure relief value (PSV/PRV) mode can be used to increase the measurement rate to approximately eight times per second.

The Crystal XP2i series will log actual pressure, average pressure, and average pressure with peaks or on demand. It is accurate to ±0.1% of reading between 20% and 100% of full scale, and to ±0.02% of full scale between 0% and 20% of full scale.

It is also fully temperature compensated and intrinsically safe to IECEx, ATEX and DNV standards.

TechRentals offers a set-up and download service for this device.

**TechRentals**

www.techrentals.com.au

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**MAGNETIC FLOWMETERS**

Emerson Process Management has announced the addition of Modbus RS485 and a low-power option to its Rosemount 8700M magnetic flowmeter range. With the Modbus output, access to advanced diagnostics (including SMART Meter Verification) and electrode coating detection, the product provides users with information about the flowmeter, installation and process.

The scalable power supply options enable access to the reliability of a magnetic flowmeter, coupled with the large amount of data available through the Modbus protocol, to provide a solution suitable for remote locations where power is limited. The combination of the low-power capabilities and the Modbus output create a solution for applications such as well pad water measurement.

The updated range also leverages human-centred design concepts for easier installation. With a fully functional, through-the-glass local operator interface (LOI), all diagnostic information is readily available. Enhanced terminal compartments offer more space and more robust connections on the sensor and transmitter, making installation and field wiring easier. Finally, the ProLink III PC-based configuration tool has been enhanced to provide a simple and intuitive way to configure the Rosemount Modbus magnetic flowmeter transmitters.

**Emerson Process Management**

www.emersonprocess.com.au
DIN RAIL PC
Advantech’s Intel Atom Quad-Core Control DIN rail PC UNO-1372G features three GbE ports for fast data transfer; two mPCIe slots to enable connection to third-party devices; one mSATA connector for an SSD or HDD; two COM ports; three USB ports; eight digital I/O ports; and one HDMI/VGA port.

The UNO-1372G has an upgraded CPU to increase performance and is now able to work over an operating temperature range as low as -20°C and as high as 60°C. To increase functionality, the UNO-1000 series now includes USB 3.0 ports for faster data transfer. An exchangeable RTC battery allows the mainboard clock to continue working in the event of a power failure. The UNO-1372G now also includes Advantech iDoor technology modules. Modules for iDoor systems include: Fieldbus protocols such as Profibus, Profinet, EtherCAT and Powerlink; memory expansion and storage with Backup MRAM; Cfast/Compact Flash and SD/mSD; digital and analog I/O and counters; smart sensors such as multifunction, analog I/O, digital I/O and counters; smart sensors such as a smart meter, pressure sensor, temperature sensor and light sensor; and communication options such as GPS, 3G, LTE, Wi-Fi, GPS, GPRS, ZigBee, RFID, Bluetooth and LTE.

Advantech Australia Pty Ltd
www.advantech.net.au

DEVELOPMENT PLATFORM
The latest version of LabVIEW delivers speed improvements, development shortcuts and debugging tools to empower developers to efficiently interact with the systems they create. LabVIEW 2015 continues to standardise the way LabVIEW users interact with almost any hardware through the re-use of the same code and engineering processes across systems, saving time and money as technology advances, requirements evolve and time-to-market pressure increases.

LabVIEW 2015 supports advanced hardware such as the quad-core performance CompacT-RIO and CompactDAQ controllers, 14-slot CompactDAQ USB 3.0 chassis, Single-Board RIO controllers, Controller for FlexRIO, eight-core PXI controller and high-voltage system SMU.

The platform enables code to be opened faster, with large libraries opening up to eight times faster and eliminating prompts to locate missing modules. Seven time-saving right-click plugins make common tasks faster, and users can develop their own plugins to maximise productivity. Code can also be debugged faster — users can examine arrays and strings in autoscaling probe watch windows and document their findings with hyperlink and hashtag support in comments. Faster code deployment is achieved by offloading FPGA compilations to the LabVIEW FPGA Compile Cloud service.

LabVIEW 2015 is extended by the LabVIEW Tools Network. The Advanced Plotting Toolkit by Heliosphere Research furnishes developers with powerful programmatic plotting tools to create professional data visualisations. The RTI DDS Toolkit by Real-Time Innovations enables IoT applications with scalable peer-to-peer data communication. Additionally, application-specific libraries for biomedical, GPU analysis, multicore analysis and sparse matrix applications are now available free of charge.

National Instruments Australia
www.ni.com/oceania
NEW PRODUCTS

WIRELESS VIBRATION AND TEMPERATURE SENSOR
Banner Engineering has introduced a wireless vibration and temperature sensor. Designed to monitor machines for increases in vibration and temperature, the sensor measures RMS velocity in inches per second or millimetres per second, and temperature. This enables the sensor to identify machine problems before they become too severe and cause additional damage or result in unplanned downtime.

The sensor is optimised to work with 1-wire serial radio devices, such as Banner’s wireless Q45VT Node, the P6 Performance Node and the MultiHop M-H6 radio. Operators can easily set vibration thresholds based on the ISO 10816 standard. When a threshold has been exceeded, the wireless node can provide local indication, send the signal to a central location and send the vibration and temperature data to the gateway for collection and trending.

The wireless vibration and temperature sensor is suitable for a variety of machine monitoring applications, including motors, pumps, blowers and many other types of machines throughout a facility.

Manufactured with a robust zinc alloy housing, Banner’s wireless vibration and temperature sensor is suitable for harsh environmental conditions. The sensor also offers multiple mounting options, including hex screw, epoxy, thermal transfer tape or magnetic bracket mount, to accommodate diverse applications.

Turck Australia Pty Ltd
www.turck.com.au

RH TRANSMITTERS
Michell Instruments has released its latest range of relative humidity transmitters for industrial applications. As well as being flexible for use in a wide range of processes, the HygroSmart 280 and 290 series include an interchangeable sensor that allows routine maintenance to be made in 30 s for most models.

At the heart of each instrument is the HygroSmart I7000XP. This sensor is fully replaceable and, because all the calibration data is incorporated, makes routine maintenance and recalibration easy. The I7000XP uses Michell’s latest polymer capacitive sensing technology, the H8000 tile, to provide reliable accuracy of 1% RH.

The HygroSmart 280 and 290 series feature a number of configurations, designed to suit different applications. These include duct-mount, wall-mount and remote sensor versions, each with optional displays for easy interrogation and configuration. Updated software also allows access to all configuration settings and data collection from a control room. The units can each be configured by users to suit specific needs including outputs, units and alarms.

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

CELLULAR ROUTER
Designed and manufactured locally to suit Australian environmental conditions, the Cybertec 2455 LTE 4G cellular router provides a high level of reliability with isolated power and serial ports. The device’s built-in dual-SIM failover architecture alleviates potential issues from network outages by offering redundant network connectivity.

The product provides secure remote cellular connectivity to ethernet and serial-based devices by incorporating an integrated two-port ethernet switch and an isolated serial RS232 interface. Smart multilevel watchdog technology enables long-term operational stability, while comprehensive remote management and diagnostic tools provide maintenance and control over the cellular network.

The device features support for 2G, 2.5G, 3G, 3.5G and 4G networks, with GPS location and PPP server/PPP client/modem emulation. It also supports DNP3 outstation and provides email and SMS functionality for remote monitoring, diagnosis and event management.

Madison Technologies
www.madisontech.com
The LMK 358H with separable stainless steel housing and ceramic sensor from BD Sensors has been designed for level measurement in waste water, waste and higher viscosity media.

With a quick and easy-to-change connector, the transmitter head is simply plugged into the cable assembly.

Reduce downtime and save labour costs with the LMK 358H.

LEVEL MEASUREMENT MADE EASY.
CASE STUDY

Level measurement and protection for PCB electroplating

Varioprint was founded in 1970 in Heiden, Switzerland, and today employs 140 people and is one of the leading technology suppliers in Europe. Two modern plants, the latest equipment, as well as clean and airy premises provide the environment for the building of customised printed circuit board solutions.

Varioprint has an export share of over 70% and delivers to more than 25 different countries, which in addition to European countries include the USA, South America and Asia.

A cutting-edge Galvabau AG electroplating system has been running at the circuit board specialist since 2013. It has a total of 52 dip tanks with 80 stopping points along a 27 m long line equipped with three automatic carriages. The fully automated system also features sensor solutions by SICK: UP56 ultrasonic sensors for level measurement and C4000 safety light curtains for area protection.

The electroplating process involves a current passing through an electrolyte bath. The metal to be applied to the object in question — such as copper or nickel — is connected to the positive terminal (anode), while the object to be coated is connected to the negative terminal (cathode). The current causes the metal ions to be detached from the anode and deposited on the workpiece.

Chemistry plays a crucial role in the electroplating process: the tanks contain a mixture of water and additives which must be in perfect proportion with one another. Furthermore, these mixtures must not exceed or fall below certain levels in the tanks.

“For level sensors that detect evaporation losses and leaks in the tanks, and monitor the medium supply, bubbling and spattering media create a really tough environment to work in,” said Patrick Risi, product manager at SICK’s Stans site in Switzerland. “Thanks to the UP56, we were able to provide Galvabau with a rugged, reliable solution that has none of the disadvantages associated with ordinary float switches or capacitance probes.”

