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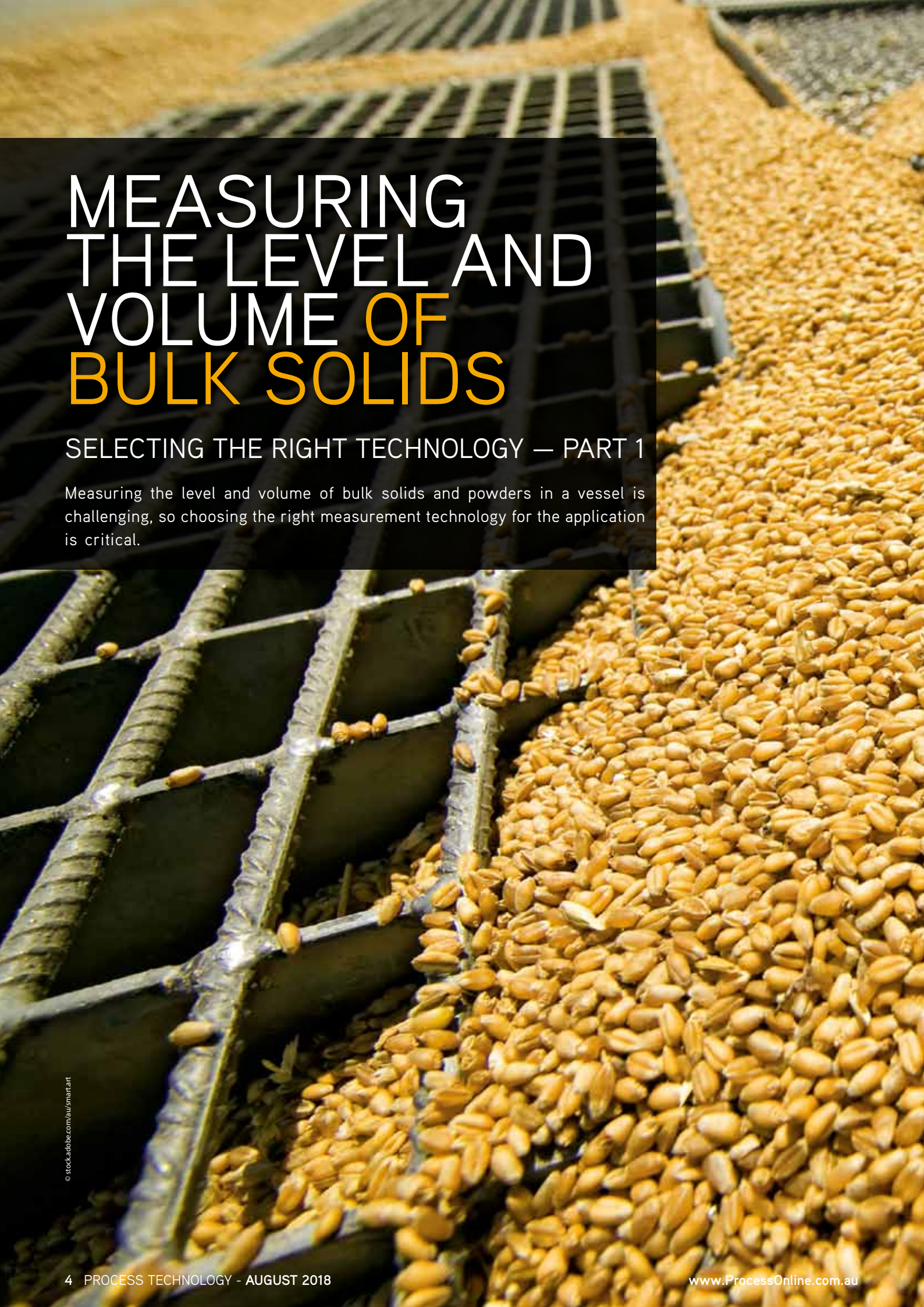
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MEASURING THE LEVEL AND VOLUME OF BULK SOLIDS

SELECTING THE RIGHT TECHNOLOGY — PART 1

Measuring the level and volume of bulk solids and powders in a vessel is challenging, so choosing the right measurement technology for the application is critical.



When it comes to the measurement of level and volume for bulk solids, there are drawbacks in using traditional mechanical measurement devices, in contrast to the advantages of automated technologies such as non-contacting radar, guided wave radar, and acoustic phased-array antennas. Each technology has its relative strengths and weaknesses, and so will be more or less suited to each application.

Measuring bulk solids

Measuring the level and volume of powders or bulk solids within a vessel is more complex than measuring liquid level, and the most fundamental challenge is the uneven and shifting nature of the material surface. When determining liquid level, there is only the need to measure a single point on the surface, because the level at that one location will be the same as at any other point within the vessel. However, the same is not true in solids applications, where the material surface is rarely flat. Instead, the surface consists of a multitude of peaks and troughs that constantly change as the vessel is both filled and emptied. Depending on how much the material in question can pile before sliding, the number of filling and emptying points, and the width of the vessel, the difference between the level of a peak and a trough can be very large. The particles of the materials can also vary from very fine powders to large rocks. And these variations can also have an effect on the effectiveness of measurement devices.

Additionally, since solids are dry materials, there is typically dust in the space above them, especially during filling. This dusty environment can cause issues with different measurement technologies. And dust mixed with moisture can create build-up on the surfaces of measurement devices.

Solids can also have application conditions which change significantly over time in a way that's not obvious from outside the vessel. For example, the wood chips, ore or grain received in spring can be completely different from what is delivered in the summer, and can sit completely differently in

the vessel with a different angle of repose. Perhaps there is changing moisture content, humidity or particle size, or different settling, or compaction. Unlike liquids, solids applications can be difficult to cycle from 0–100% during commissioning to find any reflective 'surprises' under the surface. Because of this, solids applications may need the configuration checked or tweaked periodically, especially on larger vessels. Having a remote connection to the devices via a mobile service or a network connection can be extremely beneficial.

Solids vessels are often quite large, and measurements are made from the tops of them. Automating measurements is an important key to keeping workers on the ground instead of requiring them to climb to the top of the large vessels, which raises safety concerns and wastes valuable time.

Upgrading from mechanical or manual methods

Mechanical devices such as yo-yos have been used for many years to perform solids level measurement. These devices lower a weight onto the surface of the material. By measuring the length of wire required for the weight to touch the surface, the level of the material can be determined. These systems require regular maintenance — putting personnel at risk by being exposed to hazardous conditions on tall silos — and they have limitations in terms of accuracy, reliability and repeatability of measurement. Additionally, the weight can continue to move past the top surface, so you are not getting an accurate point measurement. If the measurement is made during the filling cycle, the weight and cable could experience pull forces. Also, if the weight breaks free for any reason, it can cause damage to machinery downstream. All of these issues affect the reliability of these systems.

Measurements of this type can be made by automated means or done manually. Some silos have no automated systems. Manual measurements require operators to climb the silo to take the measurement and may have an impact on the repeatability of the measurement. They may have operators



using a yo-yo or another method to take manual measurements from the top of the vessel. Many manual measurements methods continue to be used because that is the way it has always been done or because there were issues with using or implementing an automated system. Much progress has been made on alternative automated systems for solids measurement. Consequently, many operators of modern production plants have chosen to upgrade to continuous automatic measurement and control technology, helping to improve safety, reliability and repeatability and enabling accurate and reliable continuous measurements to be accessed from remote locations such as a control room.

Measurement technologies

Some of the most common technologies for solids measurement include non-contacting radar, guided wave radar, acoustic phased-array antennas, ultrasonics and load cells. Although ultrasonics and load cells have traditionally been used for solids measurement, ultrasonics can have issues with dust, and load cells need regular calibration and have limitations for vessel sizes. Non-contacting radar, guided wave radar and acoustic phased-array antennas are newer technologies and have quite a few advantages for solids measurement, although selecting the appropriate technology depends on the application.

Solids measurement applications can be divided into two main types. The first is continuous level measurement in smaller vessels used within the production process. The main benefit of a continuous level measurement is that it can be used to control a process, or make sure that there is material available. In such applications, quick changes in surface level can occur due to the speed at



GUIDED WAVE RADAR LEVEL TRANSMITTERS ARE ESPECIALLY WELL SUITED FOR SMALLER VESSELS WITH A DIAMETER OF LESS THAN 10 M CONTAINING POWDERS AND SMALL GRANULAR MATERIALS, AND WHERE THE INSTALLATION AREA IS RESTRICTED.

which material enters and exits the vessel. This requires technology that can perform very fast level measurements and respond to these changes quickly.

The second application type is volume measurement in larger vessels or warehouses used either in the production process or for bulk storage, which is often related to a demand for inventory control. In these applications, there is a much greater surface area to monitor and inaccurate measurement can lead to a huge discrepancy in product volume; there are relatively big vessels in the production process, as well. Here, the surface level changes at a much slower rate and, therefore, device speed is less relevant — but greater accuracy is required to support better inventory management. When selecting a measurement device, it is important to understand whether volume or level is the desired primary measurement, as this will influence the technology choice.

Guided wave radar

Guided wave radar level transmitters provide continuous level measurements, based on microwave technology. Low energy microwave pulses are guided down a probe, and when the microwaves are reflected from the material surface back to the transmitter, the level can be measured. If the dielectric constant of the material is low, a proportion of the emitted pulse continues down the probe, which allows the probe end to also be detected.

Guided wave radar level transmitters are especially well suited for smaller vessels with a diameter of less than 10 m containing powders and small granular materials, and where the installation area is restricted. These devices can use probe-end projection functionality to allow for measurements when the surface pulse is too weak to be detected. This commonly occurs when the material dielectric constant is very low, especially in combination with a long distance to the surface, or electromagnetic interference. When the dielectric constant of the material being measured is low, only a portion of the electrical signal is reflected off the top of the material. The rest of the signal continues down the probe. When the signal reaches the end of the probe, there is a strong reflection. Since the microwave signal propagates more slowly in the material than it does in air, this echo is seen at a distance further than the actual probe end. With probe-end projection technology, the actual probe length, the probe end reflection echo location and the dielectric of the material can be used to calculate the level of the material when the initial reflection from the top of the material is not strong enough to make a direct reading. This function is recommended for solids with a dielectric constant less than or equal to two (eg, perlite or plastic pellets).



