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July 2015 vol.29 no.2
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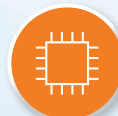
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JULY 2015

ON THE COVER



For over 30 years, optek has focused on the development and support of high-performance inline photometric analysers for liquid and gas processing applications all over the world. As a global partner to various industries, optek offers advanced technologies including superior signal amplification, inline calibration support, Profibus PA, FOUNDATION Fieldbus and multilingual user interfaces for easy on-site operations. Worldwide, optek has four main operations located in Germany, the United States, Singapore and China. Manufacturing is based in Germany and optek maintains a large inventory of analysers, parts and accessories in both the European and US facilities. This enables optek to provide products specifically configured to meet customer requirements rapidly and efficiently.

optek has a comprehensive product portfolio – including turbidity meters, colorimeters, UV absorption sensors and conductivity sensors – installed in some of the roughest process conditions in plants all over the world.

Recent product releases have included a 12 mm absorption probe for use in bioreactors to precisely measure the growth of microbial or cell cultures as a function of NIR absorption. There is also a single-use cell (SUC) designed to optimise separation, purification, concentration and formulation processes in disposable chromatography and ultrafiltration systems.

Wherever process composition is controlled, the name optek has become synonymous with world-class products and support.

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

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MANUFACTURING AND THE CLOUD

Glenn Johnson, Editor

The broad general acceptance of cloud computing means that the market for cloud services is growing rapidly. In this article we take a look at some of the types of cloud services that can add value for manufacturing and processing organisations.

It is predicted that over the next decade, cloud services will be a leading driver of productivity for manufacturers. Cloud services provide the opportunity to eliminate investment in IT capital equipment and the associated software costs and expenditure in in-house expertise through the use of pay-as-you-go solutions. These solutions allow small to mid-sized businesses to leverage applications previously considered prohibitively expensive and designed for use by large organisations.

With its low cost of entry and maintenance, the cloud can help to level the playing field and ensure that enterprise-class systems are no longer out of reach for even the smallest companies, while for larger companies, particularly those with multiple facilities to manage, costs can be reduced dramatically while improving business competitiveness.

So how can cloud computing be of benefit to those in the processing and manufacturing industries? Naturally, one does not expect that real-time process control or automation can be performed using cloud services — latency and security will always be issues here, at least for the foreseeable future. However, there are two main areas of application in which industry can benefit from cloud technology — customer- and partner-facing business services, and non-real time, non-process critical applications such as ERP, EAM and CMMS systems, as well as reporting and analytics.

In the first area, manufacturing businesses can leverage cloud technology in the same way that non-manufacturing businesses can — to provide additional internet-based services to both customers and suppliers; to streamline ordering, procurement, sales and product support; and to provide interactive services for customers — all more efficiently and without having to invest heavily in internal resources for these purposes. As Internet 4.0 and the Internet of Things

(IoT) become adopted within manufacturing, the extent to which these services can be leveraged will increase, to enable greater competitiveness and responsiveness to market demands.

There is much information about the possibilities in the area of improved business and market responsiveness enabled by cloud services and the internet. In this article we will focus more on how cloud technology can help with streamlining a manufacturing or processing business at the technical level.

In recent times, as new technologies have emerged, we have often heard the term 'killer app'. In other words, the application for a new technology that will launch it into the mainstream. Many would say that in the application of cloud services in the manufacturing and processing industries, there are two killer apps: the availability of cloud-based asset management and condition monitoring, and cloud-based process analytics and reporting. How 'killer' these applications will be, will depend largely on the size and nature of the individual business.

But first we need to understand what the cloud provides, and how it does it.

Cloud models

There are three basic cloud models:

- **Public cloud:** All services are provided by a cloud service provider over the internet, offering the greatest level of efficiency in shared resources but the least level of control over the data.
- **Private cloud:** The services and infrastructure are privately managed by the end user, providing the greatest level of security and control but not significantly lowering the cost burden.
- **Hybrid cloud:** A mix of public and private cloud in which the organisation chooses which aspects of the business are best served by either service.

For industrial companies, the hybrid cloud model is clearly the best compromise between efficiency and security. The

Collaboration and work task execution	<ul style="list-style-type: none"> • Condition-based maintenance (CBM) • Workflows and certain types of procedural enforcement • Shared development and collaborative testing • Virtual reality simulation and training environments
Reporting and analytics	<ul style="list-style-type: none"> • Process analytics, especially for post-production optimisation and root-cause analysis • Remote diagnostics and system health monitoring • Long-term process historians • Manufacturing business intelligence • Process or batch summary reports • Energy management • Mobile summary reports, alerts, and notifications • Dashboards, KPI monitoring, and other web portal-based solutions • Manufacturing Execution System (MES) reports.

Table 1: Typical business needs that can be addressed with cloud-hosted solutions. (Source: "The Cloud for Manufacturing", Invensys and Microsoft, 2014)

Item	On-Premises	SaaS
Licensing	Varies	Included
Maintenance	Varies (typically 15%–20% of licensing costs, annually)	Included (performed automatically)
Support	Varies (typically 22% of licensing costs, annually)	Included
Hardware	Extensive	Included (sized automatically)
Implementation	Varies (additional cost in time)	Included (with rapid provisioning)
IT infrastructure	Extensive	Included (scaled automatically)
Payment	Up front	Typically by user/usage per month

Table 2: Cost comparison between on-premises and SaaS models. (Source: Microsoft and Invensys, 2014)

organisation can choose which applications are suitable for hosting in the cloud, and which are not.

Deployment models

There are three methods of deploying cloud services: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).

IaaS

IaaS is the most basic cloud-service model and basically offers computers — physical or (more often) virtual machines — and other resources. Additional resources may include virtual-machine disk image libraries, raw block storage, data storage, firewalls, load balancers, IP addresses and VLANs. IaaS cloud providers supply these resources on-demand from their large pools installed in data centres. For wide-area connectivity, customers can use either the internet or dedicated virtual private networks (VPNs).

With IaaS, cloud users are still responsible for installing operating system images and their application software on the cloud infrastructure. Cloud providers typically bill IaaS services on a utility computing basis, the cost reflecting the amount of resources

allocated and consumed. The financial benefit for the customer is in not having to maintain some or all of their computing resources themselves, saving on hardware costs and depreciation, as well as space and energy costs. The customer still needs to maintain the operating systems and software applications and data, including backups, and therefore still requires the technical expertise in-house.

PaaS

In the PaaS model, cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database and web server. Customers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some PaaS offers the underlying computer and storage resources scale automatically to match application demand so that the cloud user does not have to allocate resources manually.

In an industrial cloud PaaS service, an industrial automation software vendor or ERP, EAM or CMMS vendor may provide the platform (along with the maintenance

of that system) to provide the associated service, and it is up to the customer to program and configure it to their needs and manage the collection of the data from the site.

SaaS

In the SaaS model, a service provider deploys, manages and services the entire solution stack. The manufacturer retains ownership of the data, including the right to remove the data at any time. SaaS is sometimes referred to as 'on-demand software' and is usually priced on a pay-per-use basis or using a subscription fee. SaaS applications are different from other applications in their scalability — which can be achieved by cloning tasks onto multiple virtual machines at run-time to meet changing work demand, while load balancers distribute the work over the set of virtual machines.

To accommodate a large number of cloud users, SaaS applications can be multitenant, that is, any machine may serve more than one cloud user organisation. This, however, may raise security concerns for some organisations, so the choice of application (and therefore the criticality of the stored data) is important.

The pricing model for SaaS applications is the most flexible — typically a monthly or yearly flat fee per user — so the cost is scalable and adjustable if users are added or removed at any point.

Comparing deployment costs

Table 2 shows the typical costs of an on-premises model compared to a subscription-based SaaS model. Note that the cloud-hosted SaaS option is significantly less complex and can be easily scaled up or down as needed because there is no commitment period.

Asset management and maintenance

Within large sectors such as oil and gas, elaborate condition monitoring programs have often been run on-site or as 'private cloud' services since such large organisations usually have the budget to run them, along with the associated skilled resources. However, for smaller organisations that may not have the IT infrastructure and support to do the things that they want to do or need to do, the SaaS model may be much more attractive and cost-efficient (Table 2). With the SaaS model, the client pays a subscription fee to use software over the internet or a VPN. All software updates

are included, and users can access the software and configure it to their needs. All other tasks associated with maintaining the software, including data backups and server maintenance, are handled by the provider.

One of the benefits of using the cloud for asset management and condition monitoring is that measurements and analysis can be executed faster and correlated with more data. Rather than implementing such systems at each facility — also an expensive exercise with so much duplication of resources and effort — data can be shared from all the facilities of an organisation in a 'central' cloud application. Aside from much lower cost, the next most important advantage is that a larger statistical data set is available to perform predictive analysis. In other words, for a given technology in use at multiple plants, more data is likely to be available to make statistical reliability predictions more accurate.

Data storage

Of course, the comprehensive collection of condition monitoring and process analytics data will result in a large increase in data storage requirements. Purchasing and maintaining the infrastructure for keeping such data in-house is extremely expensive, as are the resources required to process the data. However, the scalable infrastructure provided by cloud services provides the storage in a much more cost-effective way.

Remote access for specialists

Traditionally, one of the common difficulties faced by smaller organisations with CMMS and EAM systems, or advanced analytics tools, is having the in-house expertise to do something with the data. For example, reliability experts at the facility level often don't have the skills to do the necessary kind of statistical analysis to fully take advantage of the tool. So one of the emerging benefits attributed to the cloud for asset management is the ability to tap into a much wider pool of experts and technicians.

With the cloud, organisations now have the opportunity to utilise an enterprise-wide approach — not treating each facility as an island and not requiring experts at each facility, since the data can be accessed by experts anywhere in the organisation or by third-party consultants and advisors.

Mobility and collaboration

A major factor driving cloud use is the ubiquity of mobile devices, both in and out of the workplace. The ability of mobile devices to securely access business and

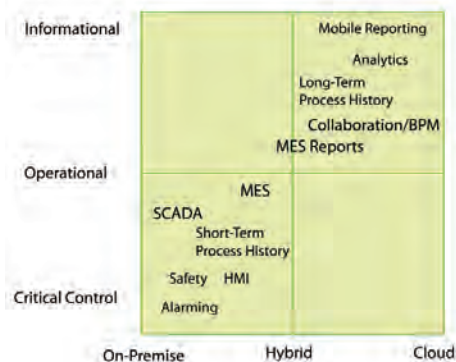


Figure 1: Matrix of possible hosted solutions for industrial applications. (Source: Microsoft and Invensys, 2014)

machine data stored in the cloud is creating greater business agility and knowledge, and has the potential to increase loyalty and productivity at the employee level.

In asset management and field maintenance mobile data access has become a requirement, making it possible to react quickly to changing events, while it also supports the expectation of younger employees of having connectivity to their data and having a collaborative environment, so they can share information with their colleagues.

With mobile devices and the right back-end systems in the cloud, industrial organisations have the ability to collect and share data from the older workforce, such as work instructions and notes.

The issue of security

For any organisation, anything that is seen to present the possibility that an intruder might get access to operational systems is considered a threat. Data privacy is also of great concern, as is performance. Fourth is data access: what if the cloud service stops working? Can the data be retrieved? The idea of trusting the company's data to some other organisation's service can be a concern.

Cloud-based software lowers the TCO but it can be a different matter to trust your data to an entity that is not a full-time member of your own organisation.

It is important to confirm that the service provider, particularly in a SaaS scenario, can guarantee independence of the networks and non-interference, as well as the security of the connectivity and the data. The systems on-site accessing the cloud service also need to be via a carefully configured encrypted VPN.

Data and application selection

One of the first security considerations when looking at cloud solutions should be an evaluation of how sensitive the data is that would be stored off-site. One thing to consider is that any machine data that is not critical to the physical output of the production process may be a good candidate to be hosted in the cloud. This could potentially include condition-based maintenance data, as well as optimisation, analysis, reporting and alerts or notifications (Table 1).

If the data being collected isn't business proprietary data (not general control system data), such as acoustic or vibration data, it's not as sensitive as process, temperatures, pressures and flows. Process analytical data (such as MES reporting data) that is not considered intellectual property can also be stored and analysed in the cloud without posing a significant security risk.

The cloud may actually be more secure

Unless an organisation is large enough to afford its own IT group with specific security skills, then a cloud service based on a well-known infrastructure such as Amazon AWS or Microsoft Azure (for example) may be far better. Since cybersecurity is a relatively new issue for manufacturing organisations, and many do not have the necessary skills and knowledge in-house, then the question is whether their on-site servers and storage systems in their traditional architectures are more secure than what is available from cloud service providers anyway. Quite often, they're actually less secure, because IT security is not part of the organisation's core competency. Modern vendors of cloud services typically have more secure servers than their clients, since it is one of their range of core competencies.

Summary

Many manufacturers today are competing in a global marketplace in which their aspirations are being eroded by greater competition. Legacy information systems make it difficult to extend the plant's information infrastructure globally and to take advantage of new methodologies and services offered by clever use of the internet.

Applied in the right way, cloud-based infrastructures allow manufacturers to overcome these restrictions and allow them to seek new business opportunities and efficiencies — while at the same time reducing costs and overheads. Now is the time to start thinking about how your organisation can take advantage of the cloud.



GEAR UNITS

The P-X series from SEW-Eurodrive combines the advantages of the planetary gear units and the X Series bevel-helical gear units. Due to the integrated intermediate flange, the P-X range offers compact drives with low weight and good stiffness.

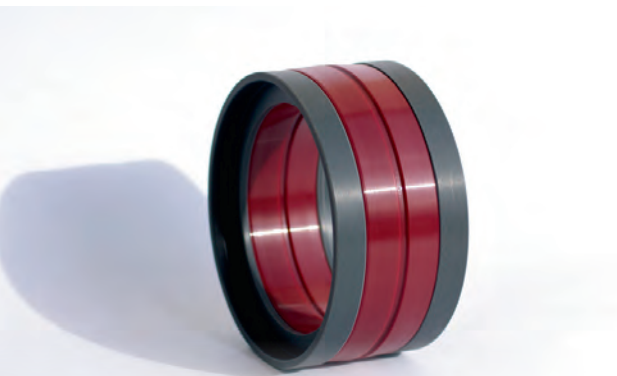
The drives can be used wherever high performance and torque are required in a compact package, such as drives for bucket-wheel reclaimers, apron feeders, crushers or compact belt drives.

The P-X bevel-helical planetary gear units are available in seven sizes and cover a torque range from 100 to 500 kNm. The gear ratio range extends from $i = 160$ to $i = 550$. The series is designed for high thermal ratings, as it boasts a shared oil chamber and a thermally optimised housing. It can be used at low temperatures below -25°C in conjunction with heaters and heating mats. Both sides of the symmetrical invertible housing construction are fitted with inspection covers. The motor adapters

are compatible up to motor size IEC 355 at 500 kW.

