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WHAT'S NEW IN PROCESS TECHNOLOGY

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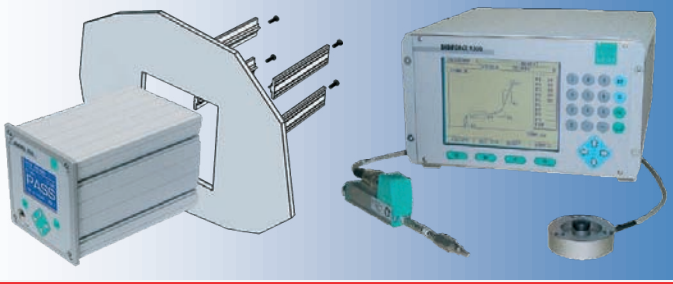

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WHAT'S NEW IN
PROCESS TECHNOLOGY
FEBRUARY 2016

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ON THE COVER

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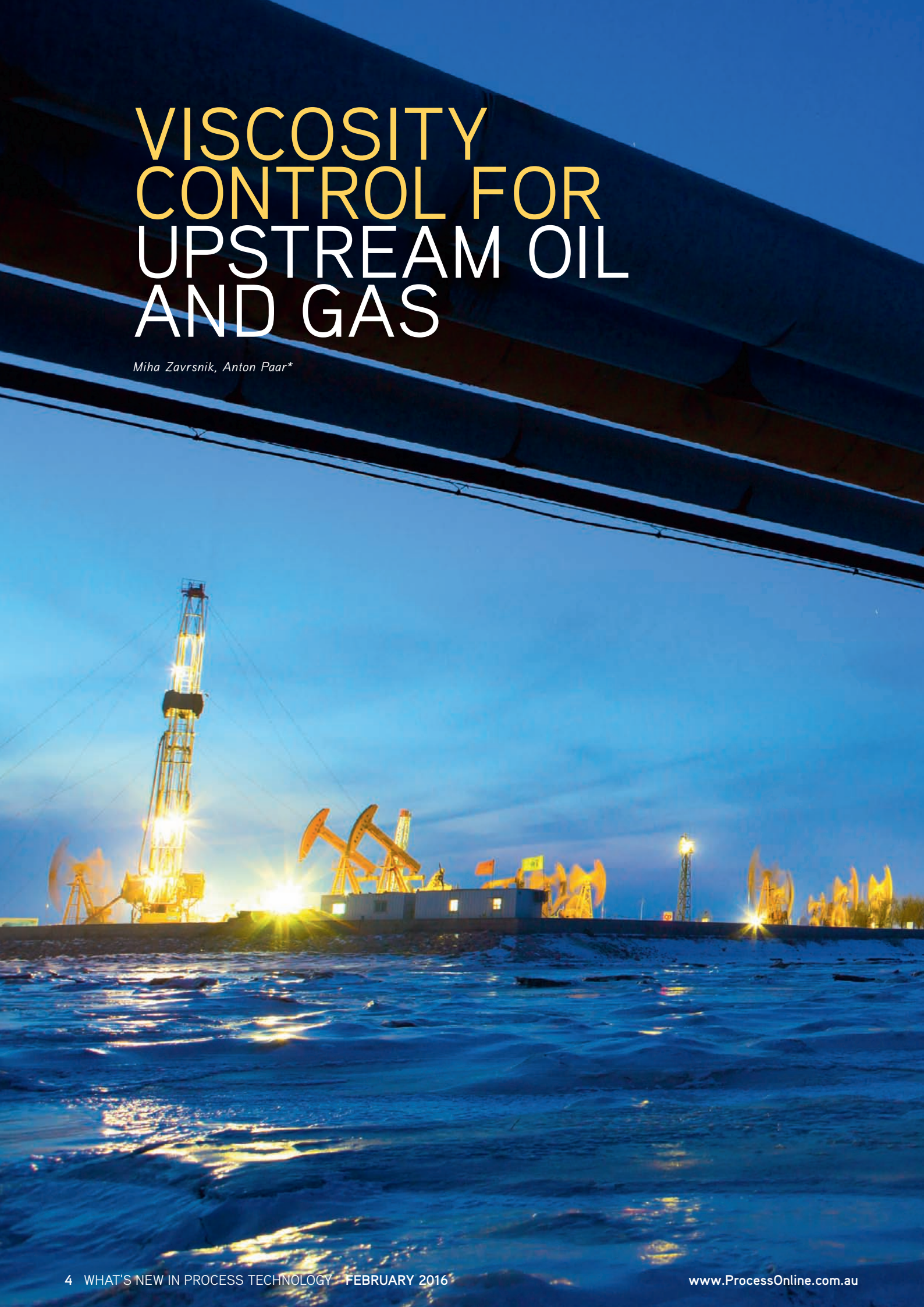
ROTEX specialises in solutions for gas transmission, gas processing, thermal power generation, mining, steelmaking and the alumina industries.

Powerflo Solutions Pty Ltd
www.powerflo.com.au

VISCOSITY CONTROL FOR UPSTREAM OIL AND GAS

*Miha Zavrsnik, Anton Paar**



Upstream spending plans have been the first casualty of the oil market's collapse to lower prices. As a result, the oil and gas sector is looking to ways to extend the lifetime of mature fields, develop technologies for unconventional reservoirs and improve the transportation between production and refining.

The dramatic drop in oil prices over recent times has driven oil producers to scale back spending. While lower oil prices will reduce production costs for many sectors and boost consumers' disposable income, upstream spending plans have been the first casualty of the market's collapse. Some of the major oilfield service providers have been laying off employees while budgets are reduced and projects are postponed, curtailed or cancelled.

With low oil prices expected to persist through 2016, many see low oil prices as presenting opportunities for the oil and gas industry to innovate and strengthen its base for the next phase of industry development. It is seen as an opportunity for long-term investment and efficiency improvements. Providing proper technologies to intensify cost reduction and productivity enhancement are the key challenges for the near future.

In this article we will focus on viscosity, one of the basic measurement techniques affecting different key operations within the upstream market.

Upstream

The oil sector comprises various business areas, including oil exploration, drilling, refining and distribution to consumers. The downstream part involves refining and distribution of the finished products, like petrol and diesel fuel. In this article we focus on the upstream segment, which includes drilling (as part of exploration and operation), recovery of the crude oil to the surface, and transportation of the crude from the production site to the refinery.

As conventional reservoirs are depleted and more unconventional resources are being exploited, chemicals play an increasingly important role in tackling the upstream challenge. Smarter chemicals and how they are used can boost production, cut costs and reduce environmental impacts.

Online viscosity measurement, as well as extensive laboratory rheological evaluations, are substantial parts of the main innovation areas for developing and improving production technologies to extend the lifetime of mature fields, developing exploration and production technologies for unconventional reservoirs, and improving the transportation between production and refining.

Why viscosity is important

Dynamic viscosity is an important parameter for quality control in a wide range of industrial processes and is one of the most important fluid properties for the production of many industrially important substances. Non-Newtonian viscous behaviour is a property of particular importance regarding a fluid's performance during oil production, completion design or reservoir management. Viscosity controls reservoir productivity and displacement efficiency, and influences pump and pipeline design.

Almost all chemicals of upstream significance, especially those of multiphase nature (emulsions, dispersions, suspensions and slurries) and polymeric solutions, have a non-Newtonian behaviour — meaning that their viscosity is not only influenced by temperature. Generally, we can observe pseudoplastic or shear-thinning properties, based on which fluids' viscosities decrease with the applied shear rate.

Real-time viscosity information is of significant importance for production and transportation. The rheologically interesting information found in the low shear rate section of the viscous flow curve is especially important, as it provides feedback with regard to proper formulation for the intended end destination of the fluid (whether just in the bore hole, fracture or some other part of the reservoir).

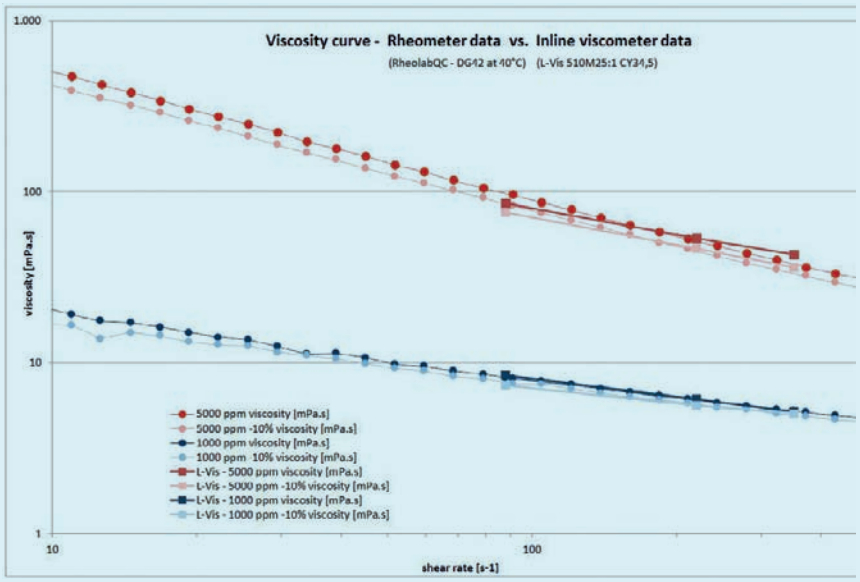


Figure 1: Example of Non-Newtonian polymer solution measured with laboratory rheometer versus measurement with inline viscometer at three different shear rates.

Where viscosity control is crucial

Drilling for exploration and production

Drilling is physically creating the borehole in the ground for an exploratory well and associated geological and geophysical surveys, or for what will eventually become an oil or gas well. Any fluid that is used in a drilling operation in which the fluid is circulated or pumped from the surface down the drill string, through the bit and back to the surface via the annulus is called a drilling fluid or drilling mud.

Drilling fluid design and selection starts with defining the functions that are required of the fluid. The rheological properties of the fluid will influence cleaning, transportation of cuttings, hydraulic power and bit cooling, as well as borehole wall support and friction.

Numerous additives are used in order to reach optimised specific purposes which are sometimes contradictory. For example, drilling fluid must be viscous enough to lift the cuttings to the surface; at the same time, its viscosity must not be too high, so that friction pressure losses are kept to a minimum.

Complementing the laboratory sample measurements (which may occur only once per day) with online drilling fluid viscosity measurement provides access to more precise and dependable drilling fluid properties in real time — data that is vital when crucial decisions are made.

Fracturing

Hydraulic fracturing (also known as 'fracking') is an important well completion technology for the advance of unconventional resources, such as natural gas that is trapped in shale rock formations. It is used to create a fracture network through which light oil and gas can migrate to the wellbore.

The fracturing fluid used in the well stimulating process is a blend of carrier fluid and a proppant, such as sand or glass beads. The proppant and carrier fluid are blended in specific proportions targeted to the dynamics of each individual well.

In order to carry the correct amount of proppant to the fracturing zone, the viscosity of the carrier fluid must be accurately maintained throughout the stimulation process. One can install an inline viscometer on the low-pressure side of the blender utilising a slipstream flow through a sample system off the hydration tank, which continuously verifies that the rheology of the fracturing fluid is within established specifications and generates an alarm indication when it is not.

Based on an accurate and reliable viscosity measurement of the carrier fluid, the operator can maintain the proper suspension of the proppant within the carrier fluid. In addition, real-time viscosity measurement allows the oilfield service company to mix the carrier fluid on-site, thereby reducing fluid availability risks or problems and costs associated with excess fluid disposal.

Chemical enhanced oil recovery

Often, when primary production begins to wane, injection wells are drilled to flood the reservoir with water (especially in regions where the injection water is readily available), maintaining pressure and sweeping additional oil into adjacent producing wells. Known as secondary recovery, water flooding operations have raised average global recovery by 25–35%. However, these conventional techniques still leave 60% or more of the oil in the ground.

Enhanced oil recovery (EOR) methods can be implemented to mobilise the oil and displace it towards production wells — for example, by reducing interfacial tension and capillary contrasts, or by increasing the viscosity of the displacing fluid. In this case, chemicals that are not naturally present in the reservoir (surfactants, polymers, acids, etc) are injected into the reservoir to achieve a higher or faster oil recovery. The most frequently used polymer (by far) in chemical EOR is polyacrylamide. Polymers and other chemicals enable injected water to better match the viscosity of the reservoir oil, which helps the water penetrate the rock pores to improve oil production. If the polymer solution is not balanced for the reservoir oil conditions, production can drop substantially, negating the benefits of the enhanced oil recovery process.

One of the key factors for a successful polymer flood is the polymer solution viscosity, which must remain on target during the transport from the site of its initial preparation to the well head and down to the reservoir. Maximising oil production while minimising polymer costs is one of the key objectives for the operators. Thus, a reliable method is required to measure and monitor the polymer solution viscosity at different points along the dissolution, dilution, mixing and injection lines.