Figure 1: Guided wave radar and non-contacting radar installation.



Figure 2: Example of a non-contacting radar level instrument for solids.

In solids applications, the material can cause down-pull forces on vessel roofs, so the vessel roof must be able to withstand the maximum probe tensile load, which depends on silo size, material density and the friction coefficient. Forces increase with the buried length, the vessel width and the probe diameter. A flexible single lead probe is the most suitable choice for guided wave radar in solids applications, but the tensile load should be calculated and the most appropriate cable thickness should be used. And an anchored probe will increase the forces on a probe by two to ten times.

Non-contacting radar

Non-contacting radar level transmitters also provide continuous level measurements, but there is no contact with the material surface. Pulse radar or frequency modulated continuous wave (FMCW) techniques are used to perform the measurement. FMCW devices can improve the measurement of solids compared to pulse transmitters because they continuously send out microwave energy, meaning that the total

amount of energy sent to the surface will be much higher. In practice, this means that FMCW transmitters are much better than pulse devices at determining weak echoes within a noisy environment. FMCW devices also have much higher resolution than pulse radars. With pulse radar, microwaves are emitted towards the material and reflected to the sensor, with the level being directly proportional to the time taken between the microwave signal being transmitted and received. In FMCW devices, the device transmits a continuous signal sweep with a constantly changing frequency. The frequency of the reflected signal is compared with the frequency of the signal transmitted at that moment. The difference between these frequencies is proportional to the distance from the radar to the surface, which enables the level to be measured. Inclining or sloping surfaces deflect energy away from the radar and can generate several small reflections.

By using a dedicated solids algorithm, some non-contacting radar level transmitters

can provide high reliability even with very fast changes in level. Non-contacting radar devices still see only the portion of surface within their beam angle. Like guided wave radar, this makes them a suitable choice for applications using smaller vessels or silos, where fast movements are possible but accurate volume measurements are seldom needed. Unlike guided wave radar, there are no restrictions with respect to the weight of the material and pull forces. If the instrument is sufficiently energy efficient that it requires only two wires for power and communication, then additional cabling infrastructure will not be required.

In Part 2

In part 2 of this article we will look at the benefits of acoustic phased-array antennas, as well as the various challenges of bulk solid level measurement for different technologies.

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A reliable water supply for the Ruhr area

Roughly 4.6 million people live along the Ruhr River in the most heavily populated area of Germany. The river was an important waterway and water supply in the midst of the industrial development of the eighteenth and nineteenth centuries, and it therefore assumed a key role as a centre of commerce in the Ruhr area named after it. Mills and mines were developed and provided for the prosperity of the region. And then suddenly the Ruhr needed help, because the boom it spawned had a significant downside: wastewater from industry, mining and agriculture resulted in such heavy pollution that the Ruhr was at risk as the main water supply for the population. The people of Westphalia quickly took action to stabilise the water quality of their river with the introduction of the Ruhr Cleanliness Act in 1913, one of the first-ever environmental protection laws in Germany.

Today, Wasserwerke Westfalen GmbH also acts with a sense of responsibility for the river in fulfilling its role as water supplier. It provides roughly 100 million cubic metres of drinking water to 1.5 million residents per year. "However, we're not just a supplier of drinking water, but also a producer of regenerative electric power with five hydropower plants along the Ruhr," said Michael Schwarze, Head of Central Operations Management at Wasserwerke Westfalen GmbH. "In addition, we operate many water towers, pressurising systems and other facilities for our two parent companies. The network extends from the Münsterland region in the south to the central and eastern Ruhr area all the way to the Sauerland region in the north.

"As a water utility, we think in generations. We bear a great responsibility for the quality of life of those living in the region," he said.

Monitoring an infrastructure that spans roughly 80 km has to be well planned. The system also has to be standardised and easy to operate, and it shouldn't be beset with training expenses for personnel or prone to operating errors. Wasserwerke Westfalen recently standardised its process control system with a Simatic PCS7 system from Siemens, along with electrical engineering and automation components.

Before centralisation, all automation systems and computers for the individual power plants and facilities operated independently from one another. "Administration, engineering and all of the other tasks that arise always had to be handled on-site. This required enormous effort, both logistically and in terms of time," recalled Achim Koslowski, the manager responsible for instrumentation and control at Wasserwerke Westfalen GmbH.

Now all of the facilities and stations are controlled and monitored from a central control room. This has many advantages. "Thanks to central engineering, we not only save travel time, we can also easily manage the extensive modernisation measures and many components and systems with our comparatively small team of four project engineers," said Koslowski. "Projects can be better planned and structured, and we can also assign subprojects to our external partners more easily than before. Thanks to the preliminary work in the migration project, we now also have an absolutely stable and reliable solution, so that we can concentrate fully on our new projects."

Or, put another way: future projects can be easily planned, and their simple and cost-effective control will ensure that the drinking water in the Ruhr area will continue to be high quality and affordable in the years to come.

These advantages explain why a standardised operating philosophy is so important to the utility. This philosophy also means that operations are structured in the same way on all hierarchical levels and at all locations. The foundation is a standard library of functions from Siemens for implementing automation and process control tasks.

The benefit is clear to Schwarze: "We have to represent our complex system structure with a wide range of technology and operating hierarchies in the control system. The standard library allows us to easily solve many tasks without extensive programming effort using standardised and tested modules. We've largely standardised functions and messages so that the process control always has the same look and feel."

The process control system isn't the first solution in which Wasserwerke Westfalen GmbH has relied on Siemens as technology partner. Before the Simatic PCS 7, there were already drive and communication components that were operating reliably. That's why the water utility is currently implementing additional projects with Siemens components, including field equipment, switchgear, protection systems and network security solutions.

"We always have something to do and improvements to make in our equipment so that we can ensure a reliable supply of drinking water for the next generation," said Schwarze. "And in Siemens we've found a partner that can support us with successful solutions."

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On the open profile ends, the SMART-TERMINAL is closed with covers made of ASA+PC-FR material. The enclosures are available with profiles in the dimensions 170 x 50 mm (width x height) and in the profile lengths of 160, 200 and 240 mm. They are designed to fit standard display and touch solutions from 4.3" up to a maximum of 8". To ensure optimum operation, a kit for a 12° angle of inclination is available in the range of accessories.

The enclosures can be further modified by the OKW Service Centre. The options include, among others, mechanical machining for interfaces, a customer-specific profile length, individual lettering and printing, or the manufacture and installation of digitally printed foils.

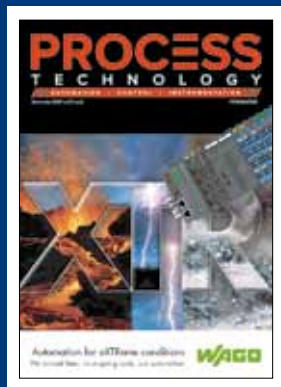
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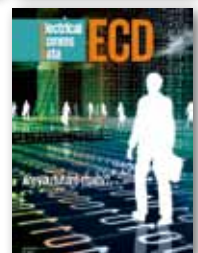
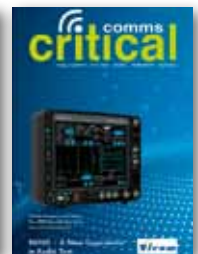
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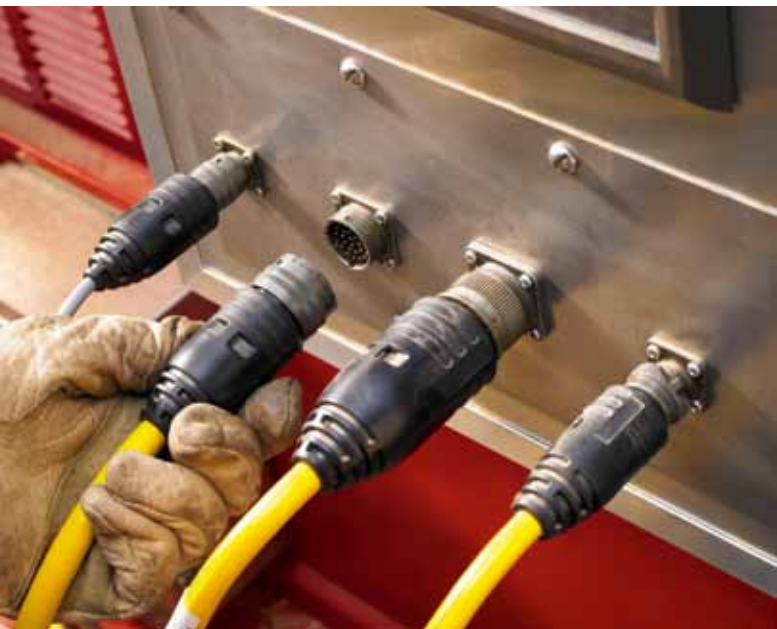
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Bayonet and reverse bayonet are frequently used in mobile equipment applications. The MIL-DTL-26482 Series I bayonet style connectors provide a quick-connect and disconnect solution that is well equipped to handle applications with vibration and a high number of circuits. This connector is suitable for applications where mating and unmating are frequent and where higher pin counts are needed for a high number of circuits or signals.

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The device is available in seven versions: three for fixed installation (Type A) with a flame retardant PVC sheath; a halogen-free and flame retardant FRNC sheath; or a PUR sheath (halogen-free, flame retardant and with increased mechanical strength). In addition, two versions are available for flexible use (Type B) with a PVC sheath or halogen-free and flame retardant FRNC sheath, as well as two solutions for highly flexible use (Type C) with a PVC sheath or a PUR sheath. Four further versions have reduced dimensions for use in constricted applications.

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17 safety functions, including customisable stopping time and distance, make collaborative automation easier. Certified by TÜV Nord, all safety functions are in compliance with the industry best practice EN ISO 13849-1 and EN ISO 10218-1 (Cat. 3 PLd) machinery safety standards for unobstructed human-robot collaboration.

Universal Robots

www.universal-robots.com



CONFIGURABLE SAMPLING SYSTEM

Michell Instruments has launched a configurable sampling system for measuring trace moisture in hazardous areas. The ES70 simplifies specifying complex, multi-optional sampling systems, not only ensuring the correct options are selected and but also reducing lead times.

