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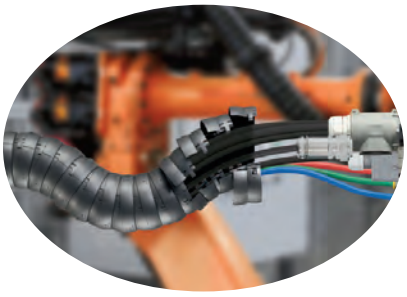
CONTENTS



ON THE COVER

WAGO is a family-owned company that has been producing innovative products since 1951. WAGO's vision is to create devices and systems that are safe and reliable everywhere in the world. The PFC200-3G is no exception to this vision. Users can control monitor, maintain and run diagnostics on decentralised machines and systems around the globe using the PFC200-3G programmable controller. This saves organisations time and money — data networks take over the routing, communicating and delivering of data. The 750-8207 PFC200-3G features an integrated network switch and an RS-232/RS-485 interface for seamless network integration. While supporting typical PLC functionality, the PFC200 can also be equipped with support for IEC61850/61400, IEC60870 and DNP3. Additionally, an integrated web server provides the user with online configuration options and status information regardless of where the implementation may be. Error-free distance monitoring and secure data transmission are among the strengths of this product. Cybersecurity is covered with the choice of OpenVPN and IPsec. A VPN tunnel connects the controller to the network via GPRS and transmits all data encrypted using SSL and TLS. The data is thus protected from access by third parties. The configuration of the VPN can also be carried out using the web-based management or Linux shell on the controller. This is a must-have product for anyone working with remote access requirements.

WAGO Pty Ltd
www.wago.com.au

WIRELESS CYBERSECURITY IN AN INDUSTRIAL CONTEXT

PART 1

Glenn Johnson, Editor

Wireless networks have been creeping into process plants, factories and utilities for some time now, the convenience and efficiencies they provide being obvious, but the cybersecurity risks must be managed well.

These days Wi-Fi can be found everywhere: in our homes and offices, and now even plant environments. In many cases it has replaced traditional wired Ethernet for most internet-related traffic.

While wireless instrument and sensor mesh networks such as those based on WirelessHART and ISA-100.11a have been with us for some years now, and provide low-power, redundant and relatively secure wireless networking for industrial process instrumentation in particular, many plants would still be reluctant to deploy them in mission-critical functions where wired fieldbus or industrial Ethernet is available.

In contrast to this we find now that in most industrial environments, Wi-Fi deployments have started popping up to solve specific application problems, despite the fact that Wi-Fi is a higher powered radio signal with greater range and is a technology well understood by the general population — including potential cyber threat adversaries. Generally, they were originally used for simple point-to-point communication links where wiring was impractical or too expensive. Now they are popping up to enable greater bandwidth applications such as security devices, and to give roaming personnel access to information from smartphones and tablets.

There are, of course, many advantages in deploying wireless technologies for greater efficiencies and improved functionality at lower cost. However, the deployment of such technologies can potentially open up a veritable 'can of worms' in relation to plant cybersecurity.

ICS security: misunderstanding the importance of confidentiality

In general terms, managing security on a data network involves mitigating risk in three areas of potential impact: confidentiality, integrity and availability (the now well-known CIA trio). Historically, as vulnerabilities in hardware and software systems are discovered and classified, they are ranked against various vulnerability metrics, including the abovementioned impact metrics[1].

In most organisations, the confidentiality metric is considered the most crucial, while availability may also be highly important, if the loss of access to systems can cause business disruption. However, we often read in industrial cybersecurity articles and blogs that confidentiality is not as important as availability in an industrial control system (ICS). Obviously the availability of the processing or manufacturing process and its safety is of the highest concern in an ICS, but we should be careful in making generalisations like this in relation to an industrial organisation as a whole, or even in relation to the ICS itself.

Why? Because the importance of confidentiality is true in general of all organisations at the business level: all organisations should be very careful of the confidentiality of their financial and business data and their intellectual property. But we should also remember that any information that might give a potential intruder information that could be used to impact the availability of an ICS (such as engineering design data) also needs to be protected. In other words, the compromising of the confidentiality of information can lead to an increased risk of ICS attack and loss of availability. If your organisation is a critical infrastructure organisation, you would (and should) be aware that your organisation will be a potential target for an advanced persistent threat (APT). Such adversaries with advanced hacking skills may well attack your ICS only after a long period of engaging in stealthy cyber-espionage against your company's business and engineering data[2,3]. It is therefore crucial that the confidentiality metric is taken seriously, and not 'brushed off' as less important in an ICS scenario.

With the business drive towards Industry 4.0 and increasing interconnectivity between IT and operational systems (IT/OT integration) — as well as the increasing tendency towards the use of commercial and enterprise networking technologies such as Wi-Fi (WLANs) in industrial environments — all vulnerability metrics should be taken seriously. The increasing flow of data both ways, between the ICS and the business network, as well as the increasing use of operational wireless-based tools such as

tablets and smartphones to carry and access engineering data, should all be considered in mitigating cybersecurity risk. This also applies to third-party support organisations you may engage, the technology they bring with them and the information they have access to or take with them.

This article will focus on the issues of maintaining cybersecurity in a WLAN environment, as this type of technology is gaining increased use in industrial networks.

Defence in Depth

The concept of Defence in Depth has been well described in the literature. In general, the concept involves using a strategy that seeks to delay an attacker by creating a resilient infrastructure that resists attack long enough to allow time for detection and response. Basically it can be said that the plant is secure if:

$$t_p > t_d + t_r$$

where t_p is the time needed to penetrate, t_d is the time needed to detect the penetration and t_r is the time needed to respond to it.

The architecture of the network, in which the ICS is segmented and firewalled internally at various levels, firewalled off from the business network, and where the business network employs firewalled segments, has been variously described. Layering the network in this way, with careful well-designed firewall rules provides multiple layers of defence that an intruder must penetrate to get to the critical control system components.

This is all very well if the only 'outside world' access is via the corporate internet connection. Such a design in which even remote VPN access for contractors and mobile staff must pass through all these layers from a single point of ingress is relatively (with correct planning) easy to protect. But what happens when Wi-Fi nodes are placed at the lower levels? Even with all the best intentions and careful planning, the installation of WLAN access points in the ICS network effectively provides a potential unlimited range of other points of ingress if not managed correctly.

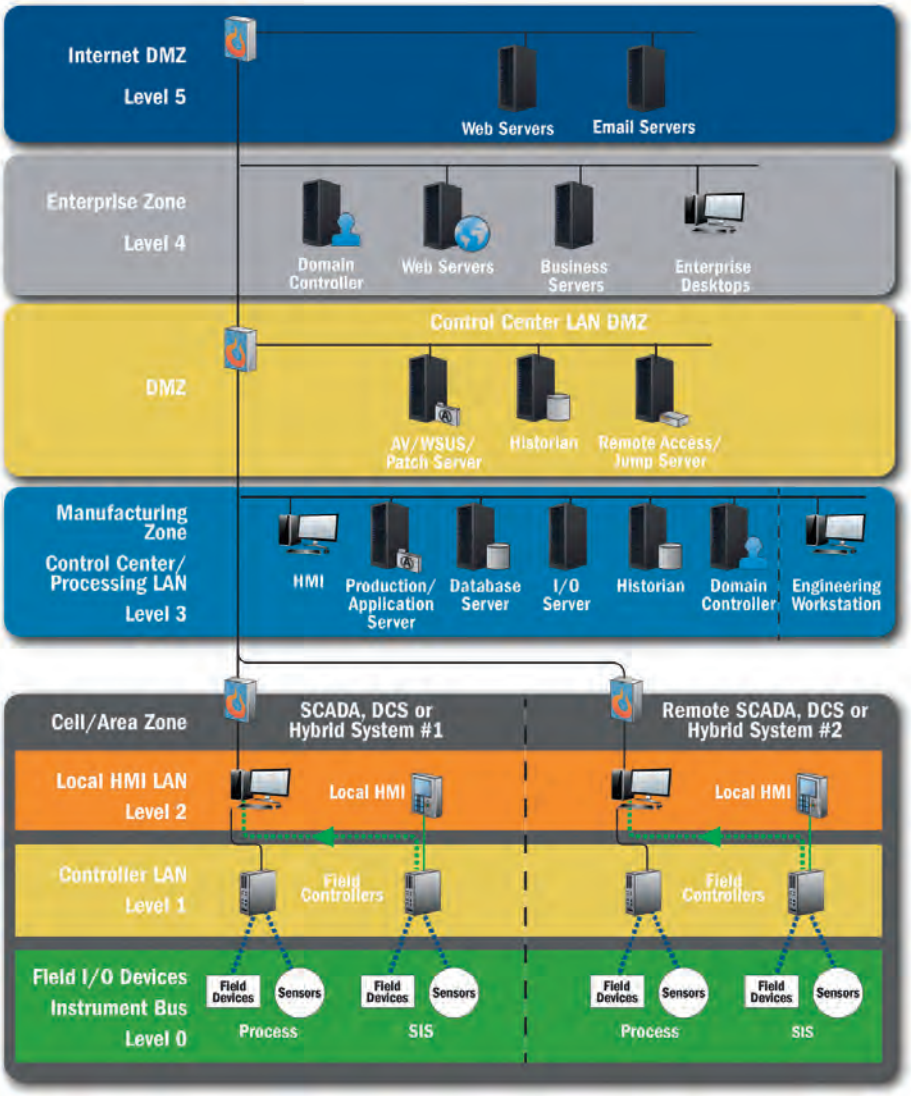


Figure 1: Defence in Depth architecture.[4]

