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CONTENTS

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TANK FARM MONITORING

MEETING AUSTRALIA'S FUEL RESERVE NEEDS: PART 1

Glenn Johnson, Editor

Meeting Australia's IEA treaty obligations will require refinery, terminal and storage operators to establish automated tank farm monitoring and inventory management solutions.

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I n April 2015, the Department of Industry and Science published its Energy White Paper 2015 "to provide an integrated Australian energy policy framework" that will be "consistent with the Government's vision for economic reform and future competitiveness."[1] The main focus of the white paper was on improving competitiveness in the energy sector, more productive use of energy and investment in innovation.

Unfortunately, transport energy security did not get much attention in the white paper. Australia is not meeting its obligations for fuel stockholdings under the International Energy Agency (IEA) treaty, but this only received a passing comment in the white paper.

At the same time a Senate committee on energy resilience and sustainability was releasing its findings[2], which included the following three recommendations:

1. The government should undertake a comprehensive whole-of-government risk assessment of Australia's fuel supply, availability and vulnerability.
2. The government should require all fuel supply companies to report their fuel stocks to the Department of Industry and Science on a monthly basis.
3. The government should develop and publish a comprehensive Transport Energy Plan directed to achieving a secure, affordable and sustainable transport energy supply.

What is the risk?

A quite comprehensive analysis of Australian fuel supply chain risk, conducted by the National Roads and Motorists Association (NRMA) in 2013[3], stated that:

The very small consumption stockholdings of oil and liquid fuels in Australia, combined with what appears to be a narrow assessment of our fuel supply chain vulnerabilities, does not provide much confidence that the strategic risks to our fuel supply chain are well understood and mitigated by our nation's leaders, the business community or the population at large.

The report also quoted an ACIL Tasman Fuel Vulnerability Assessment 2011[4] as saying that as of 2011 Australia received 55% of its petroleum shipments from Singapore, with Japan and Korea also being significant sources. Singapore acts as a regional supply hub for South-East Asia and in turn sources 40% of its supply from the Middle East. In a world of instability in the Middle East, and potential conflict in the South China Sea, disruption of supply via Singapore could have a significant impact on Australia's fuel supply.

Australia's high dependence on petroleum fuels for the transport of essential products such as food and pharmaceuticals makes this a significant problem for the country as a whole.

Australia is not meeting its reserve obligations

As a member nation of the IEA, Australia is obliged to meet the requirements of membership. One of those requirements is that fuel storage reserves must equal at least 90 days' worth of consumption. Australia is the only IEA member country among 29 developed economies whose reserves are not meeting that obligation.

The Energy White Paper stated that meeting IEA obligations would mean an investment of several billion dollars over a decade.

The challenge that will arise for fuel storage facilities and terminals in the future will be a potential need to increase capacity — including perhaps for new tank farm facilities to be built — and to achieve a more accurate and timely method of measuring fuel stocks. To date, most fuel storage facilities in Australia rely on manual tank gauging measurements, and therefore there is never an accurate understanding of available stock.

Today's low oil prices are also impacting oil and gas company profits, making investment in technology that may not at first seem essential to business operations unattractive. However, tank farm and terminal operators are now also faced with having to comply with international safety standards, so the challenge becomes investing in the right areas to not only improve safety and
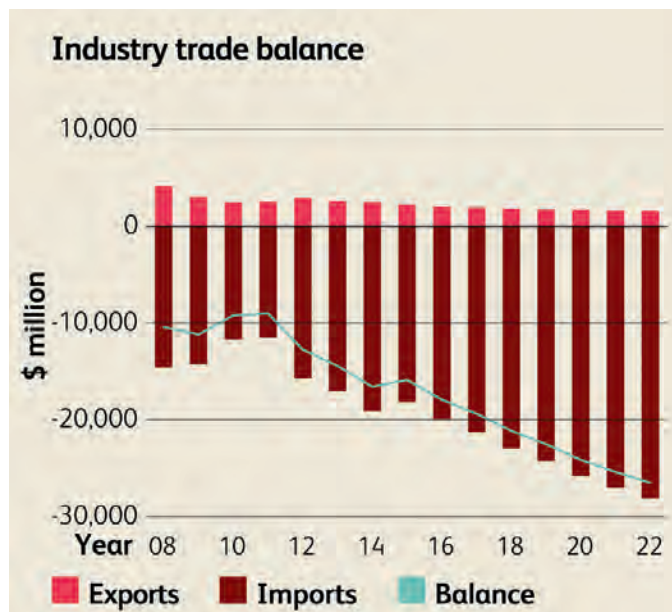
Figure 1: Imports and exports of petroleum products ($ billion).
Source: IBISWorld Market Research.

> **THE CHALLENGE THAT WILL ARISE FOR FUEL STORAGE FACILITIES AND TERMINALS IN THE FUTURE WILL BE A POTENTIAL NEED TO INCREASE CAPACITY — INCLUDING PERHAPS FOR NEW TANK FARM FACILITIES TO BE BUILT — AND TO ACHIEVE A MORE ACCURATE AND TIMELY METHOD OF MEASURING FUEL STOCKS.**

meet regulatory requirements, but to take advantage of the expenditure to maximise the business value of any tank monitoring technology that may be deployed.

How we got here

According to the Australian Petroleum Production & Exploration Association (APPEA)[5], Australia's production of oil, condensate and LPG peaked in 2000 and has been trending down ever since, while the production of natural gas more than doubled between 1998 and 2014 (see Figure 1).

There have been a number of refinery closures in recent years. As recently as 2012, Australia had seven oil refineries, but now only has four — New South Wales has lost all its refining capacity, and Victorian capacity has halved.

As a result of reduced local production and refining, Australia has been a net importer of oil since 2004. In fact, Australia's dependency on fuel imports has increased from 60% in 2000 to over 80% today.

According to the Senate committee:

Australia is a net importer of crude oil and refined petroleum products. In 2013–14, 82 per cent of the crude and other feedstock required for domestic refining was imported, with the balance supplied from indigenous production.[6]

It is also predicted that refining capacity may completely disappear by 2030, leaving Australia completely dependent on an overseas supply chain. In a world of increasing political instability, this leaves the country even more vulnerable to fuel supply disruption.

How much do we have?

How much fuel reserve Australia has is not accurately known. All fuel storage in Australia is held commercially, and is dependent on the business requirements of the organisations in the supply chain. The closure of refineries has resulted in them being converted to storage facilities and terminals, somewhat increasing storage capacity.

How much is available, in terms of 'days of stock', depends on whether stocks of fuel are expressed in days of net imports or in terms of historical average daily consumption.

According to the Senate committee, as of December 2014, Australian Petroleum Statistics (APS) reported that there was 4275 kt of crude oil equivalent stocks, representing 52 days' cover of daily net imports. In terms of historical average daily consumption, the committee was informed that Australia has 34 days of fuel stocks.

The 34 day figure is calculated on the average daily consumption of fuel in Australia divided by what is believed to be the volume of fuel available to the market.[7]

The discrepancy seems to be that the 52-days figure includes fuel in transit at sea. IEA requirements only count fuel actually held in stock, which means that as of December 2014, Australia only had about one month of reserve transport fuel.

The main reason that the actual reserve is not accurately known is that the majority of fuel storage locations have no accurate way of measuring stock at any point in time.

Many refineries, storage facilities and terminal facilities in Australia have ageing tank infrastructure, which was built without any form of automated tank monitoring. Storing commercial stock, the organisation owning the tanks may have historically not been specifically interested in accurate or continuous measurement of inventory, and the costs associated with measuring it. Many will also have operated on a 'just in time' basis — keeping only enough stock to meet customer requirements — in order to minimise business overheads.

Manual tank monitoring

Where tanks are not instrumented, manual methods of measurement need to be used. The American Petroleum Institute's *Manual of Petroleum Measurement Methods*[8] defines standardised methods of manually measuring tank levels. The two methods are to measure either the 'innage' or the 'ullage' using a bob and gauge tape dropped from the top of the tank. Innage refers to measuring the actual fluid level from the bottom reference point of the tank, while ullage means the indirect method of measuring the distance to the fluid level from the tank's top reference point. In terms of accuracy, neither method can take into account volume changes caused by temperature fluctuations.

There are also other obvious deficiencies in manual measurement methods, not the least of which are the risks to worker health and safety. Workers are of course required
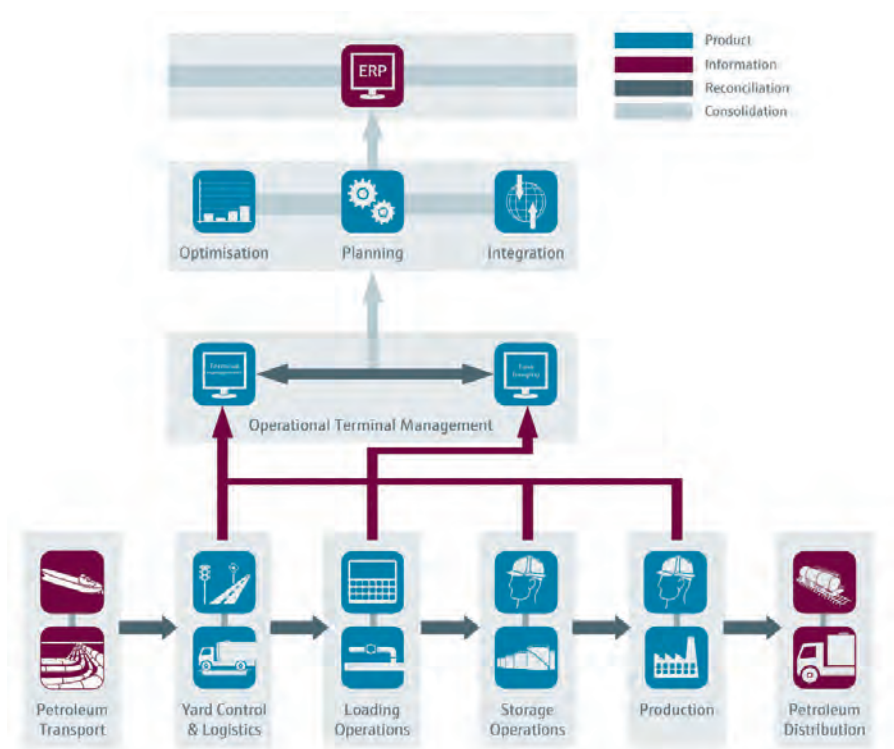
Figure 3: Integration from process to ERP. Source: Endress+Hauser.

to work at heights — with the obvious risk of falls — and are likely to be exposed to flammable and toxic hydrocarbon vapours.

It is understandable that these factors alone mean that manual tank gauging is a process that does not occur at frequent intervals, and inventory may change significantly between measurements.

Manual methods also mean manual recording. Workers need to record their measurements at the tanks, and then at a later time enter them into whatever system is used by the facility to log the data. These are often simple spreadsheets. The scope for human error and inaccuracies is obvious.

Another downside of long manual measurement intervals is that tank overfill prevention is quite weak. In order to lower the risk of overfill, the acceptable upper level limit defining a full tank has to be at a lower level than if continuous measurement is used — effectively reducing a tank farm's maximum capacity.

Safety as a driver for tank monitoring

While the Australian Government may well legislate for mandatory reporting for all fuel storage facilities, a major pre-existing driver for automated tank monitoring has been safety concerns following the Buncefield incident in the UK in 2005[9].

After the accident, representatives from the Control of Major Accident Hazard (COMAH) Competent Authority issued a report entitled 'Safety and environmental standards for fuel storage sites'[10]. The report makes safety recommendations for incident prevention in flammable and hazardous material storage sites.

As stated above, manual measurement methods are not reliable in preventing hazardous tank overfilling, and attempts to minimise the risk involve tolerating lower inventory levels. Today, modern overfill prevention systems that incorporate API 2350 (United States driven guidelines) and IEC 61511 functional safety standards are available. These systems can operate autonomously to not only alarm of potential overfilling, but to close emergency shutdown valves automatically.

An automated overfill prevention system (AOPS) also has a fast reaction time, which means that tanks can be safely filled to capacity, increasing overall inventory capacity.

Inventory visibility for business processes

The management systems of many tank farm and storage terminals rely on manual field measurements supported by tools and systems that are not very sophisticated and are often in-house developed, out of date and no longer supported.

Using Excel spreadsheets to generate reports, or relying on the tools that come with tank level gauges, results in the generation of isolated information that is difficult to put into context and which therefore provides limited value to operations. With manual measurements, the risk of error increases, as does the time to discovery of faults and failures — both of which can have a major impact on safety and performance.

In the interest of maximising business returns from automated tank monitoring, business process automation is as important as the automation of the physical process. Replacing a manual or legacy tank farm monitoring process with an optimised system can improve business returns. Eliminating the separation between the automation of physical processes and business automation systems such as ERP is not just 'Internet of Things' hype, but can provide real business benefits in terms of improved operational planning and control.

Integrating tank monitoring systems with the plant DCS and ERP systems also eliminates deviations between the availability of product and delivery schedules that can be caused by manually collected and out-of-date data — and can also have a large impact on the efficiency of downstream operations.

The main impact of access to real-time data from start to finish is that everyone involved in the operation of the facility, from operators and technicians, right through to planners in the boardroom, has access to accurate information to enable their day-to-day decision-making.

In Part 2

In part 2 we will examine how automated tank farm monitoring can assist with accurate reporting, improve safety and therefore potential storage capacity, and also help to maximise business returns by improving business processes.

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SCADA SOFTWARE

Emerson Process Management has released enhancements to the OpenEnterprise v3 SCADA platform for the onshore oil and gas market. The OpenEnterprise v3.2 release adds a native interface to the AMS Device Manager asset management software, enabling users to remotely manage and maintain HART and WirelessHART devices in wide-area SCADA networks.