On the input end, SEW-Eurodrive offers the option of various motor adapters with fans, free input shafts and other features. On the output end, standardised output shafts are available as hollow shafts with shrink disks, solid shafts with keys or as smooth models. Installation is possible as a foot- or flange-mounted design or shaft mounted with a torque arm.

SEW-Eurodrive Pty Ltd
www.sew-eurodrive.com.au



HYDRAULIC PISTON SEALS

An enduring example of a classic seal design for harsh conditions, where shock loads and pressure spikes present an issue, is the PK56 profile (or PK58 with bearing/backup rings).

Oz Seals supplies the robust PK56 and PK58 hydraulic piston seals in super polymer rather than the traditional rubber and fabric combination, which can delaminate. The super polymer makes it a long-lasting, wear-resistant seal for a wide variety of hydraulic cylinder applications. The efficiency of the heavy-duty seal benefits from the low friction provided by the triple-lubricated properties in Oz Super Polymer. It also has high tensile strength and can be used in closed pistons.

The PK56 and PK58 come in a wide range of sizes, or custom sizes can also be machined upon request. Under harsh conditions, the PK56 piston seal design is an effective and contamination-tolerant solution to hydraulic sealing.

Oz Seals
www.ozseals.com

**MULTIPLE
I/O CHANNEL
MULTIPLEXER**

The EOTec 2000 MX Multi-Node multiplexer from Ultra Electronics is designed to transmit up to 16 input channels.

The device has unlimited output channels from 2 up to 256 nodes over a pair of fibre-optic cables with I/O module selections that include 4-20 mA, 0-10 VDC and contact closure. It supports multiple nodes, so users can build daisy chain or self-healing ring topologies, which provide fault tolerance and good network reliability.

The base unit connects directly to the fibre optic cable via small form-factor pluggable (SFP) transceivers and provides visual indicators for power, global alarm and module status as well as the fibre link status. Input/output configuration is derived via a one-time DIP switch configuration with power supplied through redundant external 24 VDC power supply terminals.

Applications include remote data acquisition, emissions monitoring, data and signal transmission — in lightning-prone locations, hazardous areas, tank gauging and conveyors.

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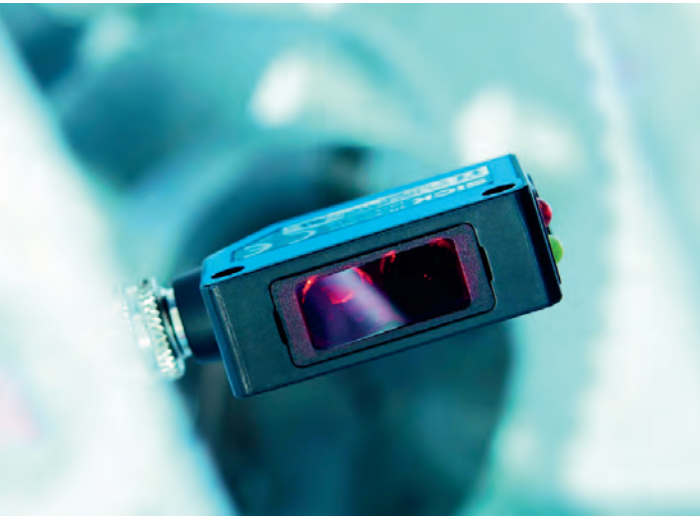
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LONG-RANGE PHOTOELECTRIC SENSORS

Sick W100-2 miniature photoelectric sensors are compatible with all standard detection principles (through-beam photoelectric sensors, photoelectric retroreflective sensors, photoelectric retroreflective sensors for detecting transparent objects, energetic sensors and sensors with background blanking), making them suitable for detection applications.

The bright, visible light spot, the clearly visible status indicator LEDs and the integrated M3 threaded mounting hole make commissioning quick and easy. Options in terms of switching output (PNP or NPN) and connectors (male connector, M8, 3-pin; male connector, M8, 4-pin; cable, 2 m), light/dark switching and sensitivity adjustment allow for a wide variety of sensor variants.

The WT100-2 photoelectric proximity sensor features long sensing ranges of up to 1.2 m. The WT100-2 photoelectric retroreflective sensor with background blanking features reliable detection while simultaneously blanking backgrounds. The WL100-2 photoelectric retroreflective sensor features long sensing ranges of over 7 m on the PL80A reflector. The WL100-2 photoelectric retroreflective sensor for detecting transparent objects features reliable switching and long sensing ranges for transparent materials. The WS/WE100-2 through-beam photoelectric sensor features long sensing ranges of over 30 m. Accessories including slotted diaphragms and polarisation filter attachments to enable positioning tasks to be carried out and small objects to be detected reliably.

SICK Pty Ltd
www.sick.com.au

LASER SENSOR

Banner Engineering has announced that its Q3X laser contrast sensor is now available with fixed background suppression. Featuring contrast detection plus fixed background suppression, the Q3X LD50 detects targets within the desired sensing range while ignoring objects in the background.

Out of the box, the product operates like a fixed-field laser sensor and detects targets within its 50 mm sensing range. However, the sensor can be programmed for low-contrast sensing within this range while ignoring objects at least 60 mm away. This allows the sensor to accurately detect its target without background objects affecting its performance.

Featuring high-speed part detection as fast as 250 μ s, the laser contrast sensor can capture up to 2000 events per second.

A typical application is label detection on a bottle, where contrast differences between the label and bottle provide reliable detection but the sensor must ignore a shiny metal rail in the background. The shiny metal background could cause a false trigger for standard diffuse-mode sensors.

The product is designed with an angled, three-digit display of signal intensity, which provides high visibility of operating conditions from multiple angles. For intuitive user set-up, the sensor has two tactile buttons located below the display.

The unit's robust nickel-plated zinc die-cast housing ensures reliable performance even in environments with exposure to cutting fluids and oils. Sensors are also rated to IP67, IP68 and IP69K for enhanced protection to water immersion and high-pressure washdown.

Turck Australia Pty Ltd
www.turck.com.au



SOFT STARTER

The FEAS Softstarter SAK31 is an electronic starter for three-phase AC squirrel cage motors with up to a 3 kW rating.

Featuring low noise during start-up, adjustable run-up time and variable starting torque, the product is designed to reduce the burden on the supply system and improve motor reliability.

Completely resin and embedded within industrial-grade plastic housing, the device is self-cooling and has been designed to withstand harsh conditions. Installation is simply done via the use of DIN rail or by wall mounting.

The product has an input voltage is 400-440 VAC, an output current of 8.5 A and an operating temperature range of -20°C to +70°C.

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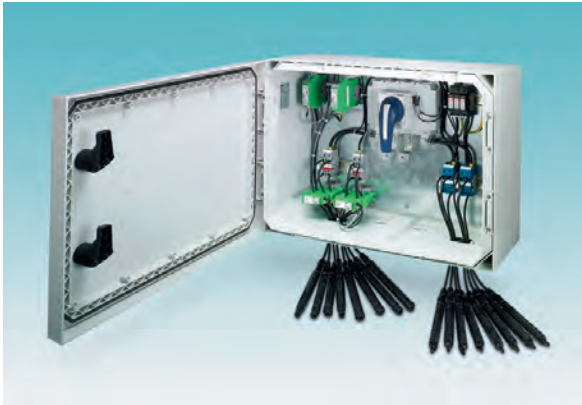
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Control Logic Pty Ltd

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Söderenergi in Sweden: How biomass is turned into green energy



Not only is the Igelsta plant one of Sweden's largest biomass power plants - the plant also received recognition as the 'Building of the Year' in 2009. It produces green energy for 100,000 homes and district heating for 50,000 homes.

"When the sun vanishes behind the clouds, we see energy demand shoot up," said Peter Hillblom, a mechanical engineer at the Igelsta plant in Södertälje. "We use measuring technology from SICK - the MCS100FT CEMS solution and also the DUSTHUNTER FWE200 scattered light dust measuring device for wet gases - to monitor our emissions, ensuring that they always fall within legal limits. Our aim is to keep improving."

In order to meet power and heat generation requirements, the power plant requires approximately 17,000 tonnes of fuel every week. The fuels used are mainly derived from forestry waste, such as chopped up wood from trees, supplemented by fuels derived from non-recyclable waste from the local area, such as waste wood, plastic and paper.

The steam produced through this combustion process is used to heat water for district heating and also to power the 'St Martin's Goose' steam turbine. The turbine was commissioned on St Martin's Day in 2009 and takes its name from the meal traditionally eaten at this time of feasting. Nevertheless, the powerful red turbine looks more like an organic monster than a high-tech creation. In the middle of the plant, the turbine is driven by high-pressure steam at a temperature of 540°C. This in turn powers an enormous generator which supplies 11 kV

and 85 MW of power - enough to light up over 1.4 million 60 W light bulbs.

Coal was the fuel used in the first Igelsta plant back in 1982. Social changes and the introduction of a CO₂ tax brought about a change: "We were very quick to start cutting down on fossil fuels and were soon able to switch to biomass and recycled raw materials. Our CO₂ emissions fell by 80%," explained Madeleine Engfeldt-Julin, communications manager at Söderenergi.

"We can consider ourselves successful pioneers in the use of secondary fuels. Our highly developed gas cleaning system means that the emissions coming out of our chimneys are almost exclusively steam," she added. "Not only is the number of pollutants very low now, Söderenergi is also constantly developing and refining its use of biological and recycled fuels."

In 2009 Söderenergi became the first company in Sweden to measure emissions using the new MCS100FT CEMS solution, which is based on FTIR technology (Fourier transform infrared spectroscopy). The system measures HF, HCl, NH₃, H₂O, CH₄, SO₂, N₂O, CO, NO, NO₂, CO₂ and O₂. As an option, it can also determine both NO_x and VOC/THC concentrations. Research proves that the gas analysis systems deliver results with a consistently high measurement accuracy for up to 14 components used together in the same system.

The DUSTHUNTER FWE200 scattered light dust measuring device from SICK uses an extractive dust measuring system to determine particle emissions at temperatures below 100°C (below the acid dew point of the exhaust emissions). The SICK measuring systems are part of a monitoring and IT network which allows various measurement points within the plant to be remote controlled. This has one distinct advantage for Hillblom: "I can access the same images as the IT staff in the control room without having to go there myself."

SICK Pty Ltd
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EA-T12CL 12" model shown priced at \$2840

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* EA9-PGMSW for use with EA9 series panels only; cannot be used with EA7 series panels.



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INDUSTRIAL WIRELESS NETWORKS

COMPARING THE STANDARDS

PART 2 *Glenn Johnson, Editor*

In Part 1 of this article, we reviewed the history of wireless sensor networks (WSNs) and defined the common standards used in industrial wireless networks. In this part we compare more closely the two prevalent wireless mesh network standards designed for use in process plants: WirelessHART and ISA100.11a.

Although WirelessHART¹ and ISA100.11a² are in many ways the same, being both based on IEEE 802.15.4³ at the PHY and MAC layers — and designed effectively for the same purpose — there are still some key technical differences between the two standards. Those differences are due to fundamental differences in design philosophy, one opting for ease of deployment and multivendor compatibility, the other choosing flexibility and scalability as key design features.

Network architecture

ISA100.11a uses backbone routers for bridging subnets. Backbone routers limit the throughput into and out of a single subnet to the throughput of one radio, but backbone routers can be used in parallel to create a very large wireless network. Since addressing is based on IPv6, there is really no practical address limitation. WirelessHART uses access points that can be used in parallel to merge subnets into a very large address space. Since the short address used in the WSN is an unsigned integer, however, addresses are limited to 30,000 in a single WirelessHART network.

Frequency hopping

Both WirelessHART and ISA100.11a use the radio interface in the 2.4 GHz ISM band as described in IEEE 802.15.4 — divided into 16 channels, using a 250 Kbps data transmission rate.

The communication reliability is increased through frequency diversity. Channel hopping in WirelessHART is dictated by the standard, meaning that devices from different manufacturers are interoperable by design. In ISA100.11a, there are three different defined channel hopping algorithms, and the user must specify which one is to be

used. Users purchasing ISA100.11a devices will need to ensure that the purchased devices support channel-hopping schemes that are compatible with one another.

In both WirelessHART and ISA100.11a, clear channel assessment (CCA) and channel blacklisting are used to combat the influence from other wireless networks. WirelessHART employs manual channel blacklisting, where a network operator must manually configure which channels are available and which channels are blocked. ISA100.11a has an adaptive blacklisting mechanism, where each device in a network may autonomously blacklist channels that suffer from noise or interference. ISA100.11 also defines four different CCA modes, where modes 1-3 are defined by IEEE 802.15.4:

1. **No CCA:** CCA is disabled, and not conducted prior to transmission.
2. **Energy above Threshold:** Reports a busy channel upon detecting energy above a configurable threshold.
3. **Carrier Sense Only:** Reports a busy medium if a signal compliant with IEEE 802.15.4 is detected.
4. **Carrier Sense with Energy above Threshold:** CCA reports a busy medium using a logical combination of Modes 1 and 2.

WirelessHART, on the other hand, has fixed its CCA mechanism to mode 2.

With the correct configuration, ISA100.11a should be better at handling coexistence with Wi-Fi networks, while WirelessHART will only listen for activity from other IEEE 802.15.4 networks.

TDMA

Both WirelessHART and ISA100.11a implement time diversity through TDMA. The main difference is that WirelessHART uses a fixed 10 ms timeslot, whereas in ISA100.11a it is configurable between 10 and

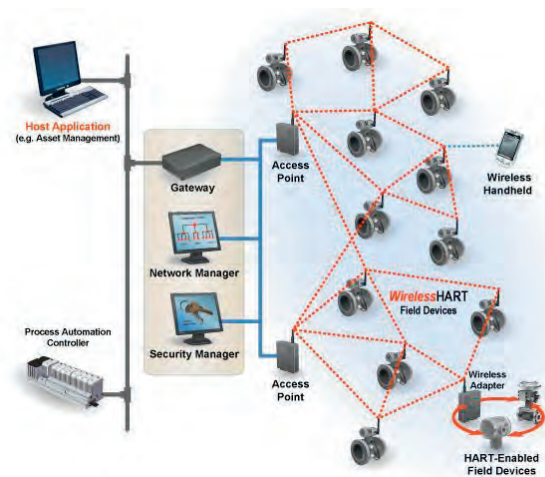


Figure 1: A WirelessHART network: Mesh routing is performed at the network layer by the access points. (Source: FieldComm Group)

routers to 6LoWPAN-enabled ISA100.11a devices; however, the routing in the mesh (hop-to-hop) happens in the data link layer using graph routing in a process known as ‘mesh-under’. The IPv6 packets are fragmented and reassembly is performed in the 6LoWPAN adaptation layer, so IPv6 itself is not actually used in the wireless network.