Edge protection: encryption and VLANs

The most obvious difference between wired and wireless networks is that wireless networks cannot easily be constrained to a physical space. While wired networks can be tapped electromagnetically (and government agencies that work with highly classified data mandate optic fibre networks, and sometimes electromagnetically shielded building spaces), this is generally only the realm of sophisticated and expensive spying technology. Wireless networks on the other hand — particularly in process plants where most of the action occurs 'outdoors' — have signals available to anyone who simply parks a vehicle outside the plant fence. The physical network layer (Layer 1) and the media access control layer (Layer 2) are therefore not protectable in a wireless scenario, regardless of technology or protocol.

Without appropriate security in place, the signals of a WLAN could be received and manipulated by an attacker, and as a result, not only might confidential information from the network be captured, but an attacker could also feed false information or control messages into the network and interfere with its operation. The need to protect against these types of attacks is so fundamental that standardised security processes have been built in to the IEEE 802.11i standard[5].

Early WLAN networks did have provision for security, but usually the default was to leave the network unsecured to avoid having to bother with passwords. Prior to 2003, the only available method was wired equivalent privacy (WEP), which was included in the original IEEE 802.11 standard and aimed at consumer markets. Tools for breaking it quickly emerged. By 2003, Wi-Fi-protected access (WPA) emerged using

WITHOUT APPROPRIATE SECURITY IN PLACE, THE SIGNALS OF A WLAN COULD BE RECEIVED AND MANIPULATED BY AN ATTACKER, AND AS A RESULT, NOT ONLY MIGHT CONFIDENTIAL INFORMATION FROM THE NETWORK BE CAPTURED, BUT AN ATTACKER COULD ALSO FEED FALSE INFORMATION OR CONTROL MESSAGES INTO THE NETWORK AND INTERFERE WITH ITS OPERATION.

temporal key integrity protocol (TKIP). It was much better, and replacing TKIP with advanced encryption standard (AES) was yet another improvement. But before long those were broken as well.

In 2006 with the introduction of WPA2, in addition to AES, counter cipher mode with block chaining message authentication code protocol (CCMP) was added as a replacement for TKIP. Even this has proven possible to break, although getting through it requires a great deal of time and effort and simply isn't practical for most hackers.

WPA2 is a security procedure published by the Wi-Fi Alliance[6] that is based on the requirements of the IEEE 802.11i standard, which specifies procedures for key negotiations, data encryption and data verification for transmission of user data within a WLAN. The applicable architecture specifies the individual encryption of each and every wireless data transmission. In order to achieve this, pair-wise encryption keys are present between the communication partners (the session key). In addition, built-in integrity protection ensures that the transmitted data is not only confidential, but also unchanged.

WPA2 includes two modes (Personal and Enterprise) which specify different methods of device authentication. Using WPA Personal mode, there is one common pre-shared key for all devices in the network. This password is preconfigured individually for all devices and access points. This type of key management might be practical for very small networks, but becomes a restrictive overhead in the management of larger networks. Typical recurring procedures, such as the replacement of an old key or the exclusion of a lost or stolen WLAN device from a network, usually require a manual and complex reconfiguration of all access points and clients.

The WPA Enterprise mode allows each device to be issued a different key and to manage those keys in a central authentication database (such as a RADIUS server). Using the IEEE standard 802.1x for port-based authentication, the access point can validate every WLAN device individually when a connection is established. Keys can therefore be managed centrally, while lost or stolen devices can be simply disconnected from the network by removing their key information from the database.

As stated above, however, WPA2 is not a panacea. It is still crackable, although it takes much time and effort. Those in critical infrastructure industries should bear in mind that if they are a potential target of a state-based actor (in the form of what is known as an 'advanced persistent threat' or APT), then perhaps deploying WLAN technology might want to be considered more carefully, or restricted to non-mission-critical use in a way that is isolated from any essential control network infrastructure.

The more advanced WLAN access points that are available allow devices to be assigned to different virtual LANs (VLANs), so that devices with different roles can be clearly differentiated. For example, a WLAN-connected vibration monitor and a WLAN surveillance camera could be isolated from each other by assigning them to different VLANs. This results in the sensor only communicating with the CMMS, while the camera's communication is limited to a security surveillance system. The segmentation makes it difficult for attackers to gain further access to the network should a simpler device be compromised – which is of course an example of the application of Defence in Depth.

In Part 2

Even though WLAN deployments effectively create additional points of ingress into the plant networks, modern Wi-Fi access points provide a high level of data encryption that makes eavesdropping on data difficult if not impossible for most hackers. But this is not the whole story.

In Part 2 of this article we will examine flaws in many Wi-Fi access points that make it possible to insert rogue clients and access points, and discuss firewalls and intrusion detection.

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OPINION

AUSTRALIA'S MANUFACTURING OPPORTUNITY

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The recent sector competitiveness plan released by the Advanced Manufacturing Growth Centre (AMGC)[1] highlights a number of areas that the sector needs to improve to become more competitive, along with identifying various opportunities for Australian manufacturers. They suggest a focus of shifting manufacturing towards higher potential markets as well as increasing the value differentiation of Australia's manufactured products and associated services. All this to be achieved by the adoption of Industry 4.0 (I4.0) as a key plank to the reports implementation strategy.

The report is lengthy and very detailed, and cites a number of good examples and cases of local success stories. Interestingly enough, although there are over 100 companies that have contributed to the report, there is no engagement with any of the technology providers in the I4.0 space.

The main difference I see between Germany and Australia with the adoption of Industry 4.0 is that I4.0 is an initiative of the German government and they have a whole industry approach. This includes government departments, industry bodies, machine and plant OEMs, and manufacturers all working collaboratively on I4.0 themes and initiatives. As a result it has permeated through all levels of business and there is no question that I4.0 is a must for German manufacturing and equipment suppliers to be successful in the future.

In Australia the approach is a little more disjointed, with a large reliance on I4.0 technology being mainly promoted by individual Germany-based vendors or suppliers and their experience with it from their head offices. We see individual manufacturing companies going it alone, keeping technology providers at arm's length and not truly leveraging the global collective knowledge on I4.0.

We are starting to see pockets of good collaboration within industry, with examples such as the establishment of Factory of the Future research centre (Swinbourne), the Prime Minister's Task Force for Industry 4.0 and the setting up of the Advanced Manufacturing Growth Centre (AMGC). However, there does not seem to be the same level of acceptance of I4.0 as I see when visiting Germany.

In my opinion, the only way Australian manufacturing is going to be able to compete on a global scale is with the adoption of I4.0. We need to reinvigorate and further develop our local manufacturing with smart technology, so that it is both efficient and globally competitive as well as being supported by a vibrant local high-tech machine, plant and equipment supply market.

We need to also choose the specific industries in which we can compete and develop our capabilities, with a view to being global leaders and suppliers for these markets. We then need to adopt I4.0 themes and concepts in these markets and develop specifics around this. We are already seeing progress in this space, with some new phrases coined like Mining 4.0, Medical 4.0 and Defence 4.0.

Finally we need to make sure we create a vibrant and globally competitive machine, equipment and plant supply industry to support this. This second-tier industry can also be a provider of equipment and machinery globally and provide great export opportunities. Unfortunately at the moment I am seeing the opposite with a trend towards the supply of plant and equipment from overseas while local manufacturers are being squeezed out of the market.