As well as providing accurate measurements, ultrasonic level sensors are also distinguished by their ability to withstand a range of aggressive media. The corrosion-resistant stainless steel housing has been issued an IP67 enclosure rating. The transducer is protected by a Teflon coating.

“The UP56’s measurements and notifications are reliable and error-free,” confirmed Christoph Hutter, head of technical services and senior manager at Varioprint AG. “The level measurement values at the individual dip tanks are displayed on the control system’s visualisation screen. If the level is too low, the medium in question is automatically refilled to the right level.”

Galvabau’s managing director, Markus Gisler, also has high praise for the number of sensor parameters that can be configured when commissioning the electroplating system.

“We can switch the analog signal and adjust the switching signal limits using the integrated operator display, a PC or even Connect+,” he said.

A total of three carriages are responsible for transportation at the fully automated electroplating plant. They transport three to six circuit boards to the dip tanks at a time and then return them again once the electroplating process is complete. To prevent the carriages from colliding with other objects or people in the plant, vertical C4000 safety light curtains monitor the path of the carriages. Classified as Performance Level PL e according to EN ISO 13849 and Type 4 according to IEC 61496, these sensors meet the very highest standards of protection. The main benefits for Varioprint AG are the system’s sensing range of 7 m, the ability to cascade the systems over the entire length of the facility and the beam coding feature, which prevents the sensors from interfering with one another during operation. If anyone breaches the protective field, the C4000 safety light curtains stop the carriages in their tracks instantly.

SICK Pty Ltd
www.sick.com.au
Greater savings start with greater process

Optimisation of the various processes across your plant operation can result in valuable savings of time and money. To aid our customers who invest in process optimisation NHP has a specialist team with expert application knowledge to help you integrate the optimum solution for your plant.

Our exclusive PlantPAx™ process automation system from distribution partner Rockwell Automation utilises Integrated Architecture components and enables multi-disciplined control and premier Integration with the extended product portfolio.

Bringing together the world’s leading products with those who know them best, NHP promise to achieve genuine results that have the ability to continuously perform for you and your business.

Scan the QR code to access the NHP Solutions City where you can view exclusive video content, case studies and literature, or visit nhp.com.au
**NEW PRODUCTS**

**EXPLOSION-PROOF TABLET**
The Getac T800 rugged tablet is ATEX Zone 2 and 22 explosion proof certified. The tablet can be used in petrochemical, pharmaceutical, oil and gas, and other industrial situations for pipeline inspections and maintenance operations. It has also received US military MIL-STD-810G and IP65 certifications.

The T800-Ex is equipped with the Intel Quad-core Bay Trail M N3530 2.16 GHz processor and an 8.1” 1280x800 HD screen, and weighs about 915 g, while its slim design makes it easy to carry. The proprietary LumiBond technology enhances the screen’s readability, sharpness and colour display under bright light.

In the presence of flammable gas and combustible dust, unplugging or plugging in devices should be avoided to prevent generating sparks. The T800-Ex’s I/O ports and internet connections are therefore wireless. The built-in 802.11ac and Bluetooth 4.0 network cards are equipped with 3D antenna technology that strengthens signal reception. Users can also take advantage of high-speed communication and rapid data transfer through its 4G LTE support.

The T800-Ex offers optional 1D/2D barcode readers, as well as the SnapBack backup battery module that can extend the total battery hour life to 16 h. Users can choose Microsoft Windows 7 or Window 8 as the main operating system.

Getac Technology
www.getac.com.au

**ETHERNET-EXTENDED MONITORS**
Siemens is extending the possibilities for its industrial flat panel products through the integration of an Ethernet interface.

Previously, industrial monitors could only be used via the DVI graphics interface and display port, limiting them to a maximum distance of 30 m from the server. The Ethernet interface now enables the use of monitor screens as far away from the server as desired.

The 19” and 22” glass-front monitors support intuitive operation with gestures and multitouch operation even if the operator is wearing work gloves.

A standard CAT cable transmits video and USB signals. On the PC side, only a standard Ethernet interface is required. Up to four monitors, equipped with a continuous glass front screen, could be connected to an IPC at one time, allowing for extended desktop and clone modes.

Connection to an Ethernet network instead of via a graphics interface brings greater flexibility in the development and introduction of decentralised operating concepts in mechanical and plant engineering.

Time and cost savings can also be achieved in parallel due to reduced effort in terms of the cabling required.

Siemens Ltd
www.siemens.com.au

**AUTOMATION DEVELOPMENT SUITE**
 Automation Builder 1.1 provides an integrated development environment for solutions using the spectrum of automation components — including PLCs and safety PLCs, motion controllers, drives, robots and HMIs — reducing software complexity and cutting time to market and cost of ownership.

The latest release of ABB’s software extends the data exchange capabilities with electrical planning and engineering software, with a bidirectional interface to EPLAN Electric P8. Electrical automation and PLC design data may be imported, modified and transferred back to the electrical CAD environment, eliminating any need to manually enter data and thereby ensuring synchronisation of signal identification between the two software environments. A comparison function also allows engineers to see what might have changed since they last looked at a project, and the ability to use profiles of previous development tool versions for compatibility.

ABB is also introducing an easy-to-use download and licensing system. ABB offers three licensing options: a basic free version suitable for first time PLC users and engineers working on smaller-scale automation, motion and drive projects; a standard version which supports integrated engineering of advanced and complex systems including the use of safety PLCs; and a premium version.

The premium version incorporates C/C+ programming tools, E-CAD interfaces and other high-level features for optimal productivity and easy collaboration, and simpler management of engineering data on large-scale projects involving thousands of I/O points.

Users may also automatically update the suite of software tools to the latest versions using a ‘one click’ mechanism.

ABB Australia Pty Ltd
www.abbaustralia.com.au

**GETAC TECHNOLOGY**

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**ETHERNET-EXTENDED MONITORS**

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Since the first industrial revolution, operational technology (OT) has been central to the global economy. It keeps industrial networks and processes running, letting business automate industrial activity where possible — thereby delivering efficiency and control.

As networking technology has changed almost everything about our professional and personal lives, two separate silos have developed: the OT environment, which sits separate from other technology; and the information technology (IT) environment, which connects to the world via the internet.

Due to the growth of the internet, cloud, the Internet of Things and internet protocol-based communications, another, quieter revolution is taking place. This revolution is the convergence of OT and IT.

OT networks tend to be based on legacy technologies and, in the past, have been kept physically separated, or ‘air gapped’, from anything connected to the outside world. But today, by connecting these systems to corporate IT systems, businesses can increase efficiencies, drive cost savings, cut delivery timeframes, improve decision-making capabilities and enhance competitiveness.

The oil and gas industry is one area where the convergence of the OT and IT environments has become common. As they grow geographically, companies rely more on technology, analytics and automation to stay competitive. This includes deploying components, systems and people that can communicate and share information with each other in real time. The benefits are particularly attractive to those companies that have been hit by diminishing profits as a result of commodity price uncertainty and hard-to-reach resource reserves. The main reasons these organisations are driven to converge IT and OT systems are the need for automation, the need for operational excellence and the need to adapt to changing working conditions.
The new approach required to manage IT/OT security

The convergence of OT and IT lets oil and gas companies increase efficiencies, drive cost savings, cut delivery timeframes, improve decision-making capabilities and enhance competitiveness. However, with increased convergence comes increased risk, as systems that were previously unconnected are now potentially accessible through an internet connection.

OT systems were not originally designed or implemented with this connectivity in mind and have therefore been largely unprotected from the security threats that abound on the internet. The threat to these systems is very real, not only from accidental misuse and malfunction but also deliberate malicious activity from inside and outside the business.

With this increase in both the prevalence and the possible severity of physical and digital security threats, it is absolutely essential to ensure operations are resilient to cyber threats and demonstrate a suitable degree of system redundancy. Organisations that fail to do so can open themselves up to significant risks.

In order to manage these risks effectively, the following steps are recommended:

- Understand what assets and systems exist and determine which components need to be protected, as well as their relative importance with respect to the organisation’s processes;
- Determine which assets are critical and which are non-critical;
- Break down the structure of the systems into logical and functional groups;
- Create a layered defence around each of the functional groups and the critical systems that have been identified;
- Control the access of people, data and commands that flow from one group to another;
- Establish ongoing periodic checks and assessments to ensure defences remain effective.

Securing network segments and assuring the integrity of communications between them

As IT and OT environments converge and the security of physical air gaps is removed, protecting operational systems from unauthorised access and control becomes even more critical. However, the technology of many OT systems lacks the basic authentication and integrity checking controls used to implement security that may be found in today’s IT systems. The challenge is to protect operational systems that lack these basic controls, without implementing security solutions that could threaten the business efficiencies offered by merging IT and OT environments.

As a first step, security within OT environments can be improved by assigning the assets, systems and processes in industrial processes and control systems into functional groups with logical groupings for access control. This ensures that communications and processes taking place within each functional zone are relevant and authorised, preventing any activity or communication unrelated to those zones.