Routing optional

In the case of WirelessHART, there are no design options — all devices must support routing — although the end user can choose to disable routing on a specific device. For ISA100.11a, routing support is optional, which means that it is feasible that a network could be built with entirely no mesh routing, losing all the advantages. If non-routing devices are to be deployed, considerably more careful site planning and testing must be carried out. This also means that both routing and non-routing versions of a device may need to be stocked as spares.

Application flexibility

WirelessHART and ISA100.11a are inherently different regarding the operational flexibility and configuration possibilities — and this is the fundamental difference in their design philosophies.

WirelessHART is a relatively ‘simple’ specification with very few optional or configurable parameters. ISA100.11a, on the other hand, is a complex specification with many configurable and optional parameters found in different stack layers. These features can be seen as both strengths and weaknesses depending on the specific application requirements.

Being an extension of the HART Specification⁵, designed simply to route HART commands and data to and from wireless devices, WirelessHART has a relatively fixed design approach. The benefit of this is that practically all WirelessHART devices will have identical network behaviour, regardless of the implementation choices made by the equipment vendor, which should easily facilitate interoperability between multiple manufacturers. This naturally comes at the cost of a lack of possibility to adapt and tailor the device and network to specific requirements, or to support other fieldbus technologies. That being said, the ARC Advisory Group in 2012 published data to indicate that of the nearly 75 million field devices installed worldwide, nearly 50% were HART devices — more than all the other fieldbus technologies combined.

ISA100.11a, on the other hand, is a complex specification with many configurable and optional parameters found in different stack layers. The wide range of optional and configurable parameters in ISA100.11a allows for greater flexibility, but it may lead to interoperability issues

14 ms. This means that users will need to ensure that all ISA100.11a devices in a given network support time slot lengths compatible with all other devices in the network.

Addressing and mesh networking

Both WirelessHART and ISA100.11a use an IEEE 802.15.4 mesh network. The routes are configured by the network manager based on information received from the devices so that redundant routes are continually updated based on the spectrum condition. The end-to-end routing and addressing in both cases is performed at the network layer; however, there are some differences in relation to the node-to-node mesh routing.

For addressing, WirelessHART uses an 8-byte local address system defined by the WirelessHART standard and no IP addressing. ISA100.11a, on the other hand, offers 6LoWPAN⁴, which specifies IPv6, therefore allowing IP connectivity between devices and allowing 128-bit addresses as an option. For this reason, ISA100.11a offers the possibility of considerably higher mesh network scalability. ISA100.11a also specifies two other addressing schemes, and so users must not only configure this, but also be sure that all devices support the method of choice. Some users may also see IP addressing in the WSN network as being more open to security vulnerabilities.

For WirelessHART, the network layer performs all the routing functions within the mesh network. This layer carries the route tables to route communications through the mesh using graph routes. Interfacing with wired networks is performed at the wireless access point, which acts as a gateway between the wireless mesh and a wired HART-over-IP backbone. The transport layer above provides the network interface to the applications, providing the end-to-end communication, with acknowledgements so the originating device can retransmit any lost packets.

In ISA100.11a, the network layer provides for end-to-end routing using 6LoWPAN. It is possible for server/client pairs to generate IPv6 packets which are then forwarded through 6LoWPAN edge backbone

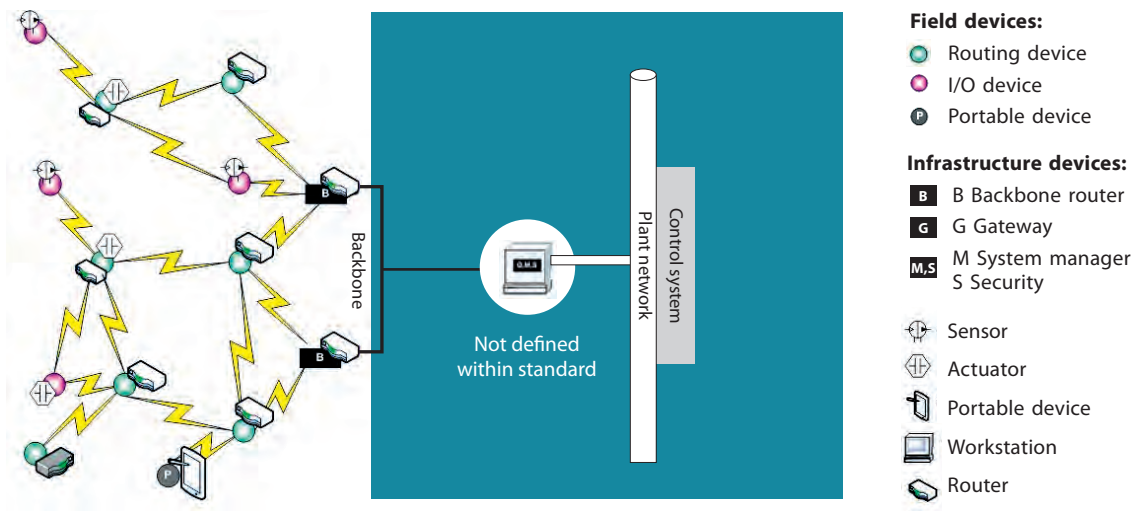


Figure 2: An ISA100.11a network: Mesh routing is performed at the DLL and IPv6 routing must be handled by the backbone routers/gateways. (Source: Yokogawa)

if different vendors choose to implement different features of the standard. ISA100.11a therefore defines application profiles — cross-layer specifications that define which options are mandatory in the different protocol layers.

Supported industrial protocols

Since, as stated above, WirelessHART is a wireless extension of the wired HART specification, all information and data in a WirelessHART network must be transmitted in the shape of HART Commands. At the OSI Application Layer, well-known HART features are readily available, supporting all the many control systems, configuration and management tools that are well established in the marketplace.

The ISA100.11a application layer is object oriented and implements tunnelling features that allow devices to encapsulate foreign protocols and transport them through the network. However, no specific functions are published, and only the system management interface is specified. Vendors must define their own application profiles to support their products over the network. As a result, most ISA100-11a implementations would involve single-vendor systems — that is, the software and all hardware devices would be supplied by a single vendor to ensure interoperability.

Security

When assessing security mechanisms, the criteria that must be considered are the confidentiality of information, the integrity of that information, the authentication of communication devices and the availability of information.

Confidentiality

Ensuring confidentiality involves making sure that only authorised members of the network can have access to the information. Both WirelessHART and ISA100-11a utilise AES-128 encryption with different key mechanisms at both the data link layer (hop-to-hop) and the transport layer (end-to-end). That is, each hop through the network is encrypted with a key, and the overall communication payload between end nodes is encrypted with a separate key.

Integrity

The integrity of the transmissions is based on mechanisms inherent to the IEEE 802.15.4 standard. At the data link layer each message includes a message integrity code (MIC) that is added to the data, which ensures the integrity of the entire MAC frame including the

payload. An algorithm at the receiving node uses the MIC to determine if the data has been corrupted or altered by an attacker.

The ISA100-11a standard adds additional security to protect the integrity of the communication by using a timestamp for each communication and using it to construct a 'nonce' — a one-time arbitrary number to sign the end-to-end communication. The receiving node checks the nonce, and if the packet was created outside a valid time interval the packet will be discarded, this adding an extra level of protection against injection and impersonation.

Authentication of devices

Devices that are to join the network must create a join request, which is sent to the network manager and security manager devices, that will verify the credentials of the request, forwarding a join response to the router that the device is attempting to connect with. Both protocols use this mechanism; however, WirelessHART additionally uses a separate join key to authenticate the new device.

Since both standards use a separate node to be responsible for keeping track of the devices in the network, the chance of a successful node replication attack is low.

Availability

Availability can be threatened by wireless interference. As mentioned previously, both WirelessHART and ISA100.11a use channel hopping and channel blacklisting to mitigate the effect of continuous or intermittent interference. However, neither protocol at this time provides a mechanism to avoid deliberate denial of service through collision attacks or join request flooding, although warning may be received by mechanisms to detect excessive retransmissions.

Both WirelessHART and ISA100.11a rely on a centralised security manager for the authentication of new devices and the generation and management of security keys throughout the lifetime of the network. This means that the loss of the security manager will cause the loss of security mechanisms in the network, and so can be seen as a single point of failure. Newer releases of WirelessHART and ISA100.11a networks are offering redundant network and security manager solutions with automatic and transparent handover from the primary to the secondary system in case of failure.

Security configuration differences

While for the most part WirelessHART and ISA100-11a use the same security protection mechanisms as described above, there is one

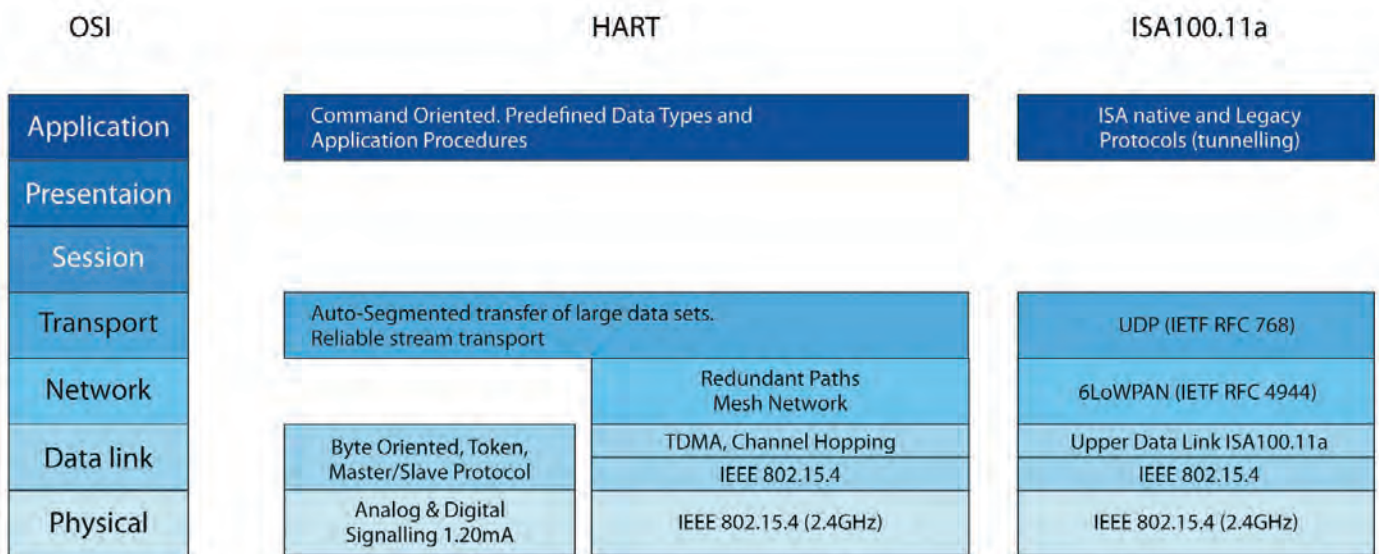


Figure 3: Industrial wireless protocol stacks.

major difference in how they are implemented: WirelessHART devices from all manufacturers are forced to be compatible by the standard, whereas many security features are optional for ISA100-11a, in keeping with its flexible design principles.

Because security algorithms require additional processing time, memory and power, making them mandatory means that devices that may not require strict security policies cannot disable them in WirelessHART to achieve benefits such as extended battery life. However, users implementing ISA100-11a must be aware that different vendors may choose to not implement all the security options, potentially introducing undesired security risks.

Conclusion

This two-part article has covered most of the architectural differences and standards involved with industrial wireless networks, focusing mainly on architecture considerations. Other additional features of these protocols — for example, quality of service (QoS) or their support for larger data transfers such as device firmware updates — have not been described for the sake of brevity, but information on these can be found in the standards or from wireless device vendors.

The two significant standards for industrial wireless networks are WirelessHART and ISA100.11a. While ZigBee (or more specifically ZigBee Pro) has been put forward as the industrial wireless standard, it lacks some of the resilience and protocol support that the main contenders offer, and as a result has not been a serious contender for use in larger industrial process systems, such as those found in the oil and gas industry.

WirelessHART and ISA100.11a, while both being based on the same basic wireless sensor network (WSN) technology of IEEE 802.15.4, have fundamental differences in design philosophy, one opting for ease of deployment and multivendor compatibility, the other choosing flexibility and scalability as key design features. Both provide network resilience for harsh industrial environments and both provide extensive security features — as much as can be provided for currently in wireless systems. However, WirelessHART enjoys the greatest market share for two main reasons:

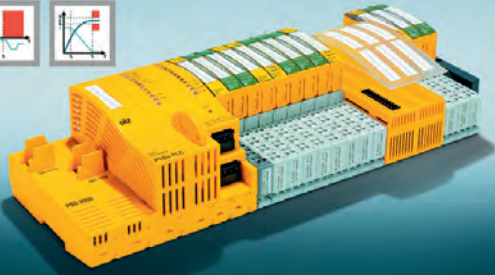
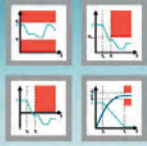
- The extensive existing deployment of HART-compatible devices (around 50% of all field devices) and therefore direct legacy compatibility with existing systems.

- The inherent fixed capabilities, with few options, that ensure device compatibility between different vendors. These benefits come at the cost of scalability, flexibility and support for non-HART protocols.

With ISA100.11a, the designers have opted to develop a standard that allows potentially any fieldbus network to be operated over a resilient mesh wireless network but have not provided the direct support for these protocols in the standard. This leaves it up to vendors to build their own software and hardware to support whatever they require. Utilising IPv6 as an addressing scheme supports greater mesh network scalability than WirelessHART, and extensive deployment options and feature choices make it far more flexible, but these same benefits introduce potentially greater deployment costs, because the network must be designed far more carefully, and choices of vendors may be affected by interoperability considerations. ISA100.11a, in its current form, is more suited to a single-vendor deployment.

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SAFE MOTION MONITORING

Release 12 of the PSS 4000 automation system includes the addition of the safe motion monitoring modules PSSu K F EI.

The safe motion module and corresponding software blocks gives the ability to monitor up to eight axes per control system (PSSuniversal PLC or PSSuniversal multi) up to PL e, Cat. 4, SIL 3 — with one safe encoder or dual proximity sensors.

The functions that can be monitored include: safe speed range (SSR), in which the maximum and minimum speeds must not pass a certain value; safe speed monitor (SSM), which supplies a safe output signal to indicate motor speed is below a defined limit value; safe direction (SDI) to make sure a drive can only move in one (defined) direction; and safe operating stop (SOS), which monitors the stop position reached by the axis and prevents any deviation from the position window.