Diluted bitumen pipeline transportation

Bitumen is a highly viscous form of crude oil; an example of oil extracted from bitumen is that derived from the Canadian oil sands in Alberta, Canada. Crude sources are produced from many locations, employing a number of production methods. The bitumen path to market includes mining and upgrading processes and polymer flood production strategies, as well as paraffinic and naphthenic froth treatment processes. In order to flow through unheated pipelines, the bitumen must be diluted. The diluted mixture improves the quality of bitumen and allows the crude oil to meet pipeline product quality specifications posted with government regulators for the crude oil flow through transmission pipelines. Typical diluents include natural gas condensate, naphtha or a mix of other light hydrocarbons. The blend is referred to as dil-bit if blended with naphtha-based diluents or syn-bit if blended with sweet synthetic crude oils. What to use is often determined by diluent pricing, access to logistics, production technologies and producer/refiner economics. Diluted bitumen has characteristics that are similar to other heavy crudes that are currently transported in pipelines, like heavy crudes from Venezuela, Mexico and California.

To meet pipeline specifications for viscosity and density, and to meet desired refinery heavy crude yields and qualities, a controlled blend with a diluent is produced. A maximum viscosity of 350 cSt (centistokes) at pipeline reference temperature is constraining, with a pipeline reference temperature between 7.5°C and 18.5°C changing in biweekly increments according to a planned schedule from winter to summer.

Natural variances in bitumen and commercially available diluents can result in a significant number of possible variations of a measured product. Add to that the mix of products at terminals, and it soon becomes apparent that the product composition changes and the accompanying potential effects on viscosity measurement are factors with several dynamic variables. The result is a changing fluid composition, and the measurement strategy must be able to cope with this fluid variance.

Of course, one of the most important factors of viscosity measurement is temperature control. Online instrumentation must have temperature characterisation with a quality above that typically found in general instrumentation. Also, its flow loop should be designed to facilitate the best possible temperature control.

> VISCOSITY CONTROLS RESERVOIR PRODUCTIVITY AND DISPLACEMENT EFFICIENCY, AND INFLUENCES PUMP AND PIPELINE DESIGN.

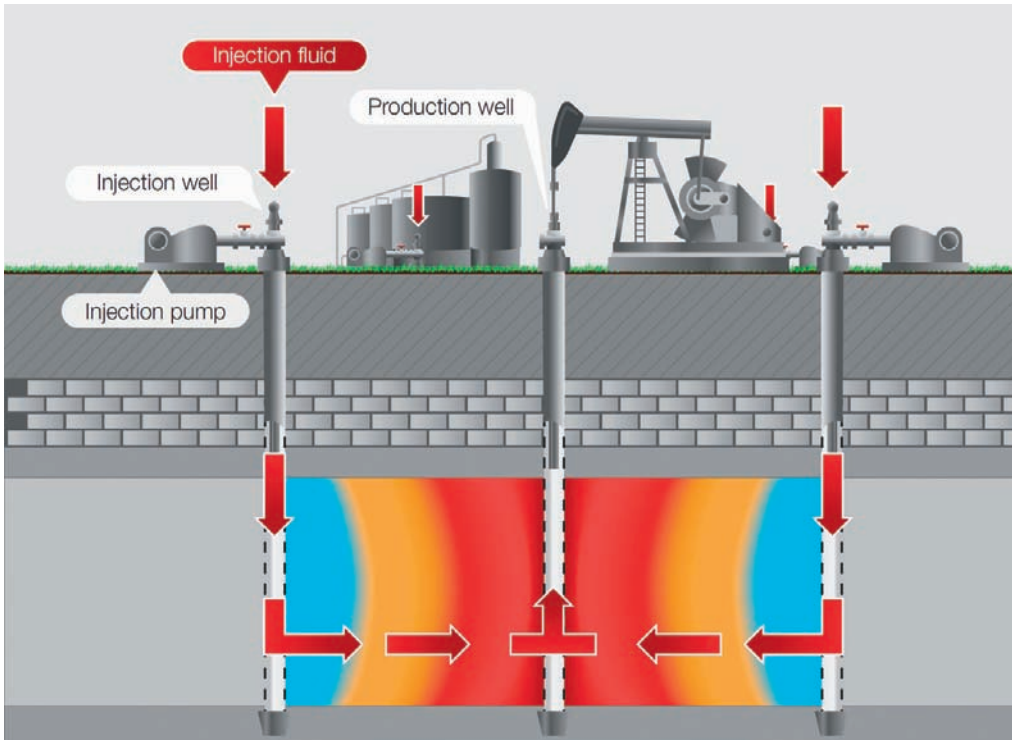


Figure 2: Basic diagram of chemical-enhanced oil recovery.

The online application of instruments for direct measurement at reference temperature, as well as curve or equation methods, has benefits and drawbacks when considering the challenge presented above. However, it is indisputable that pipeline transportation of heavy crude relies on viscosity measurements for both efficient and safe operations.

There is potential for improved process control when exposed to significant variations of the measured product. Based on a direct online measurement at reference temperature, the level of viscosity certainty is increased. The resulting benefits include substantial savings in processing and transportation, as well increased pipeline operation safety.

Conclusion

A closer look at different parts of the upstream chain reveals that online viscosity measurement and control, coupled with appropriate laboratory rheological evaluations, creates substantial innovation opportunities.

The current downturn in the oil and gas industry provides great opportunities for retrenching and focusing on the cost structure, rather than just increasing volume. The implementation of proper technologies to intensify cost reduction and productivity enhancement is a key challenge for the future.

MEP Instruments Pty Limited
www.mep.net.au

**Miha Zavrsnik is product manager for process instruments at Anton Paar GmbH and has worked for the company since 2011. He has more than 20 years of diverse working expertise in team management, product and project management, general sensor and test systems development, information technologies systems, quality assurance and fibre optic communications component development.*

MOTOR CIRCUIT ANALYSER

The ALL-TEST PRO 5 provides a convenient means of analysing and maintaining electric motor health. Through stator and rotor analysis it can test all types of motors such as synchronous induction, brushless DC, servo, single-phase and wound rotors. It is available to rent from TechRentals.

Motor circuit analysis can be utilised for testing motors prior to installation or storage, for fault identification and troubleshooting, for analysing winding condition over time through trending and for predictive maintenance.

The three test leads with heavy-duty custom Kelvin clips, combined with the unit's lightweight handheld design, allow for testing of motors in difficult locations. Testing can be completed from distances of over 300 m if necessary, depending on the cable. Its 2 min analysis and immediate reporting, combined with the ability to store 650 tests, will reduce overall plant maintenance and testing times.

The ALL-TEST PRO 5 utilises test frequencies of 50, 100, 200, 400 and 800 Hz. It has a 0.01 to 999 Ω resistance measurement range, and a 0.1-999 Ω ±2% impedance range. Relative accuracy phase-to-phase is ±0.1%. Motor circuit analysis software is included for trending and diagnostics.

TechRentals

www.techrentals.com.au

DC MICROMOTOR

Faulhaber is expanding its range of drives in the medium power range with the 1727…CXR DC micromotor, adding a compact drive to the CXR series. A powerful neodymium magnet gives the graphite-commutated motor a high power density with a continuous torque of 4.9 mNm. It generates this power in a housing that is 17 mm in diameter and 27 mm in length. The temperature range in which it can be used is from -30°C to +100°C.

As with the other drives of the series, the 1727…CXR can be combined with encoders and with precision gearheads from a coordinated product range. It can be optionally actuated with the SC 1801 speed controller or the MCDC 3002 motion controller for speed control or positioning.

The product's compact dimensions and good performance data open up a wide range of potential applications. The motor is suitable for use as a high-performance servo drive in automation and robotics.

ERNTEC Pty Ltd

www.erntec.net

DC GEARMOTOR

The DC-max motor is a motor offering high-powered rare earth magnets and maxon's rhombic winding packaged in a cost-effective housing and fitted with a GPX gearhead. Mixing technologies in this way gives the advantage to the product designer to focus a gearmotor's strengths where they are needed in the application. The high motor speed and high gear reduction requires the gearhead to act as an efficient transmission and this is claimed to be achieved through precision machining and quality materials in the GPX gearhead.

This specific gearmotor combination was specified in a sample preparation application where the gearhead portion of the drive is exposed to a corrosive atmosphere requiring all stainless steel construction; however, the motor portion is hermetically sealed and does not require the stainless steel body of the typical motor used with this gearhead. The advantage with this mix-and-match approach to gearmotor selection being that essentially, the mechatronic equipment designer can allocate costs where needed for the device.

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Emerson Process Management

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http://bit.ly/1SRdom6

WIRELESS DATA LOGGERS

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

W&B Instruments Pty Ltd

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FIBRE SENSOR AMPLIFIER

The DF-G3 discrete long-range fibre amplifier has increased sensing power for difficult detection challenges in printing, packaging and electronic assembly.

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M12 POWER CONNECTORS

The Lumberg Automation M12 Power Connector is compact, efficient and offers the ability to transmit at high power levels for long periods of time.

The connector takes advantage of technology that works very well in high temperatures, making it suitable for harsh environments. Its compact design and high power transmission make it a cost-effective solution for operations that need a reliable, flexible connector.

The M12 Power Connector is S-, L-, K- and T-coded, and its small size makes the M12 Power Connector suitable for applications that require little space, like automotive, manufacturing, machine building and power transmission. The M12 Power Connector also fulfils global standards, such as UL and VDE, and is designed according to D-IN EN 61076-2-111.

Belden Australia Pty Ltd
www.belden.com

ANYNET SSI INTERFACE

Advanced Micro Controls Inc. (AMCI) has announced the addition of the ANE2 SSI interface module to its AnyNET I/O range.

The ANE2 is a full-featured, 2-channel SSI interface that communicates with the host controller (PLC or PAC) via a single network connection (Ethernet, Profibus or Modbus RTU). Its flexible design is expandable to 12 SSI channels or 'mix-and-match' modules for resolvers, LVDT/RVDT or stepper control/driver while using the one network connection.

The ANE2 is compatible with any PLC that supports the product's available networks as it is programmed using the I/O registers within the host controller. For example, Allen-Bradley users can configure using their RSLogix software and Schneider customers via Unity Pro.

The ANE2 features a direct interface to most gray code or binary SSI sensors such as rotary encoders, linear sensors, barcode readers, laser distance measuring sensors etc, and has DIN rail mounting.

Automated Control Pty Ltd
www.automatedcontrol.com.au

ETHERNET CONNECTOR SYSTEM

RS Components is now stocking of a wide range of products based on Ha-VIS preLink technology from HARTING. The highly innovative cabling system offers reliable termination technology, a simple and time-saving installation process and the potential to revolutionise the installation of cables for industrial networking, premises cabling and other machine-control applications.

Compatible with a range of profiles, including all ethernet-based automation profiles and futureproof 8-core cabling for Gigabit Ethernet, the HARTING Ha-VIS preLink is a modular connector system that uses a rapid termination technique allowing users to either preassemble cables or to buy already prepared cables and install them quickly and simply on-site. Allowing much preparatory work to be completed in advance, making the job quicker and more efficient, the connector system also has the potential to reduce the equipment, training and testing burden on installers, making it an attractive alternative to traditional termination methods.

The system is based on the simplicity of a termination block that a user can wire up separately: the system snaps securely into any one of seven swappable mating profiles. These include RJ45, PushPull RJ45, M12 D-coded, M12 X-coded, RJ45 HARTING Industrial Form Factor, RJ45 Keystone and a preLink extender for cable extensions. When snapped into place in the connector, the wired termination block becomes an integral part of that unit and not a separate interface. Once in the housing, the preLink termination block is vibration-proof and protected from external influences.

RS Components Pty Ltd
www.rsaustralia.com

WIRELESS PRESSURE GAUGE

Emerson Process Management has introduced a WirelessHART pressure gauge. The Rosemount Wireless Pressure Gauge enables remote collection of field data, keeping operators updated on changing field conditions and improving personnel safety by reducing manual operator rounds and field exposure.

Mechanical gauges are plagued with quality and reliability issues. These issues are commonly associated with overpressure, vibration, corrosion, extreme temperatures and accidental damage. Additionally, mechanical gauges are unable to communicate a device status.

Emerson's Rosemount Wireless Pressure Gauge utilises piezoresistive sensor technology to deliver reliable pressure readings. With the flexibility to accommodate changing process conditions, the gauge also gives up to 150x overpressure protection compared to traditional gauges, which provides for a safer field environment by using two layers of process isolation.

Bourdon tube gauges have traditionally been a mainstay for taking pressure readings in the field, but are limited to visual indication of process conditions when an operator is present. Bourdon tubes also use moving parts, which can break or wear over time due to use and vibration, causing inaccurate readings or process to spill.