Oil and gas asset owners are under increasing pressure to maintain the profitability of their field operations. OpenEnterprise v3.2 together with AMS Device Manager allows asset owners to extend the reach of their predictive maintenance capability out to their remote assets, providing a powerful and proactive method of diagnosing potential device problems remotely. This results in reduced trips to the field and helps to avoid unplanned process shutdowns, improving safety, reliability and profitability.

The native interface of OpenEnterprise v3.2 to AMS Device Manager enables the collection of wired and wireless HART digital device data over low bandwidth wide-area SCADA networks from Emerson ROC, FloBoss and ControlWave RTUs without adding the additional complexity and expense of external HART multiplexers. Support for AMS Device Manager SNAP-ON applications, OpenEnterprise SCADA server redundancy, multiple deployment options and data collection for up to 10,000 HART devices ensures flexibility and scalability for a wide range of remote oil and gas applications.

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The Turck TBPN safety block I/O module combines both standard and safety I/Os in a single device.

Turck Australia Pty Ltd

http://bit.ly/2bryO9B

IP UPGRADEABLE ENCLOSURES

ROLEC is now offering three of its die-cast enclosures with a protection class rating of IP67 that can be upgraded to IP69K.

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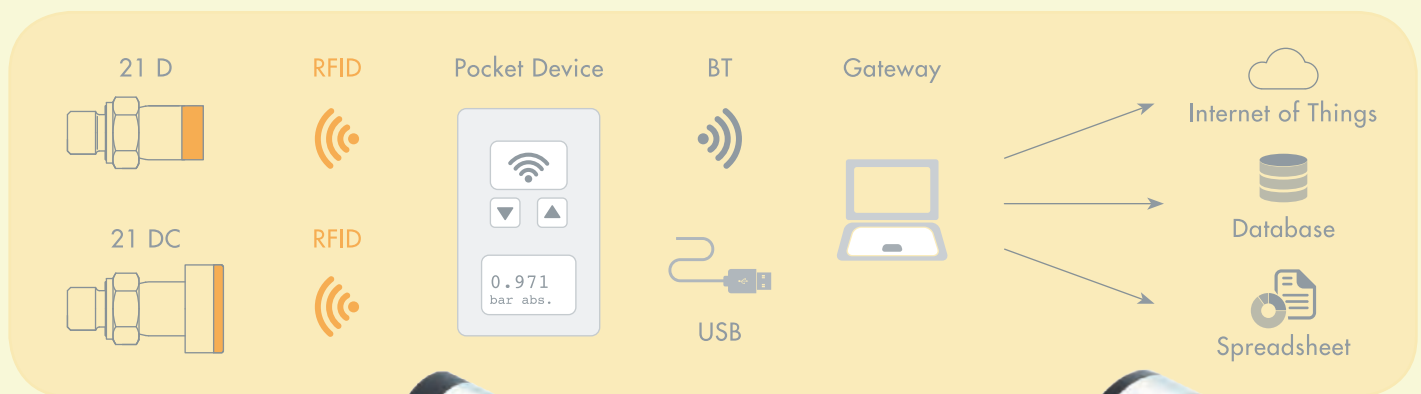
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UPDATED SCADA PLATFORM

Siemens has launched SIMATIC WinCC SCADA V7.4, which focuses on greater efficiency and openness. Aimed at the food and beverage, water and wastewater and general manufacturing industries, the updated SCADA platform enables easy access of data that facilitates informed and quicker decision-making.

The WebUX option for web-based operator control and monitoring uses widely available HTML5-compatible smart devices and has been extended in functionality. For example, WebUX now supports all important WinCC controls (eg, alarming, gauges) and enables objects to be made more dynamic by means of VB script.

The SIMATIC S7 controller channel has been extended to allow up to 128 S7-1500 controllers per server. In addition, a standard OPC UA client has been integrated in order to exchange data easily with third-party systems. For the exchange of data (iDoc) with MES and SAP systems, the WinCC IndustrialDataBridge option has been extended to include an XML file-based interface.

Various functional expansions in SIMATIC WinCC V7.4 increase engineering efficiency. For example, drag and drop between the Configuration Studio and Graphics Designer is possible, in addition to extended search and replace functions. Furthermore, bulk data can be processed purposefully in V7.4 by means of a VBA (Visual Basic for Applications) interface. At runtime, trend and bar-chart controls have been expanded to include intuitive multitouch gesture control, such as zooming and panning.

For the efficient diagnosis of SIMATIC S7 controllers on the workshop floor, a system diagnosis control is now available. Windows 10 Professional and Enterprise are now supported operating systems.

Siemens Ltd
www.siemens.com.au

BOLT LOCK SYSTEM

The Euchner bolt system has a robust, die-cast aluminium design, making it suitable for industrial use. It combines a door stop and handle in a single unit and is available with or without an escape release.

It is used for the simple safeguarding of safety doors for the small transponder-coded safety switch CES-C04. The bolt system complies with all the requirements in the EN ISO 14119 standard.

The bolt can be used for doors hinged on the left or right. The wide, strong handle makes the door easy to open and close.

To prevent the door from accidently closing, the system allows padlocks to be fitted in the bolt tongue and in the handle in the open position.

Treotham Automation Pty Ltd
www.treotham.com.au

MULTIPHASE TEST CONNECTOR

HARTING has released the 10 B multiphase test connector designed to prevent failures and ensure worker safety when performing maintenance on machinery. Featuring simple measurements, the tool is a suitable control device for service technicians and engineers, as well as all personnel tasked with the installation, service and maintenance of three-phase motors (230/240 VAC, 50 Hz).

The reliable operation of machinery and equipment is indispensable for production and servicing. Failures result in high costs and demand quick response. This is especially true during maintenance, when replacing defective equipment, and during the connection and installation of replacement components. Improper procedures, inadequate testing and defects during installation can irreversibly damage motors and result in manufacturing interruptions.

The multiphase test connector, however, determines the connection of the phases (L1, L2, L3) on the AC motor power supply, as well as the interconnection at initial torque (star or delta connection) and the direction of rotation. These parameters are important for safe connection, swapping components and servicing, and for avoiding maintenance errors. The test connector also meets DIN EN 61010-1 standards.

HARTING Pty Ltd
www.harting.com.au
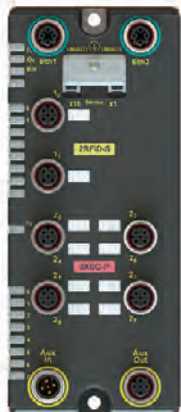
I/O DEVICES WITH LOGIC

Engineers, OEMs and integrators can now add logic to compatible I/O devices through Turck's ARGEE technology. The solution brings logic to the device level so manufacturers can create more flexible control without investing in or upgrading a PLC.

The ARGEE environment is accessible via a HTML5-compatible web browser, which eliminates the need for complex third-party software or licensing that is common with PLCs. Inside the environment, users can set condition and action statements to be carried out by the I/O device. The application's intuitive design includes a flow chart, similar to ladder logic, which allows for easy programming by users of all experience levels.

By taking advantage of ARGEE on Turck's multiprotocol Ethernet I/O devices, manufacturers are able to realise field logic controllers.

FLCs benefit small to mid-size OEMs and manufacturers who are looking to add logic without investing in a PLC because the devices can be used as stand-alone logic controllers. FLCs can also enhance PLC operations when used to back up a PLC or as a data processing partner for a PLC.

ARGEE technology is standard in all Turck multiprotocol Ethernet I/O devices. These devices can be used on any Profinet, Modbus TCP or EtherNet/IP platform. They include the TBEN-L/TBEN-S on-machine block I/O, BL compact on-machine flexible block I/O and FEN20 in-cabinet block I/O.

Turck Australia Pty Ltd
www.turck.com.au

USB DATA ACQUISITION

Futek Advanced Sensor Technology has announced the redesigned USB520 and USB530 measurement instruments. The devices are compact in size while delivering little noise interference, high speed, and accuracy and nonlinearity to $\pm 0.005\%$ of FSR.

The products eliminate the need for a power supply and digital equipment, and come out of the box with a plug-and-play connection to a PC. They work with strain gauge mV/V inputs, voltage inputs, current inputs and encoder inputs, making them compatible with various industry applications.

The devices offer USB 2.0 communications and an internal resolution of 24 bits. The USB520 has a sampling rate up to 4800 S/s, while the USB530 has a sampling rate up to 14,000 S/s.

Metromatics Pty Ltd
www.metromatics.com.au

MODULAR DISTRIBUTION SYSTEM

The Weidmüller maxGUARD range is a modular system that combines both electronic fusing and power distribution in the one device. With maxGUARD, the terminal blocks previously installed separately for distributing 24 VDC potential to the outputs of the electronic load monitor now become an integral part of the 24 VDC control voltage distribution solution.
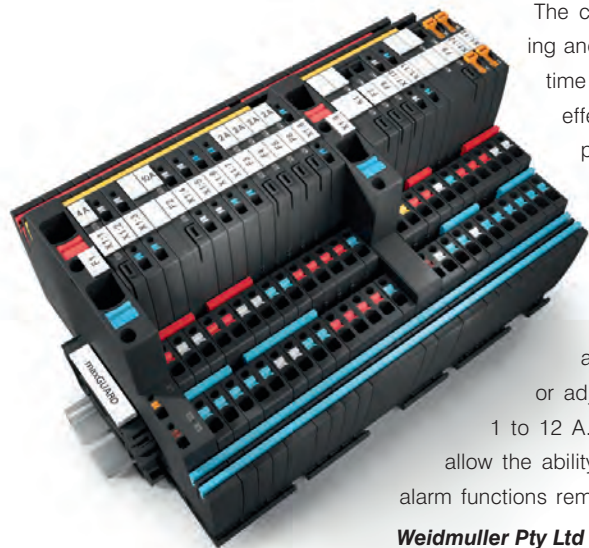
The combination of load monitoring and potential distribution saves time during installation, provides effective plant monitoring and protection of overload conditions, and reduces the overall amount of space required on the terminal rail by up to 50%. The range is available in single-sliced modules with a 6.1 mm pitch, with either fixed or adjustable current ratings from 1 to 12 A. Integrated control modules allow the ability to reset tripped fuses and alarm functions remotely.

Weidmuller Pty Ltd
www.weidmuller.com.au

ROTARY BLOWERS

The BBC and FBC series of rotary blowers have been designed to incur minimal operating and maintenance costs and to ensure maximum reliability. Suitable for applications such as conveying and water treatment, the compact blowers come 'ready to connect'.

The complete system packages are CE and EMC certified. The machines and the electrics are preconfigured and ready-adjusted at the factory, creating less work for both the operator and system provider when it comes to planning, installation, certification, documentation and commissioning.
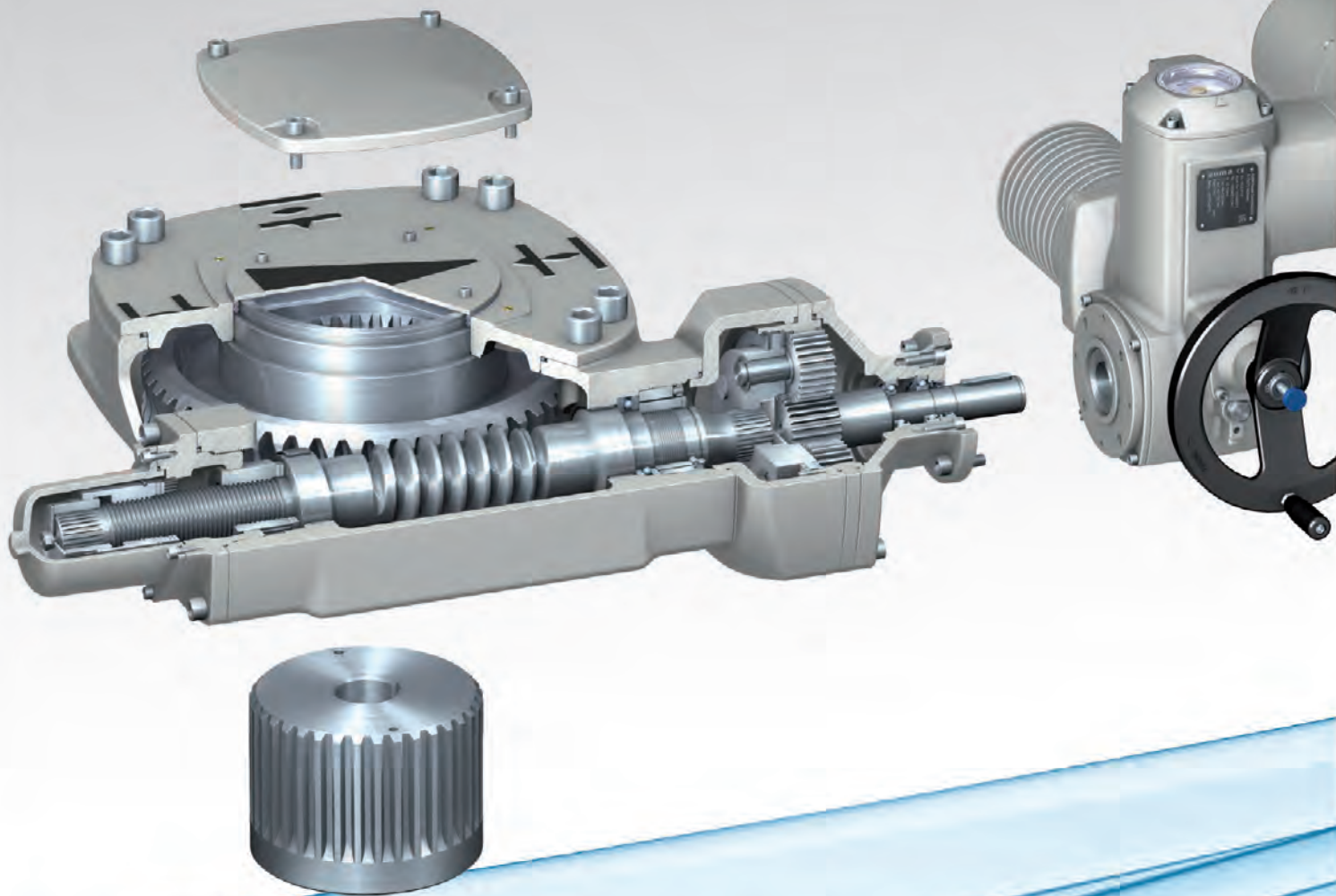
The blowers are quiet in operation due to effective broadband sound and pulsation damping which is applied to both the machine and the pipework. Operational uptime is enhanced due to the inclusion of a blower block with Omega profile rotors, whilst adaptive compression reduces energy consumption and long bearing life minimises maintenance costs.