The module PSSu K F EI includes two safe outputs to control motor contactors, relays or the STO to drives. The outputs can be directly linked with the motion

monitoring functions to ensure fast reaction times (rather than requiring processing from the program). The regular safety program can also switch off the outputs in combination with the software blocks.

This is in addition to existing PSS 4000 safe position monitoring functionality, in which counter modules with software blocks are available for this purpose, along with modules PSSu E F INC and PSSu E F ABS SSI, offering safely limited position (SLP) and safe position monitoring (SP) functionality.

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The TeSys T advanced motor management system now provides support for the Modbus TCP and EtherNet/IP protocols.

An optional expansion module enables voltage and power measurement and protection functions. With the addition of Modbus TCP and EtherNet/IP, TeSys T provides easier integration of a motor management system with PLCs and controllers, while actively supporting energy efficiency and production optimisation. It can be now be integrated into ModBus, CANopen, DeviceNet, Profibus and ModBus TCP.

TeSys T with Modbus TCP and EtherNet/IP supports real-time data exchange through enhanced bandwidth, quality-of-service message priority and built-in web pages that support data access, control and other functions.

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After plugging them in, TRION cards are identified automatically and configured within the software as soon as it is launched.

Counter/encoder inputs of TRION modules are phase synchronised. A standard counter is always a sample behind. Dewetron's SuperCounter is both fully phase and amplitude correct, so it is synchronised to analog and all other inputs, accepts any signal waveform with a trigger level from 0 to 50 V and has three modes: event counting, waveform timing and sensor input.

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Flue or stack gases pose special challenges for single-point air/gas flow measurement sensing technologies because of their multigas composition, swirling air currents, high temperature, humidity extremes and sticky or abrasive particulates.

The MT91 flowmeter from FCI meets US environmental requirements for CEMS per CFR Title 40, Part 75. The MT91 is suitable for measuring mass flow almost anywhere variable conditions limit single-point flowmeter effectiveness.

The MT91 features a multipoint averaging thermal mass flow sensor design. The design combines FCI's thermal dispersion flow element design with up to 16 flow sensing points while operating over a wide temperature range up to 454°C.

The MT91 flowmeter features a wide turndown range available from 5:1 to 100:1 with a flow range from 0.08 to 46 NMPS. Up to four meters can be installed to measure air/gas in the largest of stacks. Measurement repeatability is $\pm 0.5\%$ of reading.

All wetted surfaces are 316 stainless steel with nickel brazed joints per AMS 4777 (standard) or Hastelloy C-276 as an option. Coating materials, such as electroless nickel plating or chromium carbide, are also available.

The 316L stainless steel sensor assembly is available with flanged, threaded and retractable process connections with an IP66-rated (NEMA/CSA Type 4X) junction box. The flow element assembly is connected remotely by cable to the electronics package up to 304 m away. Dual 4-20 mA analog outputs of flow rate and temperature and dual DPDT relays are available for interfacing with DCS, PLC, SCADA, controllers or other recording devices.

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Banner Engineering SI Series safety limit switches are designed to effectively monitor the position of a wide variety of guards, gates, covers and other moveable machine fixtures and tooling. The SI Series is available in three models - SI-LM40, SI-LS31 and SI-LS83 - offering various actuating systems, contact arrangements, and housing and mounting configurations to satisfy diverse industrial applications.

Banner's SI Series feature a limit-switch style, complying with Type 1 per ISO 14119 standards, with actuating elements integrated with the enclosure. Configured with a positive-opening design for the normally closed contacts, per IEC 60947-5-1 standards, these switches provide reliable monitoring regardless of environmental conditions and withstand any attempt to override the switch and defeat the system.

The SI Series offers multiple actuating systems, including plunger, roller, spindle-mount lever and two lever styles. The switches' actuator head is rotatable in 90° increments. When properly interfaced, or used with an appropriate safety controller or module, two safety switches monitoring an individual guard can achieve a category 4 level of safety, per ISO 13849-1.

Models are available with robust, die-cast aluminium or plastic housing with an IP65 glass-reinforced thermoplastic switch housing. Models housed in plastic resist many aggressive chemicals and liquids found in industrial environments.

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CODE READER

The Lector642 image-based code reader is designed for demanding code reading applications. Changing object heights and reading distances, wide visual ranges, randomly aligned 1D and 2D codes, and fast transport speeds are some of the challenges that the Lector642 can overcome, due to its high camera resolution, and fast serial image shooting and decoding functions. It also offers a variety of fieldbus options and extensive analysis functions.

The Lector642 code reader is available in a 'Flex' version with individually adjustable illumination settings and lenses, making it a technically and economically efficient solution due to its flexibility of application.

The 'PANORAMA' accessory for all Lector642 and Lector65x models makes it possible to achieve a field of view that is about 50% larger with the same code resolution.

The Lector642 has a resolution of 1.7 MP, meaning the device can reliably identify a standard 1D code with a line width of 0.35 mm in a reading field with a width of 400 mm. Whether barcode, Data Matrix, MaxiCode or QR code, the Lector642's decoding algorithms ensure that even codes with poor levels of contrast or areas that have been damaged can reliably be detected and evaluated.

Serial interfaces, I/Os, USB, CAN and Ethernet-based fieldbuses, such as TCP/IP, EtherNet/IP and Profinet, are already integrated in the code readers, as are the function blocks. Other fieldbuses, such as Profibus, are available in the form of connection modules.

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GIGABIT SWITCH

Red Lion has released the latest addition to the N-Tron 1000 Series hardened Gigabit Ethernet switch range.

The N-Tron 1008TX is an 8-port unmanaged switch aimed at futureproofing the network by means of lower latency Gigabit Ethernet on all ports, supporting a maximum throughput of 16 Gbps including jumbo frame support.

Built for extreme environments, the 1008TX industrial switch is housed in a 39 mm-wide compact metal enclosure for EMI protection. It has a high vibration tolerance of 200g, a wide operating temperature range of -40°C to +85°C and a claimed reliability of over 2 million hours MTBF.

The product complies with IEEE 1613 for electric utility substations and NEMA TS1/TS2 for traffic control.

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GAS VOLUME CORRECTOR

Honeywell Process Solutions has introduced a metering device that measures natural gas delivered to industrial customers, helping them meet government and industrial standards.

The EC 350 PTZ Gas Volume Corrector allows for precise measurement in a design that is easy to maintain and reliable over extended operations. It is the first member of an HPS family of purpose-built, high-performance electronic volume correctors (EVCs) that meet these critical requirements.

The product uses pressure, temperature and compressibility factors to measure gas volumes. Users can program the universal bracket-, wall- and rotary-mount device in the field and employ its multiline keypad interface for simplified operation. The unit is said to offer improved accuracy, expanded memory and battery, advanced diagnostics and integrated cellular communications.

The device features a plug-and-play digital pressure transducer and an enclosure optimised for serviceability and outdoor operation. With long-term stability and extended battery life, the solution minimises the need for site visits by technicians and simplifies field repairs. It also allows for very precise measurements and long-term reliability with minimal maintenance requirements.

Honeywell offers the EC 350 volume corrector pre-configured with activated cellular radio, ready to be employed with its Total Data Services PowerSpring Meter Data Management software or other data collection software to ease IT integration in advanced metering or smart metering infrastructure.

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The F100P is a 1" meter with a maximum pressure rating of 431 bar that targets measurement for higher flow rates typical for hydrate inhibitors. The HPC010P is an ultrahigh-pressure Coriolis meter that will have a maximum operating pressure of 1034 bar to address offshore chemical injection measurement for chemicals such as corrosion, scale and asphaltene inhibitors.

Coriolis meters for high-pressure applications can deliver more accurate measurement and reduced maintenance over traditional PD technology. The meters also offer Emerson's Smart Meter Verification (online verification of meter performance) and therefore provide safe, reliable and repeatable performance with reduced maintenance in tough applications.

These flowmeters will be available starting late 2015 and are the latest addition to Emerson's chemical injection solution capabilities, which include Tescom flow control technology, Micro Motion mass flowmeters and Rosemount pressure and temperature transmitters.

Emerson Process Management
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HYGIENIC LEVEL SENSOR



The LR2750 level sensor from ifm efector can work with reflective foams. The device was specially developed for demanding applications in the food industry, features a hygienic design and resists aggressive cleaning processes. In addition, the sensor is equipped with an Aseptoflex Vario thread to suit a range of process adapters.

Due to the use of high-quality and insensitive sealing materials such as PEEK and EPDM as well as a high-grade stainless steel housing, the LR2750 level sensor is suitable for internal and external cleaning. It has the protection rating IP69K, an enhanced pressure resistance up to 40 bar and is also rated for high medium temperatures up to 150°C. This development is extremely resistant to the most adverse operating conditions such as steam cleaning.



An optional tank adjustment ensures the flexibility of the LR2750. Even if installation is difficult such as at the connection piece of a tank, the device operates precisely and without problem. Due to the ability to shorten or replace the probes it is not necessary to have several probe lengths in stock when various tanks are used, facilitating replacement.

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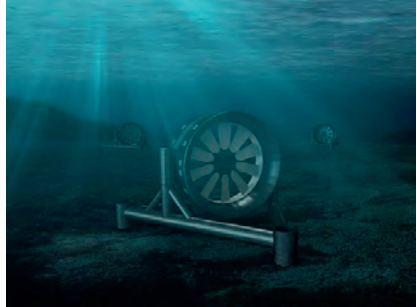



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Yellow submarine to produce tidal electricity for France



GE Power Conversion is helping build France's first subsea tidal power plant for Electricité de France (EDF), near Paimpol-Brehat, in Brittany. When completed at the end of this year, it will generate 1 MW of renewable power and feed it through a 16 km underwater cable to the local grid.

"We went to the moon 46 years ago, and now we are using it to produce energy," said Frederic Navarro, project director at GE Power Conversion in Belfort, France. "That's because the moon's gravity tugs on the ocean and produces predictable tides that run like clockwork, twice a day."

As the tides move in and out, they will spin two turbines measuring 16 m in diameter and sitting 35 m below sea level. The turbines generate electricity with direct-drive permanent magnet generators and send it for processing to a subsea converter. Navarro calls it the "yellow submarine" because of the way it looks.

The idea might be simple, but the execution is a different matter. The turbines, made by OpenHydro, a company specialising in the design, manufacture and installation of marine turbines, are so large they have to be assembled in a dry dock in the port of Brest and deployed using a custom-built barge. In the dock, they will be coupled with the subsea converter, built by GE Power Conversion at GE Power & Water's factory in Belfort.

Navarro said the subsea converter, which is 9 m long and 5 m wide, provides technology that will control the rotation of the turbines and optimise the power produced by the generators according to the speed of the tides. It can independently control the speed of each turbine, transform their variable AC voltages to DC and reduce losses along the 16 km subsea cable.

"Naturally, tidal arrays go to places where there are strong currents," Navarro says. "But these currents also make such locations a tough place to work."

OpenHydro will use specially trained divers to install the equipment at the sea bottom. "The divers will be only able to work during certain times of the day, when the conditions aren't dangerous," Navarro said. The partners expect the array to start producing power by the end of the year.

Among the technology employed to put the complex electrical design into action is GE's MV3000 low-voltage drive. Together with other electrical components, it enables the low-voltage alternating current, generated by the turbines to be transformed into HVDC, significantly reducing energy loss over a long-distance power transmission.

The onshore substation will use a GE MV7000 drive that converts HVDC back to HVAC, which is compatible with the French grid.

Being among the first projects of its kind, it was up to GE Power Conversion to conceptualise, assemble and test the highly advanced subsea converter, drawing from its expertise in marine and subsea projects.

"Reliability is of the utmost importance in this project; once the equipment is installed on the seabed it has to run in full autonomy for a minimum of five years," said Régis Baudet, project manager, EDF. "We have full confidence in GE Power Conversion to design and build a reliable and robust system that will allow continuous power generation and other operation requirements."

Source: GE Reports



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ACI CONNECT 2015

CONFERENCE AND EXHIBITION, 12-13 AUGUST 2015

Don't miss the strong line-up of speakers and exhibitors at Australia's newest conference and exhibition focused on automation, control and instrumentation technology, efficiencies and applications.

ACI Connect — Australia's only conference and exhibition dedicated to automation, control and instrumentation technology developments — is only weeks away. The event launched in Melbourne last year and the 2015 event will take place 12-13 August at Sydney Olympic Park.

The highly focused conference program features industry expert keynotes on connected manufacturing, predictive asset optimisation and the IoT, as well as the all-new Future Networks Forum, the Engineers Australia Future Tech Forum, a leadership panel and a dedicated MiniLab workshop channel catering to a broad sector of industries and job functions. A new Live Demo Theatre will be a feature of the exhibition area during the event.

ACI Connect is brought to you by Westwick-Farrow Media, publisher of *What's New in Process Technology* and *ProcessOnline.com.au*, with the backing and support of industry bodies IICA and Engineers Australia, as well as the EtherCAT Technology Group, FieldComm Group, the Institution of Chemical Engineers, ODVA and Profibus Australia.

Speakers — Conference day 1

After the opening address by Westwick-Farrow and IICA, the first day will kick off with two special keynote addresses, the first given by John McGuire, Global Industry Director at Aurecon, on the topic *Transforming Australian manufacturing — innovating with data-driven customer insight*. This will be followed by Joanna Batstone, VP and Lab Director, IBM Research-Australia, speaking on the topic *Smarter analytics — predictive asset optimisation and your industry*.

After the morning break, the Future Networks Forum will begin. Experts representing four of the leading network protocols will share their vision of the future for this critical sector of the industrial landscape — Rafael Koenig, Chairman of Profibus Australia; Ted Masters, President and CEO of the Fieldcomm Group; Steven Sischy of Beckhoff Automation representing the EtherCAT Technology Group; and Daniel Hancock of Schneider Electric, representing ODVA.