The wireless pressure gauge eliminates mechanical gauge common weak points by removing the components that inhibit the device from reporting/displaying pressure and providing up to a 10-year life, which reduces maintenance cost and time. The large 4.5″ gauge face provides easy field visibility.

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

NEW PRODUCTS

WIRE-FREE LOCK FOR COMPRESSION TUBE FITTINGS

A wire-free device for locking the nuts of two-ferrule compression fittings on instrumentation tubing is now available from Parker Hannifin. Dubbed WireFree, the safety device is constructed almost entirely from 6 Mo austenitic stainless steel for enhanced corrosion resistance.

The locking device is designed as a 'fit and forget' solution that overcomes all the disadvantages of wire locking. It can be fitted to standard compression fittings on new or existing systems easily and quickly, without requiring any modification, realignment or disassembly of components. The device is also suitable for replacing existing wire locks during routine MRO operations — installers merely need to remove the wire before fitting the new unit.

Available in straight, elbow, tee and cross configurations, the locking device is initially being offered in a range of sizes for use with tube fittings from 6 to 20 mm. Parker intends to develop other sizes to suit market requirements.

The locking device is fabricated from corrosion-resistant materials to ensure a long, maintenance-free service life and is based on an open form of construction that minimises crevices. It comprises one or more flexible clamp arms with rigid load-spreading support plates, depending on configuration, and is supplied preassembled as a single-piece part to simplify installation. The support plates incorporate self-retaining M4 socket head cap screws and use Spiralock self-locking thread technology to prevent them working loose under vibration. Both the flexible and rigid components are made from 6 Mo stainless steel, while the securing screws are 316 stainless steel.

Parker Hannifin (Aust) Pty Ltd
www.parker.com

SIMULATION SOFTWARE WITH RHEOLOGY

CD-adapco has released STAR-CCM+ v10.06, the latest update to its flagship engineering simulation solution. The release features the introduction of computational rheology, in keeping with the company's aim to facilitate innovation through multidisciplinary design exploration.

Computational rheology further expands the multidisciplinary scope of STAR-CCM+ and targets problems where viscous and viscoelastic effects are dominant. The types of applications that are now possible to solve are flow in static mixers (bread dough, food, etc), flow into containers (toothpaste, shampoo, etc), pumping slurries with significant heat generation, extrusions (foam rubber insulation for door seals, rubber tires, etc) and material processing. The capability is built on the same finite element framework as computational solid mechanics delivered in v10.04.

Computational rheology allows users to find solutions for a new category of applications, ranging from extrusions to polymer and material processing, without requiring an additional licence. The updated capability is accessible from the familiar and single STAR-CCM+ user interface, leveraging all other STAR-CCM+ features from the geometry to the solution.

CD-adapco Australia
www.cd-adapco.com.au

EXPLOSION-PROOF ENCODER

The Hengstler ACURO Xproof AX73 encoder is designed to offer users high reliability as an explosion-proof, absolute position encoder with a Profibus interface.

The AX73 is a robust unit that offers explosion protection and the ability to withstand severe shock, vibration and corrosive environments. The optical scanning system of the AX73 encoder provides a highly accurate, high-resolution sensor signal that is also resistant to the strongest external magnetic fields. Resolution is up to 14 bits single-turn and 12 bits multi-turn.

With its ATEX and IECEx approval, the Hengstler AX73 is certified and approved for international use, thus providing the user a global guarantee of safety and reliability in hazardous areas (IECEX EX d IIC and Ex tb IIIC).

Application examples are wide ranging and include winches, cranes, drill rigs, oil and gas platforms, paint plants, petrochemical facilities, bottling plants, silos, grain mills, etc.

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CASE STUDY

Automation delivers five-fold increase in productivity

Faced with increased international competition and a steep drop in mining construction, Kmar Engineering sought to automate its structural steel coping process. As a result, the company achieved a 500% increase in production, better finishes and dimensional tolerances, and the ability to produce a wider range of profiles, including pipework.

Located in Doyalson on the Central Coast of New South Wales, Kmar operates out of two factories processing beams, structural steel, tanks, silos, hoppers, ladders, walkways, platforms and much more. The business looks back at a 30-year history, mainly focusing on the mining industry. However, the recent steep drop in mining construction and pressures of both domestic and global competition have led company owner Peter Learmonth to change the way he thinks and the way he works. "Working smarter, concentrating your time on value-adding activities means obtaining greater manufacturing efficiencies and increased productivity," he said.

In face of intense competition to drive labour costs down and with the relentless pressure from the market to reduce lead times, Kmar decided it was time to automate its factory. "My aim was to provide steelwork to the local market efficiently and cheaper than before," explained Learmonth. "We decided to offer custom, versatile steel processing services in the short term to the steel suppliers themselves, who cannot afford or are not willing to wait four weeks for stuff to come from China."

After thorough investigation, Learmonth decided to go for a locally made machine from Brisbane-based Advanced Robotic Technology (ART). The company is a renowned manufacturer of routers and plasma cutters sold under the ART brand, and has recently added the Metaltek brand to its line-up of Australian-made machines. The Metaltek XB1200 structural steel coping machine offers fully automatic structural steel, pipe and plate processing in one machine.

"I had a look at some American and Canadian machines," said Learmonth. "When I started looking at the ART machine I went to Brisbane, [...] and I was really quite impressed. The machine does more things than the competitors' machines I investigated. Of course we also liked the idea that it was Australian made."

The machine was installed in December 2014 and after initial training and familiarisation with the machine, the company has been busy with work for the last couple of months. According to Learmonth, installation went smoothly and ART's support and service were very good. "We couldn't speak highly enough of them."

The Metaltek XB1200 structural steel coping machine offers fully automatic structural steel, pipe and plate processing in one machine.

Kmar's increase in orders from steel suppliers can largely be attributed to the machine's versatility and productivity. Being able to automatically process not only beams but pipework has transformed the business and opened up new opportunities. "We've been doing a fair bit of pipework since we installed the Metaltek XB machine, cutting all angles, custom shapes, creating weld preps, slots and bevels," he said. "We've recently created weld preps and widening joints on 170 tons of pipe with our Metaltek machine."

A 3-axis material handling conveyor systems and cross-transfer conveyors for loading and unloading eliminates a large percentage of lifting, flipping and moving of steel members between machines. "We simply prepare the next length of steel for loading while the previous one is cutting. A tick box on the touch screen lets the controller know that the next length is ready to load." Inside the work area, the machine automatically senses material dimensions, and an extra-articulated robotic arm performs the desired cuts, even underneath the beam.

"The machine has been changing directions for us," Learmonth concluded. "It is really like a breath of fresh air, it is almost like 'being on holidays'... what I mean is we can now concentrate on the value-add work, be more productive, concentrate on strategic business developments and let the machine do the hard work."

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

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NEW PRODUCTS

DIAPHRAGM VALVE BODIES

Bürkert Fluid Control Systems has introduced an innovative body type for diaphragm valves for hygienic applications. The bodies, manufactured with hydroforming technology, have a lightweight, sustainable and hygienic design which offers a high-performance alternative to forged and cast valve bodies.

The tube valve bodies are manufactured from 316L stainless steel, enabling hygienic tube-to-tube welding of virtually identical materials and a uniformly high quality of weld seam. Compared with cast bodies, neither cavities nor other defects occur in the manufacturing process, which means the risk of contamination is significantly minimised.

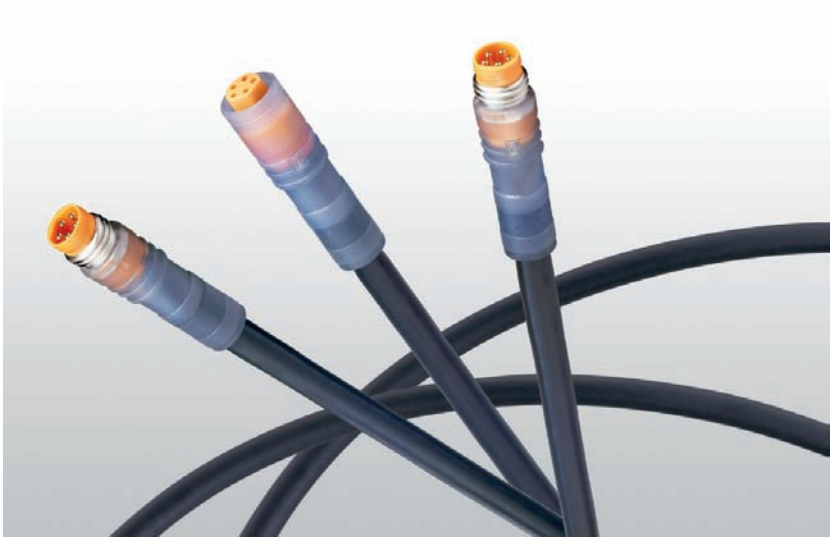
The tubes are as much as 75% lighter than forged housings, reducing the energy requirement and the heat-up or cooling phase duration of the plants during cleaning or sterilisation processes. This, in turn, lowers energy costs and reduces downtimes.

The housings enable optimised temperature control, easier process validation, shorter response times and reduced installation costs because supports are eliminated.

The manufacturing process is also designed to be more environmentally friendly, releasing just over 2000 g of CO_2 compared with almost 7000 g for a DN 25 cast valve body.

The tube valve bodies fulfil the globally established ASME-PBE standard regarding dimensions and tolerances, as well as the EHEDG requirements regarding hygienic design. They are available in welding connection sizes ½, ¾, 1, 1½ and 2″ with the Bürkert diaphragm valve types 2031 and 3233.

Burkert Fluid Control Systems
www.burkert.com.au



M8 CORDSETS

Belden's latest M8 5-pole B-coded cordsets offer an extended power range as well as snap and snap/thread attachments. They are claimed to ensure high performance reliability and make installation in the field easy, even when available space is limited.

The M8 5-pole B-coded cordsets are available in both male and female, and can be used in combination with Lumberg Automation's LioN-Power system, featuring M12 technology and multiprotocol functionality, creating a one-stop solution for meeting the demanding industrial connectivity requirements of the IIoT.

M8 technology offers good handling characteristics and meets certification according to global industry standards, such as UL 2238 for cable assemblies and fittings in industrial control and signal distribution and EN61076-104 for connectors in electronic equipment.

The M8 5-pole B-coded cordsets facilitate reliable transmission of power and signals via a compact interface to small electronic drives and sensors, making them a suitable solution for miniature robotics applications.

Belden Australia Pty Ltd
www.belden.com

PERSONAL GAS DETECTOR

The BW Gas Alert MicroClip 4-Gas Detector prevents harmful exposure to hazardous gases commonly encountered. H_2S, CO, O_2 and combustible concentrations are displayed in real time on the LCD screen. The user is also alerted by visual, audible (95 dB) or vibration alarms if set levels are exceeded within close proximity. It is available to rent from TechRentals.

Alarms can be set into categories: instant low and high alarm for all gases, time weighted average, short-term exposure limit for H_2S, CO or over limit.

The Micro Clip is lightweight and compact for comfort. Due to the critical nature of the unit, a calibration certificate accompanies each rent. The unit also features simple one-button operation, data logging of gas concentrations are provided, and a concussion-proof boot for use in rugged environments.

TechRentals
www.techrentals.com.au

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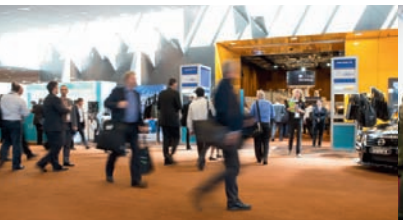


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PREVENTING, DETECTING AND MITIGATING

PIPELINE COMMODITY RELEASES PART 1

*Lars Larsson, Senior Product Manager, Schneider Electric – Global Solutions**

As aggressive exploration projects around the world uncover new hydrocarbon sources, the demand increases for more pipeline development. However, pipeline operators are under severe financial and social pressure to avoid incidents that cause commodity releases.

Pipeline integrity is a term that encompasses many technologies. It could be argued that in its purest form, the term refers to a comprehensive program that ensures hazardous commodities are not inadvertently released from a pipeline and minimises the impact if a release does occur. Though it is natural to think only in terms of preventing a commodity release, pipeline integrity has a broader definition and comprises three phases:

- **Prevention** activities and solutions seek to avoid commodity releases from occurring in the first place through proper design, construction, operation, maintenance, training and education.
- **Detection** activities and solutions help pipeline operators quickly identify that a commodity release has occurred.
- **Mitigation** activities and solutions minimise the extent or impact of the released volume and related damage.

The activities and solutions associated with each of the phases above are distinctly different and have traditionally been looked upon as three separate areas; however, technology and infrastructure have improved over the years, allowing for a more holistic view of pipeline integrity. Some causes of pipeline incidents are under operators' direct control — others less so, as seen in Figure 1. Pipelines are like all other infrastructure: components and materials degrade over time. Even the most meticulously designed and constructed pipelines must be operated properly and carefully maintained to minimise the risk of a commodity release.