We will need to develop local talent as well as import talent from overseas to help train up and develop local resources. One of the frustrating things I see at the moment within Australia is the negative connotations of the 457 Visa Scheme and the rhetoric that it is taking local jobs. For me and the business I run, the 457 Visa Scheme should be a fantastic mechanism for us to be able to import talent from overseas and use this resource to train up multiple resources locally. But at the moment, the paperwork and length of approval process significantly detracts from being able to do this easily, efficiently and cost-effectively.

Let's hope this is the new dawn in which we see all Australian manufacturers continually advance and remain globally competitive in the future of advanced manufacturing.

Reference

1. Advanced Manufacturing Growth Centre Ltd 2017, *Sector Competitiveness Plan 2017*, <https://www.amgc.org.au/Article?Action=View&Article_id=1>

Scott Moffat is the Managing Director of both Pilz's subsidiaries in Australia and New Zealand. He is a senior executive with over 20 years' experience and extensive knowledge in the automation, safety, energy, mineral processing and petrochemical industries, and possesses a unique blend of engineering background and corporate finance coupled with strong business acumen and customer focus.

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Leuze electronic has expanded its MSI 400 range of safe relays and safe controls with more than 20 components.

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The controller offers 24 I/Os as well as an integrated industrial Ethernet protocol such as Profibus and EtherNet/IP in a compact package 45 mm wide. The safety controls are suitable both for the safe monitoring of simple safety functions as well as for performing more complex safety tasks. In addition, the controls can be flexibly expanded to up to 116 safe inputs and 56 safe outputs.

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The Field Agent can be connected to nearly any industrial asset and leverage GE's Industrial Internet Platform to collect data, analyse trends and uncover insights that improve operations and asset performance. Users can build remote monitoring and diagnostics capabilities safely and securely, utilising encrypted channels that preserve data timestamp, quality and fidelity.

GE's Field Agents are powered by Predix, a cloud platform-as-a-service (PaaS) built for industrial big data applications.

Using the GE Field Agent technology, users can leverage the power of the IIoT by accessing real-time asset performance data to perform advanced predictive analytics. Armed with this valuable information, operators can optimise equipment uptime and OEMs can proactively maintain and service their equipment fleet, improving operations and growing revenues.

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TOUCH-SCREEN HMIs

Fuji Systems has launched the Monitouch HMI V9 Series, which includes three touch-screen versions — the V9 Lite, the V9 Standard and the V9 Advanced — allowing users to select the appropriate model for their application. The series offers the option of choosing between a simple HMI, a standard model and a more advanced unit, with available features including remote connectivity for tablets and smartphones, a capacitive touch panel for smooth operation and a wireless LAN interface.

All models in the series are UL certified and come with onboard Ethernet ports and SD card slots, allowing for better connectivity to peripheral devices. Select models have onboard sound output, wireless LAN (access point incorporated) and Class 1 Division 2 ratings, making them suitable for use in oil and gas applications. The VNC server function ensures that all models can be accessed from a tablet PC, and the compatibility of all V9 series models with VPN means a safer and more secure network environment. With a vibrant colour display and PDF viewing capabilities, users will benefit from high performance and ease of operation.

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DATA LOGGER FOR PRESSURE AND TEMPERATURE

The Patbox from Witt-Gasetechnik is a contact-free mobile data logger for measuring pressure and temperature rapidly everywhere in production.

The compact instrument with OLED colour display is easy to operate. It does not have to be connected, instead registering pressure and temperature via integrated sensors using NFC communication.

Once initiated via the button or timer, the box registers its measurements at intervals of 100 ms, 1 s, 10 s or 1 min. The logging runs until cancelled by pressing a button, the memory is full or the battery is empty. The internal flash chip records 600,000 entries. At 10 measurements per second, precise progress monitoring over up to 16 hours is also possible in addition to purely random sampling.

Only 90 x 50 x 20 mm in size, the product communicates pressure and temperature data via the NFC standard. This cordless near-field communication based on RFID ensures simpler data transmission — an advantage in comparison to USB as in other systems. The measuring range extends from 1 to 2000 mbar or -20°C to 60°C. The data can be read via a smartphone or tablet app for Android.

The 550 mAh battery is charged wirelessly on a charging base. According to the manufacturer, 1.5 to seven days operating time are possible once charged, depending on the measuring interval. The device is also waterproof and dustproof according to IP55.

Niche Gas Products
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OUTCOME OPTIMISING PAC

Control Logic is now supplying the PAC Systems Rx3i CPE400 from GE. Forming part of GE's Industrial Internet Control System, it is claimed to be the industry's first outcome optimising controller. It augments real-time deterministic control with embedded Field Agent technology to deliver near real-time advice through market analysis, fleet and enterprise data, or asset/process knowledge.

The Predix-enabled CPE400 provides reliable, secure communication and analytics using either cloud-based or edge-based outcome optimising apps. Controls can now be programmed to dynamically influence business outcomes, generate new forms of revenue and improve profitability.

With an operating temperature of -40 to 70°C, the CPU can be used in harsh environments, and with five Ethernet ports supporting a number of different protocols including Modbus/TCP and Profinet it provides the flexibility to communicate with a wide range of third-party devices.

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The SFY helps provide over-speed protection by sending signals that warn the logic solver to alarm or shut down, and has been certified by exida to ensure conformance with IEC 61508:2010. Users in industries such as oil and gas, chemical, power generation, pulp and paper and petrochemicals will find the SFY suitable for use in a wide variety of applications including turbine flow meters, magnetic pickups, dry contact closures, variable frequency drives, turbine tachometer generators, rotating equipment, motor and conveyor speed as well as pulse and frequency output transducers.

For example, the SFY can be used to read a signal from a magnetic pickup to the compressor shaft, providing a frequency output. The SFY converts it to a 4–20 mA output proportional to the compressor shaft speed and transmits it to the SIS Logic Solver.

Comprehensive FMEDA certified safety data is available on request. The SFY is input-to-output isolated and RFI/EMI protected, making it resistant to unpredictable ground loops and the harmful effects of plant and equipment noise. It is also available in explosion-proof/flameproof housings for use in hazardous environments.

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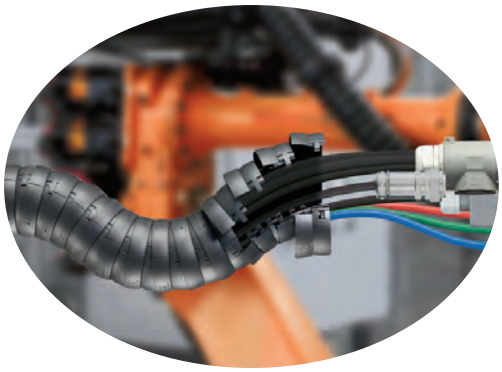

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Using pre-assembled dress-packs guarantees a quick replacement of the energy supply. For further applications for industrial robots, igus offers both customer-specific advice and an easy-to-use online configurator. With the QuickRobot tool the right solution from over 2000 options can be selected and ordered by specifying the robot manufacturer and the model series. On request, igus supplies suitable retraction systems to guide the energy chains with constant tension to the end of the robot arm, and also offers on-site installation on request.

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Brad Yager, Director Process Automation Offer & BD Pacific

In an increasingly digitally connected world, the potential for efficient manufacturing is limited only by the ability to comprehend and utilise innovative applications and technologies.

The manufacturing industry is no stranger to transformation, and the rate of change of digital transformation is more than ever. Often referred to as the Industrial Internet of Things, the industry is once again being presented with a challenge to reinvent itself. This era of cyber-physical systems heralds a new vision for manufacturing: the smart manufacturing enterprise.

Historical advancements in technology and manufacturing have undoubtedly changed human life and the way we live and work. We have seen living standards dramatically improve, while real wages have risen and the price of items once considered a luxury have fallen. But faced with a new set of challenges, the manufacturing industry needs to step up and embrace the next evolution of smart technology.

By 2050, the population of Earth will hit nine billion people. In order to meet the demand generated by this nearly 30% increase, productivity and quality will have to significantly improve.

Another issue which has required more consideration than ever before is sustainability, as the manufacturing industry is a major energy user. Industries and governments are tirelessly working on ways which could help to reduce the amount of energy consumption and to implement ways of working that would be more eco-friendly and sustainable for the future.