Where:

Sydney Olympic Park, Homebush

When:

Conference and exhibition, 12-13 August 2015

Conference times:

Wednesday 12 August 2015, 8.15am– 6.00pm,

Thursday 13 August 2015, 8.30am–5.00pm

Exhibition Times:

Wednesday 12 August 2015, 9.00am–6.00pm,

Thursday 13 August 2015, 9.00am–4.00pm

Register:

www.aciconnect.com.au/pages/pricing-and-registration

Web:

aciconnect.com.au

Speakers — Conference day 2

Day two will begin with a keynote address by Michael Freyny, Executive General Manager – Digital Factory/Process Industries and Drives, Siemens, on *IoT and Industry 4.0 – perfect match or perfect storm?* This will be followed by a leadership panel discussion, *The Internet of Things and your industry.*

The Engineers Australia Future Tech Forum will begin with a presentation by tech futurist and ABC presenter Paul Wallbank, titled *Engineering the Future – what lies ahead?*, with some insights about where your profession is heading. Business leaders and researchers will share their insights on such things as data analytics; vulnerabilities in distributed control environments; the impact of the IoT and M2M technology; extending automation and control technology to infrastructure and construction; advanced robotics; skills training and education; and integrated asset management. The speakers will be:

- Geoff Sizer, CEO of Genesys Design
- Chris Vains, GM Factory Automation, Siemens
- Professor Mary-Anne Williams, Director, Innovation and Enterprise Research Lab, UTS
- Professor Maurice Pagnucco, UNSW School of CSE
- Nick Fondas, MD iTech Corporation

Details of the individual presentations can be found at www.aciconnect.com.au/pages/speakers-topics or www.aciconnect.com.au/pages/conference-program

The aim of the forum is to look at the rapid changes in industrial networking technology and the impact of Industry 4.0, looking at issues such as:

- What challenges and opportunities does the connected IoT future bring to the industrial communications environment and how is technology adapting as a result?
- Can IT and engineering management work together at the network planning stage — and what are the benefits of better collaboration?
- How will advanced network design better enable advanced manufacturing?
- What is the future for wireless networks?
- What impact will external technology and economic forces have on future network design and planning?

After the forum presentations, a Q&A panel discussion will be held to give delegates an opportunity to pose questions to the experts, and add their own comments and thoughts on this increasingly complex, and important, area.



Mini-Labs focus on education and training

The Mini-Labs for Techs stream will be held over six sessions and will be presented by Steve Mackay, Technical Director, IDC Technologies. Day 1 will offer sessions on lightning and surge protection for instrumentation and control professionals, best practice in process loop tuning, and PLC ladder logic programming.

The second day will focus more specifically on troubleshooting Industrial Ethernet networks, the nuts and bolts of the AS/NZS 3000 wiring standard and troubleshooting Modbus over Ethernet.

**Details are current as of the time of writing and so some changes may occur. For the current program content and information about presenters, please visit <http://aciconnect.com.au/pages/conference-program>.*

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ACI Connect

www.aciconnect.com.au



RADAR INSTRUMENT FOR BULK SOLIDS

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

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

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

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

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

VEGA Australia Pty Ltd

www.vega.com/au





PROCESS ANALYSER RANGE



The Metrohm ICON 4117 process analyser range performs photometric absorption measurements in the visible light range. With differential absorbance colorimetry (DAC), the analyser compensates for the colour and turbidity of the sample by measuring both before and after the addition of a colour reagent.

The DAC technique can be used to measure aluminium, ammonia, chlorine, chromium, copper, cyanide, hydrazine, iron, manganese, nickel, nitrate, nitrite, phenol, phosphate, silica and zinc. The photometer module comprises a heated cuvette with 2.4 cm light path and a long-life LED source.

Various parameters can be managed by the software, besides analysis results — low-reagent level alarms, calibration errors and loss of sample are a few examples of alarms that can be logged in the database or sent to a control room for further review by the operator.

Multiple user levels are offered in the software, which are suitable for any operator.

Installation is simple. Users connect the power, sample and reagent lines and the analyser is fully operational.

MEP Instruments Pty Limited

www.mep.net.au



SIGNALLING AND COMMANDING DEVICES

Sirius Act is a modular system of commanding and signalling devices that features a robust design with IP69K degree of protection, high-level aesthetics and simple operation.

Users have a choice of a wide range of push-buttons and emergency stop buttons, selector and key switches and acoustic and optical indicators. The diverse range in metal and plastic versions for front panel mounting can also be combined flexibly with different rear-mounting contact and LED modules.

An online configurator simplifies selection and ordering. The components are connected to the controller via AS-Interface, IO-Link or standard cabling. Due to twist prevention and an innovative snap-on concept, these commanding and signalling devices can be installed quickly and easily without errors even if holes are not keyed.

The Sirius Act snap-on concept makes it possible to assemble the front element and rear holder quickly without tools. Disassembly is equally rapid via a release lever. A screwed connection with reliable twist prevention means that keyed holes are not essential for reliable device installation.

Being a modular product line, Sirius Act enables users to choose from four design ranges in plastic and metal versions to meet their specific requirements. The front of the holders features different actuators and indicators, while at the rear they provide slots for contact and LED modules.

There is sufficient space to accommodate up to three modules side by side and two contact modules one behind the other in each case. The modules are available with screw terminals, spring-type terminals or solder pin connections.

Siemens Ltd

www.siemens.com.au





VISUALISATION SOFTWARE

Coinciding with Release 13 of the PSS 4000 automation systems in December 2015, Pilz will be releasing PASvisu, a web-based visualisation software tool for the PSS 4000 automation system.

Visualisation projects are created and configured simply and intuitively with the PASvisu HMI software via the PASvisu Builder. The visualisation package developed by Pilz is based on the latest web technologies such as HTML5, CSS3 and JavaScript. PASvisu has intuitive operation and offers design freedom for projects: users of Pilz control solutions can use it to fully operate and monitor plant and machinery.

The web-based HMI software coupled with Pilz diagnostic functions for connection to the PSS 4000 automation system provides a comprehensive, convenient overview of the plant, locally or via remote access. The use of open web technologies provides device- and platform-independent access via PC, tablet and smartphone with genuine client/server functionality.

The PAS 4000 software platform is used to program and configure the PSS 4000 project.

Pilz Australia Industrial Automation LP

www.pilz.com.au



REMOTE ACCESS GATEWAYS WITH WI-FI

Secomea (Secure Communications Made Easy) has announced the expansion of the SiteManager range with two Wi-Fi models: SiteManager 1149 and SiteManager 3349. Adding onboard Wi-Fi provides users more options to customise their secure remote access and M2M needs.

The end-to-end solution comes preconfigured for the user's particular site and equipment. It comprises three components: SiteManager, the hardware interface, featuring a WAN uplink (3G optional), LAN ports and serial ports; GateManager, a cloud-based authentication server; and LinkManager client software, which provides the licence that the GateManager must find, in association with a password, to grant access.

Security confidence is provided by defence in depth, embracing AES/SSL encryption, two-factor authentication and a firewall that filters traffic based on the nominated destination devices.

The centrally managed authentication can be hosted by the user or the supplier via a cloud service that makes the secure connection between authorised users and devices. There is no need to worry about IP addresses, VPN protocols, TCP ports or encryption settings, a common source of error — this is all built in.

Users are connected to a site device using their own access software as though they were directly connected. Secomea provides direct access to PLCs, HMIs, drives or almost anything with an ethernet, serial or USB data port — and with both the LAN and 3G uplinks, the failover function ensures the connection is maintained.

Daanet Pty Ltd

www.daanet.com.au



ACI CONNECT | 2015

Sydney Olympic Park
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INDUCTIVE SENSORS



The uprox3 inductive sensors are the third generation of Turck's uprox Factor 1 sensors. The existing uprox+ sensors offered large switching distances for all metals; however, these distances are increased by as much as 50% in the uprox3 series. It is now possible to achieve a sensing range of 3 mm in the M8 design, 6 mm in the M12 and 10 mm in the M18, without any compromises in performance.

Because of their inherent immunity to magnetic fields, the uprox3 series sensors are suitable for use in many demanding industrial sectors, such as welding for the automotive and metal forming markets. The uprox3 series will be available with robust PTFE-coated sensors in M8, M12 and M18 designs. Turck's weldguard will also be available. Like their predecessors, all uprox3 sensors offer a high EMC stability and flexible mounting including full flush mounting, as well as precise switch points.

Turck Australia Pty Ltd
www.turck.com.au



CONDUCTIVITY SENSOR

The optek CF60 conductivity sensor features a 6-electrode, 4-pole design. The patented arrangement of the four current electrodes around the two potential electrodes results in a reliable and precise measurement of a broad conductivity range from 1 μ S/cm up to 850 mS/cm. This design also provides greatly reduced sensitivity to sensor fouling and polarisation. Designed for ultra-sterility, the six electrodes are sealed in the FDA-compliant PEEK sensor tip without the use of O-rings or epoxies.

A Pt1000 platinum RTD is integrated in the tip of the CF60 sensor providing fast-response temperature compensation. The inline sensor body ensures smooth and unrestricted flow of all process fluids with minimised hold-up and hydrostatic shear. This design results in rapid sensor response, precise measurements and maximised product recovery and quality.

Manufactured using only certified and traceable materials of the highest quality, the CF60 can be provided with special wetted parts for resistance to the acids, bases as well as organic and inorganic solvents. The CF60 sensor is suitable for CIP/SIP applications.

The CF60 sensor is designed to provide precise and reliable control of conductivity directly in the process, at low volumes. In combination with an optek Converter Control 200, it provides a system that can be used under rough process conditions.

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



AUTOMATION COMPUTER

The UNO-2362G embedded automation computer offers an AMD G-series dual core processor, daisy chain network capabilities as well as Advantech's iDoor technology. The daisy chain technology allows users to connect to, and configure, multiple Advantech ADAM modules to create star networks without the need to use a network switch.

Advantech's iDoor technology is a new modular way of adding functions to the UNO-2362G. Modules for the iDoor system include fieldbus protocols such as Profinet, EtherCAT and Powerlink. Also available are expansion and storage; digital and analog I/O; WAN, MAN, and LAN communications with Wi-Fi, GPS, GPRS, and LTE; as well as ancillary modules such as temperature, brightness, smart meters and others.

The UNO-2362G has enhanced 3D graphical performance with an AMD G-series T40E dual core processor, 2 GB DDR3 RAM (upgradeable to 4 GB RAM) and an AMD Radeon HD6250 GPU which supports H.264, VC-1, MPEG2, WMV and DivX. There are also two display outputs (DisplayPort and HDMI) which can run two monitors, four USB 2.0 ports, one mini-PCI socket and two Gigabit LAN ports.

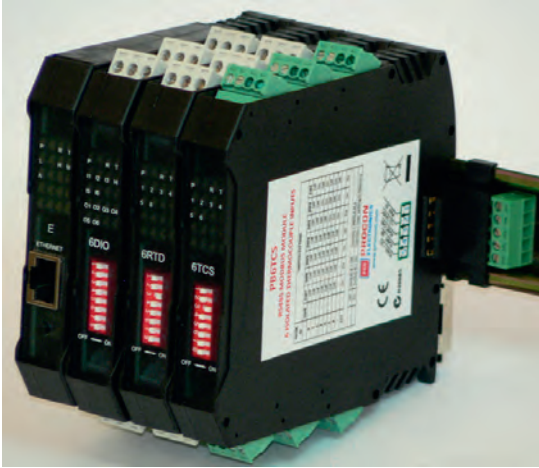
The UNO-2362G supports WebAccess 7.2 management software with IPV6 support, SUSIAccess and Advantech DiagAnywhere software applications.

Advantech Australia Pty Ltd
www.advantech.net.au





MODULAR MODBUS I/O SYSTEM



PROBUS from Procon Electronics is a modular Modbus I/O system that provides a simple low-cost solution for distributed I/O requirements.

Manufactured in Australia, the PROBUS system consists of standalone digital and analog input and output modules which are connected together on an RS485 two-wire, multi-drop network. The modules plug into a special bus connector which fits inside the DIN rail.

The modules communicate using the Modbus RTU protocol. A 32 bit ARM CPU is used in the modules to provide high-speed data processing and fast communications turnaround times. Multiple baud rates are selectable from 2400 to 115,200 baud.

All PROBUS modules plug directly onto an industry-standard DIN rail. All modules have a minimum isolation of 1500 VAC between the field and logic and all RS485 circuits are isolated. The modules have been equipped with status LEDs which are used to indicate the status of the inputs or outputs.

The I/O capabilities of a PLC can be expanded where the PLC has a Modbus communications facility available. When configured as a Modbus Master, and attached to the RS485 network, the PLC can use the PROBUS modules as remote I/O, reducing cabling costs and increasing the I/O capability of the PLC.

The PROBUS modules can also be used for distributed data acquisition by connecting a PC to the network through an RS232/RS485 converter. Procon also offers an ethernet converter to allow the PROBUS modules to communicate over a 10/100baseT network.

Procon Electronics Pty Ltd
www.proconel.com



POWER SUPPLIES

The TDK-Lambda DRF120-480 series of DIN rail-mount power supplies combines compact dimensions with an efficiency of up to 94%. No load power consumption is between 0.5 and 0.75 W depending on the model type.

The TDK-Lambda 24 V output DRF series is available in three power levels — 120 W (5 A), 240 W (10 A) and 480 W (20 A) — and can deliver a peak power of 150% for 4 s. The overload characteristic is constant current style; suitable for driving motors and other non-linear loads. Additional features include remote on/off, parallel capability, remote voltage adjust and a DC good relay output.

The supplies operate from a universal input of 85-264 VAC, have EN61000-3-2 compliance and can withstand input voltage surges of 300 VAC for 5 s.

Housed in a metal case, the DRF series offer a narrow design, ranging from 36.5 to 82 mm, saving vital space on the DIN rail. The smallest model measures 36.5 x 123.4 x 115 mm (DRF120-24-1); all DRF models will mount on either a TS35/7.5 or TS35/15 DIN rail.

The supplies can operate at full load over a wide temperature range of -25 to +60°C (derating linearly to 70% load at +70°C). Other features include overcurrent and overvoltage protection, and a hold-up time of up to 20 ms at full load.

The DRF series is approved to UL508, as well as IEC/EN 60950-1 (2nd Ed.) and UL/CSA 60950-1, among other standards.

Glyn Ltd
www.glyn.co.nz



MODULAR I/O SYSTEM

Weidmüller has released the u-remote, a modular I/O system that permits up to 64 I/O modules, making it one of the highest density I/Os in the market.

With over six communication modules to choose from, the u-remote can be integrated onto various industrial automation networks including Modbus TCP, Profinet, EtherNet/IP, EtherCAT, Profibus DP, DeviceNet and CANopen.

Equipped with an integrated web server, the u-remote offers a shorter configuration and installation time. Status LEDs on the channel and each u-remote module enable reliable diagnosis and rapid service. There are also advanced input module options including the DIAG diagnostic analog input module, which can detect sensor wire break, and the SIL safety module, which can implement a CAT3/4 safety monitoring circuit.

The I/O modules are also hot-swappable, reducing maintenance downtime and providing longer machine running time. Weidmüller's 'PUSH IN' technology, with cable size up to 1.5 mm², provides time-saving wiring and rapid replacement of sensors. Housed in IP20 protection, the u-remote system is DIN rail mounted, and at only 11.5 mm, the I/O system is suitable for use where there is reduced cabinet spacing.