Prevention

Although not the only aspect of pipeline integrity, preventing commodity releases is obviously of paramount importance. The best defence against a release is to proactively minimise the chances of its occurring in the first place. Technology and tools exist today that help anticipate potential threats to the pipeline and identify anomalies or issues before they become problems. The old adage 'an ounce of prevention is worth a pound of cure' holds true for pipeline integrity: the costs associated with avoiding a release are much less than the costs of clean-up, fines and other civil liabilities — not to mention the damage to a company's reputation. The process of preventing commodity releases from occurring can be split into the categories of design and construction; operation and maintenance; and training and education.

Design and construction

Ensuring pipeline integrity starts with properly siting the route and specifying the technical requirements (such as hydraulic calculations and physical properties of piping). Advances in construction practices and protective technology further safeguard the pipeline's structural integrity. The following are some of the more important considerations of pipeline design and construction, along with specific tools and technologies to utilise:

- **Avoid geohazards along the pipeline route:** Where the points of supply and delivery are located defines many subsequent engineering design decisions. The terrain along the pipeline corridor may be evaluated with offline design tools such as topographical and geological maps, satellite imagery, aerial photography and surveys available in the public domain, to identify geohazards such as landslides, fault lines, soft soils and underground cavities.
- **Ensure that the pump or compressor is sized correctly:** A steady state pipeline simulation tool can validate the specified size of the pump or compressor through a computational model of the pipeline's operating conditions. This simulation can also ensure that it is hydraulically feasible for the pipeline as designed to cross the terrain with the selected pump or compressor set-up in an economical fashion.
- **Ensure that surge suppression equipment is sized correctly:** A transient pipeline simulation tool can model the pipeline hydraulics to determine the design criteria for surge suppression equipment. Surge effects like water hammer can severely damage a pipeline.
- **Protect the pipeline against corrosion:** Most pipelines are painted with special coatings to limit the chance of external corrosion. Corrosion may be further mitigated with a cathodic protection system. Cathodic protection controls corrosion of a metal surface by making it the cathode of an electromechanical cell, using a more easily corroded 'sacrificial' metal as the anode of the electrochemical cell. For pipelines, where passive galvanic cathodic protection alone is not sufficient, it's necessary to use an external DC electrical power source to provide sufficient current.

Operation and maintenance

Once the pipeline is in service, continuously monitoring the operational and structural conditions within the pipeline identifies circumstances that, if not mitigated, could lead to a commodity release. Inspection and monitoring technologies provide pipeline operators with the information they need to accurately assess the health of their pipeline and perform proactive maintenance on 'at risk' areas. Some of the more important aspects include:

- **Monitor operating pressure:** The pressure or head along the pipeline can vary greatly depending on different factors, such as elevation. Having a simulation model depict what is occurring within the pipeline in real time is beneficial. This allows pipeline operators to monitor maximum allowable operating pressures (MAOP) at locations in the pipeline where no physical measurement is available.
- **Inspect the integrity of the pipeline externally:** Advanced non-destructive testing (NDT) methods detect structural damage or degradation in the pipeline from the outside. Ultrasonics or magnetic particle testing are two such NDT methods available in the market today, but there are several others as well. NDT methods uncover anomalies or trouble spots that bear closer inspection by evaluating integrity of welds and alerting operators to corrosion damage.
- **Inspect the integrity of the pipeline internally:** High-resolution inline inspection (ILI) tools periodically record data about conditions (corrosion, dents, wall thickness) as they move through the pipeline. The data is then analysed to evaluate the structural integrity of the pipeline.
- **Monitor depth of cover:** Pipelines are usually buried to protect the pipeline from general surface activity. The depth of cover depends on both existing regulations and internal pipeline company standards. Electronic equipment is available to assist in monitoring the depth of cover and could be linked with a

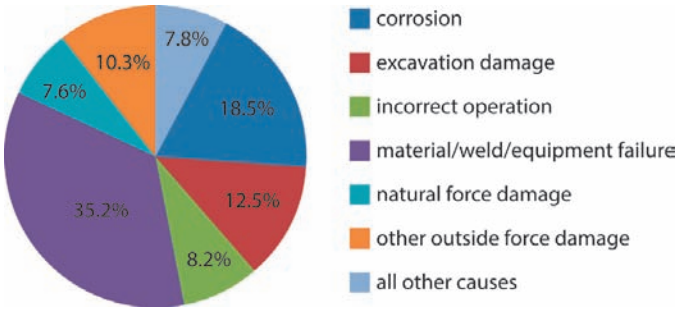

Figure 1: Pipeline incidents by cause, US pipelines, 1994–2014. (Source: US Department of Transportation, Pipeline and Hazardous Material Safety Administration)

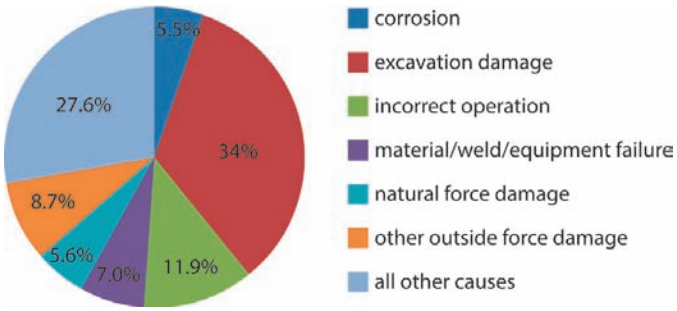

Figure 2: Serious incidents by cause, US pipelines, 1994–2014.

global positioning system (GPS) to track the exact location of the pipeline coordinates.

- **Properly calibrate monitoring devices:** Real-time transient models create an accurate hydraulic picture of pipeline operating conditions. These models can be used to compare calculated values (on pressure, flow, temperature, etc) with actual data received from various measurement instruments. Threshold deviation set points can alert operators via a warning/alarm that a specific instrument may need calibration.
- **Monitor ground temperature and excavation activity:** Communication for new pipelines is normally provided by a fibre-optic cable laid along the pipeline. Modern fibre-optic cables have sensing capabilities that could also be used to monitor the ground temperature along the pipeline and give warnings when the temperature deviates from normal. There are also advanced fibre-optic cables available today that allow the pipeline company to monitor if any excavation or similar third-party intrusion is occurring in close proximity to the pipeline.

Training and education

Pipeline operators are in charge of operating some very expensive pipeline assets and should be required to have training or even certification. Training operators on how to recognise situations or conditions that could potentially lead to a commodity release is clearly an important step in prevention. There are some things to be considered to ensure that pipeline operators have the right tools, and other third parties have sufficient information, to prevent a release:

- **Leverage operator training simulators (OTS):** Computer-based simulators for training and evaluation of pipeline operators are key tools that help improve operational safety and meet regulatory requirements. Enabling the most realistic training experience is essential in making sure the pipeline controller is exposed to both normal operating conditions and abnormal operating conditions.
- **Follow best practices for human machine interface (HMI) design:** Most HMI applications are inadequately designed to allow operators to absorb the vast amount of data and then make good decisions quickly. Specific guidelines are detailed in the American Petroleum (API) Recommended Practice (RP) publication 1165, 'Recommended Practice for Pipeline SCADA Displays'.
- **Define alarm management hierarchies:** Most HMI systems bombard operators with far more alarms than they could ever handle. A well-designed alarm management hierarchy defines different levels of severity, notifying operators only when their intervention is required.

Type	Technology
Sensing-based	• Sleeve on outside of pipeline • Fibre optic sensing temperature changes • Fibre optic sensing distributed acoustic changes, also called DAS fibre optic • Acoustic sensors detecting changes on pipeline
Imaging-based	• Thermal imaging using cameras • Imaging using cameras • Imaging using satellites or aircraft
Patrol-based	• Dogs • Car • Aircraft

Table 1: External-based detection essentially involves inspecting the outside of the pipeline using a variety of methods.

- **Avoid inadvertent excavation damage:** Excavation damage is a leading cause of pipeline incidents — and is a disproportionately larger factor for serious incidents than for all incidents (compare Figure 1 and Figure 2). The pipeline's right of way should be clearly demarcated with clear and visible signage. A variety of community outreach strategies — flyers, call centres, websites, 'Dig Safe' programs — can educate contractors, developers, municipal works departments and the general public about how to avoid inadvertent damage to the pipeline.

Detection

Although moving commodities via pipeline remains the safest means of transport, even the best-constructed and operated pipelines are at risk of a commodity release. In the United States alone over the past decade, more than 10,600 incidents were reported, with property damage totalling over US$6 billion. Even with advances in detection technology, the number of incidents has not decreased significantly as more pipelines are laid (Figure 3). The ability to notice small changes that could indicate a release and, if a release has indeed occurred, localise the problem or shut down the pipeline quickly, is a key component of pipeline integrity.

The tools and technologies for detecting commodity releases after they have occurred can in essence be split in two categories:

- External-based systems; and
- Internal-based systems, also called computational pipeline monitoring (CPM)

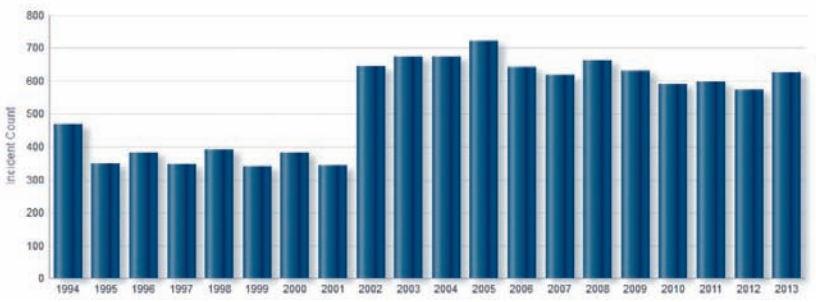

Figure 3: The number of US pipeline incidents (1994–2013) remains steady as more pipelines are laid.

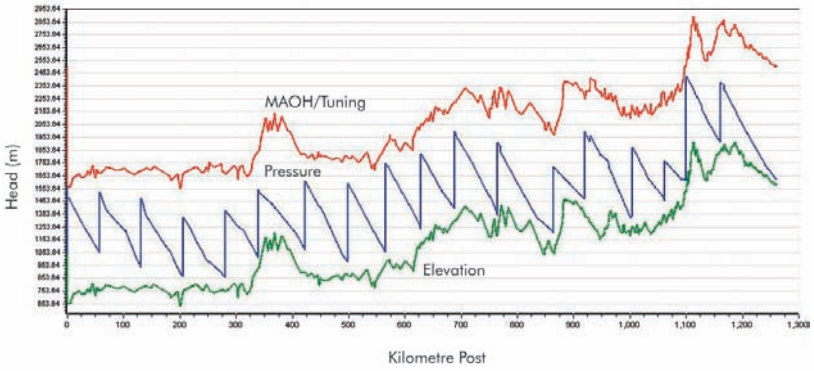

Figure 4: The most appropriate detection strategy for an individual pipeline depends on its unique characteristics.

> EACH PIPELINE IS UNIQUE, AND THE SPECIFIC METHODOLOGIES USED FOR ONE PIPELINE MIGHT NOT BE USEFUL FOR ANOTHER.

A pipeline operator could have one or both of these types of detection systems installed on the same pipeline. Each pipeline is unique, and the specific methodologies used for one pipeline might not be useful for another. For example, the hydraulic profile shown in Figure 4 displays a pipeline that is more than 1100 km long. A pipeline of this length would require different types of detection compared with a pipeline that is only 4 km long. The hydraulic display also shows the head profile for this pipeline (the blue saw-like line), which indicates that this pipeline has at least 16 pump stations and goes over terrain that is gradually increasing in elevation, as seen by the green line at the bottom. A pipeline that goes downhill or over flat terrain would potentially require a different detection methodology.

The red line at the top indicates the maximum allowable operating head (MAOH) for this pipeline. The MAOH for a pipeline constructed with different materials would be different from this one, and a different detection methodology might be more appropriate. Notice also that the slope of the blue line occasionally changes, which indicates that this pipeline probably transports multiple products or that the diameter of the pipeline is different in places. All these factors affect which type of detection system operators would choose for their pipeline. No two pipelines are the same, and each needs to be analysed individually.

External-based pipeline detection

External-based pipeline commodity release detection has been around since pipelines were initially used to transport any type of fluid. It essentially involves looking at the external surroundings and detecting the release on the outside of the pipeline wall.

External-based detection systems are increasingly employed because of their ability to detect very small spills and locate commodity releases with a high degree of accuracy. Table 1 summarises the technologies associated with external detection.

Unfortunately, while external technologies can be retrofitted to existing pipelines, the fieldwork to do so is still relatively expensive, especially for longer pipelines. However, new and shorter pipelines are increasingly using external technologies to complement internal-based or CPM-based commodity release detection applications.