To configure a system, users simply pick one option from each category to fit their application. Choices include hazardous area certification, enclosure type, whether the measurement will be for moisture in gases or liquids, and sample conditioning options such as filtration, cooling/heating and flow control.

The ES70 is available with Michell's Promet IS, Liquidew IS, Easidew PRO XP or Easidew PRO IS sensors. These options measure trace moisture in process gases down to -100°C dp and in hydrocarbon liquids down to 0.001 ppmw.

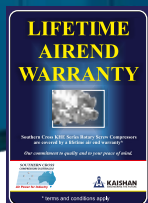
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CLOUD-DRIVEN PROCESS HISTORIANS

DELIVERING RICHER INSIGHT FOR
STRATEGIC DECISIONS

It's time to look at enterprise process data in new ways and with new technology.

A dramatic shift is occurring in the process industries as industrial companies gain an appreciation for the potential impact that cloud and big data could have on their operations. The cloud is the enabler for the Industrial Internet of Things (IIoT), which has the power to transform every aspect of a business, not least the strategically important process historian function.

In fact, the cloud needs a process historian for big data to be fully exploited. This is because the effective deployment of IIoT requires three things:

1. The ability to securely gather and access large amounts of data.
2. Analytics technology to make sense of the data.
3. Domain expertise to determine how to act upon the data.

So, as industrial companies begin to transform themselves digitally, process historians must similarly evolve to unlock the potential of IIoT.

This article examines the ideal way to migrate process historians to the cloud and the benefit these next-generation systems will have on both users and the business.

Cloud's potential to transform process historians

Process historians made their debut in the 1980s and today are a part of every process facility's system architecture. Later, high-

level historians were introduced for the enterprise while process historians handled day-to-day management and plant floor improvements. High-level historians would operate in unison with process historians to make enterprise-wide information available to corporate stakeholders.

The cloud represents the next step in the evolution of process historians. To understand the cloud's impact on historians, however, it's essential to understand the drivers behind cloud adoption.

To support the growth of smart devices, additional data storage is required. The cloud is the natural solution. Cloud technologies by their nature can scale, and they can exploit large, complex datasets for analytics. Data analytics initiatives are high on corporate priority lists: a recent survey of 200 manufacturing executives revealed that over two-thirds of companies are now investing in this area, and have plans to increase that investment.

Even as industrial companies cut expenditure, their investment in cloud is rising, and it's easy to see why. Cloud technologies deliver unprecedented flexibility and scalability, and can dramatically reduce costs. With the cloud, systems can be set up faster — by scaling up as opposed to starting from scratch.

One of the benefits of the cloud is that it shifts a company's IT responsibilities to a cloud provider, reducing infrastructure



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costs. Additionally, a cloud provider can leverage economies of scale to offer a compelling value proposition.

The real value of the cloud, though, is in its ability to exploit historical data. Today, companies are demanding more and more data be collected and used throughout the business, but the scalability limits of current process historians cannot keep pace with demand. With cloud technology, a site that previously collected process data at minute intervals using a conventional historian can now collect tags at vastly higher speeds and frequencies. Cloud technologies can scale in terms of throughput and storage far better than current historian architectures bound to a server.

They also use clustering, load balancing and feature storage that supports virtually unlimited scaling.

The cloud's scalability is a natural fit for multisite organisations. Today, different sites within an enterprise tend to have their own historians, making it difficult to perform cross-site analysis and troubleshooting. With the cloud, it's easy to integrate data across different sites and make it available across the enterprise.

Multitenancy is a key element in lowering the cost of these systems and enabling vendors to realise economies of scale. Individual systems can be expensive and require significant upfront investment. However, if shared by small and medium-sized customers, they can be more economical.

The cloud is also ideal for effective data analytics. Technologies such as Hadoop, R and Python can analyse process data and other data types to reveal insights not possible using existing historian tools.

Current industry approaches to placing a historian in the cloud

To pull process data into cloud-based solutions, most companies are taking one of two approaches: virtualising their process historian in the cloud or using a data lake. Let's look at these approaches in more detail.

Virtualising a process historian in the cloud

One way to reduce hardware infrastructure is to virtualise servers in the cloud. Most process historians support virtualisation. Manufacturers are already virtualising server components in the cloud, including their process historians, and this approach is being used by some process historian vendors as a first step toward cloud applications. This allows vendors to offer preconfigured cloud technology to customers.

By taking this approach, virtual images can scale more easily than physical computers and can effectively share server resources. But ultimately, scalability is limited by the historian's traditional

architecture, making the primary reason to choose this approach to reduce hardware infrastructure and cost of ownership.

Data lakes

In this scenario, data is pulled into a central, less structured database in the cloud, whereupon special tools can be used to manipulate and identify correlations in the data that are not possible with traditional tools. The goal of 'data lakes' is generally to load them with enough process data to support analysis. However, process data generally lacks structure, making it difficult to combine and compare with other data. To resolve this issue, it is useful to arrange data according to an asset model, giving context to process values and allowing easy comparison with similar assets such as compressors or heat exchangers. The data can also be related to sources such as maintenance records, which may identify failures or other periods of interest to correlate.

The process of uploading raw data, organising it and relating it to other data is called 'data wrangling', and it can consume 80% of a project before any meaningful analysis can be performed.

Another characteristic of big data tools is that they don't differentiate time-series from other forms of data. This isn't a major issue for offline analysis, but these tools can struggle to deal with interactive time series queries that are common to the process industries.

Other approaches

Another approach involves data infrastructures based on data lake technologies that are combined with context and analysis tools. In this scenario, customers use vendors to push data to the cloud, typically by generating large offline files. These systems cannot be considered historians, however, as they cannot present data in real time and are therefore more appropriate for batch analysis.

Four imperatives for an effective, cloud-based historian

As the IIoT advances, the lines between process and enterprise historians will eventually blur, if not altogether disappear. Cloud deployment is the primary reason for that change.

There are four features that any effective, cloud-driven historian must support. These include:

1. Traditional time series data, and alarm and event data: Traditional tools can be used to visualise and analyse data. Most analysis and root cause detection on process data is performed more efficiently by visualising data over time to track anomalies and related process variables.
2. Data lake for big data-type analysis: This is a key driver for medium-to-large organisations considering cloud technologies. Plant and site data can be pulled into this environment and analysed with tools that detect hard-to-find correlations.
3. Enterprise asset context data: When working with massive datasets, it is difficult if not impossible to perform analysis without asset context. Tag names are usually only known to local process engineers and operators. Once data is pulled into the cloud and made available to the enterprise, context is needed for users to make sense of it and perform relevant correlations.
4. Broader data types: This means that relevant data is stored in a data lake, and tools can be used on top of the system that



THE CLOUD'S SCALABILITY IS A NATURAL FIT FOR MULTISITE ORGANISATIONS... IT'S EASY TO INTEGRATE DATA ACROSS DIFFERENT SITES AND MAKE IT AVAILABLE ACROSS THE ENTERPRISE.

do not need to connect with anything else. In addition to time series data, the data lake stores information such as alarms and events, production data, transactional data, application data, geolocation data, complex data, and Internet data such as weather or real-time pricing.

Combining a historian and a data lake in the cloud

One way to achieve these goals is to combine a massively scalable historian using native cloud technology with a data lake to facilitate advanced analysis using big data technologies. In this way, it is possible to deliver the real-time process data analysis expected from a traditional enterprise historian plus the batch analysis capability from the data lake, ERP and production data. As a result, enterprise data can be analysed with tools and functions that are already in use at sites and plants, but on a larger scale. Insights found at one plant can be leveraged across all plants.

With a data lake based on a common big data analysis stack such as Hadoop, a company's data scientists can use their preferred tools, and can use the data store to collate other types of data and analyse it against process data across the enterprise.

Once enterprise data is amassed in a single data store, it is important to have a well-defined model for the data, to provide context for anyone trying to make sense of it. While data at the plant level is well known to local control engineers and operators, once it is aggregated at the site or enterprise level it is important to make it easily available to anyone looking to analyse and visualise the information.

Such a service therefore needs to offer smart cloud connector software interfaces that enables users to connect to various data sources and configure the data for transfer to the cloud quickly and easily, particularly from existing plant historians.

Configuring data for transfer to the cloud should be easily achieved by adding tag filters to identify tags and the method of transfer — for example, as raw data or as an aggregation. By taking this approach, a project involving the transfer of data to a data lake can be undertaken in just a couple of hours.

Summary

Next-generation, cloud-driven historians must be more than traditional historians virtualised or developed for the cloud, or more than a lake of unstructured data. The cloud historian of the future must be a combination of both, and much more. It must be the data platform for all cloud applications, as well as for on-site applications that connect to the cloud.

Designed in this way, cloud-driven historians will yield the rich data required for better strategic decisions that will impact profitability and business success.

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Factory upgrade safeguards long-term gelatine production

Gelatine is a multitasking ingredient for countless applications. It is a key ingredient in gummy candies, marshmallows, yogurts, desserts and much more. Food applications are perhaps the best known examples but they're not the only ones with pharmaceuticals, emergency medicine and photographic films also utilising gelatine products.

Derived from the collagen found in the bones, connective tissue, and skin of pigs, cattle, and other animals, gelatine manufacturers must adhere to stringent national and international food processing requirements. These regulations include, but are not limited to, cleanliness of the plant, equipment; and define allowable percentages of additives, flavourings, and colourings.

To help safeguard future production of a large-scaled gelatine manufacturing plant, an innovative risk management approach was undertaken to identify and subsequently replace legacy equipment with assistance from Rockwell Automation.

The ultimate goal was to identify and replace legacy equipment with minimal interruption to production.

The existing legacy DCS was over 15 years old and although it was still in operation, if it were to malfunction or breakdown, there was limited ability to have it operational in a timely manner which presented a production risk too great to ignore.

A vendor selection process was undertaken by the manufacturer to assess new technologies that could provide an effective solution for the plant's requirements. Through this process it was identified that the Rockwell Automation PlantPAx system was the most appropriate choice for this application.