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DRIVE RANGE

Regal Australia has introduced a range of AC variable speed drives from Marathon Drives.

The Marathon Drives series offer a range of different types and models of AC drives that was carefully selected and created to suit customers' needs and market requirements. They are available in five models: the MD100C compact drive to fit anywhere when size is a major problem in small panel arrangements; the MD100G general-purpose drive; the MD100P pump/flow drive; the MD100H HVAC&R drive; and the MDHP high-performance drive for precision automation systems and PM motor control.

The Marathon Drive range is currently available in power ranges from 0.1 up to 450 kW as standard, while higher power versions are also available on request.

Marathon Drives are designed to operate the motor using the lowest possible energy consumption and highest energy-efficient performance to meet all energy-efficient levels and standards. They also meet all required industry approvals: CE, C-Tick and UL.

Regal Beloit Australia Pty Ltd

www.regalbeloit.com



CAST STAINLESS STEEL PUMPS

Tsurumi Pump has designed the cast 316 stainless steel SFQ series pumps specifically for corrosive water applications including seawater, brine and even leachate in settling ponds.

The SFQ range includes 2" and 3" three-phase pumps with heads up to 44 m and flows to 2000 Lpm. They feature a high-capacity semi-open-style impeller that will perform in tough conditions.

The stator housings of the SFQ series are cast and machined 316 stainless steel, as well as the casings, impellers and suction covers.

The grade of stainless steel used has a higher content of carbon for strength. It also has a high proportion of nickel and molybdenum for improved corrosion resistance. No welds are required, which means no pitting and reduced oxidation. This material is also capable of withstanding abrasive liquids.

Tsurumi incorporates a number of features that enhance the life expectancy of the pump and cut maintenance costs. These include an anti-wicking cable gland so that water is prevented from wicking down inside the cable. The motor is protected even if the cable is damaged or the end accidentally immersed.

All Tsurumi pumps have a double silicon carbide mechanical seal. Both seal surfaces are submerged in an oil chamber, well away from the pumped liquid. An oil lifter ensures the mechanical seal faces are always lubricated and cooled, even if the pump is installed horizontally.

Australian Pump Industries Pty Ltd

www.aussiepumps.com.au



CELLULAR MODULE FOR HMI

Control Logic has announced Red Lion's HSPA+ (GMHSPA) cellular module for its Graphite HMI platform. The module uses an HSPA+ cellular network to provide high-speed data communication to remotely located assets across oil and gas, water and wastewater, power, utility and alternative energy applications.

Programmed using Red Lion's Crimson software, the GMHSPA+ module easily plugs into Graphite HMIs to provide a space-saving solution that simplifies installation. The combined solution supports over 300 different industrial protocols, enabling users to monitor and control a large variety of disparate equipment and processes, such as temperatures, pressures, flows and levels.

It provides a powerful solution to monitor and control remote equipment, using high-speed cellular networks to eliminate expensive site visits. This allows users to receive critical device and performance data in real time, thereby saving time and money while staying informed.

Graphite HMIs offer a built-in web server that enables users to monitor and control applications via PCs, tablets or smartphones. SMS and email alerts provide early warning of process issues, which helps avoid costly downtime. In addition, protocol conversion lets programmers select 13 or more simultaneous protocols from a list of over 300 to seamlessly integrate disparate devices such as PLCs, drives, barcode readers and panel meters

Control Logic Pty Ltd

www.control-logic.com.au



TETHERED OPERATOR INTERFACE

The Allen Bradley MobileView tethered operator interface is a mobile terminal that gives plant and industrial personnel the freedom to take a machine's HMI with them to make real-time adjustments to out-of-view applications.

The MobileView tethered operator interface is suitable for maintenance tasks, machine set-up or calibration activities, and other HMI applications that require the operator to see the machine. The inclusion of a hardwired e-stop button and three-position enabling switch also supports applications that require local safety functionality. The tethered operator interface puts the terminal in the operator's hands to increase productivity and safety by reducing the back and forth travel between the machine and a remote interface.



MobileView complements the Allen-Bradley PanelView graphic terminals, giving manufacturers and industrial operators a range of fixed and mobile terminals for different applications. It also uses the FactoryTalk View Machine Edition (ME) HMI software, allowing users to develop and re-use their software applications across the MobileView and PanelView platforms.

Three cable-length options, ranging from 5 to 15 m, offer flexibility for different machines and production lines. The MobileView tethered operator interface also uses a 0.25 m display with resistive touch screen, 2 GB internal SD card for application storage and USB 2.0 port for high-speed data transfer. Software-assignable functions are available as an option with either a hardwired momentary illuminated push-button or three-position key switch.

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Energy efficiency a priority at Victorian desal plant

In June 2007, the Victorian Government announced its intentions to construct a desalination plant as part of its Water Plan, which would create a drought-proof supply of water for Melbourne and Geelong. The contract to finance, design, construct, maintain and operate the Victorian Desalination Project (VDP) was awarded in July 2009 to the AquaSure consortium.

Located near Wonthaggi, construction commenced in September 2009 and was completed in 2012 by AquaSure and its contractors, which included design and construction contractors Thiess Degrémont and operations and maintenance contractors Degrémont Thiess Services (Watersure).

The VDP comprises a reverse osmosis plant, marine structures which include two underground tunnels located 15 m below the seabed, a two-way underground 84 km water transfer pipeline and 87 km underground power supply. With a production capacity of up to 150 billion litres of water per year, the VDP provides a rainfall-independent source of water to communities throughout Melbourne, South Gippsland and Westernport.

Reverse osmosis is the desalination technology used at the VDP to turn sea water into fresh water, as it is also the most energy-efficient method of desalination. However, this is not the only energy-efficiency measure that was implemented. AquaSure introduced a number of innovative systems to ensure the plant operates as energy efficiently as possible. This included incorporating systems within the plant to minimise power consumption during the reverse osmosis processes and the plant's compact modular design which reduces pipework and eliminates inefficient energy use.

The compressed air system was another area where AquaSure opted for equipment that possessed energy-reducing features such as variable speed drives and high-efficiency motors. Compressed air is used to power a number of processes within the VDP. One of the main requirements for compressed air on the plant, however, is to actuate a number of the more than 17,000 automated valves.

To maximise energy efficiency while meeting these requirements, AquaSure chose to install a Kaeser turnkey solution consisting of four Kaeser DSD 238 SFC series frequency-controlled rotary screw compressors, four air receivers along with four instrument air treatment skids which include pre- and post-duplex filter sets, as well as a desiccant dryer.

Every Kaeser rotary screw compressor is equipped with a large, efficient screw compressor block featuring Sigma Profile rotors. Powered by a direct drive system, the screw compressor blocks in the DSD series compressors eliminate the transmission losses associated with gear-driven systems, increasing reliability and service life. Further energy savings are achieved with the inclusion of the Sigma frequency control (SFC) module.



With the SFC VSD module, air delivery can be matched to actual air demand, according to the required system pressure, by continuously adjusting drive motor speed within its specified control range. This can lead to significant savings as only the required compressed air at any one time is produced, with a 1 bar reduction in pressure amounting to a 7% reduction in energy consumption.

From construction completion in December 2012 to the end of the contract in 2039, Watersure will operate and maintain the plant, seawater tunnels, pipeline and ecological reserve surrounding the plant site. The contract with AquaSure provides for flexible water ordering of up to 150 GL per year in set increments, enabling the state government to order water if required. When the VDP is not producing water, there is a comprehensive maintenance program in place which guarantees that the VDP is available to produce water when the need arises, making it an important part of Melbourne's water security in times of future drought and to support its growing population and economic prosperity.

Kaeser Compressors Australia
www.kaeser.com

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FAULT MONITORS

RS Components has added INSYS icom fault monitors to its industrial networking range.

The IMO-1 and IMO-2 fault monitors connect to sensors, measuring devices or controllers and automatically dispatch SMS messages or emails via GPRS when thresholds are exceeded. The messages are configurable and can also contain the actual monitored values of digital and analog devices. IMO-2 has ethernet and Modbus gateways, while IMO-1 has an additional port for connecting to Siemens LOGO! microcontrollers. IMO-1 supports all Siemens LOGO! objects, such as I/Os, flags and keys, thereby enabling any of these events to trigger actions.

The IMO-1 Kit is also available. It combines the IMO-1 fault monitor with a magnetic foot antenna and Siemens LOGO! adapter cable as a convenient, ready-to-use package.

RS Components Pty Ltd
www.rsaustralia.com

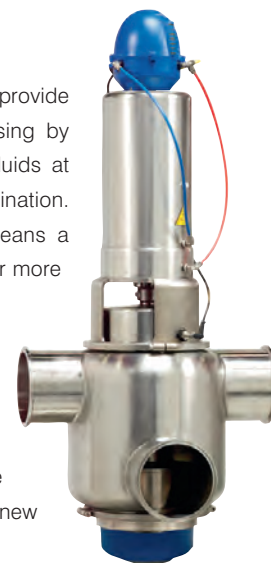
MIXPROOF VALVES

Alfa Laval mixproof valves are designed to provide maximum flexibility in hygienic flow processing by making it possible to handle two different fluids at the same time, with no risk of cross-contamination. Using two independent plugs and seals means a single mixproof valve can often replace two or more valves of other types.

Alfa Laval supplies several different designs of mixproof valves, all with leakage detection, that help boost reliability and safety levels. They enable users to design versatile set-ups that are both cost effective and easy to maintain, as well as providing new processing opportunities.

As part of the range, Alfa Laval offers a mixproof large particle valve with features designed for handling fluids with high viscosity or large particles such as lotions, soups and yoghurts. This valve is specially designed with large openings handling particles up to 45 mm in diameter to minimise pressure loss and securing product integrity by eliminating the risk of product damage or blockage.

Alfa Laval Pty Ltd
www.alfalaval.com.au



Precision Level Measurement System

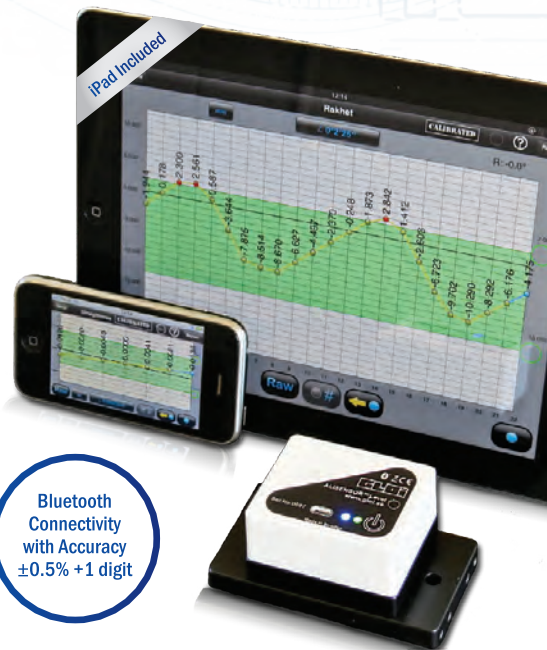
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TR1364

OPTICAL SENSOR FOR NATURAL GAS COMPOSITION ANALYSIS

Vidi Saptari, PhD, Precisive, LLC

LNG industries seek an accurate, simple and low-cost analysis solution for natural gas composition analysis.

Composition analysis of C1-C5 alkane gases (methane, ethane, propane, butanes and pentanes) is important in various applications within the LNG industries — with applications ranging from quality monitoring during production and custody transfer to its use in power generation. Advanced process control technologies providing fast and accurate feed and product analysis are critical in optimising efficiency and payback in various processing stages. In power generation applications, online and fast sensors are required to ensure optimum combustion efficiency and acceptable emission levels. In LNG transport applications, fast and easy-to-use analysers are desired to ensure quality at transfer points.

The LNG industry has generally focused on large base-load plants on land for many years. However, in recent years, smaller plants have received considerable investments including floating liquefied natural gas (FLNG) plants. In these plants, simple, low-cost and maintenance-free online analysis is key, due to capex/opex tradeoff shifts. In addition, some of these plants are built in areas where access is limited, making complex analyser system support cost prohibitive.

There are multiple measurement points through the supply chain where gas composition and calorific value are sought, including gas pre-treatment facilities, export and import LNG locations, storage tanks and vaporisation/condensing facilities. The feedstock natural gas for the liquefaction plants may have different chemical compositions, yielding a different calorific value of the output LNG.

The decision to remove the heavier hydrocarbons depends on the market for by-products (such as butane or propane) at the site of the liquefaction. The blending of multiple sources, or the desire to increase or reduce the calorific value with injection, requires careful consideration of not only the total energy content but also the implications a constantly changing composition of C1 through C5 alkanes will have for downstream refining — and particularly in power generation applications (solid oxide fuel cell, gas turbine and high horsepower stationary combustion engines).

20th-century separation technique challenged by the optical approach

The prevalent instrumentation technology used to date for hydrocarbon gas speciation and composition measurement is gas chromatography (GC). It works by physically separating the hydrocarbon compounds such as methane, ethane and propane through long, thin columns. The sample gas is injected at one end of the column, pushed by the carrier gas and exits at the other end of the column where a detector measures the intensity of the signal corresponding to the concentration of the compounds. Measurement time for a C1-C5 using a GC instrument varies from 90 seconds to 5 minutes, depending on the type of instrumentation, accuracy requirements and the configuration used. A continuous flow of a dry, high-purity carrier gas such as hydrogen or helium is also needed with a GC. Due to its comparative nature, a calibration mixture is generally needed to recalibrate the GC analyser regularly.



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Infrared absorption is an optical technology that has been well accepted for various online process industrial gas/liquid measurement applications from combustion analysis to beverage process monitoring. Infrared absorption spectroscopy analyses the absorption of light as it interacts with the sample. It can provide fast measurement (seconds or subsecond) and a simple flow-through sampling without the need for carrier gas or any other consumables. In addition, it is a direct measurement based on first-principle (not a comparative or correlative technique), providing robust and stable measurement.

In general, the system consists of a light source, a sample cell (for gases, liquids or solids), a wavelength separating element (spectrometer) and a photodetector. The wavelength-separating element 'slices' the wavelength components of the broadband light source, which then interacts with the sample molecules. Some of the wavelength components are absorbed and some are transmitted through without any absorption. The resulting spectrum is called an absorption spectrum, which acts as 'fingerprints' that can then be used to identify the sample components or quantify the composition of the sample.

Infrared absorption spectroscopy for natural gas composition measurement has long been envisioned and investigated by various groups^[1-4]. Its advantages from operational perspectives over gas chromatography are clear. However, several technical challenges have prevented its use in industrial settings. The biggest challenge has to do with the overlapping nature of hydrocarbon

spectra. Although the spectra of C1-C4 alkanes are unique, they overlap in such a way that there are not isolated peaks that make it possible to use a simple 'peak analysis' algorithm, but rather, a more sophisticated 'pattern recognition' algorithm or chemometrics is required.