In Part 2

In Part 2 of this article we examine internally based pipeline detection methods, involving computational methods and the valuation of those technologies.

Schneider Electric Industry Business
www.schneider-electric.com

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

References
1. US Department of Transportation Pipeline and Hazardous Materials Safety Administration.

DISPLAY MODULE FOR POINT LEVEL SENSORS

With the Vega PLICSLED display module, the switching status of a sensor can be read from afar, even in strong sunlight. The module is compatible with all sensors of the plics family with a relay output: VEGASWING series 60, VEGAVIB series 60, VEGAWAVE series 60, VEGACAP series 60 and VEGAMIP series 60.

Since external wiring is unnecessary, the time needed for installation is reduced to a minimum. Power is supplied via the relay electronics. The second relay output is used to control the switching status display. Depending on the module version, the switching status is displayed in the colour combination red-green or yellow-green.

PLICSLED is installed directly inside the plics sensor housing, which gives it a high degree of protection from dust and water ingress.

VEGA Australia Pty Ltd
www.vega.com/au

RADAR DUAL-ZONE SENSOR

Banner Engineering has introduced a frequency modulated continuous wave (FMCW) radar sensor for reliable detection of moving or stationary objects. Featuring a very narrow 11 by 13° beam pattern, the R-GAGE Q240 sensor is suitable for monitoring a specific area without detecting adjacent objects. With two independent adjustable sensing zones, the sensor provides far and near proximity warning signs with the capability to detect objects over 40 m away.

The R-GAGE Q240 provides easy set-up and configuration of range, sensitivity and output with simple DIP switches, avoiding the training and complicated PC interface often required. The sensor also features a rugged IP67 housing to withstand harsh environments and ensure reliable performance in temperatures ranging from -40 to 149°C. The sensor has no moving parts and a rugged design that resists high-shock and vibration conditions. Combined with its robust outdoor performance, the R-GAGE Q240 is a more reliable solution with lower costs for purchase and maintenance than traditional laser scanner solutions.

For optimal outdoor performance, the optional snap-on all-weather shield protects against extreme weather conditions and helps shed liquid off the face of the sensor.

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INDUCTIVE SENSORS

Inductive sensors with a correction factor K=1 have been developed by ifm efector. Particularly developed for factory automation, these sensors provide a uniform sensing range for the reliable detection of all metals. The compact dimensions of the devices allow use in the smallest of spaces, while electromagnetic field immune sensor technology prevents incorrect switching.

The K=1 sensors are suitable for the detection of aluminium where conventional sensors show a considerably reduced sensing range, while at the same time featuring a constant sensing range on all other kinds of metals. Fast changing switching states are precisely monitored by high switching frequencies.

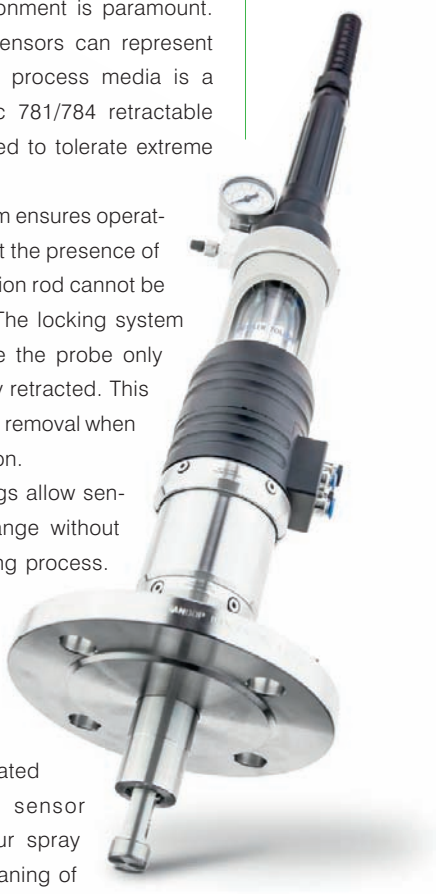
These inductive sensors are immune to magnetic fields and are claimed to be able to operate with absolute reliability even next to electric brakes. The wide operating temperature range of -40 to 85°C allows universal use and the high protection rating IP68/IP69K ensures constant reliability.

ifm efector pty ltd
www.ifmefector.com

RETRACTABLE SENSOR HOUSINGS

In harsh industrial processes, the safety of workers, the plant and the environment is paramount. Insertion points for in-line sensors can represent a weak spot where leaking process media is a possible hazard. The InTrac 781/784 retractable sensor housings are designed to tolerate extreme process conditions.

An intelligent locking system ensures operating safety at all times. Without the presence of a sensor, the housing's insertion rod cannot be deployed into the process. The locking system makes it possible to remove the probe only when the insertion rod is fully retracted. This avoids any unintended sensor removal when it is in the measuring position.



InTrac781 and 784 housings allow sensor maintenance and exchange without any interruption to the running process. The stainless steel version of the housing allows sensor deployment or retraction in up to 16 bar with no compromise to operator safety.

The design of the integrated cleaning chamber makes sensor cleaning more efficient. Four spray nozzles ensure thorough cleaning of the sensor tip, and the large chamber bore size means dirt and particles are thoroughly flushed out. Operation with Mettler-Toledo's EasyClean systems is possible for fully automatic sensor cleaning, flushing and calibration.

Wetted parts are available in different materials (stainless steel 1.4404, alloy C-22, polymer PP, PEEK or PVDF), while various immersion lengths and type of process connection are also available. The housings meet all major standards for hazardous areas and pressurised equipment directive (PED 97/23/EC) requirements.

Mettler-Toledo Ltd
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SMART SENSOR BUSINESS

VORTEX MASS FLOW METERS

The Sierra Instruments InnovaMass 240i and 241i vortex mass flow meters have been specifically designed for precise flow energy management in steam, compressed air, natural gas and water applications. Capable of measuring five process variables with one instrument, the flow meters now feature the Raptor II operating system, claimed to provide end users with flow measurement precision that promises to reduce energy costs and increase productivity.

Forms of energy in flow include heat energy (BTU or Joules) in steam or water, the potential combustive energy in natural gas and the potential expansion energy in compressed air. The InnovaMass 240i and 241i mass flow meters deliver flow energy calculations (AGA8 natural gas, steam enthalpy, thermal energy/BTU).

The FloPro software application improves point-velocity accuracy for the insertion version. In addition, the Raptor II OS Flow Engine and MassBalance sensor technology extends the measuring range down to Reynolds numbers well below 5000.

The flow meters are suitable for saturated or superheated steam, gas and liquid applications and measure mass and/or volumetric flow rate. The insertion version is for 50.8 mm or greater, while inline models support up to DN 200. Accuracy is up to 0.7% of reading, temperature to 200°C and pressure to 1500 psig (103 barg). They also offer three configurable 4–20 mA outputs, as well as HART, Modbus, Profibus DP, Foundation Fieldbus, USB and RS-232, as well as CE, cFMus, ATEX and IECEx approvals.

Procon Instrument Technology

www.proconit.com.au

CASE STUDY

Top float

Woodside, Australia's largest independent oil and gas company, is recognised globally for its world-class capabilities as an explorer, developer, producer and supplier. Its proven track record and distinctive capabilities are underpinned by 60 years of operational experience, characterised by strong safety and environmental performance in remote and challenging locations.

The company operates the Okha floating production, storage and offloading facility (FPSO), which was commissioned in 2011. The facility is located offshore about 135 km north-west of Karatha in Western Australia and stands in 80 m of water. It connects to 10 subsea wells with an estimated production capacity of 60,000 barrels of oil per day and has a storage capacity of 925,000 barrels.

The Okha FPSO has been designed to extract, process, store and offload oil as well as export gas from the Cossack, Wanaea, Lambert and Hermes (CWLH) fields. The topside processing facilities consist of oil, water and gas separation systems, plus gas compression equipment. Oil from the CWLH fields can be produced through the wells via five production manifolds connected to the Okha FPSO. In addition, the facility has one gas-lift integrated manifold, which supports gas export into the North West Shelf Project's trunk line for onshore processing at the Karratha gas plant.

The Okha FPSO is designed with a closed-loop flare system so that, under normal operating conditions, no continuous flaring occurs. The surplus gas from the production system is redirected to the cargo tanks to provide a 100% hydrocarbon blanket; it is subsequently used as lift or export gas. The facility operates 24 hours a day, 365 days a year, supporting production and maintenance activities. Production involves receiving hydrocarbons from the CWLH fields via subsea infrastructure, followed by onboard processing and storage and, finally, export of oil to tankers and gas to the trunk line. The facility and supporting subsea infrastructure are inspected and maintained regularly to ensure safe and reliable operations, and a turret mooring system that can be disconnected allows it to safely sail away in severe weather, such as cyclones.

The Okha's integrated control and safety system (ICSS) is based on a Simatic PCS 7 process control system with fault-tolerant controllers and a combination of standard and safety I/O systems used downstream. The OS level comprises three redundant OS servers (topsides and vessel, fire and gas, and package), 11 OS clients, a central archive server, an asset management server and an offshore data provider server. A total of 11 fault-tolerant controllers make up the AS level. Because the package units for the boiler, gas compressor, connect/disconnect system and nitrogen system are automated based on Totally Integrated Automation from Siemens as well, they can be easily integrated into the ICSS.

Woodside also uses Comos Walkinside 3D virtual reality software for work on Okha and other FPSOs. The software allows operators and maintenance personnel to familiarise themselves with the layout of the vessel through a 3D simulation onshore, prior to flying out to the facility. The Comos Walkinside solution can be used for immersive operator training and delivers tools for efficient data exchange with third-party applications, as well as distributed real-time collaboration. As a result, service and maintenance work can be planned, simulated and executed efficiently.

The Siemens experts in Australia have been involved in the Okha project from its early stages and provided a comprehensive training program for Woodside engineering and maintenance personnel. They also supported the project during and after commissioning, as well as during system optimisation and process improvements. Subsequently, Woodside established a maintenance contract with Siemens for the complete ICSS which is reviewed and renewed annually, including on-call support, weekly health checks and services for preventive maintenance. Siemens will also develop and manage a life cycle road map for the facility. The teams are already planning the next steps, such as upgrading the Simatic PCS 7 system to the latest version in order to keep the solution in line with technology evolution and providing Woodside with new features.

Siemens Ltd
www.siemens.com.au

OPTICAL DISTANCE SENSORS

The measuring ODS 10 and the switching HT 10 are optical sensors that detect objects and measure distances with an operating range of up to 8 m (diffuse reflex) and 25 m (reflective tape), with 3 mm resolution.

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

Highly visible status indicators, large control buttons and an OLED display help with step-by-step commissioning and diagnosis at the press of a button. The housing is compact, with integrated recesses for M4 screws or nuts, and the short depth of less than 50 mm ensures space-saving mounting in tight spaces.

Leuze electronic Pty Ltd
www.leuze.com.au

DISTRIBUTED TEMPERATURE SENSOR SYSTEM

Yokogawa's DTSX3000 is a distributed temperature sensor system that can provide continuous temperature measurement over distances of up to 50 km.

The DTSX3000 does not report the temperature at one spot but rather the temperature over the entire 50 km, the length of its temperature sensing optical fibre. With the DTSX3000, there are no blind spots when trying to detect leaks or fires along pipelines, cable runs, tunnels or tanks. As the DTSX3000 can utilise 16 fibre channels, 100 km of any pipeline can be monitored with a single unit (50 km each way).

The DTSX3000 offers a 10 s response time and up to .03% temperature accuracy. It can be configured to provide redundancy and offers low power consumption.

Yokogawa Australia Pty Ltd
www.yokogawa.com.au

CONDUCTIVITY SENSORS

Krohne has introduced three SMARTPAT sensors for conductive conductivity measurement in liquids: SMARTPAT COND 1200, 3200 and 5200.

SMARTPAT is a series of digital 2-wire loop powered sensors with integrated transmitter technology. SMARTPAT sensors can be connected directly to the process control system via 4–20 mA/HART 7 interface. They can be configured and calibrated offline via PACTware FDT/DTM, on-site with a HART handheld or an optional loop powered operating unit.

Targeted at the water and wastewater industries, the application area for SMARTPAT COND 1200 ranges from process monitoring in water treatment plants (industrial and drinking water), water quality/limit values monitoring and filter monitoring. It has a measuring range for cell constant c=1 of 100 µS/cm to 20 mS/cm.

SMARTPAT COND 3200 is aimed at quality measurements in condensate, cooling water and boiler feed water in power plants. It can also be used for reverse osmosis, monitoring of ion exchangers, deionisation or desalination processes, such as in semiconductor production. It has a measuring range for cell constant c=0.1 of 1–1000 µS/cm, and for c=0.01, 0.05-10 µS/cm.