The PlantPAx process automation system is built on a standard-based architecture using Integrated Architecture components. This system helps operators make faster, informed decisions and respond quickly to changing demands. It utilises a common automation platform for seamless integration to increase efficiencies and productivity.

The PlantPAx system connects process, discrete, power, information and safety control into one plant-wide infrastructure, leveraging EtherNet/IP as its backbone. As a result real time information is readily available throughout the enterprise.

According to Sean Doherty, account manager – Food & Beverage at Rockwell Automation, "In addition to the technology capabilities provided by the PlantPAx solution, a key focus for this project was to design a solution to meet the requirements of the plant, while minimising any production loss and operational risks associated with the changeover to the new system."



In the first stage of the project, the Rockwell Automation Global Solutions team were engaged to conduct a Front End Engineering and Design (FEED) specification. As part of this process, technical specifications, scope definition, and risk assessments were evaluated to reduce overall project risks and execution time.

"We conducted a thorough site audit at the plant and documented the existing system and current processes. As part of this, we also consulted with the manufacturer to understand the key requirements of the system and the end-user specifications," explained Doherty.

To address concerns around risk mitigation, an additional level of testing was introduced for the system with

detailed Factory Acceptance Testing (FAT) being conducted at the Rockwell Automation facility. The plant operators were actively involved in the review process and hands-on training as well as testing of the system was conducted to make sure it was functioning to meet all expectations.

The testing was conducted over a two week period to help mitigate any hardware risks and validate it was fully tested and the entire system was working as intended.

When replacing a legacy DCS system, if the field wiring is replaced simultaneously a significant risk is introduced. In this particular manufacturing plant there were approximately 1500 I/O or approximately 4000 wires in the system, which needed upgrading.

"To have someone disconnect 4000 wires and manually reconnect them, the odds are that some of them are not going to be connected correctly, some of them may be back-to-front or loose. This would then add over a week to the commissioning team because you would have to go and test every single field connection," explained Doherty.

"To avoid this, we developed an I/O adaptor card that would allow us to remove the old DCS and module and replace it with our proprietary designed module so we could signal through our system without having to change the I/O wiring. This reduced the changeover time significantly," he said.

This project highlights the importance of careful planning and risk mitigation to deliver a successful outcome. From the initial stage of working together to document existing functionality to testing and commissioning, the new system was integrated seamlessly and three days ahead of schedule.

Within a turnaround time of approximately four days, there was a very smooth transition to the new system and the factory was manufacturing A-grade quality gelatine.

Rockwell Automation Australia

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COMBINED SAFETY SWITCH AND GATE BOX HANDLE



By combining the Euchner CTP transponder-coded safety switch, mounting it on a sturdy lock plate, combining it with a Euchner MGB multifunctional gate box handle module, Treotham Automation has made a compact safety door protection device. The solution is suitable for wherever a slimline switch housing is advantageous, such as on safety fence corner posts.

Concealed mounting holes in the handle module and lock plate protect against tampering. A lockout bar is additionally integrated into the handle module to prevent the plant from starting during maintenance or cleaning work, for example. A simple plug connection reduces wiring work.

This system is compatible with all switches from the CTP family. When combined with CTP-Extended, the system offers additional controls and indicators directly in the switch's cover lid. The resulting switch is a slimline safety door protection device with the properties of an MGB.

The CTP with handle module achieves category 4/PLe in accordance with EN ISO 13849-1, without additional fault exclusion. It complies with all the requirements of EN ISO 14119. With its high degrees of protection IP67 and IP69K and a locking force of 3900 N, the CTP is suitable for demanding environments.

Treotham Automation Pty Ltd
www.treotham.com.au

SINGLE PLATFORM SAFETY SYSTEM

Honeywell Process Solutions (HPS) has released Safety Manager SC, the next generation of its Safety Manager platform. Its modular, scalable design enables it to function as a single platform for all enterprise safety applications, allowing users to consolidate and reduce their training and engineering costs, and spare parts inventories.

Safety Manager SC incorporates a Series C-based controller and Honeywell technologies such as LEAP, Universal Safety IO, offline simulation and Experion integration, which collectively simplify safety system engineering, development and testing.

Safety Manager SC was designed around three pillars: to ensure safety, simplify operations and reduce costs. The solution is SIL2 and SIL3 certified and supports small to large distributed safety applications requiring varying levels of redundancy. SC simplifies operations by seamlessly integrating DCS and safety systems, and improves maintenance and troubleshooting through its simplified design.

Safety Manager SC's smaller footprint, Universal Safety IO and LEAP deliver cost-reducing efficiencies, while offline simulation capabilities allow for faster development and checkout of safety logic.

Safety Manager SC is suitable for hydrocarbon processing companies with greenfield projects requiring SIL2 or SIL3 solutions for distributed and safety applications, or standalone safety solutions.

Honeywell Process Solutions
www.honeywellprocess.com



SAFETY SWITCH SYSTEM WITH IO-LINK

The latest safety switch system from Phoenix Contact consists of a contact-free, coded PSRswitch safety switch and the PSRmini safety relay with IO-Link.

The electronic safety switch is used for safety door and position monitoring in machines and production systems. The switch with M12 connection technology features a compact design and can be flexibly mounted on doors and guards. Due to the integrated RFID technology, it provides maximum protection against manipulation for a high level of safety. The safety switches are designed for standalone operation or can be configured in a logical series connection up to PLe in accordance with EN ISO 14119.



In combination with the PSRmini PSR-MC42 relay, important status information can be transferred to the controller via IO-Link. The machine operator thus receives a complete solution with more diagnostic possibilities for the smart factory.

Phoenix Contact Pty Ltd
www.phoenixcontact.com.au

TEST SUITE FOR PRESSURE SAFETY VALVES

In the past, it was difficult to test pressure safety valves (PSVs) because a digital gauge, a steam or gas source and a clipboard were needed. With the Ralston Instruments PSV test suite of software and hardware, it is possible to conduct the test and record most of the information on the calibrator.

The PSV test mode captures the PSV crack and reseal pressure by logging pressure at 128 times per second. The PSV mode also allows the user to select from standards such as ASME Boiler Code Section 8, simple crack tests or conditional crack tests where the allowable error may depend on the pressure of the PSV. The user can enter the pressure of the valve at the time of test and type in any other important information on the FieldLab equipment. When the user returns to the office, they can download all the relevant information and create the certificates.

The PSV test mode works with steam and gas valves as well as liquid valves, where the user needs to witness the first steady stream of liquid prior to recording the crack pressure. It also has the option of running a leak test and logging the change in pressure and whether any leakage was observed.

The FieldLab is available from 200 kPa to 70 MPa, so it covers the ranges of most PSVs in the field. It is also IECEx rated Ex ia IIC T4 Ga (-10 to +50°C).

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INTRINSICALLY SAFE ETHERCAT I/O



The EtherCAT Terminals in the ELX series from Beckhoff have been expanded with the addition of analog input terminals with TwinSAFE SC (Single Channel) technology. The compact I/O terminals can be used to support applications in hazardous areas that require both intrinsically safe signal transmission and functional safety capabilities.

The compact ELX series terminals, certified in compliance with the ATEX and IECEx standards, enable direct connection of intrinsically safe field devices through to Zone 0/20 based on an integrated safety barrier, utilising TwinSAFE SC technology. The terminal designs extended by TwinSAFE SC technology now also make it possible to achieve a safety level equivalent to

PL d/Cat 3 according to EN ISO 13849-1 or SIL 2 according to EN 62061. In this way, it is possible to use all process data existing in a system for safety technology too, such as to monitor the speed of fans in areas sensitive to explosion hazards, for example.

The I/Os are available as 12 mm-wide terminals with two or four analog input channels for 0/4–20 mA, and for RTD resistance sensors, thermocouples/mV and strain gauges. A single-channel terminal is also available for the direct connection of intrinsically safe incremental encoders, which evaluates a diagnostic-enabled NAMUR signal in accordance with IEC 60947-5-6.

With the aid of TwinSAFE SC technology, it is possible to make use of standard signals for safety-related tasks in any network or fieldbus system. The data from a TwinSAFE SC terminal is fed to the TwinSAFE Logic, where it undergoes safety-related multichannel processing. The data originating from different sources is analysed, checked for plausibility and submitted to a voting process.

Beckhoff Automation Pty Ltd

www.beckhoff.com

ABSENCE-OF-VOLTAGE TESTER

Panduit has released its VeriSafe absence-of-voltage tester in the Asia-Pacific market.

Current procedures for verifying the safe use of electrical panels are subject to human error and time-consuming. It is also necessary for an operator wearing a protective suit to first open a panel in an unknown state in order to test it, placing workers at risk of injury or death. While voltage indicators can confirm certain known states where an electrical panel is known not to be safe, they do not confirm that a panel is certainly safe from hazards such as residual current.

Panduit's approach to electrical safety with VeriSafe replaces the manual process of verifying an electrically safe environment by permanently installing an automated tester on the panel door. This minimises the risk of workers being exposed to electrical hazards by verifying the absence of voltage even before the equipment is accessed. It also provides workers with a firm confirmation that the panel is safe, as opposed to knowing that common but not all dangers have been tested for.



VeriSafe ensures the entire process of verifying absence of voltage is performed in the proper sequence — every time, every test. At the same time, the failsafe process performed by the product tests the tester itself, verifies installation, checks for voltage, verifies installation and retests the tester. All this is automatically performed at the push of a button in sequence — with no human risk of exposure to electrical hazards.

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A crushing success for Teusner Wines



Based in one of Australia's most well-known wine-producing regions, Teusner Wines has been making a variety of wines in the Barossa Valley for over 15 years. However, the heritage of the company's wines far exceeds this, sourcing fruit from vineyards in the region that are up to 130 years old.

Everything is crushed one small picking bin at a time so that Teusner can keep a close eye on colour, flavour, aroma and structure, ensuring that the eminent flavours found in old Barossa vineyards take centre stage in the wines. Compressed air plays an important role in this process, powering up the pneumatic presses that are responsible for pressing the grapes. The pneumatic press is filled with grapes and, once the door has been closed, compressed air is used to inflate a sealed bag within the press, which effectively pushes the grapes against a large sieve that softly squeezes the remaining juice out.