Components such as control valves and exhaust silencers, which would normally be installed externally, are integrated. In addition, the blowers have been designed to allow all service work to be carried out from the front of the unit.

All blowers in the range come with an internal Sigma Control 2 controller. Blower mode selection, such as remote speed control or pressure control, is therefore made quick and easy. Performance parameters relevant for dependable blower performance are monitored by sensors and warning or fault signals are automatically generated accordingly. Optional communication via data bus (multiple data bus systems can be connected) allows operational status readout and enables the machine to be remotely controlled.

Kaeser Compressors Australia
www.kaeser.com

HYGIENIC SELF-PRIMING PUMPS

The Alfa Laval LKH Prime is a self-priming pump that meets the requirements of a range of hygienic industries, including food, dairy, beverages and home personal care. LKH Prime UltraPure versions are also available for pharmaceutical applications.

Using the combination of air-screw technology, an optimised impeller and casing geometry, the pump provides efficient operation with reduced energy consumption and a low CO_2 footprint. It is EHEDG certified and authorised to carry the 3-A symbol.

Designed for clean-in-place (CIP) duties containing entrained air, the device can also pump product, potentially reducing the capital investment when designing process systems.

Quiet in operation, the pump reduces sound pressure levels by 80% when compared to products using traditional pump technologies for CIP/entrained air applications.

The pump is easy and cost-effective to service and maintain, by sharing common parts with the Alfa Laval LKH pump range.

Alfa Laval Pty Ltd
www.alfalaval.com.au

FUNCTIONAL SAFETY WITH IEC 61511 EDITION 2
IS YOUR PLANT READY?

Shalveen Sharma and Andy Yam*

With the release of IEC 61511 Edition 2, Australian companies in the process industries will be required to achieve compliance, not only on greenfield sites, but existing sites as well.

The Australian release of IEC 61511 Edition 2 is almost upon us and one of the many updates includes the addition of a 'grandfather' clause that has been adopted from the ANSI/ISA 84.00.01-2004 standard.

What this essentially means is existing plants now have a responsibility to ensure compliance. The clause states:

"For existing Safety Instrumented Systems (SIS) designed and constructed prior to the issuance of this standard, the user shall determine that the equipment is designed, maintained, inspected, tested, and operated in a safe manner."

It is no longer enough to implement current safety standards on greenfield sites and during plant upgrades — now brownfield installations must also comply. The question then is, does you organisation have the resources and skills to meet this extended compliance requirement? Engaging a functional safety consultant is therefore recommended to assist with adherence to these new requirements for existing plants built prior to 2003, which are now subject to the grandfather clause.

Additionally, if you are working on a new project, certified safety consultants can assist you to deploy proper safety solutions from initial concept, design and implementation, through to operation and maintenance.

Consultants can provide services that align with the AS IEC 61511 Safety Lifecycle (Figure 1). These services can assist plant owners to meet their obligations to comply with the standard, regardless of the lifecycle stage being examined. Whether it be from the preparation stage through to report finalisation, functional safety consultants work closely with clients to ensure that all gaps are bridged and the activity is carried out as efficiently and smoothly as possible.

The AS IEC 61511 Safety Lifecycle steps outlined below provide an insight into the value that can be provided by partnering with an experienced, certified process safety organisation. Each of the phases outlined in the IEC 61511-1 Safety Lifecycle (Figure 1) has a specific assessment process to ensure certified outcomes are met. The assessment process and implementation timing is described below.

Safety conceptual phase

Hazard and Risk Assessment (HAZOPs)

The very first step in the process safety lifecycle is to ensure all potential hazards in the process and the associated equipment are identified. This step is crucial, as all subsequent functional safety activities are designed around preventing these hazards or mitigating their impact.

following the Hazards and Risk Assessment, the IEC 61511 safety lifecycle model requires that identified SIFs are assigned a target measure of their reliability to perform the safety function.

Functional safety consultants facilitate this process in allocating Safety Integrity Levels (SILs) to the plant's SIFs. This facilitation is normally achieved through a SIL selection workshop, where all required and critical information is collated providing comprehensive information to accurately select the safety integrity levels. Their aim is to provide a comprehensive and accurate result, to help plants protect their people and plant assets, and comply with legislation — while at the same time ensuring that expenditure on equipment is budgeted realistically. Using industry-proven methods, which include layers of protection analysis (LOPA), risk graphs and a risk matrix in SIL selection workshops, plants are provided with:

- a comprehensive list of all uniquely identified SIFs;
- the SIL target for each SIF with respect to people protection, environmental protection and asset protection;
- allocation of safety requirements to all layers of protection.

SIL verification

Functional safety consultants can help ensure legislative safety requirements are met prior to final plant design — avoiding costly redesign and rework of the process safety system — by determining the intended SIS design meets all safety targets specified in the SIL selection workshops. During the verification process, if SIFs are found not to meet their target SIL, consultants will investigate options and advise the best course of action to take to reach a resolution for all issues discovered.

Carrying out this exercise early is insurance for plant designers to avoid costly redesign and associated rework, due to the inability to meet safety requirements in later stages of the project. Using reliability block diagrams, fault tree modelling and SIL verification tools, safety consultants can provide clients with:

- a comprehensive report on verified SIFs;
- assurance that the SIS design meets the required safety level.

Safety Requirement Specification (SRS)

The Safety Requirements Specification ensures that the safety specifications consider all aspects of process safety and that the SIS is designed and engineered to correct specifications prior to plant implementation. These specifications need to be maintainable and verifiable throughout the process safety lifecycle.

It is a detailed document that describes functional and safety integrity requirements for the SIFs, specifying all aspects of the Safety Instrumented System. It covers the SIS behaviour for all modes of plant operation, ensuring no stone is left unturned in the pursuit of process safety. These specifications need to be determined and documented referencing the HAZOPs, SIL classification and SIL verification reports generated prior.

The end result is a comprehensive document that describes overall SIS requirements as well as details of each SIF's safety and functional behaviour, ensuring that SIS Safety Requirements Specification can be used to validate the SIS in later phases of the IEC 61511 process safety lifecycle.

Functional safety consultants work closely with the site plant engineers. All aspects of the safety process is scrutinised node by node to identify hazard and operational issues. During this critical assessment, safeguards including safety instrumented functions (SIFs) are identified and recorded for each of the situations.

Organisations should utilise experienced functional safety consultants who are skilled in systematic hazard identification methods to ensure all potential hazards in the process plant are identified. Upon completion of the Hazard and Risk Assessment, clients should be provided with:

- an overview of all possible unwanted disturbances and their initiating events;
- determination of existing or new SIFs and other safeguards for each hazard;
- documentation of the HAZOPs results and justification for safety functions;
- action planning for improvements of the process or required clarifications.

Safety Integrity Level (SIL) selection

The challenges faced by facilities include accurately budgeting for process safety equipment and allowing for the protection of people and plant, while complying with government regulations. Through

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Functional safety

Figure 1: IEC 61511-1 overall safety lifecycle.

The diagram shows the following flow:

- Management of fucntional safety (10)
- Safety lifecycle - Structure & Planning (11)
- Verification (9)

1. Hazard and risk assessment
2. Allocation of safety functions
3. Safety requirements specification → Other means of risk reduction
4. Design and engineering of the SIS
5. Installation, commissioning and validation
6. Operation and maintenance
7. Modification
8. Decommissioning

Safety implementation phase

Design and engineering of the Safety Instrumented System

Once the Safety Requirements Specification has been produced, the next step is the design of the actual Safety Instrumented System (SIS). Through partnering with a trusted and experienced safety solution designer, the engineering and safety systems manufacturer can help to ensure that safety outcomes are achieved without leaving anything to chance.

Safety assessment and FSM audit

Regardless of the safety system 'brand' in place, a Functional Safety Audit (FSA) should be carried out prior to plant start-up. SIS validation activities are reviewed for completeness and any technical deficiencies present in the prior IEC 61511 process safety phases are identified. Readiness of the plant to move into the next phase of the safety lifecycle needs to be thoroughly assessed.

Consultants also conduct SIS Functional Safety Management (FSM) audits to ensure the plant has a compliant FSM system in place. Different areas of FSM are scrutinised to ensure the plant has adequate procedures and systems in place to comply with FSM requirements. An FSM audit is included as part of the Stage 3 FSA prior to plant start-up.

In FSAs during the operational phase, consultants analyse whether actual process safety indices and SIS performance are matching the design assumptions. Identified weak links are addressed together with plant engineers to bridge any gaps, ensuring safety is not compromised.

The advantage of utilising functional safety consultants is that they provide an independent assessment and review of the processes and preparation leading up to plant start-up. Gaps are identified and improvements are recommended and addressed towards a satisfactory resolution. In addition, functional safety assessments in the operational phase ensure SIS performance and plant safety are matching with expectations.

Safety operational phase

Safety Function Monitoring (SFM)

Most facilities collect large amounts of safety data from several sources. Making sense of this data can be challenging, especially when applying HAZOP and LOPA safety designs.

Having large amounts of data without access to rationally compiled safety KPIs and reports makes the current performance of a facility difficult to understand and compare against design expectations. This can compromise both the understanding and decision-making with regard to which safety elements require attention, especially those which impinge on the safety design.

SFM application software is available today that can help improve safety monitoring in process industries such as oil and gas production and midstream, refining and petrochemicals, chemicals, and power and energy. Such applications provide:

- plant-wide monitoring, analysis and reporting of functional safety performance, across safety systems (SIS) and devices (sensors, actuators);
- mapping of operational information from system and device activity against LOPA or HAZOP risk analysis to report the effectiveness of actual safety performance against the design targets;
- notification of deviations from safety design expectation.

The benefits of using SFM software throughout the lifecycle of the plant include:

- improved operational safety;
- visibility of safety performance at both system and device level;
- identification and reduction of spurious trips;
- optimisation of testing intervals;
- significant reduction in time and effort to produce regulatory reports;
- comprehensive information for safety validation and improvement programs;
- quick identification of safety events such as SIF Activations, Overrides/Inhibits and Protection Layer Availability to increase user efficiency and accuracy;

> **ORGANISATIONS SHOULD UTILISE EXPERIENCED FUNCTIONAL SAFETY CONSULTANTS WHO ARE SKILLED IN SYSTEMATIC HAZARD IDENTIFICATION METHODS TO ENSURE ALL POTENTIAL HAZARDS IN THE PROCESS PLANT ARE IDENTIFIED.**

• benchmarking of safety performance against design expectations to highlight variations that may indicate possible safety issues.

Function safety training for technicians and operators

Any personnel involved in the safety lifecycle activities are required to be competent for the roles they fill. Plant operators and technicians need to equip themselves with the necessary knowledge to perform their functions.

Technician and operator training courses are specifically designed to provide the necessary level of understanding of functional safety to plant operators and technicians to help them carry out their duties. At the end of the course they will have a sound understanding of safe practice in operation and maintenance as well as a clear understanding of how their actions affect process safety.

Those who deliver the safety training should be accredited Functional Safety Experts with many years of industry experience. Bringing this experience into the classroom adds the necessary practical dimension when delivering the Functional Safety Engineers course, where real-world examples and practical learnings are brought to the attention of attendees.

Such a course is designed to provide an understanding of the real-world challenges safety engineers and operators face in the industry and provides formal recognition of their achievement upon passing an assessment. Certification workshops can be held at an organisation's premises or in an off-site training facility.

Conclusion

With the release of IEC 61511 Edition 2, Australian companies in the process industries will be required to achieve compliance, not only on greenfield sites, but existing sites as well. This presents a number of challenges that many organisations would struggle to overcome with lean internal resources. TÜV Rheinland accredited functional safety consultants and trainers can help fill the gap, providing the standards-compliant analysis, design and auditing services needed to meet compliance, as well as providing the training needed for plant technicians and operators.

Shalveen Sharma B. Eng. Electrical, IPENZ is Product Manager IA Systems & Solutions for Yokogawa Australia
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Yokogawa Australia Pty Ltd
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FIELD SIGNAL INDICATOR

The JDF200 Field Signal Indicator provides digital indication of a remote analog 4–20 mA signal on a wide and clear LCD display. It is designed to deliver enhanced visibility to a user's process in a wide variety of applications and environmental conditions.

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The device features combined certifications according to ATEX, IECEx and Factory Mutual to deliver increased protection in hazardous areas and reduced inventory costs.

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AUTOMATIC BEARING LUBRICATION

Motion Guard automatic lubrication devices are designed to provide an environmentally friendly method of keeping bearings in vital machinery and plant adequately lubricated.

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The process is fully automatic and virtually maintenance-free. By providing the precise amount required for a particular rolling bearing, there is no wastage and service life is maximised.

The series has a range of options suited to different applications. The devices come in single- or multitop versions, which can deliver grease or oil to the precise location where it is needed at intervals set by the user.