When dealing with rising energy costs and a volatile commodities market, manufacturers today are challenged to increase productivity to meet the needs of a growing population without harming the environment while using fewer resources.

By harnessing the power of the Industrial Internet of Things (IIoT) in the right way, manufacturers have the opportunity to tackle these challenges head on and drive simplicity, efficiency and profitability for decades to come. The IIoT offers up a new vision for manufacturing in the form of the smart manufacturing enterprise.

The smart manufacturing enterprise

The ultimate world vision of the IIoT is an industry where smart connected assets operate as part of a larger system that makes up the manufacturing enterprise. This system comprises a variety of different levels of technology and machinery, ranging from sensing through to controlling, optimisation and autonomous operation.

Comprising smart machines, plants and operations, these systems have embedded higher levels of intelligence at the core of their structure. The links between each machine operate on cloud technologies and standard internet technologies, enabling secure access to devices and information. Across the entire supply chain, machines will hum in harmony, gathering intelligence from their environment, analysing it and using it to make autonomous decisions about how they function — optimising productivity and efficiency. The most significant transformation has been the adoption of both wired and wireless IP technologies for operational systems. This has allowed systems to evolve at a rate required by businesses in a sustainable and secure way.

> WHILE GENERATING AND COLLECTING DATA IS AN IMPORTANT ASPECT OF THE IIoT, THIS ALONE WILL NOT ENABLE MANUFACTURERS TO REALISE THE FULL BENEFIT OF THE IIoT.

While the long-term impact of the IIoT can be difficult to predict, there are three distinct operational environments which are set out for a smart manufacturing enterprise to emerge:

- **Smart enterprise control:** IIoT technologies will enable tight integration of smart connected machines and smart connected manufacturing assets within the wider enterprise. This will facilitate more flexible and efficient, and hence profitable, manufacturing. Smart enterprise control can be viewed as a mid- to long-term trend. It is complex to implement and will require the creation of new standards to enable the convergence of IT and OT systems.
- **Asset performance management:** The deployment of cost-effective wireless sensors, easy cloud connectivity (including WAN) and data analytics will improve asset performance. These tools allow data to be easily gathered from the field and converted into actionable information in real time. This will result in better business decisions and forward-looking decision-making processes.
- **Augmented operators:** Future employees will use mobile devices, data analytics, augmented reality and transparent connectivity to increase productivity. As fewer skilled workers are left behind to man core operations due to a rapid increase in baby boomer retirement, younger replacement plant workers will need information at their fingertips. That information will be delivered in a real-time format that is familiar to them. Thus, the plant evolves to be more user-centric and less machine-centric.

How do we prepare for a smart manufacturing enterprise?

Although companies would already have many systems and processes in place, executives find it hard to revise the whole operations infrastructure. Nevertheless, there are a variety of readily available solutions which assist in combining a platform concept with an open technology approach. In doing this, enterprise owners will be able to build and adapt their processes as they develop.

Before an enterprise would implement any smart solutions, it is best to gain an understanding of any issues or gaps in their existing operations:

- **Operational must-haves:** Are you losing productivity because your workers have to manually input data?
- **Unfilled needs:** Do you need a dashboard showing all production? Could you reduce energy costs by analysing different resources? What about better workflow management?
- **Existing applications:** Do they work for you? Are they integrated, so that you can access critical data from one system into the other?

The next step required is to build out a complete understanding of the technologies and applications available in the marketplace, taking into consideration:

- **Platform technologies:** Look for proven, flexible, standards-based options.
- **Open technology:** Look to see if your current providers are taking an open approach that allows their applications to be easily integrated and aligned with offerings from other providers.
- **Disruptive technologies:** Take a look at key areas like the cloud, ubiquitous reporting and virtualisation. Though your organisation may not be ready to embrace these yet, you need to understand the potential they offer and ensure that the application providers you are using or considering are integrating these technologies in their future plans.

If it is building an enterprise from the beginning or even upgrading an already existing set-up, it is key to always consider the above factors. This will ensure companies will have a smart and connected infrastructure which is suitable for their enterprise.

A platform fit for the future

Manufacturers are required to source ways to maximise both flexibility and standardisation to achieve success. While engineers require flexibility to diversify, be innovative and differentiate their products, corporate management requires tight control in order to reduce variability, ensure cost efficiency, deliver high consistent quality and maintain product safety.

To kick off the implementation of an overarching integration platform, the required functionality includes plant floor automation connectivity, process data, reporting, collaborative workflows and mobility. The importance of this platform being secure and scalable is essential for a smoothly functioning structure.

The platform will further provide a basis to integrate additional software applications as they advance and suit the unique demands of the business. Energy management software is also another platform that can be used to monitor the usage of energy throughout an enterprise. Effective management of energy-consuming systems such as HVAC, lighting and blind control can reduce energy bills by up to 30%.

What technology is leading the IIoT evolution?

As we know, the IIoT is altering the boundaries between physical and virtual entities. The result of this provides room for more flexible manufacturing models, especially when accessing process and machine data. While generating and collecting data is an important aspect of the IIoT, this alone will not enable manufacturers to realise the full benefit of the IIoT. Some other components that are required for consideration include: smart connected devices that are IIoT-ready; edge gateways to aggregate data; applications and services to assist in analysing data and achieving business objectives; and an open and collaborative environment.

Devices that are 'IIoT ready' are smart connected technologies that have embedded technologies such as wireless connectivity and web services already built into the device. These embedded devices become critical to support processes such as optimisation.

Edge gateways, or pass-through capabilities of devices at the edge, are optimal for aggregating data collected from various sources and delivering real-time business information to the right people at the right time. This is vital, as it facilitates value-added services independent of the control system. It also ensures a high level of performance and connectivity, which is also critical to the platform's effectiveness and efficiency.

Digital applications and services serve a significant purpose in achieving the business performance gains promised by the IIoT. Simple data collection must be extended to include analytics that deliver pertinent and valuable business information.

An open and collaborative environment will enable partners to develop specific applications that extend offerings and reach to help deliver the results from the IIoT. A consistent development environment with effective governance and processes will create easy integration across IIoT platforms. Most importantly, an appetite for adopting new business models to invest in these newer technologies, and levels of connectivity in order to maximise the benefits of these new ways of doing things, is essential.

Moving forward

All in all, the smart manufacturing enterprise continues to evolve. It is clear that the potential for efficient working is limited only by the ability to comprehend and utilise innovative applications and technologies. Advancements within technology have allowed enterprises to implement software solutions integrated with systems that have enhanced connectivity, intelligence and automation, which is required to drive efficiency in productivity.

There are still many areas that require standards to fully realise the potential of the IIoT. In order for companies to remain competitive in the marketplace, businesses are required to implement and adopt these IIoT technologies. It is essential to work with companies that have the expertise to apply the IIoT technologies to production systems and drive the evolution towards smart manufacturing enterprise that is more efficient, safe and sustainable.

Australian companies can now embrace this change, and smart manufacturing enterprises are the next step in the journey to a fully connected and more productive future.

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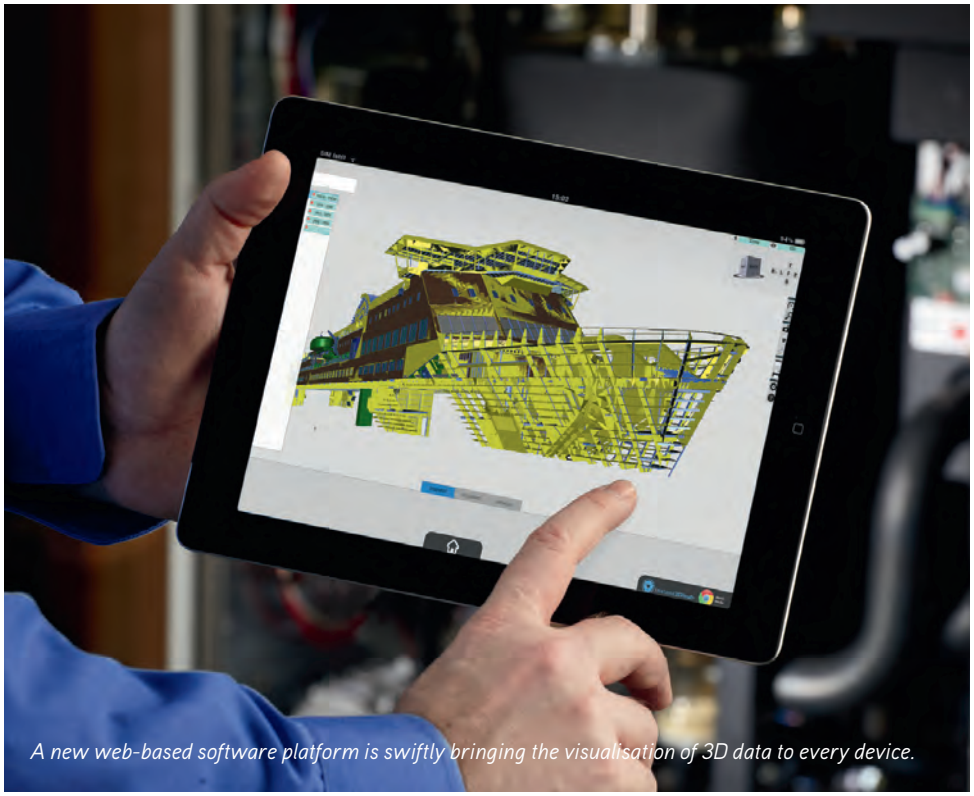
Visualising complex 3D data on any device