To keep up with growing demand, Teusner recently developed a much larger purpose-built winery. This included sourcing two higher capacity pneumatic presses, which of course created a requirement for a larger capacity compressed air system.

With a typical harvest lasting only three months, the window to process the grapes is fairly short. It was therefore important to Teusner that it invested in a compressed air system that would be efficient, allowing the company to maximise the harvest period.

Having received a recommendation for the Kaeser compressor for this application, owner Kym Teusner contacted the local authorised Kaeser partner, Mobile Compressed Air (MCA), for a solution. After reviewing Teusner's requirements, MCA recommended and subsequently installed two Kaeser SK 25 rotary screw compressors along with a 5000 L air receiver.

Filling the presses with the grapes is a labour-intensive process, so when a two-press system is in operation — as is the case at Teusner — they tend to run in separate sequences. This results in flatter air

demand cycles. MCA was therefore able to recommend the installation of two 15 kW rotary screw compressors to meet the compressed air requirements rather than one larger unit, as the time between presses gives the two compressors time to refresh the air receiver, bringing it back up to pressure between the crushing cycles. For Teusner this meant cost savings, not only in terms of the initial capital investment cost, but also the longer term associated life cycle costs of running the compressed air system.

The SK series from Kaeser Compressors would also provide the efficiency that Teusner required, not only delivering more compressed air for less power consumption, but also combining ease of use and maintenance with versatility in an environmentally responsible design.

At the heart of every SK series rotary screw compressor lies a premium-quality screw compressor block featuring the Kaeser Sigma profile rotors. Efficiency is assured with flow-optimised rotors that are able to achieve power savings of up to 15% compared with conventional screw compressor block rotor profiles.

In addition, the SK series features a cooling system that uses a high-efficiency dual-flow fan and separate airflow channels for cooling of the motor, the fluid/compressed air cooler and the control cabinet. This not only achieves optimum cooling performance, low compressed air discharge temperatures and minimal sound levels, it also promotes efficient air compression.

The compressed air system at Teusner Wines has now been up and running for over a year.

"We have now had the Kaeser compressed air system in play for one harvest and it worked perfectly," said Teusner. "We have been really happy with the quality of the machines and the level of support we received from Mobile Compressed Air."

Kaeser Compressors Australia

www.kaeser.com.au

MOTOR MANAGEMENT SYSTEM

In process plant applications, the ability for operators to monitor motor performance and further create opportunities to enhance overall energy efficiency is paramount. With energy consumption forming one of the largest operating expenses in process plants, optimising motor energy consumption is a profitable starting point for any kind of energy cost reduction initiative.

Simocode pro from Siemens is a flexible and modular motor control system for low-voltage motors that not only enables dynamic monitoring of motor performance to improve energy efficiency, it also aids in the prevention of downtime by providing smart insights for early problem detection.

Offering easy and direct connection to automation systems such as the Simatic PCS7 from Siemens via Profibus, Profinet, Modbus RTU or EtherNet/IP, Simocode pro implements all motor protection and control functions; provides operational, diagnostic and statistical data; and organises the communication between automation system and motor feeder. From planning and installation, through to ongoing operation and service of the plant or system, the system is designed to increase process control quality.

APS Industrial
www.apsindustrial.com.au



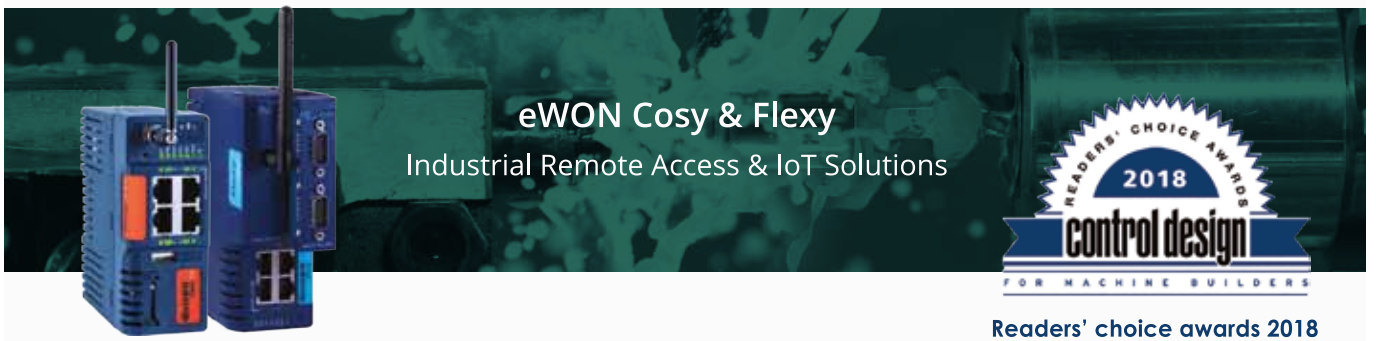
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The Neosys Technology Nuvo-7000 series is powered by Intel 8th-Gen Core i processors with an up to 6-core/12-thread architecture that offers significant performance improvement over previous 6th or 7th generation platforms.

The Nuvo-7000 series incorporates Neosys' technologies for ruggedness and versatility. It features technologies such as an effective passive cooling design, patented expansion cassette and proprietary MezIO interface. It offers a wide selection of onboard I/O functions such as Gb Ethernet, USB 3.1 and COM ports, and also features protection circuits to endure stress from ESD and power surges.

The Nuvo-7000 variants are available with different cassette expansion options that can accommodate a single PCIe card (Nuvo-7000E), dual PCIe cards (Nuvo-7000DE) or a single PCI card (Nuvo-7000P) according to application needs.

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



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FLOW VELOCITY SENSORS

The Nivus POA Series flow velocity sensors are suitable for continuous measurement of slight to heavily polluted media. The pipe-shaped sensors are designed for installation in pipes from the outside using a nozzle. Combined with a transmitter and an external level measurement the result is a complete flow measurement system.

The sensors use cross correlation ultrasonic technology to take ultrafast scans across the pipe, comparing up to 16 points in the cross-section of the pipe to compute accurate flow velocity with an accuracy of better than 1%. Typical applications for the flow sensor include stormwater, waste water and sewage water.

The flow sensor is easy to install and reduces operation downtime to hours instead of days compared to installing a traditional electromagnetic flow meter. In addition to analog output signals, the flow transmitter offers Modbus connectivity over Ethernet to be easily integrated into existing PLC or SCADA systems.

AUTECH Control Group Pty Ltd
www.autechcontrol.com.au

MOBILE ROBOT CONTROL APP

Omron has released a tablet edition of its MobilePlanner control centre software for mobile robots. The MobilePlanner Tablet Edition is an easy-to-use, portable, monitoring and control user interface tool for LD mobile robots. It is designed for viewing and controlling the robot fleet from a mobile device or tablet.

Available by downloading a free app, the MobilePlanner Tablet Edition now makes it easier to track and trace mobile robots on the factory floor. With the new software, users can connect to Enterprise Manager and view the status of all robots in the fleet.

They can also manually drive robots or initiate a map-making process to determine a specific route.

With the MobilePlanner Tablet Edition users can view robots' coordinates, their laser readings and job counts in a job queue, and show status alerts. Battery levels and travel speed can also be checked, and the robots can be sent to a dock or to other points on the floorplan map.

The Tablet Edition is available in iOS and Android versions.

Omron also offers the MobilePlanner in a PC edition which provides full configuration and control capabilities for Omron LD mobile robots, as well as Enterprise Manager with map editing and job administrations.

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MOBILE ROBOTICS

FORKLIFTS WILL NEVER BE THE SAME AGAIN

Dr Khasha Ghaffarzadeh, Research Director, IDTechEx





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Robotic technology will transform the forklift industry, causing a colossal transfer of value from human-provided driving services, towards spending on autonomous industrial material handling machines, thus fuelling an industry revenue boom far exceeding recent growth trends.

Robotic technology will also transfigure this industry, slowly but surely, enabling the rise of new types of autonomous mobile material handling units that will permeate into all aspects of our daily lives over the coming two decades. Autonomous cars are the subject of a lot of hype and media attention, yet despite being the largest prize, they will be among the last vehicle types to go fully autonomous. This is because their environment is poorly structured, and they are thus hard to autonomise. The current models of ownership and usage also provide a weak motivation for the general public to pay for autonomous driving, constricting adoption to high-end cars until long-term technology learning curves bring prices sufficiently down. A drastically different picture is found when one looks beyond passenger cars: all manner of commercial vehicles operate in a variety of semi-structured and controlled indoor and outdoor environments. In such cases, the technology barrier to autonomy is lower while a pricing system already exists that values the provision of driving services. Warehouses and factories are examples of such environments, and are thus an appealing target for autonomous mobility technology.

Incumbent automated technology to go obsolete

Indeed, automated guided vehicles (AGVs) have been around since the 1950s, essentially acting as long-range distributed conveyer systems. This technology itself has matured: sales have diversified beyond just automotive factories and assembly lines, and the onus has shifted onto suppliers to spend effort in developing customer specifications and price pressures are increasingly intense. The latter is critical in this highly fragmented business landscape where suppliers offer comparable levels of competency. We find that it is likely that companies with partnerships with major forklift players will command a competitive advantage via the removal of margin stacking. This partially explains the recent activities by forklift players to acquire, or partner with, AGV companies. AGVs, and in recent years AGCs (carts), are enjoying healthy, albeit slow, growth. Yet, the industry is on shaky ground. Indeed, it is predicted that AGVs will face a slow journey towards technology obsolescence in the next 15 years. The current positive growth rates give a false sense of long-term security, and companies will increasingly face an adapt-or-die situation.

Rise of independent mobility

The challenge to the incumbent AGV technology comes from the next generation of navigational autonomy technology. Current AGV systems are rigid and require infrastructure modifications such as the placement of reference points or lines to guide the vehicles. These systems safely work across all payload ranges. They are,



however, difficult to tweak, require advanced full system planning and involve a large on-site installation time, which represents a major manpower overhead. Fully autonomous systems will do away with such shortcomings. They offer flexibility in that routes can be changed via a software interface and updated via the cloud, and benefit from short installation time involving the CAD model

of the facility or the walking around of one robot for 'training' it.