Schaeffler Australia Pty Ltd
www.schaeffler.com.au

INDUSTRIAL VISION CAMERA

Scitech has released the PixeLINK PL-D721P camera based on the Python1300 sensor. The camera comes in both colour and monochrome versions and provides low-noise images for a broad range of industrial applications, including high-performance security and surveillance applications, parts inspection, metrology and biometrics, welding inspection, PCB and flat-panel display inspection. The cameras feature a 1.3 MP (1280 x 1024) resolution sensor capable of 210 fps at full resolution.

The models is based on an ON Semiconductor CMOS global shutter sensor with a 1/2″ optical format. The built-in image preprocessing capabilities result in high image quality, less load on the system and higher performance.

The cameras provide the user with a choice of 8- or 10-bit digitisation and a dynamic range of 60 dB. The external hardware trigger and two general-purpose outputs ensure users have the flexibility to synchronise the camera with their processes and illumination.

The product's SDK uses a common API for all cameras, regardless of the chosen interface. Software code developed for one camera is easily transferred to other PixeLINK models without the need to recompile. Overall system costs are reduced and camera integration is simplified.

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Busch vacuum system cuts energy consumption by 70%

The Feinkost Dittmann delicatessen company dates back to 1901, when Carl Dittmann opened a delicatessen in Wiesbaden, Germany. Today, the family-run business is the German market leader for olives, antipasti, capers, garlic and anchovy specialities.

At its production plant in Taunusstein near Wiesbaden, 320 employees produce different antipasti specialities made from olives, feta cheese, garlic, pepper and dried tomatoes, which are dispatched to national and international retail store chains and discount stores in over 30 countries.

Products are manufactured as preserves in glass jars or as fresh products packed in plastic trays. During the packing process in the 'fresh' department, air is sucked out of the packaging trays before a CO_2N_2 protective gas mixture is added to the package. Synthetic material foils are then used to give the packaging a gas tight seal before the packaging is closed with an additional plastic cover. This type of packaging guarantees that the oxygen content is under 1%, significantly increasing shelf life.

In total, four tray sealers are used for packing during a two-shift operation. The vacuum required for this is generated by six oil-lubricated rotary vane vacuum pumps with 5.5 kW of motor power each. They were originally installed directly on the packaging machines; however, for hygienic reasons and to reduce the thermal load in the production rooms, these vacuum pumps were later installed in a separate room above the production room and connected to the packaging machines using a pipe network.

Andreas Lutz, the technical project manager in the production plant, was dissatisfied with this solution because the vacuum pumps still required high levels of maintenance. Also, fluctuations or failures in the vacuum network were first noticed if one of the packaging machines showed an error message and automatically shut down. This led to repeated production downtimes on individual packaging lines.

He charged the vacuum specialists from Busch with the task of offering a more reliable and efficient solution, using the existing pipe network. In addition, the vacuum supply was to be designed in such a way that connection of further packaging machines would be possible if production capacity were to grow.

Busch recommended a central vacuum system with four Mink claw vacuum pumps. These have the basic advantage that they do not require an operating fluid such as oil in the compression chamber, eliminating much maintenance work such as oil checks, oil changes, oil filter changes and the costs for procuring and disposing of oil and filters.

Mink claw vacuum pumps also use non-contact operation, meaning there are no parts in the compression chamber that come into mechanical contact and thus cause wear. The non-contact operation also enables a high degree of efficiency and therefore requires less motor power than conventional vacuum pumps.

Three vacuum containers with a volume of 3000 L each are upstream from the Mink claw vacuum pumps. This ensures that sufficient vacuum levels are immediately available at the machines when they are needed.

Previously, all six rotary vane vacuum pumps were in operation an average of 15 h/day. The Mink vacuum pumps in the new central system are controlled so that only those currently needed for the actual vacuum requirements are running.

Two of the vacuum pumps with standard motors are responsible for the so-called base load. The other two vacuum pumps are frequency controlled and ensure fine adjustment of the vacuum requirements by adjusting their speed. With this intelligent solution, the pumping speed of the central vacuum system adjusts itself to the current requirements.

During normal operation, all four vacuum pumps never need to operate at full load, so Feinkost Dittmann's central vacuum system has sufficient power reserves to connect further packaging machines. There is a plan to additionally connect a vacuum filler for glass preserves, which would eliminate the need for the current decentralised liquid ring vacuum pump installation with 7.5 kW drive, creating further energy savings.

After more than two years of operation, project manager Andreas Lutz said that energy requirements have been reduced by more than 70%, alongside a drastic reduction of maintenance efforts, increased reliability and no failures or breakdowns.

Busch Australia Pty Ltd
www.busch.com.au

MACHINE VISION LIGHTING

Spectrum Illumination supplies high-output LED lights for the machine vision industry. Machine vision lights assist cameras in a factory setting by illuminating the product as it passes by on an assembly line. The cameras take images of the product and communicate with a computer. Software then detects certain markers, indicators or defects in the image of the product to make sure the final product meets the factories standards, requirements and quality control parameters.

Spectrum Illumination has product lines using high-output LEDs that include ring lights, spotlights, dome lights, diffused axial lights, linear lights, oxy lights, washdown lights and backlights.

The company also offers a modular light system (Tripod Light) that can be configured by the user. The Tripod Light includes Smart Burst Technology, analog control and variable intensity control built in.

SciTech Pty Ltd
www.scitech.com.au

ASSET HEALTH VIEWER APP

Emerson's ATG View application allows quicker and easier access to critical asset health information by putting data from Emerson's CSI 6500 ATG machinery protection and prediction monitoring system in the palm of users' hands.

With a mobile device, users can scan a quick response code (QRC) located on the CSI SI 6500 ATG cabinet and immediately view the status and health of all cards and measurements from the associated rack on their mobile device. This enables quicker maintenance rounds and reduces unnecessary trips to the control room, helping maintenance teams be more productive and responsive to changes in equipment health.

The app is built to be intuitive and easy for users to get started quickly. ATG View is available from the Apple Store and Google Play.

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

HIGH-CAPACITY PLC

The FC6A MicroSmart PLC from IDEC Corporation can execute basic instructions in 0.042 μs and has a program memory of 640 KB. There are 1024 timers and six of the 512 counters are high speed at rates up to 100 kHz. These capabilities allow the PLC to handle large programs with complex control requirements such as PID, flow totalisation and recipes.

Three models are available, each with 24 VDC or 100–240 VAC power. The 16 I/O model has nine inputs and seven relay or transistor outputs. The 24 I/O model has 14 inputs and 10 relay or transistor outputs. The 40 I/O model has 24 inputs and 16 relay or transistor outputs. Each model also includes an integral 0–10 VDC analog input. The 16 and 24 I/O models can accommodate one plug-in analog cartridge and the 40 I/O model can accommodate two plug-in analog cartridges. Each cartridge has two analog I/O points — either two inputs or two outputs.

Up to 12 expansion modules can be added to the 16 I/O model and up to 15 expansion modules can be added to the 24 and 40 I/O models. These modules can be of any type, with no restrictions as to the number of analog and specialty modules. This gives the 40 I/O MicroSmart PLC the capability to handle up to 520 I/O with a maximum of 126 analog I/O.

All models have a built-in RJ45 ethernet port, supporting Modbus TCP, and an RJ45 RS232C/RS485 serial port supporting Modbus RTU.

IDEC Australia Pty Ltd
www.idec.com/australia

POWER LOGGER

The Fluke 1738 provides users with more visibility, reduced uncertainty and better quality information to make energy consumption decisions. The device features the Fluke Connect mobile app and desktop software compatibility, giving users the necessary data to make critical power quality and energy decisions in real time. It is available to rent from TechRentals.

The product automatically captures and logs over 500 power quality parameters. Data from the device can be downloaded directly to a USB flash drive that plugs into the USB port of the instrument. The unit can be utilised to conduct load studies, energy assessments, harmonics measurements, and voltage and current event monitoring.

The device features a 4.3″ colour LCD active matrix resistive touch panel and includes four flexible clamps that allow measurement of currents from 100 mA to 6000 A, for all three phases and neutral. The supported frequency range is 42.5 to 69 Hz.

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WHAT MAKES RFID SYSTEMS INDUSTRIAL STRENGTH?

DETERMINING IF EQUIPMENT IS SUITABLE FOR INDUSTRIAL ENVIRONMENTS

The retail environments where products are sold look nothing like the industrial environments where they are produced, yet the same RFID products developed for retail stores and supply chain operations are heavily marketed to manufacturers for production operations.

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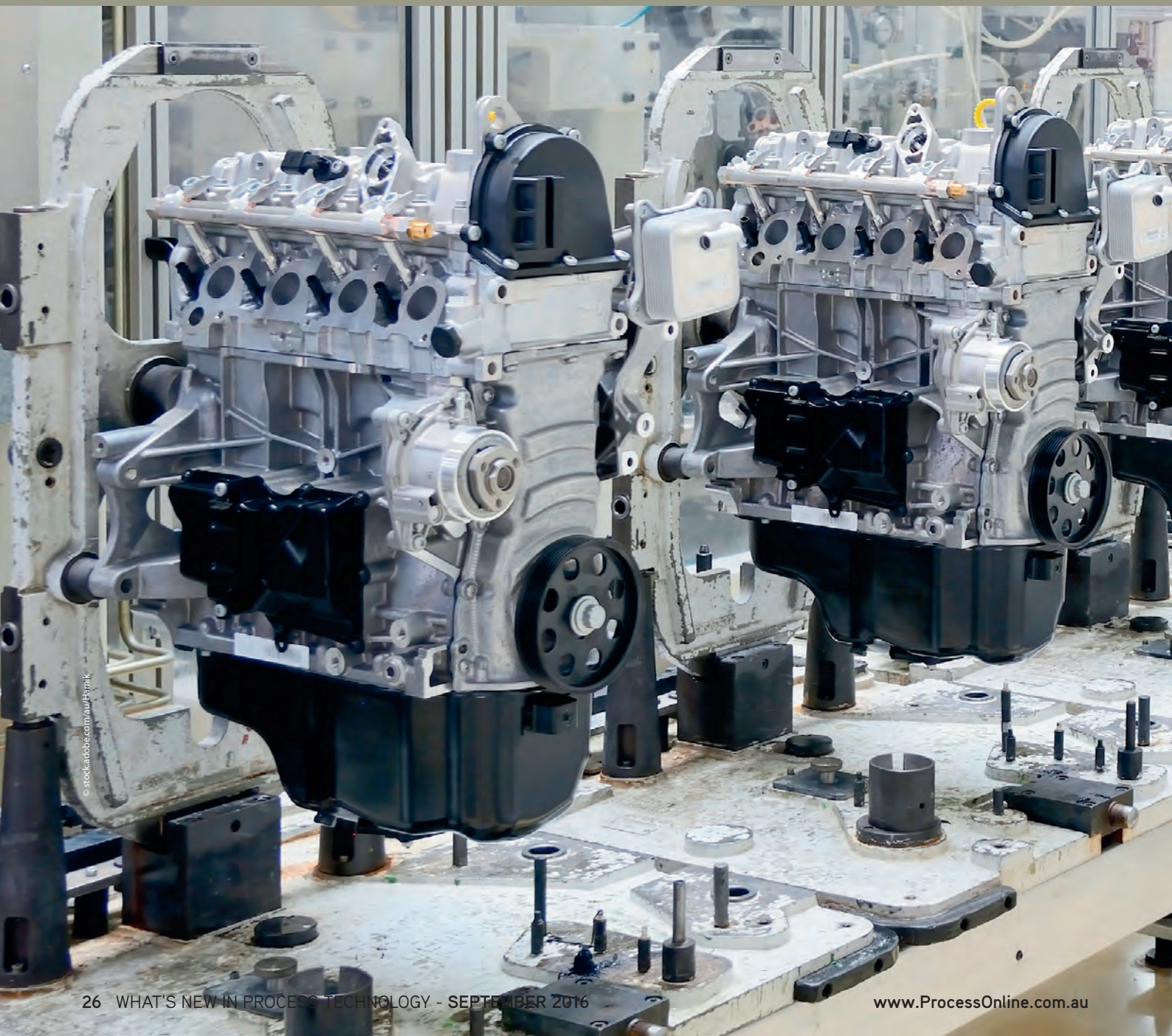
M any of the RFID products marketed to manufacturers may have different housings or IP ratings than their general-purpose cousins and may work fine in warehouses, but that does not necessarily qualify them as industrial grade.

Production environments often have their own ruggedness, performance and connectivity requirements that only purpose-built industrial equipment can reliably satisfy. For example, general-purpose RFID equipment may have the physical Ethernet port needed to connect to a PLC, but will not support EtherNet/IP, Profibus or other industrial protocols that are used to network with PLCs and other industrial automation equipment. The reader will need to be supported with additional protocol conversion, which slows system performance and adds to implementation time and expense.

EtherNet/IP and other industrial protocol support is just one example of the many features that separate true industrial RFID solutions from products that can be used in industrial environments. When evaluating RFID equipment, it is important to make the distinction between what is possible for use in the environment and what is optimal.

Three fundamental qualities determine if RFID systems will perform reliably in demanding production environments:
- Will the RFID system integrate seamlessly with industrial control systems?
- Will it provide the reliability and speed that production and information systems require?
- Can it maintain uptime and performance long term — will it last as long as the production line?

Will it integrate seamlessly?

RFID is often marketed as a 'solution' but in manufacturing operations it is almost always used as a supporting technology to provide data and visibility to the MES, ERP, e-Kanban, robotics, asset tracking, material handling, quality control and other systems that run production facilities. The first requirement for any industrial RFID system is to be able to seamlessly integrate with the enterprise's production control systems — including PLCs, sensor networks and HMIs — and the industrial protocols that run them. Failure to accurately provide data to these systems, at the reliability and speed levels they require, eliminates the value of using RFID.