In addition, networks can be architecturally divided into discrete segments. This enhances security by controlling network segments — restricting and blocking unauthorised communications or those that are using the wrong protocols and incorrect formats — and by preventing the flow of messages between segments which are targeted at ports, destination addresses or devices that do not exist in the destination network segment.

Ideally, this requires a solution that enables assured information exchange between segmented networks so that business processes can operate securely. This solution would enable a remote supervisory network to communicate securely with, and control elements within, the control system or field systems, while still facilitating secure communication between industrial systems and business networks on the corporate LAN.
An effective solution for securing network segments and assuring the integrity of communications between them must meet the following seven high-level requirements:

- Help to implement network segmentation;
- Allow bidirectional information exchange;
- Prevent unauthorised systems from exchanging information;
- Positively filter exchanged information, allowing only information verified as ‘good’ to pass into sensitive network segments;
- Ensure that the integrity of information is preserved from source to destination;
- Be as transparent to the existing systems as possible;
- Maintain the reliability of the existing systems and data flows.

Detect the presence of malware or any unusual system behaviour

Monitoring networks and network activity has always been important for managing the health of any network. As the threat levels against organisations increase, the need for more proactive and more pragmatic monitoring grows. Where OT is converging with IT, monitoring requirements now extend to both the enterprise LAN and the supervisory and control networks.

Monitoring of the enterprise LAN is important, not only to better protect the enterprise but also in order to mitigate risk and prevent cyber attacks and malware from spreading into the supervisory networks, ICS and industrial processes. Traditional forms of enterprise LAN security (such as vulnerability scanners, firewalls and IDS) aim to identify, block or remediate cyber risks before any damage is done. However, as cyber attackers have become more skilful, the ability to identify a virus and block it before it enters the network is no longer enough. Increasingly, a cyber attack will consist of a series of seemingly unrelated events which are deliberately conducted over an extended period of time so as not to raise suspicion. To detect these, cyber analysts need to look for anomalous behaviour which could herald future attacker intentions.

When monitoring should also include supervisory networks and industrial processes, organisations will need to deploy a combination of different techniques. Firstly, organisations need to recognise that, as supervisory networks increasingly become TCP/IP enabled, the cyber threat to the IP components (laptops, workstations, databases, servers, firewalls) within OT networks becomes similar to that which threatens the enterprise LAN: the security considerations for the enterprise LAN also apply for OT networks. So organisations need the same visibility into cyber activity in the OT networks as in the corporate IT network. Some security monitoring solutions deployed in the corporate IT environment may also find applicability within certain areas of OT.

Secondly, organisations need to appreciate that the nature of the threat to industrial processes and OT systems could be different to the threat to IT systems. A control system needs to be able to see, monitor, manage and respond to the industrial networks it is managing. If a valve stops working, or a temperature starts increasing beyond safe parameters, the supervisory network needs to see this, register it and respond fast. If malware targeting OT systems removes this visibility, the OT environment as a whole is under threat. With the enterprise LAN, malware may seek to enact a denial of service (DoS), but with OT networks and industrial processes, the equivalent is to create a situation with loss of view and loss of control.

The effect that a DoS attack could have on OT systems may be far more serious than on IT systems: an outage on a mail server could stop communication for a period of time, but a loss of control preventing telemetry data being accurately received could lead to incorrect control of industrial processes and possible damage to those industrial systems.

To address this threat, organisations need a solution which helps analysts build an overview of control processes, establishing a baseline of normal activity and behaviour in OT environments and allowing security managers to overlay policies on top of this observed activity. For example, if a clever attacker or malicious insider manages to alter, inject or control commands, the safeguards provided by the management system may be lost. However, an independent monitoring device which understands the operating policies for specific devices could generate an alarm if a value is changed or a command is instructing a device to function outside of an authorised range of possible operation.

Conclusion

The convergence of IT and OT offers companies tremendous opportunity to enhance productivity and increase efficiency and competitiveness. However, enterprises need to recognise that the risk of cyber attack and other security violations has increased, opening up many new security challenges.

The approach required to manage these threats requires a different mindset and methodology to traditional IT security for a number of reasons. Converged IT and OT systems result in more complex architectures, making it harder to accurately determine the security requirements of the various components and to quantify the levels of risk.

Network architectures to segregate different domains are also required. These must ensure the availability of OT systems at all times, avoid any latency in real-time protocols and ensure the validity, integrity and authorisation of data exchange.

Organisations should follow three basic steps to ensure security is managed as part of any IT/OT convergence activity:

- **Prepare:** Understand what assets and systems exist. Determine which components need to be protected, their relative importance with respect to the organisation’s processes and the structure of the network.

- **Protect:** Assign assets, systems and processes into functional groups and use these to define functional zones in the network. Use advanced solutions that can allow bidirectional information exchange, maintain the reliability of data flows and avoid additional latency, but which can ensure the integrity of information transfer and prevent unauthorised systems from exchanging information by positive filtering.

- **Monitor:** Establish ongoing periodic checks and assessments to ensure defences remain effective, and be ready to respond if attacks or vulnerabilities are detected. This includes the monitoring of both the enterprise LAN and the supervisory and control networks. Advanced monitoring approaches will be needed to detect modern advanced attackers, and the approaches for the supervisory and control network will also need to take into account the specific characteristics and risks associated with such networks.

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NEW PRODUCTS

ULTRASONIC FLOW METER
With a new epoxy-coated aluminium industrial design, the GE AT600 ultrasonic flow meter is designed to deliver quality flow measurements in a clamp-on configuration and can be easily installed right at the process measurement point. Replacing the previous AT868 model, it is designed specifically for municipal applications such as water, wastewater and other industrial flow applications.

The AT600 provides the advantages of ultrasonic flow measurement at a lower cost, with no calibration required and maintenance-free operation. Set-up and installation are simple, and the AT600 supports a wide range of pipe sizes and materials.

Thermo Fisher Scientific
www.thermofisher.com.au

IOT DEVELOPMENT KIT
M2Mzone has launched its Cumulus Internet of Things (IoT) kit to allow companies to evaluate and quickly develop Industrial IoT applications.

The Cumulus IoT kit can be used for both cloud and non-cloud applications. It contains a 3G cellular terminal with RS232/USB ports for external host control and GPIO ports for sensing and control. A Telit m2mAIR Cloud (deviceWISE) trial account and a Telit m2mAIR Mobile SIM trial account are also included with the kit.

The Cumulus IoT kit will interact with the Telit m2mAIR Cloud by connecting the included GPIO PCB, power and the antenna to the 3G terminal. The 3G terminal has pre-installed Python script to demonstrate the GPIO board push-button and to interact with deviceWISE.

The Telit deviceWISE Application Enablement Platform (AEP) connects the user’s ‘things’ to their ‘apps’ — seamlessly integrating any devices, production assets and remote sensors with web-based and mobile apps and enterprise systems. The easy-to-use deviceWISE portal has all the necessary visualisation tools and dashboards for most remote tracking, monitoring and control applications across all industries and markets.

The 3G terminal is a production-ready unit with global network approvals. Further development of the onboard script can be done from the Python source framework with code supplied.

Code examples and libraries for several programming languages are also available for developing external host processor applications that connect via the terminal serial ports. A large selection of development tools is available free of charge from the internet.

Glyn Ltd
www.glyn.co.nz

NETWORK MANAGEMENT SOFTWARE
The latest version of the Hirschmann network management software, Industrial HiVision 6.0, enables streamlined network management and delivers comprehensive security functionalities for the configuration and supervision of industrial ethernet networks.

Among the enhanced security functionalities of Industrial HiVision 6.0 is the ability to assign various rights and levels of access to the network through a user roles feature, increasing application security and regulatory compliance.

All devices on the network can also now be easily configured and managed by referring to a graphical topology map that outlines the current state of each Hirschmann device and where security functions should be used, reducing the risk of network security misconfiguration.

All systems can be accessed with one username and password through a single sign-on function. Standard security functions can be applied with a security lockdown feature across all devices with just a few clicks.

In addition to enhanced security functionalities and streamlined network management capabilities, the updated software also offers improvements to the HiMobile client for Industrial HiVision. Available as an app for iOS, Android and Windows tablets and phones, HiMobile 2.0 provides a complete graphical topology map of the entire network, including subdomains. Network administrators therefore have access to the information they need at all times for effective network management.

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The future is now: Industry 4.0

Our world is becoming increasingly digitised, from personal devices to complex systems in industry. The convergence of the physical and virtual worlds offers boundless opportunities, but also requires further understanding before the benefits can be realised.

Often bundled under buzz words like the Internet of Things and Industry 4.0, solutions are conceptualised as being ‘next stage’ and ‘in the future’.

However, holistic automation solutions covering all major Industry 4.0 requirements are already available today.

Join Chris Vains, Siemens General Manager for Factory Automation, and David Thomason, Siemens General Manager for PLM, as they explain the proven software and solutions that can enable Australian companies to maximise the benefits and opportunities of Industry 4.0.

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Date: Monday, October 12, 2015
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DUAL PORT BARCODE SCANNER
SICK has released the CLV615 dual port barcode scanner, featuring an integrated switch that makes it easy to install the sensor in a Profinet I/O network.