Tunable filter spectroscopy with chemometrics

Infrared spectrometers utilising discrete optical filter elements, generally called non-dispersive infrared (NDIR) instruments, are widely used in various online monitoring applications today. They are proven to be robust and effective due to their simple design and high optical throughput. However, they are not effective in differentiating or speciating similar chemical entities with overlapping spectra such as the different compounds of hydrocarbons.

This article presents a novel and powerful improvement of the NDIR instrumentation where, rather than using discrete optical filters with a limited number of wavelength bands selected to correspond to required measurements, a tunable element is introduced to enable a degree of continuous spectral coverage, which leads to the capability to deconvolute complex spectra. Tunable filter spectroscopy (TFS) has now been introduced very successfully to rapidly speciate light hydrocarbons in natural gas, enabling fast and repeatable calorific value measurement.

A TFS analyser uses a proprietary implementation of a tunable Fabry-Perot assembly that enables high-throughput and high-precision wavelength scanning in preselected region(s). One or more wavelength bands are scanned in a continuous manner such that the digital representation of the spectral features is captured. A chemometric-based pattern recognition algorithm deconvolves the multicomponent spectra and quantifies the concentration of the individual hydrocarbon compounds. The advanced algorithm also compensates for nonlinearities and other unwanted spectral behaviours that are unavoidably present in real-world measurements.

An optical hydrocarbon analyser for unattended monitoring

An all-optical hydrocarbon gas analyser utilising a TFS 'engine' has been developed and used in various natural gas processing applications from drilling to pipeline gas analysis in power generation.

The Precise 5 analyser, a standalone TFS analyser packaged in a NEMA4X, IP66-rated, Div2/Zone2-certified box is an attractive alternative to the traditional GC technique in various LNG measurements. It provides speciated concentration values of methane, ethane, propane, iso-butane and n-butane as well as pentanes. From these values, calorific value and Wobbe index are computed and reported. Optional carbon dioxide and hydrogen sulfide direct measurement channels are also available.



Figure 1: Precise 5 gas analyser – standalone analyser utilising a tunable filter spectroscopy sensor platform (left) and analyser unit with zero/cal sampling system (right).

A TFS-based analyser is permanently calibrated at the factory and does not require any consumable gases. Gas phase samples can flow through the analyser at wide ranges of pressure, temperature and flow rates, minimising sample conditioning requirements.

Case study: Downstream LNG quality analysis

A Precise 5 gas analyser was installed on an LRSU (LNG rundown system upgrade) application at one of the largest LNG producers in Indonesia, where the LNG final product is being recirculated prior to being loaded onto a ship. This measurement is critical to ensure that the final LNG product meets the intended specification and is used as a last checkpoint prior to the custody transfer metering point.

The LNG final product sample is heated using an existing sample handling system to reach the ambient temperature of 24°C, where it becomes a vapour before entering the analyser.

The analyser is calibrated to provide the following measurement channels:

- CH₄ (methane): 0-100%
- C₂H₆ (ethane): 0-25%
- C₃H₈ (propane): 0-25%
- C₄H₁₀ (iso-butane): 0-10%
- C₄H₁₀ (n-butane): 0-10%
- C₅H₁₂ (pentanes): 0-5%
- N₂ (nitrogen) calculated balance
- Calculated CV (MJ/m³)
- Calculated Wobbe Index (MJ/m³)

Note that the CV and Wobbe Index calculations are performed according to ISO 6976:1995 standard in particular using Table 3, Hs[25C, V(OC; 101325 kPa)].

At the beginning of the installation, the continuous real-time measurement from the Precise 5 gas analyser was compared against a daily measurement with a laboratory GC over a period of 28 days.

The TFS-based infrared measurements were found to track the daily GC reading very well. More importantly, the continuous infrared reading captures the fluctuations that otherwise would be missed by the daily GC measurements.

Summary

The LNG industry has been seeking a simple, low cost, field-deployable alternative to traditional gas chromatography for various measurements points, particularly over the last few years, due to the widespread increase of smaller plants including FLNG. Moreover, the cost of servicing, calibration gases, carrier gases and maintenance of sampling systems of the traditional gas chromatograph-type instruments is significant.

A real-time, all-optical analyser is an attractive alternative to gas chromatographs, and infrared absorption spectroscopy is a well-proven technology in various online process industries. In this article, its successful application in LNG composition and calorific value analysis is demonstrated. It is being evaluated around the world as a robust 21st-century alternative to the array of applications considered exclusive to gas chromatography.

A slightly longer version of this article with diagrams can be read online at: <http://bit.ly/1lwoPcD>.

Australian Dynamic Technologies Company Pty Ltd
www.austdynatech.com.au

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COLOUR MEASUREMENT FOR CURVED SURFACES

MicroEpsilon is introducing a sensor head for the colorCONTROL ACS7000 for performing in-line colour measurement on structured and curved surfaces with an extremely small measurement spot.

The sensor, with the designation ACS2-R45/0-28-1200(001), is designed as circular sensor and has a measurement spot of 3 x 2 mm. The small, oval measurement spot offers advantages primarily on structured surfaces that are difficult to detect with conventional colour sensors, such as wooden veneers, floor coverings and textiles. The continuous, homogeneous lighting allows measurements to be carried out regardless of the angular position of the target object. This makes the sensor head suitable for the quality control of curved objects. The curvature radius should be at least 20 mm.

The colour measurement system can be successfully applied in colour control systems for high-volume production in the automotive industry, as well as in plastics and textile production.

Bestech Australia Pty Ltd
www.bestech.com.au

BEACON LIGHT KIT

The Andon Light Kit from Werma is designed to provide a convenient way to add a call-to-action beacon on production line equipment in accordance with lean manufacturing principles. Equipment builders can use this kit to add a tower beacon to a machine, conveyor system or manual workstation to indicate operational status or show when a supervisor or engineer is required.

The kit is a complete out-of-the-box solution containing all the components needed to create an Andon system. The main AndonBOX controller contains smart electronics with illuminated switches for activating up to eight different states. Also included are red, yellow and green Werma KombiSIGN 71 LED tower lamps; lamp base, wall bracket and support tube; mains power supply; and 5 m cable and a terminal element. The power supply has an input range of 100-240 V allowing use in most countries.

RS Components Pty Ltd
www.rsaustralia.com



MULTIVARIABLE TRANSMITTER

Emerson Process Management has launched the Rosemount 4088 multivariable transmitter. The device is designed for upstream and midstream oil and gas applications, providing differential pressure, static pressure and temperature measurement from a single transmitter. The extended range capability captures flow rate spikes above the upper range limit of the transmitter to account for flow that would have traditionally been missed.

The transmitter's extended range capability delivers high measurement performance for plunger lift measurement applications over the life of oil and gas wells. Its sensor technology measures flow rate spikes while still achieving high performance over the typical operating range. By accurately measuring flow that is commonly missed, the extended range capability is said to ensure the accurate accounting of oil and gas production, potentially saving companies thousands of dollars a year.

The product provides a stable signal transmitted through Modbus, BSAP or MVS, resulting in high data accuracy and effective management of changing well conditions. It is typically integrated into a larger oil and gas production network by transmitting data to flow computers and RTUs. The device is designed to easily integrate with Emerson's flow computer products, such as the ROC, FloBoss and ControlWave, but can be used with any new or existing flow computer or RTU network that accepts a Modbus input.

Emerson Process Management
www.emersonprocess.com.au



ETHERNET I/O MODULES

The Brainboxes ED series ethernet I/O modules provide various combinations of digital or analog I/O, integrated relays, serial interfaces and network gateways, which simplify the connection of devices such as process sensors, barcode scanners, scales, switches, alarms, motor starters, display controllers and mechanical transducers to the network. The outputs are able to drive resistive, capacitive or inductive loads, or loads with high inrush current.

With an operating temperature from -40°C to +80°C, the modules are suitable for building machines, control panels or I/O systems, or for modernising existing equipment. The range comprises the ED-588 with eight digital inputs and eight digital outputs; the ED-516 with 16 digital inputs; and the ED-527 with 16 digital outputs. The ED-538 features four relay drivers and eight digital inputs. The ED-549 has eight analog inputs. Each of the modules also includes an RS485 gateway. Finally, the ED-504 has four digital I/Os, an RS232/422/485 serial port and an ethernet switch. Modules featuring a thermocouple interface will soon be introduced.

The modules can be configured and monitored using any device with a web browser. The Brainboxes Multi-Platform Software is developed for the factory floor and includes a suite of APIs designed to allow simple integration into a system.

RS Components Pty Ltd

www.rsaustralia.com

PILOT VALVE

Widely used for distributed control systems, NAMUR-style pilot valves can be found in a variety of industries, including chemical, pharmaceutical, water/wastewater and food processing.

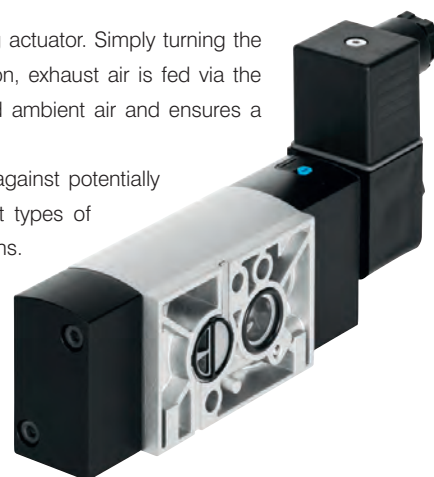
The VSNC pilot valve can be easily adapted for use with either a single-acting or a double-acting actuator. Simply turning the seal around 180° converts a 5/2-way valve into a 3/2-way valve. In the case of the 3/2-way function, exhaust air is fed via the seal into the spring chamber of the actuator. This protects the spring chamber from contaminated ambient air and ensures a longer service life for the pneumatic actuator.

In addition to the standard coil range, an IEC-EX certified solenoid system provides protection against potentially explosive environments. The design of the VSNC means that any of the coils, even with different types of protection, can be mounted on a robust stainless steel armature tube, allowing versatile applications.

Preassembled valves that reduce time and effort for tubing and assembly offer added convenience. The simplicity of the pilot valve starts with a user-oriented modular system for ease of ordering. A compact and practical range of accessories, including flow control and quick exhaust valves, is also available.

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WATCHDOG RELAY



Red Lion has released the Watchdog Relay, a hardware-based solution designed to monitor and provide for the fail-safe shutdown of processes controlled by RTUs, PLCs and other automation devices.

The product monitors the pulsing heartbeat output of a connected device, adding an extra level of safety that helps protect critical processes across industrial environments including oil, gas, maritime, power and energy. If the heartbeat stops (for reasons that may include power surges, extreme weather or device malfunctions), Watchdog's built-in Form C relay will immediately energise and provide a signal

that can be used to safely shut down the process. The signal sent upon loss of control helps to avoid costly damage to materials and equipment.

Built to operate in extreme conditions, the product supports temperatures ranging from -40°C to 80°C as well as 5-85% humidity. It carries Class I, Div II and ATEX hazardous locations certifications, and has been marine and offshore tested or verified to meet standards such as ABS, DNV No. 2.4 and Lloyd's.

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

DATA LOGGER FOR COLD CHAIN TRANSPORT



The testo 184 G1 logger is designed to monitor the transport conditions of products that have mandatory cold chain requirements such as foodstuffs and pharmaceuticals. It is available to rent from TechRentals. In addition to temperature and humidity, the 184 G1 also measures vibration and impact for delicate cargo like high-quality electronics or fragile machinery.

Transporting perishables or medications requires strict standards to ensure an uninterrupted cold chain. Monitoring

that these standards are adhered to at every stage is simple with the 184 G1 logger. Testo AG is an ISO 9001:2008 certified company, and the 184 G1 is compliant with EN 12830, FDA 21 CFR Part 11 and GxP guidelines, as well as having HACCP international certification.

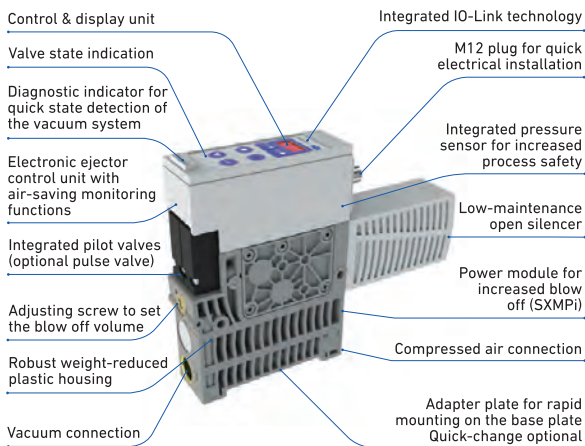
The unit also generates calibration certificates traceable according to ISO 17025, stored as PDF directly to the logger. Additionally, the measurement rate is freely selectable from 1 min to 24 h, with a measurement range of -20 to 70°C for temperature, 0-100% for relative humidity and 0-27 g for shock.

The logger also features a 120-day battery life, multiple alarm limit options and the ability to read data out to a smartphone via NFC.

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EMC-SHIELDED ELECTRIC MOTOR CABLES

Treoflex-EMC-UV-3 cables are used to supply power to motors from frequency converters while maintaining full electromagnetic compatibility (EMC).

The flexible cables come with multistranded conductors, with cross-linked XLPE polyethylene insulation, a double-stranding element screen and a PVC UV-resistant outer sheath.

Features include symmetric conductor construction; an operating temperature of -40°C to 90°C; operating voltage of up to 1 kV tested to 2.5 kV; and insulation resistance greater than 200 MΩ/km. Capacitance between conductors is 70-250 nF/km and between conductor and screen is 110-410 nF/km.

The cross-linked XLPE polyethylene insulation improves current-carrying capacity while at the same time maintaining low cable capacitance in comparison with cables with PVC insulation.

The cables are suitable for both fixed installation and moveable connections in industrial equipment, process lines and machines operating in dry and damp rooms. The symmetric construction of the cable (3+3PE) ensures the symmetry of supply voltages on the motor terminals.

Treotham Automation Pty Ltd
www.treotham.com.au

How big data helped one manufacturer make productivity gains

We live in the age of the internet, and more recently, 'big data'. Big data is massive numbers of facts and figures that are so big and complex that it needs to be analysed by computer to extract meaning. With ongoing improvements in modern systems to handle big data, its application is becoming more widespread.

It seemed inevitable that manufacturing environments, in their quest for ever greater output and reduced waste, would be examined and put under the microscope. Handled correctly and with a proper computing system, big data can be analysed to provide business intelligence (BI) heretofore unobtainable.