The need to support control systems produces a fundamental disconnect between supply chain-oriented RFID products and industrial user requirements. Most RFID readers are programmed to process ASCII data, yet PLCs and other industrial automation equipment run on industrial protocols like EtherNet/IP, Profibus, Profinet, CC-Link, DeviceNet, EtherCat, etc. Industrial protocols are binary and thus can transfer data much more quickly than ASCII-based systems, because ASCII characters consist of more bits. Converting data streams from ASCII introduces an extra step that adds time and therefore limits productivity. The delay caused by protocol conversion is often unacceptable in automated production environments where, for example, a work-in-process item may need to be identified, recorded and routed to the next process, all in three seconds or less.

There are RFID readers with native support for industrial automation protocols, but it is not a common feature. Some vendors do not even offer industrial protocol support as an option, which is a key indicator that the products and vendor are not focused on the industrial market.

Protocol conversion is typically done by developing software code to convert the RFID data string to the specific protocol, and installing it on the RFID reader or industrial automation equipment. The software development time is often a hidden cost that is not considered during system planning and hardware evaluation. Developing, testing and installing the code increases the time needed for system implementation. These cost and time factors illustrate why it is difficult to make apples-to-apples cost comparisons between industrial and general-purpose RFID readers.

This reduction in performance for RFID readers that do not have native support for industrial protocols would not be reflected in the product spec sheet, which may list how quickly tags are identified, not how quickly the data can be processed and presented to the host system. RFID readers without direct support for native protocols introduce risk, cost and performance limitations without providing any additional benefits.

Will it be reliable at production speeds?

The physical environments in industrial and supply chain settings cause RFID technology to perform differently. The primary source of potential interference in retail and supply chain environments derives from having hundreds or thousands of tags in close proximity. Tag density is also a consideration for industrial RFID users, but their environment has much more challenging and powerful potential interference sources. These include electromechanical equipment, sensors, wireless controls and other automation equipment, whose signals can impede RFID performance. Metal is a leading source of interference for ultrahigh frequency (UHF) RFID technology for example, so many production facilities are very challenging environments because of the many metal products, equipment and tooling that are present.

RFID systems for industrial environments should have built-in protections against these potential interference sources. As noted earlier, it is essential for RFID systems that support industrial automation systems to be extremely accurate and reliable. An RFID misread at a library checkout counter or retail store is an inconvenience; in a factory it could cause production line delays that cost thousands of dollars in lost productivity.

RFID systems are most reliable when tags and readers are matched to the environment. While the retail and supply chain industries have standardised on EPCglobal Gen 2 and ISO 18000-6 standard UHF technology, industrial systems often require a range of RFID technologies including UHF, high frequency (13.56 MHz), low frequency (125 kHz), microwave (2.45 GHz) and real-time locating systems (RTLS), which are available in multiple frequencies. High frequency (HF) tags are especially effective for production operations because they are resistant to interference from metal and have the memory capacity to carry production data other than a serial number. However, HF has limited read range, typically less than 60 cm, so the technology may be appropriate for tracking carriers that convey items through controlled locations in production processes. UHF is favoured when readers or personnel can't be positioned near production or for intralogistics purposes. UHF technology can be used to provide much more range from approximately 1 m to 6 m, but is limited in memory (typically 512 bits).

One of the best ways to minimise interference and maximise reliability is to use RFID tags that are optimised for the objects they are identifying and the environments where they are read. Multiple tag types may be required, including specialty tags designed to be read when applied on or near metal. Tag designs can overcome some environmental challenges, but different RFID frequencies may also be required to get the required performance in different process areas.

" ONE OF THE BEST WAYS TO MINIMISE INTERFERENCE AND MAXIMISE RELIABILITY IS TO USE RFID TAGS THAT ARE OPTIMISED FOR THE OBJECTS THEY ARE IDENTIFYING AND THE ENVIRONMENTS WHERE THEY ARE READ.

For example, some manufacturers use HF tags on the conveyors that route assemblies through the production process. The tag is encoded with the assembly serial number and is updated with variable production information such as build data, error-proofing results and configuration information during the manufacturing process. When production is completed and the part is ready to be shipped to the next stage of production, the part ID or other data from the HF tag can be automatically collected and used to encode a UHF tag on the RTI (returnable transport item) or other container used for logistics, without any manual data entry or operator intervention required. The UHF tag could also be used for internal material handling, storage and shipping processes.

Since a range of RFID technologies is typically required for industrial operations, selecting a vendor capable of supporting multiple options like LF, HF and UHF is critical. Some industrial RFID readers even have the ability to simultaneously support input from different frequencies (eg, HF and LF) and integrate with I/O modules that support sensors, PLCs and other industrial automation components.

Will it last as long as the production line?

Companies are accustomed to having their PLCs and other industrial automation systems last for many years, and have similar expectations for RFID equipment. Reliable performance and a long product lifespan are attainable in production environments, but will require purpose-built equipment. There are a few tell-tale features that differentiate rugged RFID products. These include objective ratings and certifications, base materials and fundamental product design.

Products that are marketed as 'rugged' or offer an optional protective casing are not necessarily appropriate for an industrial environment. IP, IEC and EN ratings and other independent certifications provide some insight into ruggedness and suitability, but they are just a starting point, and not a guarantee that the equipment will function reliably. RFID products designed for use in a distribution centre will not be exposed to the same levels of shock, vibration, humidity, temperature, radiation and interference as units that are used in production processes, which may include assembly, painting, stamping, grinding, welding, chemical treatment, cleaning, sterilisation, freezing, heat treatment, vibration testing and exposure to hazardous materials. For reference, many UHF RFID readers developed for warehouse and supply chain operations have an IP54 rating, whereas IP65 and EN60068 rated RFID systems are preferable for many production environments.

While IP ratings do not guarantee performance, IP65-rated RFID systems do have advantages over IP54 models in real-world production environments. IP65 devices, and individual parts that are EN 60068 rated, provide superior protection because they can withstand more shock and vibration. They are sealed against liquids, dust, dirt and other substances that could potentially penetrate a device and cause it to fail.

Smaller, subtler differences between products often have a larger impact on reliability and performance. For example, cable connections are a common point of failure for all types of electronic equipment. RJ45 and other connectors that snap in or clip in are particularly vulnerable. They can easily become broken or unplugged if the cable is tripped over or otherwise disturbed. Industrial products should be protected against this potential point of failure with threaded connectors that screw in (such as M12 type) and will not detach or break because of vibration or incidental contact.

Fundamental industrial product design calls for all components to be housed internally so that exposure to hazards is minimised. Unfortunately, RFID antennas often must remain external for maximum performance, and thus represent a vulnerability. Damage risk can be reduced by constructing antennas from durable materials, including secure connectors and by offering multiple mounting options. RFID antennas are available with IP65 ratings and certifications to withstand various levels of shock and vibration.

When determining whether RFID products are suitable for a specific environment, it is important to look beyond published marketing hype and misleading specifications. Consider the design and construction of the product and how it could be affected by various work processes. Whenever possible, products should be tested where they will be used rather than in a lab or demonstration area, because the actual work location has interference and environmental conditions that may be overlooked and impossible to duplicate elsewhere. It is very important, for example, to have a professional RFID site survey conducted when using UHF before systems are installed. During a site survey professional RFID technicians or engineers will identify potential sources of interference, evaluate location options for installing equipment, measure signal strength and collect other information so the UHF RFID system can be tuned and optimised for the specific facility. The skill of the person who conducts the site survey — as well as the overall skill, experience and breadth of product options of the RFID system provider — can greatly improve system performance and reliability.

Summary

It takes more than product packaging, ambiguous specification and clever marketing to make RFID products truly industrial. To meet the operational and business requirements of production facilities, RFID equipment needs to seamlessly integrate with industrial automation systems and work reliably in challenging conditions — and to do so for years without causing unplanned downtime. The key attributes that differentiate industrial RFID equipment from supply chain-oriented alternatives include:

- native support for industrial protocols;
- high tag read reliability and the ability to continuously operate at speeds that won't slow production systems;
- durable housing with secure connectors;
- IP65 rating and relevant certifications for shock, vibration and temperature resistance;
- the ability to support multiple RFID technologies and supporting devices as needed, including sensors, PLCs and other industrial automation equipment.

Compromising on any of these criteria will likely result in unnecessary implementation, support and replacement costs and raise the risk of system failure. These risks are greatly minimised when appropriate equipment is used, as industrial RFID systems have proven their reliability and value in a wide range of challenging environments.

Balluff Pty Ltd
www.balluff.com.au

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ONLINE IRON CONTENT ANALYSIS

Bürkert has developed a flow injection analysis (FIA) module for analysis of iron content in an online analysis system, which combines all of the necessary components, including a control unit, in a small space. FIA has been used for quantitative analyses in laboratories for years; now, due to miniaturisation using microfluidic components, the process can be carried out using a field device and the iron content can be continuously monitored at the measuring point.

In flow injection analysis, the reagent is mixed into the water sample by means of a pump. The microfluidic mixing section following the injection provides for even and complete mixing. The liquid then passes through a flow photometer that measures the absorption over time. The iron content can be determined photometrically from the detected peak-shaped signal and is then available for the control, monitoring and documentation of the water preparation.

The data transfer takes place via the EDIP (efficient device integration platform), which enables intelligent networking of all electronic Bürkert devices. The FIA module is supplemented with a supply unit for reagent, calibration and cleaning solution. It is automatically calibrated with an offset and cleaned with rinsing solution at regular intervals.

Burkert Fluid Control Systems
www.burkert.com.au

FORCE AND DISPLACEMENT CONTROLLER

The Burster DIGIFORCE 9311 is a force and displacement controller designed to offer rapid evaluation results when strict quality demands are coupled with high production rates. Built-in technologies save set-up time, simplify operation and ensure autonomous integration into modern production systems.

The product can be used as early as the development phase to determine reference curves. It can precisely monitor manual workstations and automated production lines even when a rapid cycle is running or workpiece types are changed. Continuous monitoring ensures errors are detected early so countermeasures can be implemented quickly.

Key features include a 3.5″ colour display with touch operation, automatic set-up of evaluation elements and flexible PLC connection using Profinet, EtherNet/IP or I/O. Evaluation results are available in 15 ms on average and up to six real-time switching outputs are available. Process monitoring is available with graphical evaluation elements such as thresholds, envelopes, trapezia and windows.

Bestech Australia Pty Ltd
www.bestech.com.au

COLLABORATIVE DUAL-ARM ROBOT FOR PACKAGING APPLICATIONS

HMPS, together with robotic partner ABB, has adapted the YuMi collaborative robot to suit specific packaging applications.

The robot is compact, with dimensions similar to that of a human. Its dual arm feature seven axes of movement, each allowing good dexterity and precision.

With its dual arms, flexible hands, universal parts feeding system, camera-based part location, lead-through programming and precise motion control, it is able to surpass the precision and speed of human-only working, resulting in high-quality products and less waste.

The robot comes with integrated, flexible hands which can be deployed in a variety of configurations, including servo grippers, dual suction cups and vision. The hands allow for complete customisation to meet the demands of many packaging tasks. This enables the robot to work with humans in a packaging environment that requires flexibility along with some repetition and precision. Some of the potential packaging applications include kitting of multiple components into packages, component assembly and packing of fragile materials.

The robot can operate in close collaboration with humans due to its inherently safe design. It has a lightweight yet rigid magnesium skeleton covered with a floating plastic casing, which is wrapped in soft padding to absorb impacts.

HMPS

www.hmps.com.au

Mix and MES

It is often said that knowledge is power. For a manufacturer, knowledge is definitely the key to unlocking greater efficiency through asset utilisation, traceability and transparency. Unfortunately that is easier said than done, and a lot of relevant and up-to-date data remains stranded in so-called islands of automation while management must make decisions based on outdated reports or estimates. Manufacturing execution systems (MES) operate at the level between ERP (enterprise resource planning) and control systems, and provide a real-time overview of equipment and inventory utilisation.

DSM Nutritional Products is a major supplier of vitamins and carotenoids (natural colourants) for the cosmetics, pharmaceutical and food and beverage industries. The company operates a major plant in Village-Neuf in Alsace, France, where vitamins and carotenoids and produced and mixed. The site, which also includes laboratories and research installations, employs around 500 people. About 70 of these work in the domain of premixing vitamins. Premixes are manufactured in direct response to customer orders. There is thus no actual storage of premix on-site.

Shipments must leave the works within a maximum of four weeks following order reception, including the time to deliver the necessary analysis certificates. At the Village-Neuf site, more than 1000 recipes can be assembled from around 200 raw ingredients. Seven different mixers are available, with capacities from 240 up to 8000 L. The plant's operation requires reliable planning. The traceability of each production step must be assured and logistics must be accurate.

Until 2013, the premix plant used a tailor-made process control system, which required a strictly sequential execution of process steps. To improve efficiency and be prepared for future demands, various MES offerings were evaluated. An MES represents the process control layer located between the business level of the plant with its ERP system and the local process control level.

DSM Nutritional Products chose ABB from among four competing suppliers and ordered the company's cpmPlus Enterprise Connectivity System (ECS). This system provides standardised interfaces to the customer's ERP system, according to the ISA95 standard as supported by SAP for the vertical integration of process automation.

The premix team took the implementation of the new MES as an opportunity to reassess and optimise the implementation of their processes. The new implementation may create the appearance of being 'overengineered' with respect to current requirements, but Gilles Nodot, responsible product manager at the premix plant, explained, "This approach facilitates our adaptation to the future tightening of requirements in process safety and traceability."

What has changed in terms of the MES? Some steps of the production process can now be performed in parallel. For example, in the past all raw materials required for a production lot needed to be available on-site at the same time for production to begin. Now weighing and portioning can begin as soon as the first components are unpacked. This massively increases the flexibility of scheduling at the weighing stations and thus alleviates a bottleneck.