The CLV615 Dual Port is an addition to SICK’s range of flexible fieldbus identification sensors, complementing the Profinet onboard single port for barcode scanners, image-based code readers and RFID devices. This means that either the existing solution with the external CDF600-2 fieldbus module or the dual-port variant can be used to integrate the scanner in a ring topology.

The compact laser scanner is suitable for identifying totes within picking and conveyor systems and, with a scanning frequency of up to 1000 scans/s and a reading field of between 25 and 330 mm, it is optimised for intralogistics.

There are a number of different configuration methods. As well as typical configuration direct in the control environment (via a GSDML file), the scanner can also be configured using the SOPAS ET user interface. If the barcode scanners are installed in a ring topology, the redundant set-up means that the system will continue running, even if there is an isolated fault in the cable or a field device. This is due to the fact that the CLV615 Dual Port supports the media-redundant protocol, thereby ensuring continued data communication with every device in the network after a short switching time.

TRACE MOISTURE ANALYSER
The Michell Instruments QMA401 moisture analyser features the latest generation of quartz crystal microbalance (QCM) sensor, designed to provide consistently accurate measurements of trace moisture. This consistency is achieved via a self-calibration system that adjusts the analyser against an internal moisture generator. Long-term stability of these measurement corrections is guaranteed, as the moisture generator is supplied with a calibration traceable to NPL and NIST.

Maintaining the system is simple, infrequent and inexpensive: no service at all is required for two years, at which point the desiccant dryer must be replaced — a process that can be carried out by the user in less than 10 min. The internal moisture generator can be replaced simply in the field with a freshly calibrated unit from the factory after three years of operation.

The QMA401 is claimed to be easy to use with an intuitive touchscreen interface for monitoring, logging and configuring parameters. Both real-time trend graphs and alarm indicators are immediately visible in colour on the main display. The instrument is supplied with both analog outputs, and USB and Ethernet digital connectivity, so that the device can be monitored and controlled remotely via a network.

Typical applications for the QMA401 are those which require trace moisture measurements in gases with high accuracy and fast response — such as verifying the purity of semiconductor plasma etching gases, monitoring polymer drying for plastic bottle manufacture and monitoring hydrogen cooling systems for power generators.

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PIEZO TECHNOLOGY IN PNEUMATIC VALVES

Hannes Wirtl and Ulrich Sixt*
Piezo valves are often a better alternative to conventional solenoid valves, especially in the areas of flow and pressure control and as directly controlled proportional valves.

**Piezo technology**

Piezo elements are electromechanical transducers. With the so-called direct piezoelectric effect, a piezo element converts mechanical forces (pressure, tensile stress or acceleration) into a measurable voltage. The inverse piezoelectric effect is precisely the opposite: a piezo element is deformed when a voltage is applied to it, thus generating mechanical motion or oscillations.

The piezoelectric effect was discovered in 1880 by the brothers Jacques and Pierre Curie. They found that, when subjected to a mechanical load, certain non-conductive materials produce electrical charges on their surface, which has been rendered conductive.

Piezoelectric materials, usually special ceramic objects with surfaces which have been rendered conductive, convert electrical energy into mechanical energy and vice versa. The lattice structure of the molecules in these piezoceramics is asymmetrical below the Curie temperature ($T_c$) and is thus a dipole. Under the influence of strong electric fields, it is possible to permanently polarise piezoceramics, or, in other words, give them a preferred direction. The ceramic material then has piezoelectric properties and changes shape when a voltage is applied. 3D deformation takes place along the field lines. Since the ceramic materials have a constant volume, shrinkage occurs in the material at right angles to the field lines.

The advantage of piezo-based drives lies in the fact that they can be energised with almost zero power. In electrical terms, a piezo element is a capacitor consisting of two electrically conductive plates and the ceramic piezo material which functions as a dielectric. Current only flows while the capacitor is charging, and the flow drops to zero when charging is complete. Since electrical power is calculated as voltage x current, the power will be zero if no more current flows. In applications that need to be extremely energy efficient, it is even possible to recover the charging energy when the drive is reset. This can then be used again for the next charging operation.

**Types and versions of piezo transducers and their applications**

Depending on the needs of a particular application, the effect described earlier can be exploited using various types of transducers. Disc transducers, bender actuators and piezo stacks are the basic forms from which piezo elements with more or less complex structures can be derived.

The bender actuator has a rectangular shape. Its primary element is a piece of piezoceramic material which has been rendered conductive on both surfaces. This ceramic material is entirely joined on one side to a substrate which is also conductive. The conductive surfaces of the ceramic layer and the substrate function as electrodes. If a voltage is now applied to these electrodes, the ceramic material expands in the direction of the electric field. Since in most applications bender actuators are fixed at the front end, this results in a bending motion at the free end. Bender actuators are available in multiple versions with different forces and actuator motion, and are highly suitable for use in pneumatic valves. Typical characteristic data include deflection amounting to several tenths of a millimetre and forces of up to 1 N. One special variant which is often used is the trimorph, which has a second ceramic layer on the reverse side of the substrate. This increases the performance of the transducer and can be used in a wider temperature range thanks to its symmetry. Applications for bender actuators can be found in circular knitting machines, blind reading devices (Braille modules) and pneumatic valves — with the latter especially in proportional valves for pressure and flow control.

A disc transducer is also a very simple piezo element. It takes the form of a thin ceramic disc which is bonded to a metal substrate. In order to generate an electric field, the circular area on the surface of the disc has to be metalised. If a voltage is now applied to this substrate and the electrode on the ceramic, the ceramic (as is also the case with the bender actuator) expands in the direction of the electric field and the disc becomes thicker, while at the same time its diameter becomes smaller. Together, the metallised area and the passive substrate act like a bimetallic strip and cause the overall system to bend in a spherical direction. This bending effect is used in, among other applications, high-frequency loudspeakers, sensors, micropumps, fans and ultrasound generators, such as are often used in automobile distance sensors.

Stack transducers (piezo stacks) are stacked piezo discs which are connected in series mechanically and in parallel electrically. In contrast to disc transducers, operation is not triggered by the bending of a composite material but by direct expansion in the direction of the electric field. This configuration allows only short strokes — a maximum of 0.2% of the overall height — but with enormous actuating forces up to several kN. Applications can be found in the areas of liquid valves, such as diesel fuel-injection systems, and micropositioning.
Operation of piezo valves

Piezo elements in the shape of bender actuators are primarily used in pneumatic valves. The performance of piezo valves depends on the strength of the electric field: the greater the field strength, the better the performance of the actuator and the valve. Compared to solenoid valves, piezo valves need no holding current to maintain a switching state. The higher supply voltage required by piezo valves in comparison with solenoid valves is of significance only during the switch-on phase. Even then, the switch-on energy consumed is well below the actuation power levels normal in pneumatics.

This switch-on energy 'E' can be calculated as an approximation using the formula $E = CV^2/2$, where $C$ is the capacitance of the transducer and $V$ is the control voltage. Values usually lie between 0.5 and 5 mW because the capacitance of the transducer is generally around 30 nF, while the control voltage can be up to 300 VDC.

Important to know: the switch-on energy of piezo valves is always specified in milliwatt seconds only. It is not possible, as it is with solenoid valves, to specify power ratings in watts.

When a piezo valve has been switched on and the connection to the power supply is then interrupted, the valve status is maintained because the charge carriers are no longer capable of flowing away due to the interruption. To reset the valve, the charge must be actively removed from the transducer. This can be achieved through buffer storage in another system (energy recovery) or by converting the energy to heat (short circuit). A changeover switch instead of an on-off switch is therefore required in order to operate the valve.

High-voltage generation

High-performance valves need to be operated using high voltage. The principle of a boost converter has proved itself ideal for generating this high voltage. A boost converter is extremely inexpensive and requires little space. With this device, the very high induction voltage generated during the cyclical switch-off of a coil (storage choke) is fed via a diode and stored in a capacitor — in the simplest case, the piezo transducer can also be used as a capacitor.

This circuit allows an output voltage of 300 V with an input voltage of as little as 1 V. The oscillator for the switch can often be realised by using the microprocessor already present in the system controller. However, there are also ready-made integrated circuits especially for this application. Modules of this kind also manage output voltage regulation and ensure maximum efficiency, which is well over 80%.

Advantages of piezo valves

In the world of electrically controlled pneumatic valves, solenoid valves are the absolute standard with a market share of almost 100%. Nevertheless, piezo valves offer many advantages over the prominent solenoid valves and open up entirely new areas of application.

Low energy consumption

Thanks to their capacitive principle, piezo valves require virtually no energy to maintain an active state. The valves do not generate heat, provided that high-frequency control is not used due to the fact that switch-on energy is frequently required. The energy balance increases along with the required switching frequency.
Piezo technology is ideal for use in the ‘very low power’ range of battery-powered devices. Compared to solenoid valves, it can increase the service life of a battery pack several times over in some cases.

**Intrinsic safety**
Intrinsic safety is increasingly specified as the required degree of protection for environments with potentially explosive atmospheres. An electrical system is intrinsically safe if the greatest amount of energy it can store is not enough to cause ignition of the atmosphere in the event of a fault. Piezo valves are an ideal way of meeting this requirement, thus resulting in a large number of potential applications.