If you want to be sure that the person you are sending documents and pictures to will be able to open them on their computer, then you send them in PDF and JPG format. But what do you do with 3D content?

"A standardised option hasn't existed before now," said Dr Johannes Behr, head of the Visual Computing System Technologies department at the Fraunhofer Institute for Computer Graphics Research IGD.

In particular, industry lacks a means of taking the very large, increasingly complex volumes of 3D data that arise and rendering them useful — and of being able to use the data on every device, from smartphones to VR goggles. "The data volume is growing faster than the means of visualising it," said Behr.

Fraunhofer IGD is presenting a solution to this problem in the form of its instant3DHub software, which allows engineers, technicians and assemblers to use spatial design and assembly plans without any difficulty on their own devices. "This will enable them to inspect industrial plants or digital buildings, etc, in real time and find out what's going on there," Behr explained.



A new web-based software platform is swiftly bringing the visualisation of 3D data to every device.

©Fraunhofer IGD

On account of the gigantic volumes of data that have to be processed, such an undertaking has thus far been either impossible or possible only with a tremendous amount of effort. After all, users had to manually choose in advance which data should be processed for the visualisation, a task then executed by expensive software. Not exactly a cost-effective method, and a time-consuming one as well.

With the web-based Fraunhofer solution, every company can adapt the visualisation tool to its requirements. The software autonomously selects the data to be prepared by intelligently calculating, for example, that only views of visible parts are transmitted to the user's device. Citing the example of a power plant, Behr explained: "Out of some 3.5 million components, only the approximately 3000 visible parts are calculated on the server and transmitted to the device."

Such visibility calculations are especially useful for VR and AR applications, as the objects being viewed at any given moment appear in the display in real time. In a VR application, it is necessary to load up to 120 images per second onto data goggles. In this way, several thousand points of 3D data for, say, a vehicle model, can be transmitted from a central database to a device in just one second. The process is so fast because the complete data does not have to be loaded to the device, as used to be the case, but is streamed over the web.

A huge variety of 3D web applications are delivered on the fly, without permanent storage, so that even mobile devices such as tablets and smartphones can make optimal use of them. One key feature of this process is that for every access to instant3DHub, the data is assigned to, prepared and visualised for the specific applications. "As a result, the system fulfils user- and device-specific requirements and above all is secure," said Behr.

BMW, Daimler and Porsche already use instant3DHub at over 1000 workstations. Even medium-sized companies such as SimScale and thinkproject have successfully implemented 'instantreality' with instant3Dhub and are developing their own individual software solutions on that basis.

Technologies that create a link between CAD data and the real production environment are also relevant for the domain of augmented reality. "Augmented reality is a key technology for Industry 4.0, because it constantly compares the digital target situation in real time against the actual situation as captured by cameras and sensors," said Dr Ulrich Bockholt, head of the Virtual and Augmented Reality department at Fraunhofer IGD.

Ultimately, however, the solution is of interest to many sectors, he explained — even the construction and architecture field, where it can be used to help visualise building information models on smartphones, tablet computers or data goggles.

Fraunhofer Institute for Computer Graphics Research IGD
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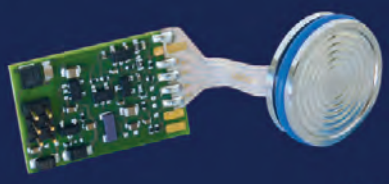
- Total error band ± 0,1 %FS at -10…80 °C



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ZERO-BLEED PNEUMATIC CONTROLLER

Bifold has developed a control system that is claimed to transform pneumatic actuation in positional control as well as on/off and ESD valves.

The PICO will be available with one control logic head which is then amplified by the Bifold filter booster range from ¼″ up to 2″. The Bifold filter booster technology allows a flow rate equivalent to larger systems to be achieved by the PICO: a ½″ filter booster system delivers a flow performance of a 1″ tubed system.

This higher flow is achieved by moving all the pressure regulation and valve control logic away from the flow line at the same time as combining the filter into the booster itself. This final step results in the maximum possible differential pressure across a single element, maximising flow.

In addition to the positional control capability, the PICO can be used with on/off and ESD actuators due to its true zero leak capability, combined with proportional control and high flow.

The benefits of the PICO with on/off actuators include: efficient use of compressed air, by only pressurising the actuator to open fully and not continuing to fill to a regulator set pressure; higher operating pressures, resulting in smaller actuators (10 bar working pressure); and allowing controlled and accurate partial stroke with diagnostics, without the need to vent any actuator overpressure before initiating movement.

The Bifold Universal controller is a fully configurable controller with on-screen valve diagnostics, signatures and data capture and features HART, Modbus and Bluetooth communications.

Rotork Australia
www.rotork.com

WIRELESS ACCESS POINT

The Hirschmann BAT867-R offers only the essential interfaces — one radio, one Ethernet port and one power supply — for industrial applications in need of a compactly designed, cost-effective wireless access point. These access points, which can also be used as clients, routers or bridges, feature IEEE 802.11ac and are backward compatible to a/b/g/n standards.

Because of its support for high-speed IEEE 802.11ac data rates, data can be transmitted at up to 867 Mbps.

Its rugged design, compact size and select feature set help applications maximise efficiency and performance. Because only the essential interfaces have been included, the BAT867-R is suitable for industrial settings where space and budgets are limited, such as discrete automation and machine building settings. Users also have access to extensive management, redundancy and security functions with Hirschmann's operating system, HiLCOS.

Belden Australia Pty Ltd
www.belden.com

SELF-CONTAINED LINEAR MOTOR

The LinMot linear motor features an integrated drive. This concept allows the controller to be eliminated from the electrical enclosure for linear direct drives, thus reducing installation time and effort. On the application side, this opens up the possibility to efficiently couple the devices in a daisy chain linkage.

Clevis and rod ends can be provided to replicate air cylinders. Most communication standards can be provided to suit the application. The actuator is rated to IP65 and the motors can be supplied to IP69K and Ex rated.

Benefits of the linear motors include full servo control capabilities, high-speed positioning and force control.

Motion Technologies Pty Ltd
www.motiontech.com.au

INDUSTRIAL CAMERAS

Ximea XiQ USB 3 industrial cameras are compact, measuring 26.4 x 26.4 x 21.2 mm and weighing 27 g. Performance is claimed to be four times times faster than GigE, five times faster than Firewire and 10 times faster than USB 2.0 for machine vision applications. They are suitable for a range of applications, including industrial, manufacturing and factory automation, robotics, food and print inspection, face recognition, automotive crash testing and rapid process capturing.

With a CMOS global shutter, the cameras offer fast, high-speed, high frame rates: 500 fps at VGA; 90 fps at 4 MP (2048 x 2048) and 170 fps at 2 MP resolutions. They are compatible with more than 30 vision libraries, Windows, Linux, Mac OSX, ARM and the USB3 Vision Standard. Colour and monochrome versions are available.

SciTech Pty Ltd
www.scitech.com.au

SAFETY LASER SCANNER

IDEC Corporation has introduced the SE2L safety laser scanner, claimed to be the world's smallest and the world's first with master/slave functionality and dual protection zones.