SMARTPAT COND 5200 has a measuring range for cell constant c=1 of 10 µS/cm to 15 mS/cm and is designed for use in separation processes (caustic solution/water) or process monitoring in water or wastewater treatment in chemical, petrochemical as well as in the water and wastewater industries.

Each SMARTPAT sensor is specifically designed for its area of application: approvals and certificates range from installation in hazardous areas up to Zone 0 to hygienic areas.

KROHNE Australia Pty Ltd
www.krohne.com.au

EMBEDDED COMPUTER

The MPL CEC10 rugged embedded computer range housings offer sufficient space for a 2.5″ HDD/SSD or other expansion requirements. With the integrated PCI-Express Mini Card slot, the unit can be expanded with any mPCIe module.

The product comes with an expansion board interface which offers two PCIe, two HSIC, two UART, SATA, SDIO, LPC and I²C. This allows maximum customisation and system expansion with additional interfaces. The industrial PC meets many rugged standards, including EN50155, IEC 60945 and MIL-STD-810.

The computer is available in various chassis — a compact aluminium housing with DIN rail or flange mount, a rugged MIL IP67 case or an open-frame solution with a cooling plate. The chassis solution enables operation in a moderate or harsh environment without the need of a fan or ventilation holes. The design integrates standard connectors for easy connection or lockable headers, depending on housing choice.

The family has been designed to withstand harsh environments and extreme temperature conditions from -40°C to +85°C. The rugged design, combined with industrial-grade components, offer high reliability and long-term performance.

The unit has been designed to suit different industries and is a suitable embedded computer solution for industrial environments, railway applications, MIL/COTS applications and other environments where a rugged, long-term available computer is needed.

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

CALIBRATOR FOR PRESSURE INSTRUMENTATION

The DPI 612 Flex Series is a full-function calibrator that builds on the DPI 600 Series. The DPI 612 Flex Series provides all the convenience of the Druck DPI 610/615, with improved generation capabilities, higher accuracy and simplified touch-screen operation. It provides all the tools for pressure generation and signal measurement in a self-contained portable package, integrating pressure measurement, pressure generation, signal measurement and power supplies. Contained inside a rugged enclosure, it's all that's needed to maintain and calibrate pressure instrumentation.

The DPI 612 includes interchangeable pressure modules for pressure range flexibility. It can generate 0 to 20 bar/300 psi in less than 30 s, 100 bar/1500 psi without gas bottles and 1000 bar/15,000 psi hydraulic pressure. Compared to the DPI 610, its pressure measurement is twice as accurate and it has three times better electrical accuracy.

The product features DUT and pressure module overpressure protection, plus a quick-to-fit and tool-less pressure connection system. Its simplified touch-screen interface includes an application dashboard, quick task selection and Favourites storage.

The unit features fast, three-touch set-up for any application. It calculates pass/fail errors, documents results and interfaces with calibration software.

Thermo Fisher Scientific
www.thermofisher.com.au

STAINLESS STEEL PANEL PC

Interworld Electronics has released the Aplex APC-3795P projected capacitive touch stainless steel panel PC. The PC is housed in a fanless, fully sealed, stainless steel, IP65 and IP69K certified enclosure with waterproof I/O connectors.

The APC-3795P is supplied with an internal 17″ 1024 x 768 resolution LCD that features 350 nits luminance and 1000:1 contrast ratio. A projected capacitive touch screen makes the APC-3795P suitable for operator panel and HMI control applications.

The panel PC includes a built-in motherboard with an Intel i3-4010U 1.7 GHz or Intel i5-4310U 2.0 GHz processor that supports up to 4 GB of DDR3L 1333/1600 MHz memory. An internal 2.5″ SATA2 hard drive bay and an internal SD card slot are provided for system and data storage. Rear waterproof M12 I/O connectors provide access to two COM ports, one USB 2.0 port, one USB 3.0 port, one Gigabit Ethernet port and DC power. The APC-3795P can operate from an 11-32 VDC power source.

VESA 75x75 rear mounting holes allow the panel PC to be securely wall- or arm-mounted.

IP69K certification makes the PC suitable for laboratory, food processing and industrial high-pressure washdown environments. For applications requiring a smaller or larger display, the APC-3595P features a 15″ LCD while the APC-3995P provides a 19″ LCD.

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

CELLULAR ROUTER

The Hirschmann OWL 3G industrial cellular router is a single-box solution that provides secure and reliable remote access. Network problems can be solved quickly, and support costs can be reduced, with the OWL 3G's remote access capabilities.

The product is designed for machine builders, system integrators and automation vendors in search of easy ways to monitor and troubleshoot machines without going on-site or creating connections where wired networks are not feasible. The router is suitable for use in power transmission and distribution, as well as machine building settings. Due to the router's ability to securely and reliably connect an ethernet network to the internet, it is also a key solution for companies looking to take advantage of Industrial Internet of Things (IIoT) technologies.

The two-in-one router is equipped with two ethernet 10/100 ports and two SIM card holders, which back up communication in mobile operator networks and provide failover to one another, enhancing overall network availability and security.

Belden Australia Pty Ltd
www.belden.com

POWER SUPPLIES

Balluff has introduced the PS Series, a range of rugged power supplies for industrial automation. Specially developed for controllers and use in any market, these devices with IP20 protection for DIN rail mounting provide reliable, clean and regulated power even under challenging conditions.

The user can select from a broad range of models with single- or three-phase input. In addition to versions for 24 VDC there are also models with other output voltages. All featuring CE, UL/cUL, CCC and TÜV certifications, these units offer MTBF of up to 800,000 h.

Available power ranges from 18 W (0.75 A) to 960 W (40 A). If the power requirements are even higher, multiple units can be combined and connected in parallel mode.

All power supplies feature a metal or metal/plastic housing as well as integrated overload and overvoltage protection. The output can be set to compensate for losses in cabling and shared components. A short-circuit protected output and an output contact for diagnostics are also provided.

Due to the integrated Balluff high-performance mounting system for DIN rails, the units can be simply and conveniently installed in various control cabinet assemblies. The screw terminals are aligned to enable the integration of the AC input from below and the DC output from above. Connections with contact protection render additional safety equipment superfluous.

Balluff Pty Ltd
www.balluff.com.au

APPETITE FOR LNG GROWS

INDUSTRY STRUGGLES

Peter Caro, Director, Area Sales, Aspen Technology Australia Pty Ltd

Despite record low LNG prices, and the ever increasing capital costs of new production plants, there is pressure on the industry in Asia-Pacific to increase capacity by improving existing plant efficiencies and constructing more facilities.

Demand for LNG as a carbon-friendly energy source continues to grow in many regions, with the appetite being highest in the Asia-Pacific region. Before the end of the decade, when most of the current under-construction projects reach production, there will be a short period of oversupply, but not for long. By 2021 the world will need additional supply capacity — more output, more plants.

Nonetheless, in the current volatile economic climate, and because of the relatively long project construction timelines of 5 to 10 years, investors are reluctant to commit to new LNG projects.

At a macro level there are engineering design solutions that can aid in mitigating the investment risk, assist with optimising design and lowering construction costs, as well as, at a detailed level, improving efficiencies for existing production facilities.

LNG price on the slide

The crude oil spot price continues to fall, and since the LNG price is indexed to the oil price, it is no surprise that the LNG supply prices are racing to the bottom. This is despite the fact that in the Asia-Pacific region the LNG supply contracts are long term (as Australia has signed with Japan), and so these contracts really only delay the inevitable. From the start of 2014, the LNG price at the Japan/Korea Marker (JKM) has fallen from around $18/MMBtu to $7.2/MMBtu — down 60%.

The impact on existing large Australian LNG plants, mostly using offshore gas feeds, is devastating, and they are scrambling to find ways to improve efficiency and reduce operating costs (OPEX).

Optimising the existing plant, with a focus on the liquefaction process (which accounts for 40% of the operating costs), offers the quickest and most significant OPEX reduction. Optimising this process by implementing advanced process control (APC) can improve efficiency and bolster plant reliability, resulting in greater yield and lower costs.

LNG demand on the climb

The demand for LNG from the Asia-Pacific region continues to grow at around 4% pa. This is despite the fact that, since 2012, Japanese consumption has dropped as they recommission their nuclear power plants that were mothballed after the Fukushima disaster. The excess supply has been absorbed by increased purchasing from China and Korea, but in anticipation of significantly higher demand, offshore natural gas and CSG-to-LNG projects were launched nearly a decade ago, and as these come online there will be an oversupply for a few years, and then a supply

shortage from 2021. It is anticipated that by 2017, Australia will be the world's largest LNG exporter.

According to Philip Olivier, CEO of ENGIE Global LNG, "Oil will not stay at current lows so we should avoid being hit by a double-whammy of rebounding oil prices and a growing shortage of LNG supply. New liquefaction and export projects need to be carefully advanced through the current down-cycle, though many investors shy back from taking FID (Final Investment Decisions) in the current low price environment."[1]

Looking forward from 2021, and with a 5- to 10-year construction timeline, more new LNG facilities need to be on the drawing boards right now. But the construction costs (CAPEX) of LNG facilities, recognised as one of the most expensive process plants to build, have increased by 20–30% since 2005, and 80% of the current projects are over budget and behind schedule.

By implementing leading-edge process plant design software that incorporates sophisticated capital cost estimating, it is possible to mitigate against inefficient upfront design, avoid over-engineering (and overspending), and better manage project execution. Using these tools will help to reduce the capital costs and project blowouts, thereby reducing investor risk and uncertainty.

Modelling the market

To further reduce FID hesitation in this volatile LNG market, investors demand greater assurance than ever before that every conceivable business scenario has been simulated and tested.

Economic scenarios such as future oil prices (which will determine LNG prices), future demand, the impact of renewable energy sources, long-term contract viability in an oversupplied market, political stability at plant locations and much more need to be modelled by the economic strategists.

As importantly, it is imperative that the potential LNG project, including conceptual design, detailed design, project costing, anticipated throughput, planned efficiency, operations and maintenance, as well as ROI, is extensively modelled and tested to take into account every conceivable scenario, such as:

- gas feed composition variations
- gas feed pressure changes
- output demand volatility
- environmental considerations such as ambient temperature (after all producing LNG is a cryogenic process)
- plant reliability impacting shutdowns and start-ups

The latest process plant design software tools incorporate the option to perform realistic and extensive technical simulations, ensuring that investment risks are mitigated and worst-case/best-case outcomes are considered during future plant operations.

Chiyoda Corporation, the largest Japanese integrated engineering company and the world's leading LNG contractor with major involvement in the Inpex Ichthys project off Darwin, uses these tools to verify operability and controllability of new LNG plants, including the gas cleaning, NGL recovery and liquefaction sections of the plant. Chiyoda examines possible transient scenarios, such as operation procedures for start-up and shutdown, including compressors. This allows Chiyoda to design more reliable and robust LNG plants, with stable operation of the NGL recovery unit and less risk in the start-up of the plant and operation of the equipment, specifically the compressors.

Down with downtime

The extremely 'tight' LNG industry — with low selling prices, volatile demand and high capital costs — demands high plant reliability and minimal downtime. This requirement is even more critical in CSG-to-LNG plants due to the upstream implications of a gas train malfunction.

Typically, an LNG train is supplied by hundreds of CSG wells. Less groundwater needs to be pumped out and treated, the longer a well is in operation. Consequently, if the gas demand on wells is reduced due to a train shut, then the groundwater builds up and has to be pumped out in greater volume at a later stage, incurring additional costs. Alternatively, the wells can be allowed to supply gas as normal but the gas is then flared to the atmosphere, which is both costly and environmentally harmful. Added to the fact that the train is not producing and earning revenue, these additional costs are extremely undesirable.

> LOOKING FORWARD FROM 2021, AND WITH A 5- TO 10-YEAR CONSTRUCTION TIMELINE, MORE NEW LNG FACILITIES NEED TO BE ON THE DRAWING BOARDS RIGHT NOW. BUT THE CONSTRUCTION COSTS ... OF LNG FACILITIES ... HAVE INCREASED BY 20–30% SINCE 2005.

A prerequisite for success in this market is robust detailed overall design, coupled with intensive design and simulation testing of each phase of the process, each sub-process and even individual critical pieces of equipment such as compressors, refrigerators and heat exchangers. The ability to model the performance, for example, of a plate fin heat exchanger, as it is pushed to the limits of its operating envelope, can reduce the risk of a plant shut as greater efficiency is chased.

Implementing a high granularity plant-wide software engineering tool that incorporates the ability to drill down to component level can ensure sufficient detailed simulation and testing, and deliver a robust, reliable LNG facility.

Within Fives for example, the Cryogenic|Energy business group is a major manufacturer of brazed aluminium heat exchangers (BAHX), using exchanger design and rating simulation software products to understand the heat exchanger's impact on the entire process rather than as a sole unit. Specifically, Fives wanted to monitor multiple BAHX in series, and the real pressure levels at BAHX outlets along with thermo-hydraulic coupling to optimise the final design of the cold box. This strategy not only allowed Fives to optimise the equipment design in the context of the process, but also to optimise CAPEX and OPEX simultaneously over the life of the equipment.