Current models all have limited payloads, partially because safety is not yet fully trusted. The robots and software are also still somewhat expensive, limiting applicability to less cost-sensitive sectors. Human workers may also put up a resistance to wide-scale adoption, seeing them as more of a threat. None of these are, however, a showstopper.

The transition towards infrastructure-free and independent autonomous navigation technology will take place. The payloads will increasingly rise to cover the full spectrum, and hardware costs will fall thanks to major investment in other autonomous driving industries. In fact, it is predicted that very soon costs across the board will fall below the level of AGVs since they save on installation and infrastructure modification costs. This story can be contextualised as part of a slow change in the navigation technology for AGVs moving from low-cost wire or magnetic tape guidance to laser localisation and now to natural feature recognition and SLAM.

This technology evolution, however, increasingly necessitates a transformation in the nature of the companies towards software and algorithm plays. Indeed, it is the importance of software (autonomy algorithms, fleet/inventory management systems, user interfaces) that explains why California has emerged as a hotspot for investment and startups in this arena. Luckily, many of the major changes will arrive in small evolutionary steps, giving the wise incumbents the chance to go with the flow and exploit their customer relationship and application know-how to stay in the warehouse/factory mobility automation game. They will, however, have to fundamentally alter their engineering skillset.

Colossal value transfer towards vehicle suppliers?

Independent autonomous navigation enables the mobile material handling vehicle industry (forklifts, tugs, etc.) to generate far more revenue than would have been the case without autonomous mobility. Indeed, vehicle suppliers will increasingly capture the value that currently goes to the wage bill spent on human-provided driving services. As quantitatively demonstrated in IDTechEx's 20-year forecasts (*Mobile Robots and Drones in Material Handling and Logistics 2018-2038*), this will represent a major sum despite the fact that our projected figures for future autonomous mobility hardware costs suggest a long-term devaluation of driving services in high-wage regions. Our technology roadmaps also suggest that autonomous forklifts will soon become a major feature of the in-

dustry, despite them not even being mentioned in major forklift companies' investor presentations today. Indeed, our forecast model suggests that nearly 70% of all forklifts sold in 2038 will be autonomous.

This transformation will, of course, not take place overnight.

Indeed, the timescales of adoption

will be long, explaining why in our study we

have chosen to build 20-year models where different phases of growth are clearly marked and underlying assumptions and conditions are explained. In our forecast model for autonomous mobile industrial materials handling vehicles, we project that annual sales of autonomous versions will steadily rise but remain a tiny share of the global addressable market until around 2023. We will then enter the rapid growth phase soon after, causing a transformation of the industry and dramatically raising adoption levels.

The forklift industry is open to innovation — it embraced electric powertrains in the past, particularly for indoor environments in Europe. It will also adopt autonomous navigation. In fact, merger and acquisition between forklift and automation (also AGV) companies is already a trend. In the past few years, Toyota acquired Tailift (2014); KION acquired automation specialists Egemin and Dematic; and Mitsubishi Nichiyu took over UniCarriers (2016). Toyota owns the Raymond, Toyota, BT and CESAB brands, while KION Group operates the Linde, STILL, Baoli, Fenwick, DM and Voltas brands.

Beyond the confines of factories and warehouses

New types of mobile robots are emerging. Here, the rise of navigational autonomy will enable mobile material handling units (robots) to enter new walks of life. This is because mobile robots will become increasingly able and authorised to share spaces with humans, intelligently navigating their way and avoiding objects. They will therefore enter new spaces to ferry items around, diffusing from highly controlled and structured environments towards increasingly less structured ones.

These technologies will share a common technology platform with other autonomous material handling units, although each application will need to be adapted to each environment, and this ability to customise (or initiate) will remain a source of value for start-ups and SMEs for years to come. Here, currently, the hardware is often an integral part of the software, which is customised to each environment. This prevents commoditisation in the short to medium term, but will not manage to prevent it in the long term. Consequently, such mobile robotic companies will inevitably have to seek new sources of revenue. Therefore, a long-term rethinking of business models will be required with emphasis shifting from the robot onto data-based or delivery services. Our contacts tell us that this rethinking, too, has already begun.



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RUGGED TABLET

Equipped with the latest 7th Gen Intel Core i3/i5/i7/Celeron processor, front and rear cameras, a 1D/2D barcode scanner and an NFC reader, the PWS-872 offers all of the features of its predecessor (PWS-870), as well as increased computing power. Built-in Wi-Fi, NFC, 3G/4G LTE and Bluetooth 4.1 technologies provide enhanced connectivity for rapid data acquisition, high-speed transmissions, over-the-air (OTA) updates and real-time communication with backend systems. The 10.1" WUXGA LED display with scratch-resistant Corning Gorilla Glass 3 supports multitouch PCAP control as well as gloved operation. Meanwhile, the screen's 1920 x 1200 resolution and 1000 cd/m² brightness ensure readability in direct sunlight to support outdoor applications.

Designed for operation in harsh industrial environments, the tablet's lightweight (1.4 kg) yet rugged design features a wide operating temperature range of -20 to 50°C, IP65 rating for protection from water and dust ingress, a 1.3 m drop tolerance and is MIL-STD-810G certified for shock and vibration resistance. Additionally, to ensure convenient and flexible use, PWS-872 has a swappable external battery that provides up to 11 h of continuous operation and five additional programmable PCAP hot keys that allow for easy program execution and parameter setting, as well as combo key functionality.

The PWS-872 can be integrated with a wide range of peripheral modules and accessories, including a vehicle docking station, VESA mount dock, multibay battery charger, universal cover, UHF RFID reader and RJ45+COM+USB3.0 module, to provide application-specific solutions for automation, supply chain manufacturing, mobile field service, warehouse and logistics, and factory management.

Advantech Australia Pty Ltd
www.advantech.net.au

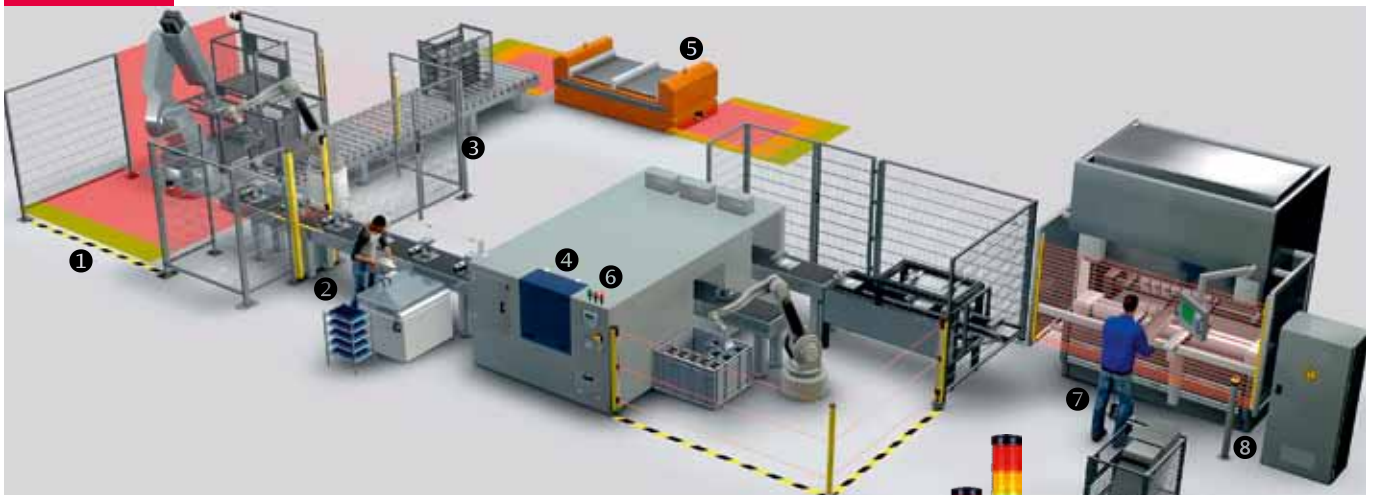


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EMBEDDED SYSTEM

The iEi Integration TANK-870e-H110 is a high I/O, flexible, fanless embedded system powered by Intel's 6th and 7th Generation of iCore CPUs.

The product supports four USB 3.0 ports, two Gigabit Ethernet ports and two RS-232/422/485 COM ports. For video it comes equipped with a VGA port supporting resolutions up to 1920 x 1200 and one HDMI 1.4 port supporting resolutions all the way up to 4096 x 2160. It also has room for storage, featuring a 2.5" HDD or SSD bay and also one full-size mini PCIe slot that can accommodate an mSATA SSD. The system also features one full-size mini PCIe slot that can support a Wi-Fi card for wireless network access.

The unit has a rugged design, with a wide operating temperature range of -20 to +50°C.

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



AC UPS SYSTEM

Due to the VFI-SS-111 online topology, the QUINT AC UPS ensures seamless transfer and returns a pure sine curve in mains and battery operation. Users can combine the uninterruptible power supply with 1 kVA of apparent power with various UPS-BAT energy storage options. IQ technology enables optimum use of buffer times and preventive monitoring of the energy storage: at any time, the AC UPS provides information on the charging state, remaining period and service life of the battery module, increasing the system availability.

Using the integrated USB interface, users can connect industrial computers with the uninterruptible power supply and shut them down conveniently. Devices can also be started with the BAT-START cold start function from energy storage, even without mains input.

The QUINT AC UPS can also be switched in parallel for redundancy and increased performance. The output voltages and automatic voltage detection are adjustable. The wide operating temperature range of -25 to 60°C also guarantees a high level of flexibility in terms of use.

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PRESSURE CALIBRATOR

The Fluke Calibration 2271A industrial pressure calibrator provides an automated solution for calibrating a wide variety of pressure gauges and sensors. Due to its modular design, it can be configured to meet different needs and expanded to cover a broad workload. The 2271A is compatible with modules in two different accuracy classes, to provide maximum flexibility in workload and budget. The PM200 modules provide an accuracy of 0.02% FS for most ranges. The PM500 modules provide 0.01% of reading, allowing the 2271A to be used to test or calibrate higher accuracy transmitters and digital gauges.

The 2271A is suitable for calibration laboratories starting out in pressure calibration because it offers wide pressure measurement capabilities in a single instrument. Everything needed for calibrating pressure is included; only supply pressure need be connected. The 2271A is also suitable for labs that currently calibrate pressure transmitters and gauges and want to expand their capabilities or make their processes more efficient.