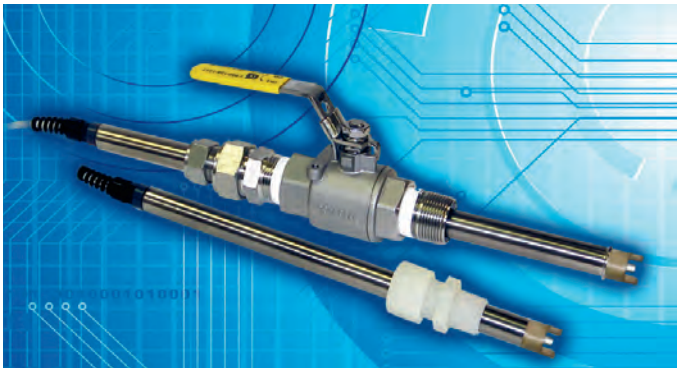
Master/slave functionality allows one scanner to act as master and communicate with up to three other scanners. The safety controller only needs to communicate with the master, reducing the required number of input and communication channels on the controller. This can allow safety controllers to be used in applications such as providing full 360° protection for an AGV, which requires four scanners.

Dual zone protection allows one scanner to scan two adjacent zones simultaneously and independently, performing the work of two scanners for the cost of one. A common application is providing dual light curtain protection for two robots mounted side by side. In many applications, dual zone protection cuts costs in half.

The scanner provides a standard 270° arc of protection at a distance up to 20 m; this protection area can be configured into any pattern using software provided with the scanner or with the scanner's teach mode. Up to 32 patterns can be stored in the scanner; different patterns can be selected and applied on the fly by sending commands to the scanner through the Ethernet port or by configuring the encoder input to react to changes in speed.

The scanner is certified for use in Safety Category 3, Performance Level d (PLd), SIL2 applications. It is housed in an IP65 enclosure.

IDEC Australia Pty Ltd
www.idec.com/australia



SULFIDE-RESISTANT PH SENSORS

Petroleum refiners must take care to monitor and treat naturally occurring H_2S that contaminates water in their operations to meet regulatory limits. The sulfide-resistant Models S10 and S17 analytical pH sensors from Electro-Chemical Devices (ECD) monitor pH in water-based solutions. The S10 and S17's Model 20005130 replaceable cartridge electrode features a pH range of 0 to 14 at temperatures from -5 to 130°C and survives pressures up to 300 psi at 25°C. It has been tested to sulfide ion concentrations of up to 25 ppm.

The S10 and S17 range consists of two unique sensor designs and replaceable electrode cartridges. The S10 sensor is an immersion- or an insertion-style sensor, and the S17 is a valve retractable-style sensor. They are fully rebuildable and feature a 316 stainless steel body that incorporates the sensing cartridge, a temperature module and a signal conditioner with cabling. These cartridges provide specific solutions for the measurement of pH, ORP, specific ion (pION), dissolved oxygen, conductivity and resistivity in a wide range of industrial process applications.

The pH and ORP cartridges are available with either Radel (PES) or PEEK construction configurations with full crown, double- or single-tine style pH bulb protection. The pION cartridges with solid state, glass or PVC sensing membranes are suitable for continuous online measurement. The DO electrode is a galvanic cell with a lead anode, silver cathode and Teflon membrane. The conductivity and resistivity electrodes are designed in both contacting and toroidal sensor configurations for application flexibility.

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

SAFETY SWITCHES

The Pizzato NS series of safety switches make it possible to create circuits with maximum PLe and SIL3 safety levels by installing just one device on the machine. This avoids expensive additional wiring and allows for quicker installation.

The series has two electronic safety outputs that must be connected to a safety module with OSSD inputs or to a safety PLC. The series offers optional multiple connections (daisy chain), for up to a maximum number of 32 devices, while maintaining the maximum PLe safety level. LEDs are displayed on the front face, providing visible diagnostics.

The switches are used on machines where hazardous conditions remain for an extended duration, even after the machines have been switched off — eg, the mechanical inertia of pulleys, saw blades, parts under pressure or high temperatures — and when it is necessary to control machine guards (allowing the opening of protections only under specific conditions). They also have IP67 and IP69K protection ratings for tough environmental conditions.

The safety switch is equipped with a large hole for centring the actuator's pin. This makes it easier to align the actuator and the hole on the head of the switch during the assembly phase, which is helpful for off-axis doors.

The top module of the switch incorporates the release device mechanism and the lower module includes the connection outputs. The modules can be rotated in 90° steps, thereby facilitating different mounting combinations.

Leuze electronic Pty Ltd
www.leuze.com.au

SAFETY LIGHT CURTAINS

Pilz PSENopt II safety light curtains are designed for use in machine guarding applications to detect the presence of a person's finger, hand, limb or whole body. Depending on the application, the product satisfies all the requirements of EN/IEC 61496-1 for finger, hand or body protection.

The product comes in a standard Type 4 and a Type 3 light curtain. The Type 3 light curtain works with the revised version of IEC 61496-1.

The light curtains are suitable for manual workplaces, such as those with materials handling or robotic applications. With their high shock resistance of 50g, they are suitable for rugged industrial environments and offer hand protection and finger protection up to Category 4, PL e and SIL 3. The light curtains work with continuous single beams that completely eliminate so-called 'dead zones' so they can be positioned closer to the application, saving valuable space.

The light curtains can be applied flexibly and installed easily with the assembly aids. Due to their 5-pin connection they can be directly connected to a decentralised Pilz PDP67, effectively reducing the commissioning effort.

The product enables muting, blanking or cascading using just one light curtain. These functions open up a wide range of possibilities for the integration of light curtains into the workspace. Muting is used to distinguish between a person and material, and to transport material into and out of a danger zone.

Pilz Australia Industrial Automation LP
www.pilz.com.au

MINIATURE SAFETY LIGHT BARRIERS

The SLB series of safety light barriers from Schmersal are claimed to be the smallest safety light barriers. With small dimensions and built-in analysis, the range includes SLB 240 (Type 2), SLB 440 (Type 4) and SLB 450 (Type 4).

Standard features include an integrated safety monitoring module, automatic start or restart interlock, Safe OSSD outputs, integrated visual indication, four-stage optical coding for multiple units in close proximity, prewired or M12 connectors and IP67. Range is up to 15 m with the SLB 240/440 and up to 75 m for the SLB 450.

An optional electric heater is available on the SLB 450 to offer frost-free operation in low-temperature applications down to -30°C, making it suitable for applications that require protection of equipment within cool rooms, freezers and outdoor applications.

The range can be used on all equipment where a narrow protective height is required or the equipment length is long. Example industries include paper and printing, timber processing, mining, packaging and warehousing.

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

CHLORINE ANALYSER

The TC-80 total chlorine analyser monitors total chlorine in drinking water, rinse water, cooling water and other freshwater samples, from 0.05–20 ppm chlorine as the standard range or 0.005–2 ppm with the low-range sensor. Its plug-and-play design allows it to be installed right out of the box. Its panel mount design includes built-in flow control, which eliminates the need for complicated pressure regulators and rotameters.

The product incorporates a constant head flow control device, a pH sensor, a chlorine sensor and ECD's T80 analyser/transmitter mounted on a PVC panel. By connecting the sample and drain lines, then connecting the power and outputs, the device is ready to use.

The TCA sensor is a three-electrode amperometric sensor with a gold cathode, silver halide anode and 304 stainless steel counter electrode. The pH sensor provides compensation for samples between pH 4 and pH 12.

Amperometric chlorine sensors are flow sensitive, so a constant head flow controller maintains the optimum flow by the sensor over a wide range of incoming sample flow rates.

The product is available with either 110–240 VAC or 24 VDC power and graphically displays both the total chlorine and pH, allowing for easy trend analysis. The standard configuration has two 4–20 mA outputs and three alarm relays.

It is also available with an auto-clean option that includes a solenoid-actuated spray cleaner using either 30 psi process water or air.

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

HMI WORKSTATIONS

Eaton has expanded its range of MTL GECMA HMI workstations, introducing a thin client (TC) and personal computer (PC) version.

The TC and PC versions complement the existing MTL GECMA remote terminal (RT) and are approved to global hazardous certification for Zone 1 environments. As a result, they are suitable for use in hazardous EX zone areas in the chemical, pharmaceutical, refinery and oil and gas industries.

The TC version is designed for virtualisation applications, eg, for batch control. The workstation works with a client server in the safe room across a LAN. This saves space in the cabinet as users don't need a dedicated PC and the user can control up to 255 HMIs from a single server.