"With the new MES, we now have real-time information about the entire process, which is furthermore more reliable and transparent," explained Nodot. "We know at any time how much of what material is at which process step. This permits a detailed planning process with much-reduced demands for storage of raw materials."

While implementing the system, ABB staff worked closely with the premix employees in order to realise the best implementation.

ABB's delivery includes seven stations for the Extended Automation System 800xA control system in combination with cpmPlus ECS, as well as 15 other stations purely for cpmPlus ECS. The MES solution is based on virtualised servers.

"It is difficult to quantify the efficiency gain from the MES, since we have at the same time optimised the processes themselves," Nodot concluded. "But we believe as a percentage, it is in the double digits. Above all, we are extremely pleased with the functioning of the new solution."

Source: ABB Review

ABB Australia Pty Ltd
www.abbaustralia.com.au

BATCH SOLUTION

In today's processing environment, modern batch systems must account for the growing need for flexible, scalable solutions, true distribution of control and responsive functionality. To address this, Rockwell Automation has introduced its SequenceManager solution, which enables powerful and flexible sequencing capabilities of the batch process at the controller, offering increased functionality for skids, off-network systems and single-unit controls.

Leveraging a Logix-based controller platform, the product allows operators to configure, view and obtain critical information about batch sequences stored in the controller, increasing visibility and accessibility to all stages of the production process.

The solution is suited to industries where batch process control is regulated or business critical, such as food, beverage, pharmaceutical and chemical. Specific applications include single- or multiple-independent unit operations, such as OEM skids, clean-in-place systems, dryers, evaporators, ovens and reactors.

Rockwell Automation Australia
www.rockwellautomation.com.au

VALVE ACTUATORS

Built from a series of interchangeable modular building blocks, the Rotork CK valve actuator design can facilitate quick delivery. The modular construction presents a wide range of options and features, enabling each actuator to precisely match its specific valve duty and function. The choice ranges from basic actuators requiring separate motor controls to more sophisticated versions equipped with a digital control unit.

The digital control unit provides integral control, with data logging for diagnostics and asset management. The module is compatible with hardwired, digital or analog control protocols and offers integration with centralised and distributed control systems.

Non-intrusive, password-protected configuration is performed using the actuator selector switches or the handheld Rotork Setting Tool using infrared or Bluetooth interfaces. The display window provides position indication, status and alarms, plus user-friendly, menu-driven configuration screens.

The actuators provide isolating or modulating operation of multiturn, part-turn or linear valves. Operating from single-phase or three-phase electrical supplies, all actuators are environmentally sealed to IP68 against an 8 m head of water, for a maximum of 96 h continuous submersion, with 10 electrically powered operations permissible whilst submerged.

The actuators are manufactured in a range of three frame sizes. Manual handwheel operation, designed to standard EN12570, is independent of the motor drive and selected with a lockable hand/auto lever acting on a safe, low-speed clutch.

The maximum multiturn output torque is 10,800 Nm, while part-turn torque up to 205,600 Nm is achieved in combination with secondary gearboxes.

Rotork Australia
www.rotork.com

PORTABLE OPTICAL SURFACE MEASUREMENT

The Nanofocus μsurf mobile is a portable optical 3D surface measurement system suitable for portable roughness measurements, analysis of 3D structures and the measurement of microgeometry, topography, layer thickness and volume.

The system was developed especially for measuring large objects such as rolls and vehicle bodywork. The portable confocal microscope weighs only 5.5 kg and the system is ready for on-site use within a few minutes. Large-scale measurements are also possible along the radius of curvature of a roll due to integrated autofocus.

A typical measurement with the device takes 5–10 s. It is available in different configurations, giving users the opportunity to choose the set-up that best suits requirements. The portable measurement system can be transported safely from one location to the next in a roller case with a rollable workstation. It is now also available with an objective nosepiece.

A broad range of additional equipment makes it possible to use the device for portable 3D surface measurements in different industrial sectors. Special software solutions, such as for the paper and print or steel industry, are available. The quality of the texture on rolls in the printing or steel industry or the geometry of recessed cells can be precisely inspected and evaluated from the micrometre to the nanometre scale.

Additional benefits include high optical resolution, motorised x-, y- and z-axes and real 3D measurement data.

SciTech Pty Ltd
www.scitech.com.au

I/O MODULE

Panasonic has released a multi-input/output unit for its FP7 series programmable controller. The AFP7MXY32DWD I/O module has 16 digital inputs and 16 dual-polarity transistor outputs.

The inputs are able to support a wide range of devices, such as encoders and two-wire system sensors. It is has four high-speed counter channels capable of up to 500 kHz at supply voltages of 5 and 12 VDC, or 250 kHz at an input voltage of 24 VDC. Eight of the inputs can also be used for applications requiring a high-speed interrupt program function.

The 16 transistor outputs can be used as standard transistor outputs of either N or P polarity. They can also be configured for applications requiring ultrahigh-speed pulse output of up to 500 kHz or pulse-width modulated outputs.

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

SAFETY SIGNS FOR WASHDOWN ENVIRONMENTS

Brady Australia's range of ToughWash Plastic Encapsulated Signs and Tags featuring a one-piece construction and subsurface graphics is designed to withstand harsh washdown conditions.

Designed specifically for food processors who face tough challenges when it comes to workplace safety and compliance, operational efficiency and food safety, ToughWash signs and tags provide an option for visual communications on the production floor. Available with metal or X-ray detectable properties, these signs and tags are made to withstand the harsh environments of food plants.

The signs and tags feature full-colour, high-resolution printing with clear graphics that are both easy to read and professional looking. They are designed to withstand high-pressure water, chemicals and abrasion for enhanced durability.

Brady Australia Pty Ltd
www.bradyaust.com.au

SANITARY BULK BAG UNLOADER

Flexicon's BULK-OUT bulk bag weigh batch unloading system with manual dumping station and flexible screw conveyor automatically conveys weighed batches of contamination-sensitive materials to downstream processes and allows rapid sanitising.

The BFC model discharger frame is equipped with a cantilevered I-beam with electric hoist and trolley for positioning of bulk bags without the use of a forklift. A SPOUT-LOCK clamp ring atop a TELE-TUBE telescoping tube securely connects the clean side of the bag spout to the clean side of the equipment intake and maintains constant downward tension on the bag as it empties and elongates, promoting complete discharge from the bag.

At timed intervals, FLOW-FLEXER bag activators increasingly raise opposite bottom edges of the bag as it lightens, ultimately forming a steep V-shape that promotes complete discharge of free- and non-free-flowing materials from the bag.

A bag dump station with folding bag shelf allows manual dumping of minor additions into the hopper from handheld packaging and containers.

The hopper is vented to a BAG-VAC dust collection system that draws airborne dust from manual dumping activities away from the operator when the hopper lid is open. A FLEXI-FORCE lump breaker integral to the hopper reduces agglomerates and promotes the continuous flow of material into the charging adapter of the flexible screw conveyor.

Load cells supporting the entire system are linked to a PLC that stops the flexible screw conveyor once the system has lost a preset amount of weight.

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

BLEND OPTIMISATION SYSTEM

Emerson Process Management has announced a release of SmartProcess Blend which incorporates a Blend Order Management System as well as an enhanced online and offline optimiser for control of continuous inline blenders.

The SmartProcess Blend Order Management application provides a multi-language, web-based user interface to link the refinery's blend schedulers to the blend operators. Planners and operators are able to view a blend order, test it with current data and run the offline optimiser from the Order Management tool. Using the DeltaV DCS environment, operators can review approved orders, select one for execution and automatically run that blend using closed-loop optimiser control.

The SmartProcess Blend Optimizer applies closed-loop optimisation to the blend control process. Using nonlinear blend models combined with online analysers, an optimiser continuously calculates the optimum ratios that make the batch on-spec at the lowest possible cost or as defined by user-defined penalty functions. Penalties can be set based on component cost, deviation from planned recipes or deviation from target qualities.

SmartProcess Blend manages the life cycle of a blend, from planning and scheduling, to optimisation, to online control of the final blend properties. The system is designed as a set of generic templates that are configured to meet the specific refinery's blending needs. The system is capable of handling complex blending, and can also be used for simple, recipe-based ratio blending like asphalt with fewer components and quality specifications.

Emerson Process Management Aust P/L
www.emersonprocess.com.au
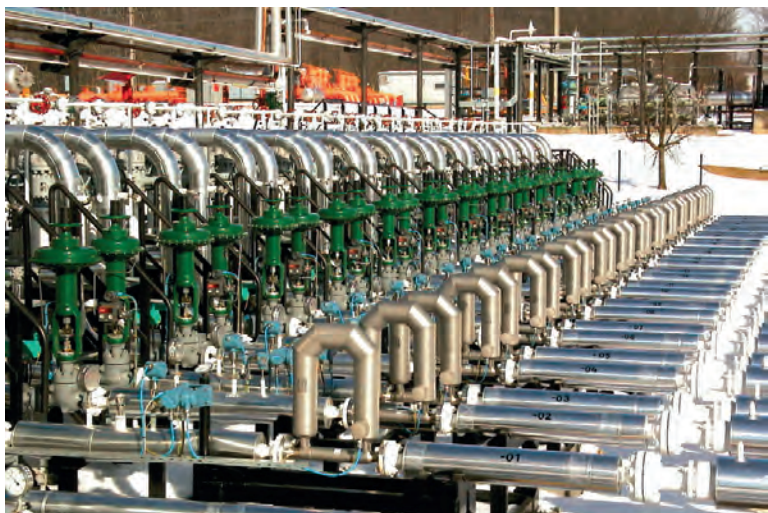
PUSH-IN TERMINALS

Weidmüller's A-series PUSH IN terminals reduce connection times for solid conductors and conductors with crimped-on, wire-end ferrules by up to 50% compared to tension clamp terminals. The conductor is simply inserted into the contact point as far as the stop, resulting in a safe, gas-tight connection. Even stranded-wire conductors can be connected without any problem and without the need for special tools.

The terminals are available in various designs as two, three or four connection terminals with the matching feedthrough, test-disconnect and ground terminals. Conductors with cross-sections ranging from 1.5 to 10 mm^2 can be connected. Flexible potential distribution can be made with the cross connection facility, and faster maintenance is possible with available test points supported by an easy-to-install identification marker system.

Weidmuller Pty Ltd
www.weidmuller.com.au
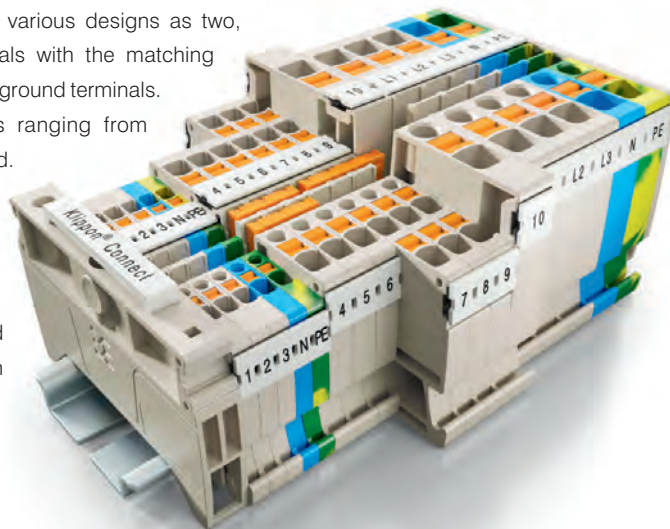
SENSORS IN HYGIENIC CONDITIONS

Sensors used in food processing must be designed to be able to withstand harsh clean-in-place procedures.

Achieving reliable results, even in harsh conditions, is particularly important in food production and processing. Supplying contaminated or inedible food can result in considerable financial losses and a damaged reputation. One method of fulfilling the strict hygiene standards that apply in this context is to clean the systems using high pressure every day; however, this means that the individual components are exposed to strong thermal and mechanical loads as well as aggressive chemical cleaning agents, which presents a real challenge to sensors.

Organisations such as the EHEDG (European Hygienic Engineering & Design Group) and the American 3-A Sanitary Standards are developing guidelines for hygienic machine and system construction — including the components used in the systems. In an age of globalisation, we rely more and more on harmonisation between these guidelines and the certification criteria.

Washdown and hygienic design

Machines and systems which process foodstuffs are arranged in different zones in accordance with the relevant hygiene requirements:

Zone B
Zone B is also known as the splash, cleaning or washdown zone. Washdown indicates that the splash zone of a machine can be wet-cleaned well and quickly. With this type of cleaning, there will be little or no residues (foodstuffs, cleaning agents, water) left on the surfaces. Sensors in the splash zone must therefore be rugged when exposed to cleaning agents and high-pressure cleaning.

Zone A
Zone A is the foodstuff or hygiene zone. For 'hygienically designed' machines — and the sensors used in these machines — certain additional standards apply. A machine is considered to be hygienically designed if it remains free from product residues during use, as this forms an ideal breeding ground for germs. Consequently, it is important to avoid dead space and open joints when designing components.

Sensors that are designed in accordance with hygiene standards are constructed in such a way that they can be used directly in the foodstuff zone (hygiene zone) of a machine. Less build-up of product deposits means less cleaning, in turn reducing the amount of detergent, water and energy required. The system throughput increases thanks to shorter cleaning intervals — which can be an economic benefit, particularly if products are changed frequently.

The material makes all the difference

To ensure reliability while meeting the particular requirements of the food industry, sensors are manufactured in a range of housing materials.

Stainless steel (Inox)
Sensors enclosed in stainless-steel housing are chemically resistant, rustproof and durable. They guarantee chemical material resistance and absolute tightness during intensive cleaning and disinfection.