One place you would most expect to see this process of big data being collected by controllers, consolidated in a database and then analysed is on the production lines of the manufacturers who make these very products. This is precisely the case in one of Omron's largest factories, in Kusatsu, Japan. Here, Omron's Sysmac Machine Automation Controllers (MACs) not only control the manufacturing processes, their SQL client functionality serves real-time data collated from sensors in the field to an SQL server. The server then distributes this data for in-depth scrutiny.

The MACs were originally installed at Kusatsu as part of a continuous improvement program. Like so many factories, much information about production had come from informal, anecdotal reports by experienced operators on the plant floor. While a good deal of this information was correct, solid tangible evidence was needed in order to gain further productivity improvements.

As Masaru Takeuchi, general manager of Omron's Automation Systems Division, said, "The experience and intuition of experts take a major role in improvement activities at production sites, but the improvement points that the experts cannot identify are hidden in the bottlenecks which hinder production efficiency. In order to overcome such situations and promote further improvements, we needed objective data."

As the analysis needed to be done in real time, high speed was a prerequisite. By embedding SQL database client functionality within the controller and using its in-built Ethernet port as a direct link, rather than a third-party gateway, sufficient increases in speed could be achieved. The co-processing structure of the MAC ensured time-critical tasks, like servo updates, were unaffected.

One of the problems faced by the project team was how data collated by the server could be distributed effectively to the numerous parties that requested it. Each party was interested in very different aspects of the data, and extracted meaning in diverse ways. There was a preference for graphical formats, which can be visualised more quickly and also overcome any language barriers which may exist.



After some consideration, it was decided to use software from Microsoft, with an Excel front-end. The log data collected was converted into real-time charts for display on the site portal using Microsoft SharePoint Server, and exported to Microsoft Excel using PowerPivot for Excel. Instantaneous visualisation was provided to all employees for the entire process.

"Big data has existed for a long time in production lines, but the environment to use it effectively has not been created," observed Takeuchi. "Data does not make sense until people who support production sites read and use the data. The environment to connect between data and people in the best way was necessary. Our Kusatsu factory has already used this data to understand the reality of production lines that could not be grasped by using only individual experiences and intuition."

As Takeuchi remarked: "The challenge to improve never ends!" A slightly longer and more detailed version of this article can be read online at: <http://bit.ly/1UeU5Dt>

Omron Electronics Pty Ltd
www.omron.com.au

ENERGY MANAGEMENT



Energy Advisor is a real-time energy management information system that automates the process of monitoring and managing energy consumption across mills, plants and refineries.

With real-time, meaningful information about a site's energy performance, process manufacturers can identify inefficiencies and irregularities and take corrective action, saving on average 5-10% in energy costs annually. In energy-intensive process industries - like chemicals, metals and mining, oil and gas, pulp and paper, and refining - where energy is often 30-50% of the operating expense, these savings can have a significant impact on the bottom line.

Energy Advisor pulls energy data from various sources, including (but not limited to) Emerson's DeltaV and Ovation distributed control systems as well as its wireless infrastructure, to provide real-time analysis and historical context. Using Emerson's process models, manufacturers are now able to analyse and compare three critical items: the amount of energy a system is designed to use; what it has used over time; and what it is consuming in the moment.

The product integrates seamlessly with current site control and information systems, allowing straightforward implementation. Key features of the technology include: Consumption Monitoring,

to identify and log root causes for energy overconsumption; a Data Integrity Checker, to verify the integrity of energy data before it is used; an Energy Target Calculator, which creates models from past historical data to predict target energy consumption; and Standard Reports, which include cost per unit of production, energy performance trends and electrical demand cost.

Emerson Process Management
www.emersonprocess.com.au

MODEL PREDICTIVE CONTROL SOFTWARE

Rockwell Automation Pavilion8 Model Predictive Control (MPC) software now delivers a more user-friendly configuration environment, step-by-step prompts, warning diagnostics and flexible workflows to simplify building, maintaining and adjusting highly complex process models.

Pavilion8 MPC v5.0 software remains control system independent, but smoothly integrates with the PlantPAx process automation system from Rockwell Automation and includes four key enhancements.

Updated Windows-based solution builder tools provide an improved overall user experience for both expert and inexperienced users, and improve workflow by enabling users to create a customised working environment and providing access to online help. Users can also more easily modify past work to simplify model maintenance and re-use.

The run-time controller has been updated to allow users to add new predictive disturbance measures in half the time and easily compare differences in MPC application versions. Users can now easily sort, rename, add, delete, compare and copy MPC variables and software supporting a flexible workflow, which can help reduce troubleshooting time.

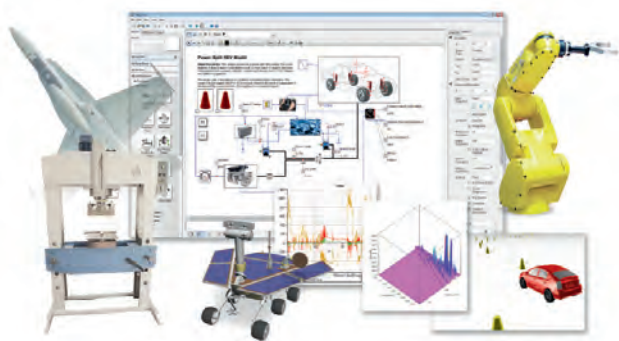
Users can now configure their process models with specific metrics for production, quality, energy usage and other factors. They can also continuously measure their processes according to these metrics and use historical records to track ongoing benefits.

Rockwell Automation has redesigned the software's user interface to align with current technology standards. This includes support for newer browsers like Internet Explorer 11 and operating systems such as Windows 2012.

Rockwell Automation Australia
www.rockwellautomation.com.au



SIMULATION SOFTWARE



Maplesoft has released MapleSim 2015 and the latest member of the MapleSim family of products, MapleSim Server.

With the MapleSim Server, MapleSim applications can be shared with other engineers in the user's organisation, even if they do not have MapleSim. Using a web browser, engineers can perform a wide variety of tasks, including changing parameters, manipulating model equations, running new simulations and viewing updated results. By using the server, organisations can easily make these solutions available to more people while fully controlling access and eliminating version control problems.

MapleSim itself has been enhanced to include tools that help engineers manage large models efficiently. Engineers can now search their model to determine which components reference a particular parameter; find all occurrences of a particular component or component type; and see exactly where a look-up table is used in a model. MapleSim 2015 also generates help pages automatically from custom components in a shared library; simplifies the updating of common properties shared by multiple components; and supports Modelica Standard Library 3.2.1, the latest official release of this international standard.

The entire family of MapleSim products, including connector products for FMI and Simulink, the MapleSim Control Design Toolbox and specialised component libraries, have been updated to take advantage of MapleSim 2015.

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CHEMICAL REACTION SIMULATOR

CD-adapco has released DARS v2.10, a standalone simulation tool for the 0D and 1D management and analysis of chemical reactions, which can be fully integrated within STAR-CD and STAR-CCM+. DARS v2.10 now features a library generation functionality that makes it possible for users to quickly explore new fuel blends and operating conditions for simulations with STAR-CD and STAR-CCM+.

DARS v2.10 provides a library generation functionality that facilitates analysis of fuel compositions, accurate prediction of knock and emissions for dual fuel engines, exploration of combustion of any fuel or oxidant mixtures and exploration of soot yield for new fuels and new operating conditions. The technological gains in DARS v2.10 are designed to provide users with confidence in their results through updated modelling capabilities and advanced technologies.

The user experience in DARS v2.10 is enhanced by making the technology more accessible, reducing engineering time and offering straightforward simulation workflows. Users will benefit from a streamlined workflow from DARS to STAR-CCM+/STAR-CD, a new GUI module for library generation and context-sensitive library generation.

Using DARS v2.10, engineers will enjoy productivity gains through faster simulations, the ability to explore more designs, faster, and increased efficiency. The objectives are accomplished in DARS v2.10 through the parallelisation of library calculations, scripting/command line functionality and compact libraries.

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TAG REGISTRY SOFTWARE

Intergraph has launched SmartPlant Master Tag Registry, a module for tag management and tag register production that makes registers easier to produce with higher quality for handover to owners. SmartPlant Master Tag Registry (MTR) transforms how companies manage tags and register information required for handover and is a solution to a systemic problem in the industry. The full extent of its capabilities will be realised with phased releases.

MTR leverages the inherent capabilities of SmartPlant Foundation, Intergraph's solution for plant information management, for collecting and consolidating information. MTR builds on this by providing specific functionality to automate consistent tagging rules among supported products and then makes tag register generation, management and monitoring dramatically more efficient. APIs will be provided to support integration with non-Intergraph applications.

MTR automatically collects and organises tags into a master tag registry as they are created and used in various work processes during projects, shifting the planning and preparation for data gathering earlier in a project, reducing both risks and costs, and eliminating manual work.

Intergraph Corporation Pty Ltd
www.intergraph.com/global/au/

Nissan Australia benefits from computed tomography system

With talk revolving around the demise of manufacturing in Australia and the shrinking automotive component manufacturing activity, one OEM defies the trend. Nissan Australia, a fully integrated OEM, has been increasing its manufacturing capabilities and will be the only car manufacturer with a direct presence in Australia after 2016 with Ford and Holden shutting down local manufacturing. With projected growth into the future, Nissan is investing in equipment to ensure it maintains its technological and quality advantages.

Nissan operates an aluminium casting facility in Australia (Nissan Casting Australia). The 90,000 m² plant houses both high- and low-pressure die-casting machines with the capacity to produce 10,000 tons of cast parts and accessories per year. From this, over 2 million parts with a value of in excess of \$65 million are exported to other Nissan assembly operations around the world, including Japan, the US, Thailand, South Korea and Mexico, as well as other manufacturers such as Calsonic Kansei and Jatco, a Japanese transmission manufacturer.

For the last six months, the Nissan Casting plant has been operating three shifts a day, 7 days a week to keep up with demand. With demand set to grow with new contracts having been awarded to NCA, it is also recruiting more staff, dispelling the myths about Australian manufacturing.

When asked why business was booming for NCA, managing director Peter Jones replied, "Our success is not based solely on price. We can proudly say that the demand for our products is based on quality. If you look at the finish, accuracy and tolerances of some of the parts we manufacture, like those for the Nissan LEAF and e-NV200 electric vehicles, you might think they have been machined when in fact they are straight out of the mould. Such is the quality of these castings that we have the exclusive contract to supply these parts."



With quality being such an important factor in the future success and sustainability of NCA, it has recently invested around \$500,000 in a new Y.MU2000 Computed Tomography (CT) system from Yxlon (Germany). This is the technology that Formula 1 teams use to ensure their parts meet specifications. The system works in the same way a medical CT scanner works and allows operators to delve non-destructively into the inner structure of a casting by generating a 3D reconstruction. This will allow them to see if porosity or casting defects are present, check tolerances and make adjustments accordingly to correct any problems, thus maintaining quality.


The data generated will have benefits for quality control as they will be able to monitor casting quality. Additionally, there is the benefit for new products where the use of CT can be applied to the optimisation of tooling and systems. This is of particular importance with castings becoming more complex and thinner walled to save on weight and materials, and ultimately cost.

Richard Trett, managing director of AXT, Yxlon's Australian distributor said, "This is the second supplier we have worked with this year who is looking to leverage their unique technical expertise. Investing in quality, rather than price, is the way to ensure the future of Australian manufacturing."

Some of the parts that NCA manufacture include oil pans, gearbox housings and final drive housings that go into more than 30 different models from the Nissan, Infiniti and Renault stables. This includes the all-new, soon-to-be-released Nissan NP300 Navara. With continued investment in technology, the future for this auto manufacturer in Australia seems assured. It also demonstrates that quality can often win the battle over price and this should be a platform for Australian manufacturing to build from.


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AS I SEE IT



HARNESSING INFORMATION TO MEET RAPIDLY CHANGING PACKAGING DEMANDS

Global competition is increasingly challenging manufacturers to offer an exhaustive breadth of products to meet rapidly changing customer needs. In the case of packaging machinery, this means that the machinery must be flexible enough to keep up with frequent line changes and scalable enough to handle the introduction of new products.

The recent acceleration of the Internet of Things enables new levels of connectivity for people, processes, data and things — ultimately providing greater productivity, better utilisation of assets and improved decision-making for industrial companies. The magnitude of this evolution is momentous with more than 80 billion internet-connected devices projected to be in use in 2024, up from less than 20 billion in 2014.

Establishing a connected enterprise can help manufacturers optimise their production and supply chain by integrating information technology (IT) with operations technology (OT) to improve business performance and minimise risks.

To achieve this, end users are looking to machine builders to provide smart machines that can provide real-time access to production information, enable flexibility in relation to changing markets and demands, and also easily integrate into their facility.

The need for smart manufacturing is growing, particularly in countries where manufacturing costs are high, with more and more manufacturers requiring the capability to access intelligent, real-time data from their machines.

There is also a growing need for our customers to merge their information technology and operational technology to harness real-time data and improve productivity and agility. This convergence improves connectivity across enterprise operations and provides the platform to integrate information across business systems and the plant floor.

One of the technologies that makes possible the acceleration of this convergence of network infrastructure and the integration of technical and business systems is the EtherNet/IP communications platform, through Rockwell Automation's collaboration with Cisco on products, services and educational resources.

Effectively managing real-time control and information flow provides enterprise-wide machine and device-level information gathering. This connectivity provides access to real-time production data and helps packaging manufacturers increase agility and productivity while also reducing engineering time and costs for machine builders.

While having access to real-time data is invaluable from a diagnostic, production throughput, safety, quality and efficiency perspective, increasing connectivity and visibility into the system opens it up to potential security risks that require careful consideration and mitigation.

Effectively developing a complete connected enterprise requires a comprehensive approach to industrial security that extends beyond the control system to include policies and procedures that address people, process and technology-related risks.

The value proposition that the connected enterprise delivers to both machine builders and end users is focused on information. It provides the technology to dramatically increase the amount of data available for analysis. It enables a variety of opportunities for improving business models and performance for machine builders, from reduced downtime and optimised capacity to improved machine design and monitoring capabilities.

Better information sharing drives better decision-making, exposes process inefficiencies, facilitates best-practice collaboration and uncovers new competitive opportunities. Packaging machine builders and their customers are increasingly realising the benefits that more information, insights and data can offer them to improve profitability in a competitive marketplace.



Michael Vlahos has 15 years' experience in industrial automation and has worked with customers and system integrators in a range of industries including mining; water and wastewater; food and beverage; and automotive. In his current role at Rockwell Automation, Michael is the OEM Sales Lead for the South Pacific region.



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Subscriptions

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March 2015 total CAB audited circulation (Aust + NZ)
6,230 readers (70% personally requested)



Contact the editor

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

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