Fluke Australia Pty Ltd
www.fluke.com.au



INDUSTRIAL ROUTER

The RAM-6021M12 industrial router from Red Lion Controls is purpose-built to withstand extreme conditions from the factory floor to transportation and hazardous locations. It offers an IP67 dust-proof and water-resistant enclosure, -40 to +80°C operating temperature, 50g vibration and 200g shock tolerances, and is tested to hazardous location, marine and rail standards.

The rugged industrial router delivers the security required to prevent unwanted intrusion in both the connected factory and remote locations. With WAN-to-LAN and LAN-to-LAN connectivity, the RAM-6021 and RAM-6021M12 provide simple configuration to seamlessly connect, monitor and control machinery and equipment. They deliver an all-in-one solution with quick network set-up to existing Ethernet infrastructures, including networks with Modbus- and DNP3-enabled devices.

The robust feature set in both RAM-6021 models includes RAMQTT for cloud connectivity and an easy-to-use event engine that can locally trigger I/O or send email messages based on real-time operational data.

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DRUM TIPPER WITH SCREW CONVEYOR

The TIP-TITE drum tipper with integral flexible screw conveyor allows volumetric feeding of bulk material from drums into downstream processes free of dust.

A hydraulic cylinder raises and seats the drum rim against a discharge cone, after which a second hydraulic cylinder tips the drum to an angle of 45, 60 or 90° with a motion-dampening feature. At full rotation, a pneumatically actuated slide gate valve opens and charges the conveyor, which meters the material volumetrically according to infinitely adjustable user controls.

As the flexible screw rotates, it self-centres within the tube, providing clearance between the screw and the tube wall to eliminate or minimise grinding. The flexible screw is top-driven beyond the point at which the material exits the conveyor, preventing material contact with bearings or seals.

The conveyor transports bulk materials from sub-micron powders to large pellets, whilst the gentle rolling action of material prevents the separation of blends. The rugged inner screw is the only moving part contacting material, resulting in reduced maintenance. A broad range of screws with specialised geometries is available to handle free- and non-free-flowing materials, including products that pack, cake or smear in other types of conveyors.

The unit accommodates drums from 115 to 200 L weighing up to 340 kg and measuring 915 to 1220 mm in height. An optional pneumatically actuated vibrator on the discharge cone promotes complete evacuation of non-free-flowing materials.

Flexicon Corporation (Aust) Pty Ltd

www.flexicon.com.au

PoE SWITCHES

Phoenix Contact is expanding its selection of PoE switches with the 1000 Series unmanaged and 4000 Series managed switches. These switches are suited for harsh ambient conditions in applications such as video monitoring, machine automation and building automation. In addition, they are compatible with all IEEE 802.3 at (PoE+)-compliant devices available on the market.

The 1000 Series unmanaged PoE switches offer a wide temperature range, full gigabit ports and support for jumbo frames, along with monitoring for connection breaks on individual ports. Based on the PoE power budget of 30 W per port and variants that feature SFP fibreglass ports, PoE-capable terminal devices can be connected flexibly and without additional configuration.



The 4000 series managed PoE switches feature a high PoE power budget of 60 W per port in anticipation of the new IEEE 802.3bt standard. Additional advantages include gigabit SFP ports and updated configuration options. Scheduling enables on-time activation of PoE functionality to reduce data traffic and power consumption. The status of the connection to the terminal device is monitored using the watchdog function. In the event of a malfunction, it is automatically restarted or shut down.

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A REAL-WORLD *SURVIVOR* STORY

HOW TO ENSURE IMMUNITY AGAINST DISRUPTION

Is engineering a profession that is eating itself alive? Is it creating the technology that will end it? Or will technological disruption make us more creative?

What is it about the *Survivor* TV series which still has us riveted, 18 years and 36 seasons later? It's the 'same scenario, different palm trees' time and time again, but what's the secret sauce that has its ranking furiously rising to the top? In a word: it's real. Here is a microcosm of humanity, desperately in need of a shower, stripped of all pretension, pressurised to the point of breaking and left to write their own survival story. Conditions are tough, each episode says, now how far are you willing to go to come out on top?

We are captivated by the show because we see ourselves in the same scenario. All the more in today's working world, we face the same kind of pressure. Doctors, lawyers, accountants — professionals, who have traditionally occupied the top of the pecking order, are now staring down the barrel of AI disruption and contemplating a potentially more sustainable career in fine arts. Nothing is as it once was; disruption is moving fast and rewriting the rulebook as it goes.

The digital age has thrown us all into a game of *Survivor* that requires a brave new strategy across all organisational silos. And, ultimately, the winners will be those who can ruthlessly apply this strategy to their game plan.

Want to be disruption's final survivor? Learn to beat it at its own game. Learn how to be disruptive yourself, first.

An interesting predicament

Engineers are essentially today's backstage heroes. From the tallest superstructure to the lightest smartphone, it's the engineer who has brought that entity to life, synthesising years of experimentation and expertise, to create an experience that the end user simply steps into unblinkingly. Its creative journey is invisible to the consumer, but any engineer would understand the back-end story. And that story, up until recently, was exclusive to the engineer.

But all that is changing now. The benefits of high-end engineering technologies are now at anyone's fingertips. The same inventions that took large budgets and high-tech laboratories can be performed with a personal laptop in someone's living room. We buy drones as birthday presents. Our kids can print their own candy dispensers and chess boards. Game engines can be run at home to create a personal virtual reality world through the purchase of a licence for any 3D modelling software, for example, Revit. And in 10 years, the possibility of solving extraordinarily complex mathematical problems on the fly will sit snugly in your back pocket as a function of the average smartphone.

The point: Engineering is potentially a profession eating itself alive — disrupted by the technology it originally created. (After all, it was an engineer who designed that 3D printing kit, that drone and that software program Revit.) We are moving from a world



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where the engineer 'makes the thing' to a new world where the 'engineer makes the thing that designs the thing that the engineer used to design'.

The grim but awesome reality

But engineering is not only cannibalising itself; it's metamorphosing the status quo of most other professions as well. IBM Watson is fast learning how to accumulate and interpret complicated cancer-related medical diagnostics with far greater accuracy than oncologists. The expectation is that in time, not only will the Jeopardy champ do it better than the doctor, it will save a national healthcare system millions in trial-based expenses.

The legal profession is replacing flesh-and-blood attorneys with artificial intelligence and finding that the machines can save money and spare the drudgery. Where the idea of 'burning the midnight oil' has always been associated with over-caffeinated lawyers — pouring over documents, drafting contracts and digging for legal dirt — the new legwork could be done by sophisticated algorithms that offer flawless insight in a fraction of the time... and never need the coffee.

Of course, in the near future, no career will be immune to disruption. Human mechanics will be hanging up their tools, teachers will face replacement and even hamburger flippers threaten to be automated.

However, will engineering be the ultimate *Survivor* profession that outwits, outplays and outlasts all others? Traditionally, the pecking order of professions, at least in the developed world, saw doctors at the top, followed by lawyers, accountants, engineers and arts professions at the bottom. We are now seeing a possible reversal with demand for those creatives moving to the top as industries are forced to think differently about solutions.

There is significant potential to reap from a disrupted market with brand new value equations. The question is, which of these professions, engineering included, will act on it?

The way to stay alive

The solution is to predict the unpredictable and remain one step ahead of the game. Disruption cannot be seen as the enemy. It has to become the enabler — and those who manage to exploit its transformative power will outlast the change. If you want to survive, you need to bring digital and computational technologies into your own discipline to see how you can possibly disrupt yourself before someone else does it for you.

This means you'll have to see the agility gaps between you and your competitors, as well as the corporate inertia within your own operations. A McKinsey study among 1600 firms found that those firms able to look change in the eye and reallocate their capital accordingly had substantially higher growth rates and shareholder returns than those who spent their money practically the exact same way over 15 years.

You have to forge new value by quantifying your intellectual capital. Considering that half of the world's most valuable organisations are idea-intensive, leveraging the power of data, algorithms and software, you'll have to make information a prime asset of your business. Companies like Apple and Google, McKinsey notes, have done this by creating underworlds of app developers and Android innovators. The more creativity that comes out of these spaces, the stronger the bonds of loyalty that users and developers feel to the brand.

You're going to have to go hard after talent since competition is fierce and job loyalty is no longer in style. That means you'll need the right kind of workplace to attract and retain the people you're looking for. HR operations have to rethink their organisational structures and offer more flexibility and mobility, ensuring an environment that invites collaboration, creativity and the best in divergent thinking.

Today's world is complex and cut-throat and worthy of constructive panic. All of us are gunning for the prize, but it will take tremendous effort and strategy to win it. Ironically, organisations that choose to play it safe at base camp are risking the most; anything short of fearless front-footed action is too little too late. At the end of the day, those who learn to stay alive and 'beat' disruption will be those who've learned to join it.

This article was first published by Alocs Chong on Aurecon's Just Imagine blog.

Aurecon Pty Ltd
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HIGH-FORCE ELECTRIC ACTUATORS


The Tolomatic RSX080 actuator features forces up to 80 kN and is suitable for replacing hydraulic cylinders. Designed and tested for 100% duty cycle, the actuator is roller screw-driven for long, consistent life in demanding environments. Applications include pressing, punching, stamping, riveting, fastening, joining, injection moulding and sawmilling.

In addition to the RSX080, Tolomatic high-force linear actuator solutions include the RSX096 actuator (130 kN). The heavy-duty construction of both models includes tie rods and Type III hard-coat anodised aluminium or zinc-plated steel. A standard anti-rotate feature prevents the rod from rotating without external guidance. Rated IP65 with an IP67 option, the actuators resist water from a light washdown and dust from outdoor environments. The RSX actuator is also designed and rated for extreme conditions including cold weather operation. A food-grade version, designed for volumetric filling and other high-force food and beverage applications, is made of 316 stainless steel and food-grade white epoxy to meet USDA specifications.

Additional features include an access port for relubrication to maximise service life and a breather/purge port to prevent ingress into the actuator.