VISTAL
A high-strength plastic, reinforced with glass fibre, VISTAL offers mechanical properties exceeding those of conventional plastics. A VISTAL housing can reach a level of mechanical strength and tightness sufficient to receive a rating of IP69K.

PTFE
A PTFE coating ensures all-round protection for the sensors and cables. The PTFE plastic is not affected by solvents or other aggressive chemicals. Its surface is so smooth and slippery that hardly any external substance can stick to it, making it suitable for use in hygienic and wet areas.

Housings with an IP69K enclosure rating
Housings with an IP69K enclosure rating guarantee that the sensors and their accessories will stand up to intensive cleaning processes, regardless of whether these involve a high-pressure jet of up to 100 bar or water temperatures of up to 80°C.

Hygienic accessories
What use are hygienic sensors if the mounting components provide a breeding ground for germs? Mounting systems should also fully comply with EHEDG recommendations; for example, connecting cables can be made of PVC with M12 plug connectors for use in the food and beverage industry. With Ecolab certification and IP69K enclosure ratings, users can be sure that connecting cables are resistant to the cleaning agents and disinfectants for which they have been tested.

SICK Pty Ltd
www.sick.com.au

LASER LEVEL TRANSMITTER

The LLT100 laser level transmitter provides continuous, non-contact level measurement of any solids or liquids, even clear liquids. It is designed to meet the demands of process automation and inventory management in industries such as mining, aggregates, oil and gas, chemicals, food and beverages, power, pulp and paper, pharmaceuticals, and water and wastewater.

The maintenance-free instrument measures the storage level of any material, independent of its properties or conditions. Solid material is detectable up to 100 m and liquids up to 30 m. Positioning applications, where the position of a tripper car is precisely measured, for instance, can be done at distances up to 200 m.

With its narrow laser beam (at 30 m, the spot is approximately 20 cm wide), the product can avoid obstructions and be installed near vessel walls in tanks or silos with mixing blades, grids or obstructions. The device measures continuously and provides rapid surface change tracking. Advanced signal processing functions prevent the impact of falling material or splashing on measurement precision as well as giving measurement results in dusty, foggy and narrow environments. Even clear liquids are measurable and no longer a limitation for laser level devices.

The product is easy to configure, with fast installation. It is powered from the loop, while HART communication makes it convenient to use. It comes with industrial IP 67/Nema4x approval for hazardous areas.

ABB Australia Pty Ltd
www.abbaustralia.com.au

SPECTRAL NITRATE/NITRITE SENSOR

TriOS develops and produces optical sensors and associated equipment for water quality analysis. The reagent-free sensors are used in environmental monitoring and process control in a broad range of applications such as surface/drinking water, marine research, industrial and wastewater treatment.

The TriOS family covers a range of parameters with online photometers, fluorometers, radiometers and other sensors. Typical applications include the measurement of nitrogen (nitrate and nitrite), BOD equivalent (BODeq), CODeq, SAC254, radiance/irradiance, colour, concentration of oil in water and algae such as cyanobacteria (blue-green algae).

Replacing expensive and time-consuming lab tests, the OPUS is a new generation of optical sensor for online analysis of nitrogen (nitrate/nitrite) and carbon compounds (CODeq and BODeq). Manual maintenance is reduced by the use of nanocoated (hydrophobic) lenses and built-in air cleaning. The sensor's reagent-free spectral measurement allows for field mounting of the OPUS to deliver real-time, continuous and reliable information for automated control.

All products are supported with a full range of mounting alternatives such as process mount (floats and flowcells), in-line and remote operating solar-powered buoys. The TriOS G2 interface allows sensor configuration either through one of the TriOS centralised controllers or remotely via a web browser. Communication outputs include analog (4–20 mA) and digital Modbus (Ethernet or Wi-Fi).

Control Components Pty Ltd
www.controlcomponents.com.au

LASER MEASUREMENT SENSOR

Banner Engineering L-GAGE LTF Series laser sensors feature time-of-flight technology. The laser measurement sensor ensures accurate distance measurements out to a distance of 12 m. By emitting a pulsed light, the LTF measures the amount of time for the light to reflect off the object and return to the sensor to calculate the distance. This enables sensing in long-range applications, including loop control, part presence or absence and fill level.

Designed with a Class 2 laser emitter with small, highly visible spot, the LTF provides easy sensor alignment and high excess gain. The same sensor that provides repeatability of less than 3 mm and accuracy of ±10 mm can also detect dark targets past 7 m and white targets at 12 m.

In addition to precision distance measurement, the LTF delivers consistent detection of targets regardless of the angle, environmental conditions or ambient light. The dynamically adjusted laser sensor can also sense objects with varying materials and shapes. The laser power increases output for dark targets or objects at steep angles, while reducing power for shiny targets.

Users can also select from several teach modes, including 2-point teach, mid-point teach, switch-point teach and push-button adjust, to accommodate diverse applications.

Featuring a 2-line, 8-character display, the LTF makes adjustments and menu navigation simple and easy to read. Additionally, the bright LED indicators provide clear status indication for analog output, discrete output and power.

To satisfy applications in harsh environmental conditions, the LTF features durable IP67-rated die-cast zinc housing.

Turck Australia Pty Ltd
www.turck.com.au

BATTERY-POWERED WATER METER

As water meters are often installed in remote locations, reducing the frequency of visits to the sites and the time spent on set-up and maintenance is crucial. This relies on aspects such as a simplified installation, integrated diagnostics, a long battery lifetime, remote communication options and low overall maintenance requirements.

The polycarbonate converter housing of the Krohne WATERFLUX 3070 features IP68 waterproof plug-and-play connectors that do not require wiring on-site and a small installation footprint to fit into electrical cabinets.

For locations where mains power is available, the product is now available with an external FlexPower unit to connect the meter to a 110–230 VAC or 10–30 VDC power source. The FlexPower module also has an internal battery that serves as a battery backup.

Integrated pressure and temperature sensors make the WATERFLUX an all-in-one water meter for drinking water network applications, eliminating the installation and wiring of separate flow, pressure and temperature sensors. Pressure and temperature values are available via the display or via Modbus. Alarms can be generated via the status output or via Modbus. The integrated pressure and temperature sensor is available for diameters DN50-200.

The Modbus RTU output can be provided via a low (battery) power and a high (mains) power version. The low-power Modbus version can be used for data communication with a data logger GPRS module. When operated via the mains power, the high-featured Modbus option can be used for data transfer to automation and process control systems.

KROHNE Australia Pty Ltd
www.krohne.com.au

MINIATURE LOAD CELL

FUTEK Advanced Sensor Technology has announced the LCM300, a miniature inline threaded load cell with a capacity range from 22 to 453 kg. It is RoHS compliant, has robust construction in 17-4 stainless steel with male threads and a 3 m-long 28 AWG 4-conductor shielded PVC cable. Utilising metal foil strain gauge technology, its miniature design gives it a height of 3 cm, a diameter of 2.54 cm and a weight of only 56 g.

The LCM300 is a tension and compression load cell and offers high accuracy and stiffness. It has nonlinearity of $\pm0.5\%$ and deflection of 0.025 mm nominal, making it suitable for endurance, press or inline applications.

Metromatics Pty Ltd
www.metromatics.com.au

TURBIDITY PLATFORM

The Hach TU5 Series turbidity platform comprises both laboratory and online turbidimeters that employ a 360° x 90° detection technology. This technology uses an optical design that sees more of the sample, delivering improved low-level precision and sensitivity while minimising variability from test to test. Using identical 360° x 90° detection technology in both lab and online instruments also removes user uncertainty over which of their turbidity measurements to trust.

In addition, all turbidity-related activities, from maintenance and cleaning to actually taking a measurement, will be done in less time. The TU5 Series reduces the time needed to get a turbidity measurement users can rely on, with 98% less online sample surface area to clean, sealed vials for calibration, and the elimination of the need for indexing and silicone oil in the lab. A smaller online sample volume also means turbidity events will be detected almost immediately.

The TU5 Series Turbidity Platform offers the option of three different instruments — one for lab and two for online measurements. The TU5200 is for use in the laboratory, while the TU5300 and the TU5400 are both equipped to provide continuous measurements. The user-friendly interface and improved workflow offer operators of all skill levels the ability to get highly accurate and reliable turbidity measurements.

Hach Pacific Pty Ltd
www.au.hach.com

80 GHZ RADAR LEVEL INSTRUMENT FOR LIQUIDS

Following the launch of the VEGAPULS 69 continuous radar level instrument for bulk solids operating at 80 GHz, Vega has now introduced the VEGAPULS 64, a radar level sensor for liquids operating with a transmission frequency three times higher than the widely used 26 GHz. Instruments with a higher frequency are suitable for media with poor reflective properties, in production shafts up to 120 m deep or in silos with internal installations that generate strong false echoes.

VEGAPULS 64 is suitable for liquids due to its high dynamics and improved focusing. Media with poor reflective properties (low dielectric constant) can now be measured significantly better than with previous radar sensors. Due to the better focusing, the beam passes by internal tank installations or build-up. Interfering signals, which previously had to be filtered out with false signal suppression, now play hardly any role in the measurement process.

With the higher frequency, it is now possible to use a much smaller antennas. With the VEGAPULS 64, the antenna diameter is less than 20 mm. The technology also allows precise measurement of the level very close to the tank bottom. This opens up perspectives in determining the level in small containers used in the pharmaceutical and biotech industries, as well as determining the amount of fuel left at the bottom of large fuel tanks. Measurement accuracy is ±2 mm, even with a working range up to 30 m.

VEGA Australia Pty Ltd
www.vega.com/au

ULTRASONIC SENSORS

With ultrasonic sensors, colour, transparency or the object's surface shine do not play a role in the detection. Blister packages in packaging technology or transparent plastic bowls in the food industry, for example, can be reliably detected.

The ifm ultrasonic sensors in M18 design provide a particularly small blind zone (only in the diffuse version) and long sensing ranges, which are usually only achieved by sensors of a considerably larger design. In the case of the retroreflective version there is no blind zone.

The sensors operate reliably with heavy soiling so that they can be used in applications in which photoelectric sensors meet their limits. The vibrations from the sonic transducer also assist with the reduction of soil build-up on the measuring face. The ultrasonic sensors also have a scratch-resistant surface.

The ifm ultrasonic sensors can be easily set up using any one of three methods: through a teach button on the sensor; via a direct connection to a PLC; or via IO-Link making them Industry 4.0 (IIoT) ready.

The ifm ultrasonic sensors are available in diffuse and retroreflective versions, and with 1.2 m and 2.2 m sensing distance options. Digital (PNP and NPN), analog (4–20 mA and 0–10 V) and IO-Link outputs are available. M8 cube and M18 cylindrical body designs offer various mounting options, and long and short body versions are available in both plastic and stainless steel.

ifm efector pty ltd
www.ifm.com/au

3D VISION SENSORS

With the configurable TriSpector1000 3D vision sensors, integrators and end users can carry out a wide variety of inspection activities quickly, easily and with a high degree of availability, including height and completeness monitoring; volume, thickness and dimension measurement; integrity checks of containers; and the counting and positioning of objects.

The image-processing capability is already integrated in the TriSpector1000, delivering up to 2000 3D profiles/s. These high-resolution measurement results are converted directly into millimetre values by the vision sensor without the need for another PC and output in real time over the Gigabit Ethernet interface.

The TriSpector1000 makes it possible to manage numerous 3D inspections of dimensions, quality and completeness in the food, pharmaceutical and packaging industries. It features a rugged, anodised aluminium housing resistant to a variety of media, offers the choice between IP65 or IP67 enclosure rating and is available with a front screen made from either glass or break-proof PMMA plastic. Due to laser triangulation, measurement is independent of product factors such as colour, shape, gloss, brightness, patterns, surface texture or any moisture on the product. Intensity data can also be recorded by the vision sensor, allowing it to check for the presence of labels or imprinted patterns.

The TriSpector1000 range offers three different variants for different working ranges: 56–116 mm, 141–514 mm and 321–1121 mm. The single-housing concept is claimed to ensure a geometrically stable and precise measuring scenario for any application.

SICK Pty Ltd
www.sick.com.au

STAINLESS STEEL PRESSURE TRANSMITTERS

Hawk offers a wide range of pressure and hydrostatic level transmitters for the food and beverage industry. Key features are the stainless steel electronics housing, strong flush diaphragms and active temperature compensation.

The series 8000-SAN has an accuracy of 0.2% zero and span, internally adjustable, while the series 2000-SAN has an accuracy of 0.1% and easy calibration without test pressure via three push-buttons and a display. The series 4000-SAN has an accuracy of 0.075%.

All models offer the following a stainless steel electronics housing, a strong and polished flush diaphragm, minimum oil filling and active temperature compensation, with more than 40 hygienic process connections.

The available pressure ranges are from 0–40 mbar up to 0–1000 bar with an output 4–20 mA. On the series 2000-SAN and 4000-SAN, the HART protocol is also available.

For level applications, tank linearisation can be programmed easily in both the series 2000-SAN and 4000-SAN. All transmitters are CIP and SIP cleanable and are certified according to 3A and EHEDG.

Hawk Measurement Systems Pty Ltd
www.hawkmeasure.com

RADAR INSTRUMENTS FOR THE WATER INDUSTRY

The Micropilot FMR10 and FMR20 non-contact radar instruments are suitable for level measurement in the water and wastewater industry and other utilities. They offer Bluetooth commissioning, operation and maintenance via a mobile app. Signal curves can be shown via the app on every Bluetooth-enabled smartphone or tablet (iOS, Android).

A radar chip design with integrated radiofrequency components and a direct emission transceiver results in a compact device that will fit in limited-space applications. The full PVDF body of the device resists outdoor conditions and ensures a long sensor lifetime. Sealed wiring and fully potted electronics eliminate water ingress and allow operation under harsh environmental conditions. In hazardous areas or places difficult to reach, safe and secure wireless remote access is available via Bluetooth.