Big data, big gas

One of the strongest challenges in the oil and gas industry is to manage information, to understand the processes and implement strategies to increase efficiencies. According to Curtin University's Dr Brian Evans, Director of Subsea Engineering Projects, "Our ability to become lean and mean will come down to our ability to master data analytics."[2]

The second report in Lloyd's Register Energy's Oil and Gas Technology Radar research series[3] maintains that any number of reasons can be cited for oil and gas companies' inability to use data more effectively. Simply handling and safely storing the large volumes of data being collected is a challenge for many companies. The same is true of dealing with unstructured data — the type that originates, for example, from images or maps, or text embedded in email, social media and other forms of communication.

According to Duco de Haan, commercial development director at Lloyd's Register Energy, "Two factors stand out as hindrances to upstream companies' better use of data. Silos (in companies) are the biggest problem. The lack of data integration across different parts of the business is rated the toughest challenge oil and gas firms face in improving their use of data. It was not uncommon, over the years, for different business units of large, integrated operators or contractors — or even different departments within the same units — to adopt slightly different formats in entering the data they collected. This presents a huge headache when seeking to apply advanced analytics tools to generate insights from data that business managers can use. Databases can of course be cleaned and formats standardised, but it can be a long and expensive process."[3]

Tim Walsh, COO, assurance operations, Lloyd's Register Energy, claims, "The biggest challenge for asset management is working out basic information about the configuration of the plant and what condition it's in.

"Much of this could be expedited through better use of data — understanding what data is available, what form it's in and having systems that are joined up. System integration is a big issue. There can be four or five systems that look at the same thing. A lot of historical data is poorly structured and, often, operators don't have any way to assess the quality of the data."[3]

The situation is exacerbated when operators and engineers, looking for increased efficiencies, start with plant optimisation which is typically 'tested' using extensive spread-sheeting, and playing the 'what-if' game. The results of this scenario planning are not available to all stakeholders and very seldom tested in conjunction with the overall control system.

Until recently there has been no readily available plant optimisation software that includes a data historian and the ability to seamlessly interface into multiple formats of data. Now it is possible to run 'what-if' modelling as before, but integrated into the optimisation software so that the iterations are evaluated and stored for future reference.

Opportunities in gas

Within five to six years there will be a shortfall in LNG supply, and with design and construction taking 5 to 10 years, it is critical for new projects to be 'on the table', if not already in initial building phase.

The current low oil/LNG prices will not continue for much longer, especially when demand outstrips supply, and then returns on investment will be meaningful. But it is essential that owners of existing, and planned, LNG facilities employ the latest engineering software tools to ensure reliable and 'proven by simulation' design, efficient processes and optimised process control. In this way risks can be minimised and ROI maximised.

Aspen Technology Australia Pty Ltd
www.aspentech.com

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3. Ibid., p38

POWER SUPPLIES

PULS CP10 Series 10 A power supplies are very compact, with a width of only 39 mm, and are available in 12, 24 and 48 V versions.

Power is available over a wide temperature range from -25°C to +60°C. Additionally, there are power reserves of 20% included, which may be used continuously at temperatures up to +45°C. For short-term peak loads with a maximum length of 12 ms, the units can deliver three times the nominal output current.

The units are equipped with a wide-range input circuit from 100 to 240 VAC and have a 95.2% full-load efficiency.

Other features include active power factor correction, DC OK LED indication and a long lifetime expectancy. All models in the CP10 range have IECEx approval and there are also dedicated DC input versions that can take voltages between 88 and 360 VDC.

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

EXTRUDER RUPTURE DISCS

Pressure relief specialist Elfab has launched its own extruder rupture disc range, primarily designed for overpressure protection of plastic extrusion processes. The pressure relief device not only provides protection for extrusion lines, it is also one of Elfab's widest ranging pressure relief products, combining various dimensions, thread types and body configurations to best suit the requirements of each application.

The range expands Elfab's electron beam-welded OE5 range to further provide advanced process management and leakage control. The OE5 combines a scored rupture disc that is welded directly onto the end of a plug assembly.

Each of Elfab's extruder rupture discs (ERDs) consists of a threaded body with a conventional rupture disc electron beam welded to the end. As each ERD application is different, the company manufactures all products in-house.

Elfab's range of ERDs provide high leak tightness and offer maintenance-free design. Each rupture disc can be custom-engineered to meet industry specifications.

Elfab Limited
www.elfab.com

DATA LINE SURGE PROTECTORS

Times Microwave Systems has introduced a range of high-performance data line surge protectors.

Proprietary circuitry results in surge let-through voltage on data lines of less than 20 V peak at 3 kA 8 x 20 μs surge test current, and less than 10 V peak at 100 A 10 x 1000 μs surge test current, while complying with extended RFC2544 test methods for data integrity. These difficult tests are conducted on two protection devices separated by 100 m of Cat 5e cable over a broad temperature range measuring throughput, latency, packet jitter and frame loss.

There are three models available. The LP-DOE-1G is designed for 1000base-T ethernet data cables for indoor use, with all data pins protected to chassis ground, while the LP-POE-1G is for 1000base-T PoE systems with all pin pairs protected to chassis ground with up to 60 VDC injected. The LP-PAE-100 model provides for protection for 100base-T power and ethernet cables with all pins protected to ground. Data pin pairs are (1–2) (3–6) and DC pin pairs are (4–5) (7–8).

The RFC2544 test results for each of these devices are available for download on the Times Microwave Systems website.

Rojone Pty Ltd

www.rojone.com.au

ETHERNET SWITCHES

Crystal Rugged has introduced the RCS6450-12 and RCS6450-24 switches based on the Brocade intelligent, scalable edge switch line. The ruggedised switches are designed for small and medium-sized applications with improved cooling, shock, vibration and humidity performance for heavy industrial and military environments.

The ruggedised switches operate in harsh environments where size, weight and power limitations are a concern. Weighing between 4.3 and 4.5 kg depending on configuration, the 30.48 cm deep units offer fixed mounted or Delrin glide mounting on standard EIA-310 racks.

The RCS6450-12/24 are also cooled with forced air convection via internal high-reliability long-life fans. This compact, lightweight unit offers full Layer 3 routing, LLDP-MED plug-and-play operations, as well as availability in MIL-CIRC I/O or gigabit Ethernet standard connectors.

Both the 12- and the 24-port units are available with a standard 120/240 VAC COTS power supply and front or rear I/O options, a single 120/240 VAC EMI-compliant power supply, an 18–36 VDC EMI-compliant power supply or a combination of AC or DC supply modules in a 1+1 configuration.

Metromatics Pty Ltd

www.metromatics.com.au

CORROSION-RESISTANT ACTIVE COOLING UNIT

An active cooling solution for small outdoor electronics and instrumentation equipment cabinets sited in hot climates has been launched by Intertec. The MULTICOOL 1100 cooler features a GRP (glass-reinforced polyester) housing that is inherently resistant to corrosion.

Offering 1100 W of cooling power, the product is a self-contained module that mounts directly on the outside wall of the equipment cabinet. It is especially suitable for cooling outdoor cabinets that are sited in hot and humid environments and wherever atmospheric contaminants such as salt, sulfur or carbon dioxide exacerbate metal corrosion.

There is no direct air path between the ambient environment and the inside of the equipment cabinet. The closed-loop refrigeration system has two completely separate and thermally isolated compartments: one for its evaporator, the other for the condenser and compressor stages. The evaporator is the only part of the system that is connected to the inside of the cabinet, via air ducts that are hermetically sealed to the cabinet walls, and employs fan-assisted air recirculation to maximise cooling performance. Heat is extracted from the cabinet by airflow over the evaporator and transported to the condenser via refrigerant gas. The condenser is cooled by its own separate fan, with the hot air and waste heat from the compressor being exhausted direct to atmosphere.

Suitable for use in ambient external temperatures from -20°C to 55°C, the cooler measures just 75 x 52 x 25 cm and weighs only 38 kg.

INTERTEC-Hess GmbH

www.intertec.info

HUMIDITY PROBE VERIFICATION SYSTEM

Weighing just 3.2 kg and with a battery life of up to 8 h, the Michell Instruments HygroCal100 verification system for humidity probes is designed with portability in mind.

The humidity test chamber allows the evaluation of relative humidity sensors in the range of 5–95% RH. Up to seven probes, with different diameters and output signals, can be validated simultaneously. The HygroCal100's design allows the probes to be integrated with the chamber and user interface, enabling the operator to easily monitor the readings of each probe during the calibration cycle. The calibration data can be downloaded from the unit on to a USB drive for later use.

An external reference hygrometer, such as Michell's fundamental, chilled mirror Optidew Vision, can be integrated into the system. If this reference has a traceable calibration, it allows users to incorporate this traceability into their verifications.

The unit is easily programmable through its touchscreen interface, enabling calibration routines to be completely automated. The operator defines the humidity points, and time to remain at each of them, inserts the probes and the reference (if used), then leaves the unit to work through the cycle.

The HygroCal100 contains an internal polymer reference — Michell's latest generation HS3 sensor, giving ±0.8% RH accuracy. For long-term reliability, the HygroCal100 can be calibrated against an external reference. This is an automatic function: once the reference is connected and the calibration initiated, the HygroCal100 automatically runs through the steps and prompts the user for actions.

AMS Instrumentation & Calibration Pty Ltd

www.ams-ic.com.au

MICRO PLC

The UNO-1252G micro-PLC is only 10 cm high and DIN rail mountable. The unit comes with the energy-efficient Intel Quark processor, using only 10 W while being powerful enough to perform data transmission and sensing functions within IoT gateway applications.

Gateway computers are useful because they help to connect legacy devices to the Internet of Things (IoT) without needing to replace the entire infrastructure. The small, economic UNO-1252G is suitable for this purpose since it has an array of integrated I/O ports and the ability to expand even further by using a choice of iDoor modules.

To protect itself from spikes in electrical supply, the UNO-1252G includes isolated COM and digital I/O ports, and also supports a wide supply voltage range of 10–36 VDC.

Advantech's iDoor technology is a modular way of adding versatile functionality, giving system integrators the flexibility to choose the functions that they need. iDoor modules can be used to add additional cards such as Wi-Fi, 3G and GPS.

The UNO-1252G also includes a 1 GB SD Card to run a Yocto Project Linux distribution. The Yocto Project is an open source Linux distribution that allows users to develop their own application using an SDK. The UNO-1252G also supports Advantech software applications such as SUSIAccess for remote control and monitoring. It also includes two 10/100 LAN ports, an mPCIe card slot, five LED indicators for power, battery, SD card and COM ports, as well as three programmable indicators for engineers to assign their own functions.

Advantech Australia Pty Ltd

www.advantech.net.au

COMPACT DA SYSTEM

The EME PicoPetite is a compact, self-contained, full-featured data acquisition system (DAS) measuring only 51 x 59 x 30 mm and weighing less than 142 g for 32 channels. Additional channels can be added or removed in 8-channel increments, adding or subtracting only 55.4 mm per eight channels to the height dimension. Up to 64 channels can be installed in a single unit and units can be daisy-chained together for high channel counts.

The product is manufactured with a self-contained T6 aluminium housing, designed to be hard-wearing and shock resistant, allowing for it to be used in some of the harshest conditions. It features shock and vibration resistance of over 250 g and is SAE J211 compliant. The sampling rate is up to 250 kHz, with 16 bit A/D resolution, and individual channel excitation can be 2.5, 5 or 10 V.

Metromatics Pty Ltd

www.metromatics.com.au

INFRARED CAMERA

The Fluke TiS75 infrared camera, with professional-grade 320 x 240 pixel resolution, has precise manual focusing that enables maintenance professionals to pinpoint issues with equipment and electrical systems.

Focus is one of the most important factors in conducting infrared inspections, because an out-of-focus image can produce a temperature measurement that is incorrect by 20° or more. The TiS75 has a long-travel focus wheel that enables fine manual focus adjustments so technicians capture in-focus images with precise measurements. It features a 3.5″ screen to help pinpoint issues while still in the field and also offers one-touch image access, which eliminates the need to scroll through a menu to view images.

As part of Fluke Connect, the product can transmit measurements to a smartphone or tablet for later detailed analysis. Those measurements can be uploaded to the cloud. Technicians can combine uploaded images and measurement data from multiple Fluke Connect test tools to create and share reports from the job site via email and collaborate in real time with other colleagues with ShareLive video calls or email, increasing productivity in the field.

The Fluke Connect Assets subscription service offers ShareLive video calls that enable teams to easily share and access infrared inspections on the go and look at trends per piece of equipment over time.