The PC version is a stand-alone system and has system hardware that meets the needs of complex applications with high computing power demand. The workstation has a watchdog function that automatically monitors the operating system; if there is no input from the system, it automatically restarts itself.

RT is a point-to-point device, with one workstation assigned to one PC in the safe area, and features a keyboard, mouse and video. The RT terminal's modularity means upgrades to existing installations are quick and easy, which can save time and minimise maintenance and downtime. Traditionally, the whole unit would have to be dismantled off site, but with MTL GECMA, individual parts can be replaced on-site, increasing plant availability.

Eaton Industries Pty Ltd
www.eatonelectric.com.au

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IS LI-FI THE FUTURE FOR INDUSTRIAL NETWORKS?

Glenn Johnson, Editor

Wireless networks are showing up more commonly in industrial environments but have the drawback of more complex network design challenges, not the least of which are concerns about cybersecurity. Perhaps the latest research into light-based wireless networks offers a solution.

With all the talk of Industry 4.0, the IIoT and the Industrial Internet, the demand for the interconnection of industrial automation equipment and computing systems has never been pushed along at a faster rate.

While current network technologies are orders of magnitude faster than they were even a decade ago, the desire to add wireless technologies into industrial environments is opening up new problems that have to be solved, not least of which are their application in an interference-rich environment and issues of cybersecurity.

You may have heard or read in recent times about the new kid on the block: Li-Fi (Light Fidelity). There has been a great deal of buzz about it since it was first demonstrated in 2011, transmitting data using a normal (if slightly modified) LED light bulb. LEDs have a unique ability that goes beyond their use as energy-efficient lighting devices. They can be switched on and off within nanoseconds, which makes them superfast transmitters of binary data. This flickering occurs faster than the eye can see, so even LEDs used for room lighting can be used to transmit data. Some are now saying that this has the potential to be a key enabler in the quest for Industry 4.0, since the potential bandwidth is so much greater than Wi-Fi.

However, we need to place it in the context of industrial control networks as a whole.

Where we are

Wired analog signals have traditionally been the norm for sensing and actuation in process plants, and, while digital fieldbus technologies have been supported by major automation vendors for many years now, they have not really made the expected market penetration. In plants where the analog 4–20 mA signal is king, even newer technologies such as Industrial Ethernet have stood even less of a chance, due to the high cost of rewiring a plant. The "if it ain't broke, don't fix it" mantra is fine for existing plant operations, but not in keeping with the newer demands of IT/OT integration. In factory automation, on the other hand, digital fieldbuses and Industrial Ethernet have been much more successful due to the need for more precise control at greater speed. IT/OT integration is therefore more readily achieved in a factory automation environment because technologies already exist that have the potential to provide for the additional data required.

The introduction of wireless technologies has helped to alleviate the problem of upgrading wiring in order to extending monitoring and control to non-process critical functions, such as condition and energy monitoring. Wireless instrumentation standards such as WirelessHART and ISA100.11a have made it possible for process plants to implement additional functionality without the expense of upgrading cabling or implementing fibre optics, while the well-known and ubiquitous Wi-Fi technologies have been expanding to the plant and factory floor to provide higher-bandwidth communication for modern technologies and tools such as smartphones and tablets, improving technician efficiency and safety.

Wireless instrumentation networks such as WirelessHART are based on a self-healing, low-power mesh technology and as such can be extended out across a process plant relatively securely and without significant additional infrastructure other than gateway nodes that connect to the wired network. Being low power and having high standards of cybersecurity protection built-in means that they are inherently more difficult for those with malicious intent to penetrate. Wi-Fi, on the other hand — being higher power and higher bandwidth — presents certain inherent features that must be well understood:

- Not being based on a mesh network concept, Wi-Fi systems require access points (APs) to be within range of Wi-Fi clients and, in environments with high electrical interference and many metal structures, may require careful strategic placement. More APs may be required than would be needed to cover a similar area in a non-industrial environment.
- APs must be provided with power and be wired into the network. If an AP is required at a distant end of a plant, the wiring will still be required to connect it, both electrical power and data cabling — often fibre optic. This can have a significant effect on the true cost-effectiveness of Wi-Fi in some environments.
- Industrial-grade APs are significantly more costly than those used in office environments.
- The higher power of Wi-Fi technology means that signal 'bleed' easily occurs outside the plant or factory, opening them up to access by third parties from outside the plant and forcing the requirement for a greater level of planning around cybersecurity and secure infrastructure design.
- Although Wi-Fi technologies have offered greater speed and bandwidth over the years, there is an upper limit on the future capabilities due to lack of available spectrum. The fastest standard currently — 802.11ac — achieves its higher bandwidth by utilising the 5 GHz band rather than the 2.4 GHz band of earlier standards, but with the higher frequency comes lower reliable range and, hence, the need for more APs to cover the same area. In addition, effective bandwidth in real usage scenarios is always much less than the theoretical maximum.

Li-Fi: the wireless technology of the future?

The idea of information transmission through the air using light is technically not a new invention. In 1880, Alexander Graham Bell actually invented what he called a 'photophone', which he believed was more significant an invention than the telephone. With this invention he was able to use a mirror to transmit the vibrations caused by speech over a beam of sunlight for a distance of 213 m. Vibrations on the mirror were effectively modulating the light beam.[1]

In recent years there has been considerable success in the development and testing of commercial Li-Fi systems, although it is still early days. The interest in Li-Fi to a great extent has been spurred on by two developments:

1. The reliability and ubiquity of LED lighting, which can be switched or modulated rapidly.
2. The enormous and growing user demand for wireless data is placing huge pressure on existing Wi-Fi technology — with the exponential growth of mobile devices, by 2019 more than 10 billion devices are expected to exchange around 35 quintillion (1018) bytes of information each month.[2] This is expected to present significant problems using existing wireless technology due to frequency congestion and electromagnetic interference.

The visible light spectrum, from around 400 nm to 700 nm, has a huge unregulated bandwidth capacity more than 10,000 times larger than the microwave spectrum used by Wi-Fi and cellular technologies.

Bell aside, modern Li-Fi — or visible light communication (VLC) — was invented by Harald Haas from the University of Edinburgh and presented in a TED talk in 2011[3], when he demonstrated for the first time that by flickering the light from a single LED, he could transmit far more data than a cellular tower. Then in 2015, researchers at the University of Oxford achieved a bidirectional speed of 224 Gbps.[4] Early commercial trials in office environments in Tallinn, Estonia have achieved transmission speeds of 1 Gbps — 100 times faster than average office Wi-Fi speeds. It is also rumoured that Apple is already designing Li-Fi capabilities into future generations of its smartphones and tablets.

According to Haas: "All we need to do is fit a small microchip to every potential illumination device and this would then combine two basic functionalities: illumination and wireless data transmission… In the future we will not only have 14 billion light bulbs, we may have 14 billion Li-Fis deployed worldwide for a cleaner, greener and even brighter future."

So what does this mean for industrial environments?

Like all technologies, Li-Fi has its benefits and its drawbacks. But sometimes, what may seem a drawback in one situation could be a benefit in another.

Range

Firstly, unlike Wi-Fi, Li-Fi cannot penetrate walls. It can therefore only be accessed by devices in direct line of sight of the light source that is being used as an access point.

This could be seen as a disadvantage where mobile devices are roaming between rooms or visibly separated areas, and may disconnect temporarily. It has been shown, however, that existing Li-Fi technology can still achieve a speed a speed of up to 75 MBps when reflected around a corner using a mirror.

Security

The obvious advantage of Li-Fi's inability to pass through walls is the security benefit. A Li-Fi network set up on a plant floor cannot 'leak' outside and is therefore impervious to outside hackers.

Noise immunity

Being based on light, Li-Fi is immune to interference from network signals from machinery or devices in adjacent rooms. And, of course, it is completely impervious to EMI from large electrical machines.

Solar interference

This is the biggest single drawback for Li-Fi. There is limited scope at the moment for deployment outdoors due to one very large interference source: the sun. I would expect, however, that through clever coding techniques it may be possible to reduce the effect of solar interference in some scenarios by increasing its effective signal-to-noise ratio (SNR), perhaps with some reduction in available bandwidth.

Advantages for indoor factory environments

Good lighting is important in any factory environment, and modern LED lighting is supplanting older lighting technologies due to its greater energy efficiency as manufacturers try to minimise energy costs.