**Switching speed**
Piezo valves can be incredibly fast, easily reaching the sub-micro-second range. These valves are the ideal solution for applications where speed plays a decisive role. Applications include high-speed sorting systems and, in particular, closed-loop control circuits, as this type of circuit usually works better the faster the individual components react.

**Proportionality**
Proportionality is an intrinsic characteristic of piezo technology. Since ultimately all pneumatic processes in an application are analog, this is an unbeatable advantage: there is no need for pulse width modulation and the associated noise problems as a means of trying to achieve a certain proportionality when switching solenoid valves. This means that piezo valves are very resistant to wear and need only minimal energy input. Combined with their short response times, the proportionality of piezo valves make them ideal actuators for all higher level control systems.

**Antimagnetic**
Piezo technology can also be used without any risk of failure in areas with a high magnetic field strength, for example, magnetic resonance tomography (MRT).

**Minimal weight**
The fact that housings are usually plastic, and, in particular, the absence of iron and copper, make them very portable.

**Low cost**
This technology can be mass produced if large quantities are required, for example, piezo-ignited lighters, which are available for very little money.

**Long service life**
When a system is designed correctly, piezo drives can achieve an unusually high number of operating cycles. They consist of a single solid-state working component with no further wearing parts which might be subject to friction.

**The one restriction**
The advantages described above cannot all be exploited at the same time in a single valve. Valves are generally designed for a particular application in which individual, specific benefits come to the fore.

*Hannes Wirtl and Ulrich Sixt are Head of Development and Product Manager, respectively, for Piezo Valves at Festo AG & Co KG, Germany.

Festo Pty Ltd
www.festo.com.au

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**Figure 3:** Piezoelectric actuators with technical data for various types.

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<th>Force</th>
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<td>100 – 1,000 μm</td>
<td>0.1 – 2 N</td>
</tr>
<tr>
<td>10 – 100 μm</td>
<td>1 – 10 N</td>
</tr>
<tr>
<td>10 – 100 μm</td>
<td>1,000 – 10,000 N</td>
</tr>
</tbody>
</table>

**Figure 4:** Energy-saving potential of piezo valves compared to solenoid valves.
CONDUCTIVITY INSTRUMENT

KROHNE has introduced a hygienic inductive conductivity measuring system, the OPTISYS IND 8100, for the food and beverage industry. With its fast response time, it is particularly suitable for applications in the field of product separation/identification, or in CIP plants to shorten transition phases and save cleaning fluids.

The 3A- and EHEDG-certified measuring system offers two 4-20 mA outputs for conductivity, concentration and temperature. Within the conductivity measuring range from 50 µS/cm to 1 mS/cm, the OPTISYS IND 8100 features 14 preset range/output combinations for convenient commissioning. Alternatively, the analog output can be set freely via the touch display or via PC with optional configuration tool.

For media separation, four conductivity ranges can be defined via PC. The concentration output can be used to display the concentration of four factory-set ranges, such as caustic soda, nitric acid, or a custom medium, with which the concentration curve can be programmed via a 30-point linearisation.

OPTISYS IND 8100 uses a touch display for configuration. It features different selectable display modes and warnings: the background colour can be set in three colours — white, green and red; steady or flashing related to alarm settings. Further there are two solid-state relay contacts configurable as limit switches. The compact design with IP67/69K housing suits pipes with small diameters. The sensor is encapsulated in a PEEK body for use in hygienic processes or directly in concentrated acids or alkalis. Various hygienic process adapters such as Tri Clamp, DIN 11851, SMS or Varivent N are available.

KROHNE Australia Pty Ltd
www.krohne.com.au

COMPRESSED AIR MANAGEMENT SYSTEM

Kaeser Compressors recently launched its second-generation master compressed air management system. The Sigma Air Manager (SAM 2) is designed to maximise the efficiency of all components within the compressed air station. For the user this translates into reduced energy costs, improved efficiency and sophisticated energy management as per ISO 50001.

For optimum energy efficiency, the SAM 2 uses Kaeser’s advanced 3-D Control to analyse the relationship between three key factors: switching losses (start/stop), control losses (idling and frequency conversion) and pressure flexibility (average increase above required pressure). Based on this information and the specific pressure required by the user, the SAM 2 then predictively calculates the optimum achievable configuration and adjusts the connected components accordingly.

Operating status, pressure history, free air delivery, power consumption, as well as maintenance and any error messages can all be easily displayed and analysed on the SAM 2 in both real time and retrospectively from the user-friendly 12” colour touchscreen.

It is also possible to see at a glance whether the compressed air system is operating efficiently from an energy management perspective. Alternatively, data can be accessed remotely using a PC and network connection.

Maintenance and error messages can be immediately sent via email to a preset personal address. The remote diagnostics option also allows for preventive maintenance and service requirements to be based on actual use. Both of these features increase compressed air availability and reliability and also help keep lifecycle costs to an absolute minimum.

Kaeser Compressors Australia
www.kaeser.com

ETHERNET CABLE TESTER

The Fluke DSX-5000 CableAnalyser copper test solution enables testing and certification of twisted pair cabling for up to 10 Gigabit Ethernet deployments, and will certify shielded and unshielded structured cabling systems from Category 3, to 6A and Class C, to FA at Level V accuracy. It is available to rent from TechRentals.

It features high-speed testing, including a 9 s Category 6 autotest, and a built-in alien crosstalk testing capability. PLA004 (Cat 6A/Class EA), CHA004 (Cat 6A/Class EA) adapters are included.

The DSX-5000 also features the ProjX management system for tracking complex jobs, a Taptive user interface for simplified testing protocols across multiple media types and LinkWare management software for test analysis and professional test reports.

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CONTROLLER

NI has announced updated embedded systems hardware based on the LabVIEW reconfigurable I/O (RIO) architecture. This hardware includes the high-performance CompactRIO Controller for integrators with rugged, industrial applications.

The controllers are fully supported by LabVIEW software, the LabVIEW FPGA Module and NI Linux Real-Time, now based on Security-Enhanced Linux, which enables advanced security features for Industrial IoT applications.

The high-performance CompactRIO controller is now available with an Intel Atom quad-core 1.91 GHz processor, making it possible to tackle more tasks with the same controller and process data with greater precision, accuracy and speed. A Kintex-7 FPGA allows for performing inline processing on more channels and to implement more complex filtering and control algorithms.

NI Linux Real-Time gives access to an extensive community of applications and IP with a secure and robust Linux-based real-time 64-bit OS, while an embedded UI offers a local HMI and the ability to use the control system to customise and handle HMI tasks, drastically cutting component costs as well as development and integration time. Secure Digital (SD) storage gives greater control over how data is stored, managed and accessed.

National Instruments Australia
www.ni.com/oceania

WATER-IN-FUEL SENSOR

With no moving parts, the WIF-1250 water-in-fuel sensor from Gems Sensors & Controls has been designed to detect the presence of water in fuel for both storage and mobile systems. Typical applications include off-highway vehicles, heavy machinery, diesel storage tanks and generator sets. It can also be a useful addition to fuel filters and lubing oil tanks to sense lubricant property degradation.

Based on reliable conductivity technology, the WIF-1250 utilises an alternating DC voltage at the probe tip to prevent typical probe material loss through electrolysis.

The sensor can operate over a wide temperature range (-40 to 125°C) and has a built-in slosh dampening of 5 s on the switch output. With an insertion length of only 5 mm and simple NPT mounting thread, the WIF-1250 can be mounted in any orientation for tight spaces or OEM applications.

Control Components Pty Ltd
www.controlcomponents.com.au
VALVE ACTUATOR GEARBOXES

Manufacturing advancements have resulted in enhanced sizing flexibility for AUMA’s part-turn GS gearboxes. Three duty classes, (1, 2 and 3), have been introduced to support all anticipated operations across predicted valve lifetimes. The classifications, paired with the introduction of additional flange sizes, enable the company’s GS gearboxes to be mounted on larger valve flanges.

AUMA GS gearboxes are designed to be used for automating large-scale butterfly and ball valves: the company’s range caters for torques between 500 and 675,500 Nm. Comprehensive product revisions undertaken by AUMA encompassing corrosion protection, surface treatment of metals, enhancement of connection technologies and selection of optimal lubricants have improved the mechanical properties of the gearboxes and given AUMA a platform to reassess permissible torques.

With no binding standard for valve gearboxes, AUMA continues to adhere to EN 15714-2, which defines high lifetime requirements for actuators. EN 15714-2 specifies a sophisticated load profile for type tests and lifetimes up to 10,000 operation cycles, depending on the device’s size.

The lifetime specifications of the standard are the basis of AUMA’s duty class 1 gearbox. For duty class 2, assuming infrequent operation, 1000 duty cycles is assumed: this increases the permissible gearbox torque by 25%. In these instances, smaller and more cost-efficient gearbox sizes can be selected to suit customers’ applications. Duty class 3 is adopted for manually operated gearboxes enabling higher torque levels due to extremely infrequent operations.