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POWER SUPPLY

The Sorensen XFR 600-4 is designed to provide power for product R&D and other production test applications, including electroplating and burn-in, magnet control, and automated test equipment. It is available to rent from TechRentals.

The 600 V, 4 A DC power supply is suitable for high-power applications where a range of output voltages and currents are required. It provides 2.4 kW of power, features remote analog programming and has an operating range from 0 to 50°C.

The product can be stacked in rack mounts without ventilation space between units due to its thermal management. Constant voltage/current operation with automatic crossover and mode indication provides stable power for testing. Additionally, soft switching allows for greater efficiency by virtually eliminating switching transients, reducing heat generation and decreasing stress on the switching transistors.

TechRentals
www.techrentals.com.au



CONTROL LOOP MONITORING SOFTWARE

Metso has announced a new version of its Expertune Plant-Triage control loop monitoring software. The latest version further improves process plant operational efficiency, reduces cybersecurity risks and helps to improve profitability.

This version provides a clearer view of PID (proportional-integral-derivative) tuning benefits via a new Performance Evaluation dashboard and a Performance Summary panel. These features show the effect new tuning parameters will have on valve duty, relative response time, robustness and performance.

In addition, the PlantTriage Level Wizard is an advanced tool that tunes level controllers for surge tanks. The purpose of surge tanks is to maintain a constant flow to the next stage of the process. Proper tuning guarantees maximum use of surge, while preventing the tank from emptying or overflowing. The Level Wizard helps to get the balance just right.

Expertune PlantTriage is designed for identifying the root causes of control system performance issues. Version 18 offers interaction analysis with greater resolution. Two analysis tools, Process Interaction Map and Interaction Hot Spots, are used to find the underlying root cause of an upset or event. Users can now find both short- and long-term interactions, ranging from 1 min to as long as 14 days. These tools can pinpoint the root cause of a specific incident, and help in analysing short duration or sporadic events.

The latest version also includes advances in cybersecurity. Users may now choose encryption on communications with PlantTriage servers. Other improvements make the browser interface more secure, robust and less vulnerable to attack.

Metso Australia Limited
www.metso.com



IO-LINK MASTER

The Wenglor EP0L001 IO-Link master is a multiprotocol module designed for consistent communication right on up to the field level. Up to eight IO-Link-compatible sensors and actuators in accordance with IO-Link standards 1.0 and 1.1 can be easily and flexibly incorporated into the control level via Industrial Ethernet.

The eight IO-Link-compatible, freely configurable M12 ports offer high flexibility where module allocation is concerned, and reduce the costs of each channel to a minimum. Four

of the eight ports are laid out as class B variants in order to be able to make increased load current available, as frequently required by actuators. A continuous load current of up to 2 A per class B port (total 8 A) is possible. Supply power to all components is assured by the L-coded M12 plugs, which also provide the opportunity of connecting additional field modules. In the event that a terminal device should fail, electrical isolation ensures that module communication is not interrupted and that disturbances are quickly eliminated. A total of 12 digital inputs, eight digital outputs or configuration by means of eight IO-Link-compatible ports offer connection diversity and efficient use of the master.

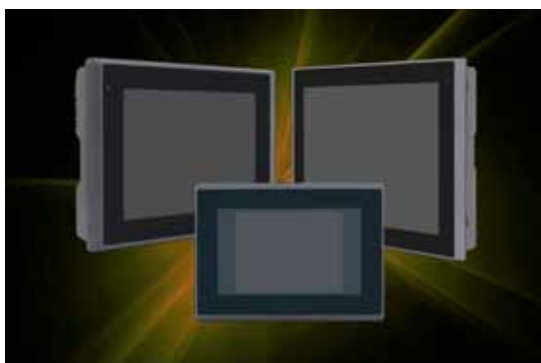
The IO-Link master supports both PROFINET and EtherNet/IP Industrial Ethernet protocols. The respective protocol can be selected at the master with the rotary encoder switch. The two switch ports permit connection via line or ring topology. Depending on protocol, the IO-Link master offers functions such as fast start-up, shared device and Device Level Ring, as well as MRP.

Treotham Automation Pty Ltd
www.treotham.com.au

INDUSTRIAL MONITORS

The Apex Technology ADP-1XX0A industrial monitors feature a lightweight and compact design. This series has five models of LCD sizes from 5.6" to 12.1", making it suitable for various factory automation applications.

The ADP-1050A, which has a 5.6" screen in this series, is available with a resistive touch screen, while the ADP-1070A (screen size 7"), the ADP-1080A (8"), ADP-1100A (10.1") and ADP-1120A (12.1") come with a choice of either resistive touch screen or a projected capacitive touch screen.



All the models feature an industrial-grade plastic housing, making the monitors thin and lightweight, which allows for easy installation. The front panels feature IP65 protection and the units have an industrial temperature range able to withstand temperatures from 0 to +50°C.

The monitors come equipped with both VGA and DVI connections and also feature five OSD function keys on the rear of the unit.

The ADP-1XX0A supports both panel mounting and VESA mounting options.

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OEE REPORTING SOFTWARE

ATS Intelligence collects operational data such as defect rates, equipment status and cycle times directly from the production line and provides near real-time analysis. This analysis is said to aid in the reduction of manufacturing costs and improvement of operational efficiency, providing a vital step in a smart digital transformation.

In Version 2.5 the processing of operational data has been extended to the cloud and support has been added for local reporting and dashboards. The benefits include faster data analysis as ATS Intelligence now precalculates the results of commonly required calculations during runtime so that reports can be generated as close to real time as possible.

The system can also upload manufacturing KPIs to the cloud using Microsoft Azure, where big data analysis can be performed. With all reports available in the cloud, users can analyse data anywhere in near real time.

High-quality data is achieved by using a default value if a bad or poor-quality value is received. Additional value can be added to data by performing automatic data contextualisation, accomplished by linking received data to the batch, order or job ID associated to the production run.

ATS Applied Tech Systems Pty Ltd

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NEW
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POWER ANALYSER

The Hioki PW3390 power analyser is suitable for testing of mains power frequency and power electronics, high frequency power measurements including applications such as solar and wind farms, variable speed drives and electric vehicles. PW3390 delivers four input channels and $\pm 0.04\%$ basic accuracy for power. A 200 kHz measurement band and flat amplitude and phase characteristics up to high frequencies enable the precise measurement of power.

A broad current sensor line-up expands the range of measurement possibilities including the CT7040 AC flexible current sensor series that can measure commercial power lines up to 6000 A. A zero-crossing filter detects the fundamental frequency for harmonics analysis in the range of 0.5 Hz to 5 kHz.

A wide variety of built-in interfaces includes LAN, USB (communication, memory), CF cards, RS232C, synchronisation control and external control. A D/A output delivers analog output for up to 16 parameters.

Power Parameters Pty Ltd

www.parameters.com.au

LOW-PROFILE BULK BAG FILLER

Flexicon's TWIN-CENTREPOST bulk bag filler with explosion-proof controls has reduced height posts for low-headroom applications. It is equipped with a manual fill head height adjustment to accommodate small bag sizes, pneumatically retractable bag hooks, an inflatable connector to seal the bag inlet spout, and a feed chute outlet port for dust-free air displacement during filling.

An explosion-proof electrical system controls the automated vibratory densification/deaeration deck, which stabilises the bag for storage and shipment.

The dual-post frame is a design that maximises strength and improves accessibility to bag hooks while simplifying construction. It is constructed of carbon steel with durable industrial coating, with product contact surfaces of stainless steel. Also available in all-stainless construction finished to sanitary standards, it is said to be the first bulk bag filler to receive USDA acceptance.

The filler is available with a flexible screw conveyor, tubular cable conveyor or dilute-phase pneumatic conveying system to deliver a full range of bulk materials from nearby or distant upstream sources.

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THE IMPORTANCE OF ANALYSER MAINTENANCE

Modern processing plants are becoming more automated, and for good reason. A well-automated plant can not only improve efficiency, consistency and quality, but can also reduce energy consumption, waste and emissions. Crucial elements in this automation chain are the field instruments and process analysers — devices which are only useful if you can rely on the readings they provide, yet frequently suffer from lack of maintenance.

Unlike many instruments, process analysers require frequent maintenance and recalibration as the measuring element is in direct contact with the process. As a consequence, the process will have an influence over the performance of the analyser — and the nastier the process, the more frequent the maintenance requirement.

Analysers are used for many applications: product quality, chemical dosing, regulatory monitoring etc, so perhaps it's not too difficult to imagine the implications of not maintaining the analyser.

Overdosing of chemicals lead to high operating cost and damage to plant and equipment. Underdosing chemicals causes reduced yield, lost product and consequently reduced profitability. The long-term effects of a decline in product quality and consistency can result in a bad reputation and lost customers. Similarly, environmental excursions lead to a bad reputation and can be an expensive mistake!

Let us consider the humble pH analyser. It is probably the most common of process analysers and used in a wide variety of applications. However, it is also one of the most maintenance-intensive analysers because the process so easily influences the measuring elements, causing drift and non-responsiveness.

We've established that maintenance must be performed: our next challenge is to find someone willing to perform that task! Experience tells us that few people relish this task on an industrial plant. Also, few people understand why it is required and can become quickly frustrated. The

risk here is that they leave the analyser unmaintained and adopt a stance of 'it never worked anyway'. Yet a clearer understanding of what and how the process can be influencing the measurement can often help ensure the maintenance is done effectively. This must be addressed through education.

There are ways to help ensure the job is done, such as careful consideration of the installation location. Can the sensor be accessed easily for example? Does the process have to be shut down to access the sensor? Is there high temperature or pressure to be wary of? These are a few things that might otherwise promote procrastination, or reasons to not maintain.

When a decision is made to use a process analyser it's accepted that quality and relevance of measurement remain the primary areas of interest. After all, there is usually a good reason the measurement is required. However, neither of these can be achieved without maintenance.

Maintenance and calibration will provide confidence and trust in the measurement, enabling operators and engineers to make appropriate decisions about process changes and contribute to the overall health of your plant and operation.



Nick Crowe is the Product Manager for Process Analysers at Yokogawa Australia & New Zealand. Nick has been working with process instrumentation for over 15 years and has been focused on process analysers for over 10 years. He began work as an analyser service engineer before moving into sales and eventually product management roles.

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