Fluke Australia Pty Ltd
www.fluke.com.au

CASE STUDY

RFID streamlines automated tomato harvesting

Australians eat 22 kg of processed tomatoes per head every year, due to its presence as an ingredient in tomato sauce, soup, stews, pasta sauce and more.

Founded in 1899, the Japanese tomato processor Kagome has more than 100 years' experience in the tomato growing and processing industry. Since 2010, Kagome Australia's factory in Echuca has been cultivating and processing tomatoes, providing high-quality tomato products to food companies in Australia and overseas.

Today, cultivating and processing tomatoes is automated, and it can be a logistical challenge to get the tomatoes from the field to the factory in the most efficient way.

On the Echuca fields, Kagome operates 12 harvesters loading tomatoes into more than 300 huge bins, each with a capacity of 14 tonnes. Once a bin is full with fresh tomatoes, it is unloaded at a bin pad, waiting for one of 12 trucks to pick it up and take it to the weighbridge close to the factory. One trip from the fields to the Kagome factory takes approximately 90 minutes and each truck can load three bins — that is an average of around 42 tonnes of tomatoes per truck.

Three years ago there were long truck queues at the weighbridge, forcing drivers to wait for 12 minutes until their tomatoes could be weighed. As part of Kagome's quality control process, three samples from each bin had to be processed in the laboratory to ensure they were from a Kagome farm, and the drivers had to prepare paperwork to document the harvesting process as well as the quantity and quality of the yield.

This paper-based process increased the potential for human error, which could result in contaminated products and conceivably create widespread foodborne illness. To ensure traceability, it was time for Kagome Australia to implement a paperless automated identification solution at the weighbridge.

Food traceability is the process of tracking a product's history and sharing that data along the entire processing path — so-called 'farm-to-fork' or 'paddock-to-plate' programs. While traceability has always been important for the food and beverage industry, in recent years the need for real-time recalls has increased in Australia due to plant processing errors or recalls from Food Standards Australia New Zealand (FSANZ).

An effective tracking and tracing program comprises a number of components, starting with accurate and fast identification. For years, the identification workhorse has been the ubiquitous barcode, but RFID technology is increasingly found in food tracing as technology improves and prices come down.

SICK Australia presented the RFU63x read/write unit to Kagome in 2012. The device is a UHF RFID solution for the tracking and tracing of re-usable containers that also offers the possibility of bulk detection. Furthermore, the RFU63x can be used as an intelligent stand-alone system. Integrated functions such as data processing and filtering ensure stable reading performance and short reading cycles.

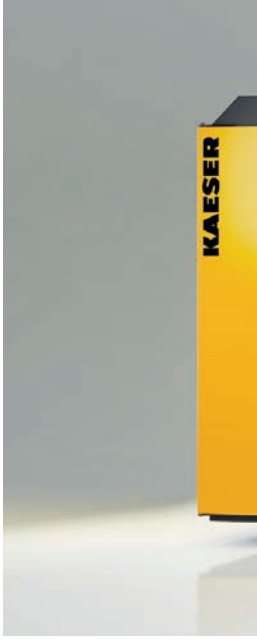
In January 2013, Kagome installed six RFU63x units from SICK — each equipped with three antennas for double-stacked bins — at the weighbridge and discharge hill at the factory in Echuca. Resistant and stable RFID tags were attached to the tomato bins, accompanying them right from the start of the harvesting process.

RFID allows real-time identification of where the tomatoes come from. Due to paperless identification, no truck driver has to leave the truck at the weighbridge anymore, so driver safety is enhanced. The trucks are spending less time at the weighbridge and traffic jams in front of the weighbridge and the tomato drop hill have become a thing of the past.

As the truck time at the weighbridge has been reduced from 12 minutes to two minutes, the truck driver can manage one extra trip per 12-hour shift. With a fleet of 12 trucks and one truck loading an average of 42 tonnes of tomatoes, this means a productivity gain of 504 tonnes.

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

SICK Pty Ltd
www.sick.com.au



LINEAR ACTUATORS

The Rollon R-Smart linear actuator is specifically designed for long strokes and high load capacity. It features high efficiency, due to its use of dual linear bearing rails and is of simple construction, allowing quick fitting and easy lubrication as the rails are positioned externally to the aluminium profile.

The 200 mm size is suitable for automating large gantries requiring long strokes and high load-carrying capacity. This even allows the use of a cantilever design due to its high overturning-moment capacity.

The series features a steel-reinforced polyurethane toothed belt drive and dual linear bearing rails with two carriages per rail to support the load, all mounted on an anodised extruded aluminium profile of 6060 alloy. The R-Smart 220 has a static vertical load capacity of 237,000 N.

These features give the benefit of moving heavy loads with smooth motion, as well as speeds of up to 4 m/s over a maximum useful stroke length of up to 6 m. Longer strokes are possible with a joined version. Rollon's S-Smart and E-Smart actuator ranges can also be combined to provide 3-axis or 2-axis gantries for pick-and-place operations.

A range of adapters and accessories is also available for the fitting of servo motors and planetary gearheads to the actuators, all of which are available to produce a complete motion system.

Motion Technologies Pty Ltd
www.motiontech.com.au

ROTARY SCREW COMPRESSORS

The recently redesigned DSDX series rotary screw compressors from Kaeser now feature an efficient IE4 motor. Said to be the most efficient motor available, IE4 complies with, and exceeds, prevailing Australian regulations for three-phase electric motors.

The rotary screw compressors feature an electronic Thermo Management system, which controls the oil temperature to ensure a safe and consistent differential from the dewpoint temperature. This feature also creates energy savings by preventing unnecessarily high screw compressor block discharge temperatures.

A sophisticated design and the inclusion of a 1:1 drive configuration combine to enhance the efficiency of the compressors further. The screw compressor blocks have been completely redesigned and now feature a refined Sigma Profile design. Other improvements include a redesigned inlet valve and reduced internal pressure losses, delivering improved specific power on previous models.

The updated DSDX models include an integrated Kaeser axial centrifugal separator and no-loss electronic Eco-Condensate drain. This ensures high moisture separation performance with minimal pressure loss. Condensate separation is performed with maximum reliability and energy efficiency at all times.

For optimum performance, the rotary screw compressors feature the innovative Sigma Control 2 controller. Equipped with its own web server, operational data as well as maintenance and alarm messages can be viewed from any PC running a standard internet browser, simplifying compressor operation and maintenance.

The series includes both water- and air-cooled models. Versions are also available with Sigma Frequency Control.

Kaeser Compressors Australia

www.kaeser.com

TACHOMETER, SPEED AND FLOW DISPLAYS

The WPMZ series 1/8 DIN digital panel meters have a 2.4″ TFT full-colour LCD screen, and the front panel enclosure is IP66 rated.

The digital tachometer display is a small and cost-effective device displaying the RPM values of engines and various motors for rotation speed measurement. The display is selectable as a single/dual display, vertical display, graph display or alarm setpoints. Four setpoints are available for a comparative output, while 2-channel models are also available. Optional outputs include analog, BCD open collector, RS232C and RS485 (Modbus).

The WPMZ-5 tachometer model has an input frequency range of 10 MHz to 500 kHz and is dual input selectable (calculating between inputs).

WPMZ-6 flow rate model has an input frequency range of 10 MHz to 120 kHz, and can provide a sampling rate of 100 samples/s when using the analog input.

Bestech Australia Pty Ltd
www.bestech.com.au

SIGNAL CONDITIONERS

The VEGATOR 100 series is a standardised platform for signal conditioning instruments and barriers.

In line with Vega's plics philosophy, the housing has an integrated electronics and operating design, delivering consistency and uniformity even among simple components such as signal conditioning instruments and isolating modules. Everything follows a modular concept: channel numbers and functions are clearly structured, making selection easier, along with standardised order codes, connectors, temperature ranges and operating instructions, across the whole series.

All devices of the VEGATOR 100 series have identical dimensions. Even in the case of the 2-channel models, VEGA maintains the standard width at 20 mm. This allows a higher installation density and number of channels to save valuable space in control cabinets. Careful attention to design ensures that the hazardous areas — Ex and non-Ex zones — are clearly, cleanly and, above all, safely separated.

The VEGATOR 111/112 and VEGATOR 121/122 signal conditioning instruments for point level detection can be used in conjunction with vibrating level switches VEGASWING, VEGAVIB and VEGAWAVE in different electronics versions. Typical applications include monitoring functions such as high level alarm or dry run protection. Users can also benefit from the high-quality test function. By means of a test button, SIL and WHG function tests can be easily and conveniently performed without having to dismount the level switch — a time-consuming operation — and the signal conditioning instruments confirm the successful completion of a test via LED.

VEGA Australia Pty Ltd
www.vega.com/au

CHILLED MIRROR HYGROMETER

Michell Instruments has redesigned its S8000 Integrale chilled mirror hygrometer to take advantage of improvements in technology since its introduction in 2007.

The improvements cover three areas — mechanical design for increased durability and strength, improved sensor head for faster readings at lower dewpoints and increased simplicity of use with a touch-screen interface with intuitive menus. The S8000 Integrale MKII now includes many of the features found in Michell's top-of-the-range chilled mirror instrument, the S8000 RS.

The S8000 Integrale MKII has an improved sensor head design, featuring improved integrity and sealing mechanisms. This means that the Integrale now has a faster response to -60°Cdp, improved sensitivity and faster reaction to transient dewpoint conditions. The pressure rating of the instrument has improved from 17 to 20 barg, and the unit still has the same accuracy of ±0.1°Cdp.

The updated chassis design is not purely cosmetic. As well as being more durable and resistant to scratches, the casing now facilitates easier access for maintenance: there are just four screws to remove rather than 18 on the previous model.

The full colour touch-screen interface is intuitive and makes the instrument both easy to use and interrogate. The S8000 Integrale also offers more options for communication. As well as Modbus RTU over USB, it offers the option for Ethernet, RS232 and RS485.

Typical applications for the s8000 Integrale include high-precision moisture measurements in metrology laboratories and cleanrooms as well as industrial applications.

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

AS I SEE IT

THE RECENT RISE OF ROBOTS IN MANUFACTURING

One of the most significant developments in industrial automation technology has been the proliferation of robots in manufacturing. It has been most exciting to see, as robots will undoubtedly provide substantial productivity increases. There are numerous reasons for the increasing acceptance of robots - lower costs and functionality improvements are two factors, but there are other drivers.

In the past, robots were handled by companies dedicated to their implementation. They worked largely in isolation, detached from the rest of the process they operated in. Robotic programming was seen as a somewhat esoteric science. Kinematics, the physics of objects moving in three-dimensional space, invariably involved complex mathematical calculations and was considered beyond all but the most qualified engineers.

But this has dramatically changed recently. Perhaps the biggest breakthrough for robots into the mainstream has been the integration of their programming into standard industrial controllers. The science and calculations have moved away from low-level manual work and into discrete, self-contained function blocks (FBs). These FBs handle all the low-level details, abstracting them away from the programmer and allowing them to concentrate on the rest of the control system.

Robotic FBs are like any other IEC61131 compliant FB, leveraging off this well-established industrial programming standard. They are therefore immediately recognisable to automation engineers and will seamlessly integrate into their programs. So when a robotic FB is used in the ladder diagram language, they are powered by input contacts and manipulate output coils, just like any other FB. Similarly, when used in structured text, they receive input parameters for operation and assign results to output parameters.

But this is not to say the complexity of the mathematics involved has diminished. By no means! Take for example conveyor tracking, where robotic movements need to be synchronised to a moving workpiece - a common pick-and-place procedure. It requires data from an advanced vision system to be calibrated (which provides 'eyes' for the robot), considerable number crunching to calculate the kinematic transformations, and synchronous output to all the servos that control the robot. As a single controller can handle multiple robots, this same procedure can be iterated several times per cyclic scan! To achieve reasonable accuracy, this all needs to be done at high speed, requiring an advanced processor and an extremely fast control network. However, programmers are mostly unaware of these activities, as they happen behind the scenes.

Having a single controller that supports both standard control operations (eg, sequencing and logic) and robotic functions makes good sense. Many robotic movements need to be interlocked with the rest of the control system, especially the mandatory safety-rated ones. Programming is greatly simplified by utilising the same languages engineers are already familiar with and that the rest of the control program already uses. Fault-finding is enhanced too, as all warnings and errors are generated from the one source, requiring a single tool set.

The recent surge of interest in robotics for manufacturing has been most exciting. It has been driven by numerous factors, but the demystification of robotic programming, its integration into standard industrial controllers and the use of the now-entrenched IEC languages have all been critical influences to robots becoming mainstream.

Harry Mulder has been involved in the industrial control industry almost 30 years, the last 25 years spent at OMRON Electronics. With a degree in computer science, his experience includes sales, engineering and product management. He currently manages engineering and marketing teams in Australia and New Zealand but still enjoys getting involved with day-to-day problem solving.

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