Barron GJM
www.barron.com.au
Versatile sensors multitask in German brewery

The Warsteiner Group is one of the leading private brewers in Germany, a family-run business that includes 120 companies worldwide. At the heart of the group is Warsteiner Brauerei Haus Cramer, founded in 1753 in Warstein, western Germany. Here, up to 4000 pallets are moved and 200 trucks dispatched every day.

When selecting sensors for the various inspection tasks within the busy facility, Warsteiner was attracted by the versatility of the BVS-E vision sensors from Balluff. The brewery now uses the sensors after the filling process during a 100% inspection for the presence of labels on kegs, the proper text on bottle labels as well as the quality of six-pack cluster packages.

On the bottling lines for the 0.5-litre bottles, a fast laser is used to burn in the best-before date, the time of day and the machine code on labels affixed to the rear of the bottles. The vision sensor is used to inspect these markings on each bottle with the ‘edge counting’ tool.

Andreas Zydek, managing consultant of BHV Automation, which advised the beverage producer during the design of the systems, explained: “The bottles move extremely fast. As many as 55,000 bottles pass through the system every hour. For the sensor, with its black/white CMOS image sensor (640 x 480 pixels), that leaves a processing time of 25 ms per inspection at 16 bottles/second. But the sensor handles this task with ease. We used a particularly compact VA ring light with a Fresnel lens as additional lighting. It intensifies and focuses the light power of the integrated lights.”

The sensor and light are integrated in a sealed V2A installation housing with AR-coated glass pane, which facilitates simple cleaning of the system with a large amount of water and detergents.

After filling, groups of six bottles are clustered together to form a six-pack. The cardboard packaging consists of a carton, which is automatically pushed over the bottles from above, and three cardboard tabs, which are interlocked below the bottles to form a secure package. Warsteiner uses a Balluff vision sensor here to inspect the tight fit of all interlocks on the bottom of the package. If even one of the interlocks is defective, the six-pack is rejected. The sensor is triggered by the edges of the six-packs as soon as they are detected by fibre-optic cables.

The sensor is also used in the labelling systems for 30-litre and 50-litre re-usable stainless steel kegs. It checks for the presence of labels which provide information about the beer type, filling date, best-by date, batch number and lot size. The sensor reads a 2D-Matrix code which is printed on the label, facilitating a fast detection process during the filling of 1000 kegs/h.

On the labelling line, as soon as a sensor reports the presence of a keg, a label is printed and affixed to the protective cap on the keg. Kegs that do not have a label are immediately rejected.

“We did, of course, consider other processes, such as the use of barcodes,” said Zydek. “But the high read quality is reached in this environment only with a DataMatrix code in combination with an imaging process.”

Should a barcode become damaged, soiled or swollen due to moisture, it can often barely be read, if at all. With a DataMatrix code, on the other hand, 25% or more of the information can be damaged and it is still read correctly. Compounding this problem is the fact that the position of the label on the protective cap varies slightly, so the information must be detected independent of position. For the vision sensor from Balluff with its 360° code detection, this is not a problem.

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NEW PRODUCTS

ETHERCAT ABSOLUTE ENCODER
Hengstler has introduced the ACURO AC58 EtherCAT absolute encoder to complement the AC58 range of encoders.

Hengstler’s AC58 EtherCAT absolute encoder is suitable for position feedback on many applications that include mobile machines, laser cutting and welding equipment along with packaging and printing machinery.

Some of the key product features include single plus multturn resolution up to 32 bits and a cycle time of 62.5 μs. The AC58 EtherCAT encoder also has programmable resolution, presets, offset, direction, warning positions, speed scaling, acceleration scaling, speed limits and temperature limits. It outputs speed, acceleration, operating time and temperature in addition to position.

Automated Control Pty Ltd
www.automatedcontrol.com.au

SOUNDER AND FLASHING LIGHT
Pfannenberg has released the Patrol range of combination sounders and flashing lights, which are suitable for any application. Each product carries a sound level range from 100 to 120 dB, with light intensity from 5 to 15 J. It can be used up to 170 m away and holds up to 64 different tones that can be customised to suit any type of installation. With many uses, the range is suitable for any signalling solution, from machine pre-start to fire evacuation alarms.

The range is suitable for harsh environmental conditions and features an IP66 protection rating against water and dust, as well as the IK08 rating for protection against impact such as hail storms. It has an operating temperature range of -40°C to 55°C.

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ULTRASONIC FLAW DETECTION
The Olympus EPOCH 650 digital ultrasonic flaw detector is an enhancement to the EPOCH 600 model and has been designed to meet the needs of manufacturing companies, field service providers and inspection companies.

The large, full VGA transflective display combined with a digital high dynamic range receiver provides a clear image on the screen in any lighting condition. The EPOCH 650 is designed to meet the requirements of EN12668-1 and supports a wide range of standard and optional flaw detection features, including encoded B-scan and optional corrosion thickness gauging.

The device is designed to achieve IP66 rating for the unit with knob and button controls or IP67 in the navigation pad configurations.

The EPOCH 650 simplifies high-quality data collection and reporting using multiple onboard reporting tools and a comprehensive data filing system. The unit supports multiple methods of storing, archiving and reporting inspection and calibration data. Reports can be generated in a variety of standard formats which can be saved to a removable microSD memory card or exported.

A second 2 GB microSD memory card is used for all onboard data storage and is securely mounted to the PC board inside the instrument. In the event the instrument is damaged beyond repair, this memory card can be removed at an authorised service centre to recover critical data. An in-built video recording feature can capture up to eight minutes of the live A-scan inspection data at 60 fps.

Olympus Australia Pty Ltd
www.olympusaustralia.com.au

ROTARY JET MIXER
The Alfa Laval rotary jet mixer effectively handles liquid and powder mixing, gas dispersion and cleaning-in-place (CIP) while reducing time, energy and costs.

The rotary jet mixer is said to provide faster and more efficient mixing than conventional methods in many applications. It combines high blending precision with minimised mixing times and up to a 50% reduction in energy requirements. Based on rotary jet head technology, it can be used in tanks between 100 and 800,000 L in size.

Equipped with two or four nozzles, the rotary jet mixer is positioned below liquid level in the tank. Liquid is withdrawn from the tank outlet by a pump and circulated via an external loop to the mixer. It helps reduce operating expenses while achieving fast and efficient mixing. A single rotary jet mixer can handle liquid mixing, gas dispersion and powder dispersion applications — plus tank cleaning — without requiring separate equipment for each process, thereby delivering significant savings.

Alfa Laval Pty Ltd
www.alfalaval.com.au
UNIK 5072 Pressure Transmitter

Thermo Fisher Scientific are pleased to announce ex-stock availability of this low cost general purpose stainless steel pressure transmitter.

- **Output**: 4-20mA
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- **Certification**: IECEx ia Group IIC

*Selected popular ranges. Stock availability subject to prior sale.

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NEW PRODUCTS

PROCESSOR WITH TOUCHSCREEN
Watlow has released the F4T with INTUITION temperature process controller. The controller features a 4.3”, capacitive colour touch panel with high resolution and a graphical user interface. It provides intuitive navigation and screen personalisation allowing channels, alarms, inputs and outputs to be programmed with user-defined specifications.

- The controller is scalable and offers a range of field-removable input/output modules, allowing the unit to be configured into multiple applications while integrating with the required hardware.
- The device combines temperature PID, over/undertemperature limit, power switching, math, logic, timers and counters into one integrated system, thereby lowering ownership costs, reducing design complexity and saving wiring time and panel space.
- The COMPOSER software, which connects with the controller via Ethernet, speeds up and simplifies commissioning and archives and documents controller set-up.
- Other features include agency certifications such as UL, FM, CE, RoHS, W.E.E.E. and NEMA 4X/IP65 and other communications options including Ethernet, Modbus TCP, SCPI, and EIA 232/485 Modbus RTU.

Watlow Australia Pty Ltd
www.watlow.com

MACHINERY HEALTH ANALYSER
Emerson Process Management has enhanced its portable CSI 2140 Machinery Health Analyzer with a wireless interface to popular laser shaft alignment tools. This advance reduces the equipment and time necessary for operators to perform vibration analysis and corrective tasks in the field.

- The CSI 2140 already offers four-channel plus phase data collection to save time and effort, advanced vibration analysis that embeds expertise in the tool and multiplane balancing to correct imbalance in industrial fans. By adding a wireless link to laser fixtures, Emerson further streamlines the work process. Using the CSI 2140, personnel can perform route-based vibration data collection, analyse the root cause and align the machine in one visit.
- The shaft alignment option for the CSI 2140 uses the familiar Emerson interface to guide technicians through a three-step process that quickly achieves precision alignment. The laser fixtures employ sweep technology to measure misalignment easily, even in tight clearance applications. An advanced option monitors the corrective machine moves in vertical and horizontal directions simultaneously. All data collected with the CSI 2140 can be uploaded wirelessly to a single database using the AMS Suite: Machinery Health Manager software. This enables the maintenance team to collect data, analyse problems and document results in parallel.