The FMR10 offers a 4–20 mA output signal with a fixed cable length of 10 m. It has a measuring range of 5 m with an accuracy of ±5 mm and an operating temperature of -40°C to +60°C. Ingress protection class is IP66/NEMA4x.

The Micropilot FMR20 can perform both level and flow measurement (with open channels or weirs via a linearisation table). It offers a 4–20 mA/HART output signal with a cable length of up to 300 m. It has a measuring range of 10 or 20 m with an accuracy of ±2 mm and an operating temperature of -40°C to +80°C. Ingress protection class is IP66/68 or NEMA4x/6P. It also has gas Ex approvals and the option of an RIA15 remote display.

Endress+Hauser Australia Pty Ltd
www.au.endress.com

LOW-RANGE PRESSURE TRANSMITTER

The A-10 pressure transmitter from WIKA is now available with the low pressure ranges from 0–50 to 0–600 mbar. The wetted parts in this variant are all welded from stainless steel.

The mbar pressure ranges are particularly suitable for level measurements on small tanks in stationary and mobile applications. A further field of application is all types of gas measurement.

Among WIKA's measuring instruments for general industrial applications, the A-10 offers more than two million variants. Users can choose from a wide selection of pressure ranges, process connections and output signals. A free test report provides information on the measuring points recorded during manufacture.

WIKA Australia
www.wika.com.au

Fumed silica measurement problem solved

Cabot Corporation is a leading global specialty chemicals and performance materials company headquartered in Boston, Massachusetts, USA. Founded by Godfrey Lowell Cabot in 1882, Cabot's original business was as an early producer of carbon black. The company built its first fumed silica facility in Tuscola, Illinois, in 1958.

Employing approximately 4500 people worldwide, Cabot's businesses deliver a broad range of products and solutions to customers in every corner of the globe, serving key industries such as transportation, infrastructure, environment and consumer. It has been an industry leader for more than 130 years in products such as rubber and specialty carbons, cesium formate brines, activated carbon, aerogel, fine cesium chemicals, fumed metal oxides, graphenes, inkjet colourants, masterbatches and conductive compounds.

Cabot Carbon's plant in Barry, Wales, needed to solve the problem of how to measure the level of fumed silica in a silo. Fumed silica is used as a thickening agent in everything from gel batteries to non-drip paint, as a light-scattering agent in cosmetics and as a toothpaste abrasive. However, it is notoriously difficult to measure with non-content level measurement technologies, having a bulk density of around 30 g/L and a surface area of sometimes hundreds of square metres per gram. A material as light as this presents significant difficulties for bulk measurement.

After a number of failed attempts, including a leading radar system, Cabot Carbon turned to Pulsar's non-contacting ultrasonic technology to monitor levels in an 11 metre-high silo.

For Cabot Carbon, accurate measurement of the level of the finished fumed silica product in the silo is very important for stock control and to check for tanker loads. A number of approaches had been tried to measure the contents, including radar, but all had failed because of the lightness and absorbency of the product. All non-contacting measurement methods rely on being able to bounce a signal back from a material surface and measure the time taken for it to reach a transducer. Whether that signal is a microwave or an acoustic pulse, the challenge is to supply a signal with enough energy, then discriminate that signal against a background of competing noise.

Pulsar's approach was to supply its highest power transducer, the dB50, along with an Ultra 5 ultrasonic control unit. With a beam angle of less than 5° (at -3 dB inclusive), which helps to concentrate the power at the target, and a relatively high frequency of 20 kHz, the dB50 is designed to measure up to 50 m, so was putting a great deal of ultrasound energy into the measurement. Even so, the signal that returns to the transducer from the very absorbent silica is very small.

The Ultra 5 control unit features five control relays and offers an optional 4–20 mA input for a pressure transmitter or similar. It includes preprogrammed tank shape conversion for a variety of standard tank shapes, while unusual shapes are also accommodated through a 32-point linearisation function. In the case of Cabot Carbon's requirements, Pulsar's latest generation DATEM echo processing software identifies and dynamically tracks the material level, maintaining a link to the true material level even as it changes and other signals from the internal features of the vessel compete.

Jason Jones, Cabot Carbon's electrical engineer, said, "The Pulsar equipment has cured a headache for us. We were really struggling to find something that worked and was cost-effective, and Pulsar's kit ticks both boxes."

Bintech Systems Pty Ltd

www.bintech.com.au

PYROMETER

LumaSense has recently launched the IGAR 6 digital pyrometer with 'Smart Mode' switching between single- and two-colour (ratio) modes. The pyrometer covers the temperature range 100–2000°C.

The seamless switchover allows the pyrometer to measure in single-colour mode over the range 100–250°C and then transition to two-colour mode measurement with all its advantages, including automatic emissivity determination and partial sighting of the target.

Other features include through-the-lens and laser sighting, and a TV option with both analog and digital outputs. Supporting small target sizes down to 2 mm, it has a dirty window warning, a fast 2 ms response time and an integral LED display.

Applications include heat treatment, induction heating, forging, vacuum processes and coating.

W&B Instruments Pty Ltd
www.wandbinstruments.com.au

LASER DISPLACEMENT SENSOR

The Micro-Epsilon optoNCDT 1420 is a laser triangulation displacement sensor designed for displacement, distance and position measurements. Its combination of high speed and miniature size allows for a range of industrial applications. The compact triangulation sensor achieves a high measurement accuracy (0.08% FS) and measuring rate (4 kHz). The small sensor size, along with connector type options of cable or pigtail, ensures an easy installation process.

The product features an intelligent surface regulation system, known as Auto Target Compensation (ATC). This ensures stable measurement even when there is a change of colour or brightness on the surface. The sensor is operated using a user-friendly web interface, which allows for eight sensor settings to be stored. These settings can be easily applied to other sensors when required. Users can also easily optimise measurement tasks with video signal display, signal peak selection and adjustable signal averaging.

Bestech Australia Pty Ltd
www.bestech.com.au

PARKING/ACCESS TRAFFIC

LD100
Parking Detector
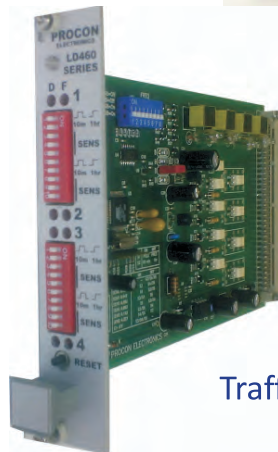
LD462O
Traffic Detector

- INDUCTIVE LOOP VEHICLE DETECTORS
- BOOM GATE LOGICS
- TURNSTILE LOGICS
- CUSTOM CONTROL MODULES
- MODBUS TCP/IP SERIAL GATEWAY

LOOP DETECTORS

MULTI CHANNEL
Single, Dual and Four Channel loop detectors.

APPLICATIONS
Free exit-loops, safety loops, closing loops, arming loops and general vehicle sensing.

CONFIGURATION
DIP switch setup enables many different functions to be easily configured.

MODULAR DESIGN
Standard wiring compatible with industry standard 11-Pin Din rail mount relay socket.

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INSTRUMENTATION & SENSORS

PYROMETER FOR THE ALUMINIUM INDUSTRY

AMETEK Land has developed a pyrometer that provides a three-in-one capability specifically for aluminium applications, including extrusion press exit, extrusion press quench zone and aluminium strip mills.

The SPOT AL EQS (SPOT Aluminium Extrusion, Quench and Strip) pyrometer is a flexible instrument with preconfigured algorithms that make it especially suitable for use at the extruder press exit and quench position, as well as at mill entry and exit positions in hot rolling mills. In addition, the pyrometer's algorithms can be customised and tuned for bespoke applications and specific aluminium grades. It is specifically designed to work in low-emissivity environments where regular pyrometers might struggle to provide accurate and reliable readings. It has the ability to measure a wide temperature range from 200°C to 700°C.

The product can be configured remotely through a web server and, with PoE capabilities, is able to communicate data over ethernet through a variety of different protocols (such as TCP/IP and Modbus/TCP), along with the traditional 4–20 mA/0–20 mA output signal.

The device can be installed by a single person. If the sensor is in an inaccessible location, the product has a remote viewing capability to verify alignment. A built-in camera aids alignment, which, combined with a green LED, allows the user to position the measurement point in an optimal location to avoid ambient light reflections.

Lear Siegler Australasia Pty Ltd
www.learsiegler.com.au

OPTICAL STRAIN TRANSDUCERS

HBM FiberSensing optical interrogators and sensors are based on fibre Bragg grating (FBG) technology, which ensures a suitable solution for long-term structural health monitoring. They are designed for both laboratory testing and field deployment across a range of industries, including civil engineering, energy, R&D, aeronautics and gas pipelines.

They can be used in harsh environments, such as structural monitoring of pipelines and bridges and measuring high strains. Easy to install and electromagnetically safe, they can be used in highly explosive atmospheres.

The optical sensors can determine strain, temperature, acceleration, displacement and tilt in components, structures and environments where conventional technologies have reached their limits. Particular sensors can be used for extreme strains measuring up to ±10,000 μm/m. Others are suited for operating under high temperatures of up to 100°C.

The sensors can be used for the testing of structures and materials with high levels of strain, high numbers of load cycles, high electromagnetic noise or in highly explosive environments. They can also be used for monitoring the condition of large structures in harsh environments using different types of sensors connected in line over long distances and interrogated by a single instrument.

The sensors offer a wide strain measurement range for such applications and are said to provide greater long-term stability and lower installation expenses compared with electrical strain gauges. Steel-reinforced fibre cables and special strain relief make the strain sectors very rugged.

HBM Australia
www.hbm.com
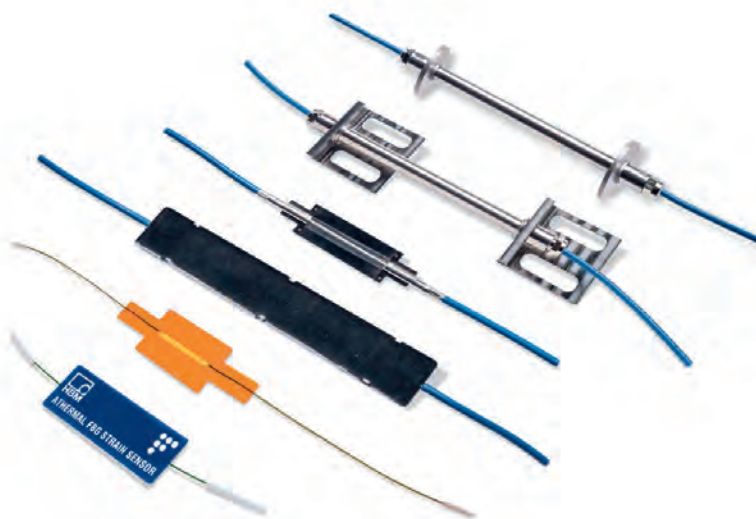
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AS I SEE IT

NEW OPPORTUNITIES ARISE WHEN INNOVATION MEETS NEED

As our Prime Minister likes to remind us, we are living in "exciting times" and that's very true — however, how do we turn that excitement and opportunity into reality? It's like turning potential energy into kinetic energy: you need connections. The electricity has to flow and the rubber has to meet the road. How do we do that in the industrial world?

What role do existing manufacturers have to play and what practical steps can innovators do to maximise opportunities?

As Australians we have a distinct advantage in our acceptance of new technologies and ideas, in that that we aren't affected by the 'not invented here syndrome'. This is simply because very little is actually invented here! Unlike countries like Germany, the USA or Japan, Australia is truly a more level playing field, where new ideas and solutions stand on their merits and buying decisions are not typically influenced by a preference for local manufacturers.

The new paradigm that is slowly making its way to the industrial world has many names: Industrial IoT, Internet of Everything, Industry 4.0. Call it what you will, the fundamental point is that there is now a new set of tools that can be deployed to solve problems and integrate manufacturing with other parts of an enterprise.

I see four areas that need our attention so as to maximise opportunities, particularly in industries where we have a reasonable market for local suppliers to target, such as agriculture, mineral extraction, oil and gas, and renewables. Those areas are marketing, end-user opportunities, collaboration and outsourcing, and education.

Aussie companies typically don't spend proportionately as much on marketing as US-based companies. Self-promotion isn't part of our national character or ethos. Yet ironically it's never been easier or cheaper to promote your wares — and especially so in niche areas of industrial electronics. So it's imperative that local innovators let potential users know of their existence and what problem they are solving.

In terms of end-user opportunities, manufacturing enterprises play a crucial role: they have the potential to offer opportunities to start-ups and smaller enterprises. They need to embrace innovators and, in a way, to even incubate them. There are many ways they can do this. For example, creating problem-solving competitions or by taking a small equity stake in a range of start-ups.

In relation to collaboration, our culture tends to work against us, as we are fiercely independent — often to a fault. Engineering-driven organisations tend to want to reinvent the wheel, even if their area of expertise is limited metaphorically just to the rim, spoke or hub. We need to focus on our value-add, specific IP or process, and explore the value in outsourcing or partnering with others in areas they specialise in.

We also need to invest now for the next generation of innovators. STEM subjects need more funding and attention; however, they are instruments in an orchestra: where is the focus on the conductors and composers? Schools should be teaching STE**A**M — the 'A' being for artistic: for creative people and entrepreneurs. They are the drivers of innovation. Our children need to be taught real-world skills in entrepreneurship so they have the confidence to start or get involved in new ventures.

Manny Romero is Managing Director ANZ for Swedish company Westermo Data Communications Pty Ltd. He has worked in the automation field locally and internationally since 1986, and for the last 15 years has focused on industrial communications. He is excited about the Industrial IoT and the opportunities it brings for local innovators.