Emerson Process Management
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Watlow Australia Pty Ltd
www.watlow.com

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Emerson Process Management
www.emersonprocess.com.au
PLC SERIES WITH UPGRADED Firmware

RS Components (RS) is now shipping the latest Siemens SIMATIC S7-1200 CPU series, featuring upgraded firmware v4.1 that introduces performance improvements, extra features, and support for forthcoming fail-safe CPUs.

The v4.1 firmware has improved instruction processing for faster execution of PLC programs, while increased work memory makes extra resources available for program and user data.

Updated features include enhanced motion capabilities such as position control and support for analog or PROFlndrive drives. A PID control block allows temperature control in active heating or cooling systems, as well as interval measurements using high-speed counters. In addition, a built-in web server allows flexible access via IP address. There is also dynamic copy protection; support for shared I-Device, allowing connection of multiple controllers and fast data exchange; and enhanced configuration handling that allows modules to be specified and left unconnected without triggering alarms.

The firmware also introduces support for the forthcoming fail-safe S7-1200 CPUs and signal modules (SM) for implementing safety-related appliances.

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The digitalisation of the industrial world involves the collection and analysis of data from a large number of sensors with the aim of aiding the people responsible for plant operations, maintenance and management. Handling this flood of data in an intelligent way holds the key to greater plant efficiency.

Data is on everybody’s agenda — and no more so than in the industrial world. Taglines such as the Internet of Things, Industry 4.0, Industrial Internet and other related topics repeatedly show up in technology publications around the world, and immense quantities of data are becoming available in many industrial settings. But only when this data results in actions will efficiency gains be made.

Data flow is the lifeblood of an industrial plant. Is this the picture of the future? Partly it is, but, to a large extent, intelligent devices in plants are already communicating with each other. For example, in a typical control loop, in which sensor data is analysed in real time by the controller and then fed back to the actuator, all the devices involved are intelligent and all of them exchange information in some form or another.

So is the future just about rearranging what already exists in a more productive way? Again, partly it is, but technologies now available allow information to be processed in new ways that can have a significant impact on service offerings.

Firstly, storing massive amounts of data has become affordable due to cloud storage offerings from several major providers. In the industrial domain, this will allow more extensive analysis of product and system behaviour than ever before. Data from multiple devices can be stored over an extended period and used to improve operations and maintenance in industrial plants — for example, by reducing asset downtime or allowing a more efficient utilisation of the service workforce. Depending on the data contracts with customers, benchmark information can be shared to highlight performance deficits.

For non-real-time-critical parts of the system, this can be done now — but the quest for algorithms to uncover the most relevant insights has just begun.

Secondly, the traditional automation pyramid — with its mainly hierarchical system architecture — is being rearranged. More
intelligent sensors and controllers that are more flexible exist in a meshed network that now connects to the Industrial Internet. Further, all information has to be available immediately and everywhere. Production managers want to be able to check key performance indicators (KPIs) in real time and have state-of-the-art visualisation of this information on all form factors — from big-screen, fixed installations to mobile devices like smartphones and tablets. Isolated subsystems will exist only in special cases and will suffer from reduced functionality as they will not be able to participate in the data and service ecosystem.

**Flexibility**

Flexibility is a key aspect in the new world of maximum data exploitation. One key driver of flexible systems is the need to be able to customise each and every product — rarely are two cars with the same configuration ordered during a given production cycle. This is also true for smaller, significantly cheaper products — for example, the Apple Watch. Therefore, the production facilities of the future have to be able to create products with high variability and be reconfigurable in a very short time. Further, product cycle times are getting shorter — months for smaller consumer goods and just a few years for complex goods such as cars. Such cycle times require production devices that can be plugged into the existing facility with minimal engineering. Finally, virtual engineering will need to start with early simulation models, based both on historical data and real-time data from virtual and real devices.

**Accessible data platforms**

Data will no longer reside in information silos, but will be accessible for advanced analysis in cloud platforms. The analysis will access data gathered over long periods of time as well as high-frequency data streaming into the analytics engine in almost real time. A huge bonus is that these services can be scaled according to customer needs — there is no need for precautionary overprovisioning for each customer. Modern analytics platforms like Google Cloud Dataflow, Amazon Kinesis, or Spark can provide the foundation for such advanced offerings.

Of course, the main role of automation suppliers is to produce the applications that are built on these platforms. These applications can be used internally or externally. Internal applications include automated analysis of customer feedback — such as service requests or failure reports — that improve internal processes and optimise products. External applications give customers access to advanced information — for example, operational KPIs that allow monitoring of plant productivity.

**Device- and plant-level analytics versus fleet-level analytics**

As already mentioned, data analysis is not new. However, many monitoring and diagnostics solutions focus on individual devices — to detect a failing sensor or to analyse vibrations from rotating machinery like motors and generators, for example. In some cases, this has been extended to entire plants or at least sections of a plant — for example, to monitor a complete shaft line with drive, motor, gearbox and load (a compressor, for instance) or to use flow sensors, pressure sensors and mass measurements to carry out leakage detection on a pipeline or water network.

The increased availability of data will enable comparisons across multiple plants — so-called fleet analytics. The fleet can be devices within one enterprise — for example, all electrical motors of a particular type. Here, a supplier like ABB potentially has access to a much larger fleet, namely the entire installed base of the motor in question. A fleet is also understood to mean the set of all complete plants of a particular type inside one corporation, all the vessels in a shipping company or all paper machines in a paper company.

**Homogeneous versus heterogeneous data**

So far, data analysis has mainly involved signal analysis of conventional numerical process data originating from sensors. Today, there are numerous other sources of data that are waiting to be tapped. For example, search engines are extensively used to find data on the web, but there are many textual data sources in the industrial environment that can also be searched to yield useful results — like service reports, operator logs and alarm lists. Other
STORING MASSIVE AMOUNTS OF DATA HAS BECOME AFFORDABLE DUE TO CLOUD STORAGE OFFERINGS FROM SEVERAL MAJOR PROVIDERS. IN THE INDUSTRIAL DOMAIN, THIS WILL ALLOW MORE EXTENSIVE ANALYSIS OF PRODUCT AND SYSTEM BEHAVIOUR THAN EVER BEFORE.

New insights into advanced service offerings

None of the technologies and trends described so far provide direct value to a plant operator. Data collection and data analysis may increase knowledge and enable predictions, but unless someone acts on these, there will be no effect on the plant performance. Only when the knowledge is turned into actions and issues are resolved will there be a benefit from analysing more data. In other words, knowing what is faulty is one part of the equation, but fixing it is another part.

Providing remote access to data and analytics for service experts will close the loop of continued improvement. Online availability of support from a device or process expert is essential for a quick resolution of unwanted situations. Coupling remote access with the new technologies now available enables earlier detection and better diagnostics, and therefore facilitates faster service — resulting in better planning and an increase in plant and operational efficiency.

References


Edge versus cloud computing

Another interesting challenge is to identify where the data analytics should take place. The previous discussion largely assumes that the relevant data will be stored centrally — perhaps in the cloud. However, devices are becoming more intelligent, so there is more computational power closer to where the data is generated. To perform the computing close to the source is sometimes called edge⁵ or fog⁶ computing. It is already the case that not all data is sent to a data historian. For example, when using a medium-voltage drive to control the roll speed in a rolling mill, only the speed and torque are collected at the control system level, while the current data is typically only available inside the drive.

With intelligent sensors and actuators, it may be that only information that has already been analysed is available in the cloud storage. An important trade-off here, then, is to decide which signals to process locally and exactly what information to transmit to the central storage, since at the edge there is usually no historian and hence the local data may not be available for later analysis. An important factor in that consideration is that data storage costs are declining, thus reducing the need for the historian to employ compression and potentially destroy information that could be useful later.
Melbourne – The Main Event

1–3 December 2015

Melbourne hosts the national conference and exhibition – the main event in the Comms Connect calendar. If you attend only one Comms Connect event each year, Melbourne offers the greatest breadth and depth of technology, access to expertise and networking opportunities.

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- ARCIA annual gala dinner – 600+ attendees


New in 2015 – the Capital City Conference Series

Working even closer with ARCIA in 2015, Comms Connect brings you the Capital City Conference Series. One-day, streamlined conferences for the time poor and those unable to attend the two- and three-day events. Purely educational, with no exhibition, these new initiatives run in conjunction with ARCIA’s Industry Networking Dinners.

Next Instalment: Adelaide – 23 September, National Wine Centre

Melbourne Sponsors
PH SENSOR GUIDE
Mettler Toledo has released a booklet describing good operating procedures for pH sensors. The guide enables the process industries, including the pharmaceutical and chemical industry, to present quality measurements for in-line applications, pH being the most common liquid process analytical parameter.

pH is typically measured using glass pH sensors - instruments that have been available for almost 100 years. Over this time, many developments have been introduced to improve sensor measurement accuracy, durability and ease of use. Today, pH sensors for industrial use are high-performance devices tailored for specific applications.

Mettler Toledo’s Good Operating Procedures for pH Sensors explains how to correctly use and maintain pH sensors. The good operating procedures guide explains, step by step, how to correctly use and maintain pH probes to give greater performance and measurement accuracy. In some applications, the proper care of pH sensors can easily double their lifetime.

Topics covered in the guide include: pH sensor structure; calibration (single-point and multipoint); pH sensor maintenance; and selecting the best pH sensor for the application.

The guide is available to download from: www.mt.com/pro-pH-GOP.

Mettler-Toledo Ltd
www.mt.com

TEMPERATURE-SENSING ENCODER
The Hengstler ACURO AD58DQ encoder incorporates the Siemens DRIVE-CLiQ and an input for motor temperature sensing, as well as temperature sensing for the encoder itself. It has been developed specifically for integration with servo motors that require communication with Siemens SINAMICS/SINUMERIC drive families.

The encoder is designed in a manner that maintains its precision, despite being able to operate in harsh environments that are subject to high levels of vibration, shock and mechanical loads. It features up to 24-bit single-turn and 12-bit multiturn resolution in a compact and robust design that meets the requirements of SIL 2/PL d/Category 3.

Automated Control Pty Ltd
www.automatedcontrol.com.au
COMPRESSORS
Kaeser has recently expanded its ASD SFC series of Sigma frequency controlled rotary screw compressors – now available from 22 to 30 kW.

The 22 kW ASD 40 SFC and ASD 40 T SFC rotary screw compressors from Kaeser produce free air deliveries between 1.02 and 4.58 m³/min. Like all other models in the ASD range, these models save energy in multiple ways.

At the heart of every ASD series rotary screw compressor lies a premium quality screw compressor block featuring Kaeser’s Sigma Profile rotors. The Kaeser screw compressor block is equipped with flow optimised rotors for high efficiency. All Kaeser rotary screw compressor blocks are powered by premium efficiency IE3 drive motors for maximum performance and reliability that complies with, and exceeds, prevailing Australian MEPS regulations for three-phase electric motors. The motor drives the compressor screw block directly without transmission loss via a maintenance-free coupling.

Costly idling periods are effectively minimised with the ASD series due to the inclusion of the industrial PC-based Sigma Control 2 compressor controller that ensures efficient system control and monitoring.

The ASD SFC models feature variable speed control — the volumetric flow rate can be adjusted within the control range according to pressure. As a result, operating pressure is precisely maintained to within ±0.1 bar. This allows maximum pressure to be reduced, which saves both energy and money.

Premium compressed air quality can be further achieved by opting for an ASD T model, which features an integrated refrigeration dryer.

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* Feb 2015 research by Markets and Markets
Fuel and chemicals from steel plant exhaust gases

The quantities of exhaust gas that arise from steel manufacturing plants are gigantic: the chimneys of the Duisburg Stahlwerke in Germany alone unleash several million tons of carbon dioxide. Fraunhofer has developed a process by which these exhaust fumes can be reclaimed and recycled into fuels and specialty chemicals. With the aid of genetically modified bacterial strains, the research team ferments the gas into alcohols and acetone, converts both substances catalytically into a kind of intermediary diesel product and from this they produce kerosene and special chemicals.

Participants in the research include the Fraunhofer Institute for Molecular Biology and Applied Ecology IME in Aachen, as well as the Institute for Environment, Safety, and Energy Technology UMSICHT in Oberhausen and the Institute for Chemical Technology ICT in Pfinztal. The technology came about during one of Fraunhofer’s internal preliminary research projects and through individual projects with industrial partners. The patented process currently only operates on a laboratory scale.

“From our viewpoint, the quantities of carbon alone that rise as smoke from the Duisburg steelworks as carbon dioxide would suffice to cover the entire need for kerosene of a major airline,” explained Stefan Jennewein of IME, who is coordinating the project.

“Of course, we still have got a bit to go to reach this vision, but we have demonstrated at the laboratory scale that this concept works and could be of interest commercially. In addition to the exhaust gases, syngas — similar gas mixtures from home and industrial waste incineration — can also be used for the engineered process,” he said.

The biochemists at IME use syngas — a mixture of carbon monoxide, carbon dioxide and hydrogen — as a carbon resource for fermentation. Using bacterial strains of the Clostridium species, the syngas transforms either into short-chain alcohols like butanol and hexanol, or into acetone. To do so, IME engineered new genetic processes for the efficient integration of large gene clusters in the Clostridium genome. At the same time, Fraunhofer further expanded its syngas fermentation system and used it for experiments with the steel and chemicals industry.

The chemists around Axel Kraft at UMSICHT evaporate the residual fermentation products and, in a continuous catalytic process, couple the fermentation molecules into an intermediate product consisting of long-chain alcohols and ketones. This interim product already meets the standards for ship diesel and, like fats and oils, can be converted through hydrogenation into diesel fuel for cars or kerosene for planes. Kristian Kowollik from the environmental engineering department at ICT obtains specialty chemicals from the interim product connected with this, which already can now directly replace petroleum-based products. For example, amines can be used in the pharmaceutical industry or the production of tensides and dyeing agents.

“The products synthetically produced by us can be used both as fuels as well as specialty chemicals, in the same way this has worked until now with petroleum as the raw material source,” stated Jennewein.

In the next stage, the scientists strive to demonstrate that their technology also works with large quantities.

“Over the next one and a half years, we aim at gaining a better understanding of the processes, and to optimise them. Our goal is to apply for certification processes for the fuels. That is how its viability for practical use will be officially validated. For vehicle diesel, that takes about one year, and for kerosene about three years,” added Kraft.

Fraunhofer-Gesellschaft
www.fraunhofer.de

FLOW SWITCH

The V8 Flotect flow switch has a leakproof body and vane constructed of tough durable polyphenylene sulfide which has excellent chemical resistance.

In most applications, the switch is normally off while there is sufficient flow of liquid or air. When flow stops, the vane spring moves the vane, actuating a single-pole double throw switch rated 5 A at 120/250 VAC to start or stop a motor, pump or engine; or to operate a damper or valve; shut down a burner; or actuate an alarm or signal.

The full-size trimmable vane is provided with moulded-in graduations allowing for installation in a 1” through 6” pipe. Operating pressures are up to 150 psig (10 bar) and temperatures to 100°C. The V8 flow switch can be used in various chemical processes, industrial systems and similar applications where process conditions are compatible with polyphenylene sulfide, ceramic 8 and 316 stainless steel.

The V8 switch is useful for applications in chemical processing, liquid transfer systems, water treatment, air conditioning, refrigeration, heating systems, cooling lines, machinery, food processing and machine tools.

Dwyer Instruments (Aust) Pty Ltd
www.dwyer-inst.com.au
The IoT enables companies to establish an information-enabled business, linking consumer information, distribution, manufacturing and supply chain — allowing manufacturers to become flexible and competitive on a global scale.

Manufacturing generates more data than any other sector, making analytics even more relevant. By combining the data source elements of the consumer, supply chain and manufacturing into the plant automation platform, improvements in control can be made in real time.

For example, traceability is particularly important to the food and beverage industry. Data-oriented decisions or changes in manufacturing can be made rapidly — providing secure, lower cost to market while allowing businesses to add value to their products to meet consumer demands.

It is estimated that by 2020, one billion new middle-class consumers will add $8 trillion to consumer spending. These global population trends will result in increased demand for manufacturing, resources and infrastructure. The value proposition that the IoT can bring will deliver improved asset utilisation and enterprise risk management for manufacturers.

The growing population will place ever-increasing demands on the production of food, on the automotive industry and on infrastructure. Production volumes will need to increase and workers will become more engaged with production data, based on consumer demands. The use of visualisation dashboards on production lines will be more widespread. Employees can monitor the productivity data — such as units per hour, energy use and shift volume requirements. Workers will be more informed and focused to help reduce scrap and downtime. It is not about having fewer workers but about driving a more productive and engaged workforce.

Mobility tools powered by the IoT will provide dashboard-style access to real-time consumer and manufacturing information. Various management layers will have improved visibility to drill down to a particular line or process and look at parameters such as machine availability, scrap rates, predictive maintenance and energy usage. When linked to business drivers such as sales forecasts, production volumes, stock turns and profitability, more productive and efficient manufacturing can be driven through the entire business.

Manufacturing facilities now have a global reach with consumer markets in different parts of the world, so brand protection and compliance are vital for exporters. IoT technologies can help manufacturers remain successful on a global scale by delivering integrated consumer supply information.

Market demographic consumer data can also be captured through their smart device. In turn, this can be linked back to the business enterprise system enabling a smart manufacturing layer. This information allows the optimisation of the entire supply chain from raw product to tracking of distribution and authenticity — facilitating global ‘track and trace’ and product recalls. Production machines and ingredients can be rapidly batch managed to meet demand. IoT technologies help to enable secure, safe and efficient food production and distribution to global markets.

For the exporter of manufacturing machinery, the IoT will provide a link to their equipment, enabling product updates and service information to be done remotely, saving on costly travel while enabling the end user to maximise machine uptime.

Stephen Broadbent joined Rockwell Automation in 2007 and is currently the Country Manager for Rockwell Automation New Zealand. He is a multi-industry specialist in power electronics and variable speed drive design and application.

Stephen heads the New Zealand business of Rockwell Automation across software automation solutions and industrial products. He is a qualified electronics engineer and holds a degree from Staffordshire University in the UK.
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