© Malcolm Cochrane/PureLiFi

> LIKE ALL TECHNOLOGIES, LI-FI HAS ITS BENEFITS AND ITS DRAWBACKS. BUT SOMETIMES, WHAT MAY SEEM A DRAWBACK IN ONE SITUATION COULD BE A BENEFIT IN ANOTHER.

If the LED lighting also acts as a uniformly distributed wireless Li-Fi access point, its greater bandwidth than Wi-Fi offers the potential for new applications, such as Full HD video connections between control room and technician and other streaming video functions, as well as direct online access to data and information at gigabit speeds.

The ability to transmit ever larger amounts of IIoT data from sensors without additional wiring — interference-free and securely — is also a potential advantage that leads us back to our Industry 4.0 agenda.

Li-Fi technology could be used not only for room-wide or plant-wide data transmission, but also point-to-point between moving machines such as robots or automatic guided vehicles (AGVs). Large amounts of control and sensor data can be transmitted between, say, the end effector of a moving robot and another robot or robot controller without the need for data cabling — and at greater speeds.

What about hazardous areas?

The obvious answer to this is yes! There are great advantages. Since many hazardous areas are outdoors, there is still the issue of solar interference; however, for short-range communication, such as between a field device and a device calibrator or other data recording device, Li-Fi is a method of communication that could significantly increase data communication speeds while being completely safe in environments where an explosion hazard exists.

If the solar interference issue is overcome, then gone will be the days of worrying about energy levels in hazardous areas placing limitations on communication power. Under such circumstances, Li-Fi could potentially bring the speed and power of high-speed data communications to hazardous areas in process plants, permitting the advantages described above for indoor factory scenarios.

Summary

It will be some years before Li-Fi is a serious contender for use in industrial environments. But watch this space. Like all technologies, it will start small, with limited application, but the current accelerating pace of technological development that we are seeing today may mean that we will see Li-Fi systems in our factories and process plants sooner than we may expect. It is also expected that it will be more likely that we will see radio-based and light-based systems coexisting in hybrid systems combining the benefits of both.

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IoT EDGE SERVER

The Advantech Edge Intelligence Server (EIS) is designed to accelerate IoT implementation by providing integrated solutions that include an edge computer, WISE-PaaS software packages, IoT development tools, preconfigured cloud services and the flexibility to add more software modules from the WISE-PaaS marketplace.

The EIS incorporates a ready-to-run package that includes built-in WISE-PaaS software for device management, centralised security management, interactive multimedia content editor, SCADA and HMI. This fulfils a multitude of different application requirements, and also provides comprehensive development tools and SDKs with standard protocols (Modbus/OPC/MQTT) for sensors and other devices. It also provides preconfigured Azure services to help customers move current solutions to the cloud, so as to improve operation efficiency and business transformation.

Advantech Exclusive Software Service provides access to the WISE-PaaS Marketplace, an online software shopping website that delivers IoT Cloud Services, Security Services, WISE-PaaS IoT Services, and the Solution Ready Package for Edge Intelligence Server (EIS). WISE-PaaS Marketplace integrates with IoT eco-partners on cloud and software solutions to accelerate building blocks for IoT developers. Customers can subscribe to WISE-PaaS Marketplace services and access numerous IoT software solutions by spending their WISE-Points, Advantech's digital currency included in WISE-PaaS VIP membership packages.

The EIS-D110 entry-level edge server and the EIS-DK10 starter kit include a ready-to-run edge system preconfigured with WISE-PaaS software packages, wireless I/O module, sensor and Microsoft Azure service. Also available are the multiple I/O EIS-D120 and high-performance EIS-D150.

Advantech Australia Pty Ltd
www.advantech.net.au

HAZLOC CONTROL STATIONS

IDEC Corporation has introduced the EC2B Series of enclosures, control stations and accessories for hazardous location applications. The standard and custom control stations utilise IDEC's EU2B line of hazardous location push-buttons, pilot lights, selector switches, key selector switches, emergency stop switches and analog meters.

All EC2B and EU2B products are UL certified for use in Zone 1 and 2, and are also certified for use in hazardous locations by IECEx (Global), ATEX (Europe) and TIIS (Japan) to meet the strictest safety standards. The enclosures and fully sealed pilot devices are rated IP65 and Type 4X for protection against water and corrosion, and are available with exposed or finger-safe IP20 screw terminals. The enclosures are constructed of 304 stainless steel to provide long service life in hazardous and corrosive areas.

Standard control stations include the most popular and common options. If one of the standard control stations doesn't fit the application requirements, users can specify a custom control station by selecting from the wide variety of EU2B control devices and enclosures. IDEC will build the custom control station to customer specifications, deliver the station with drawings and provide a part number for future orders.

IDEC Australia Pty Ltd
www.idec.com/australia

PLUMMER BLOCK HOUSINGS

The latest FAG plummer block housings from Schaeffler are large-size bearing housings, engineered to increase the service life of fitted spherical roller bearings by up to 50% compared to conventional plummer block housings.

Their advances — including increased strength and shock resistance due to the use of (EN-GJS-400) spheroidal graphite cast iron — make the SNS suitable for the diverse range of applications where spherical roller bearings are widely used, including machinery operating in aggressive environments.

The plummer blocks — for shafts from 115 to 530 mm diameter — are designed to distribute the load on the bearings more effectively than previous and alternative housings. The design is a split plummer block, which allows maintenance to be carried out more efficiently and quickly by providing easier access to the bearing.

Schaeffler can also provide a special split labyrinth seal which facilitates the use of the FAG split spherical roller bearing inside the housing. Four different seal variants, including high-speed labyrinth seals, split labyrinth, clip-in and bolt-on Taconite seals, ensure effective sealing of the SNS housing to protect the bearing from harmful contaminants.

An axial lubrication groove in the upper section of the housing ensures optimum lubricant supply for bearings in every bearing position. The design also integrates good anti-corrosion characteristics and reduced cleaning requirements, due to inclined run-off areas as well as a projecting upper housing section.

Schaeffler Australia Pty Ltd
www.schaeffler.com.au

NEW PRODUCTS

INDUSTRIAL SWITCHGEAR

Clipsal by Schneider Electric has developed the 56 Series Industrial Switchgear in different materials to suit the environment it is installed in.

The Grey (GY) range is the original switchgear for 56 Series industrial plugs and sockets for general commercial and industrial applications. It is suitable for resisting the effects of high impact and long exposure to UV, both indoors and outdoors. It can be used in areas subjected to low and high temperatures and in dusty/damp environments.

The Chemical Resistant Grey (CG) range has been designed for indoor food environments where aggressive alkali/caustic cleaners are used and washdown procedures are the norm. This includes dairies, abattoirs and food processing plants. It is suitable for indoor applications and resisting cooking oils such as canola.

The Chemical Resistant Orange (RO) and Chemical Resistant White (RW) material offers resistance to a wide range of chemicals. They are suitable for butcher shops, delicatessens and automotive workshops, and in environments where high visibility is important (RO) or where aesthetics are important (RW). They resist corrosive and industrial chemicals, general chemicals such as detergents, oils/grease found in automotive and workshop environments, petroleum-based products and UV damage.

Clipsal by Schneider Electric
www.clipsal.com

MAGNETIC LENGTH SENSOR

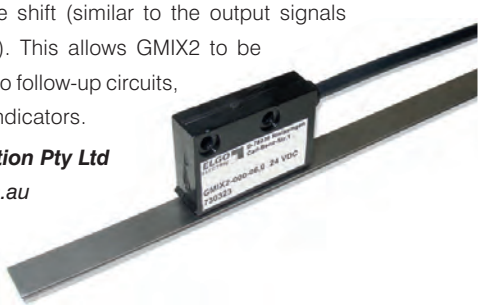
The Elgo GMIX2 incremental sensor can be installed at a distance of up to 4 mm from the magnetic tape.

The measuring system features a resolution of 2.5 mm (four edge-triggered), a repeating accuracy of ±2.5 mm and a maximum operation speed of 10 m/s (output frequency 4 kHz), making it suitable for applications in storage or conveying for longer distances.

Due to the wear-free measuring principle (by magnetic scanning) and high protection class of IP67, the sensor works well in rough environments always uninfluenced and reliably.

The compact sensor offers an integrated translator circuit, which converts the detected signals into square wave signals A and B with a 90° phase shift (similar to the output signals of rotary encoders). This allows GMIX2 to be connected directly to follow-up circuits, such as position indicators.

Treotham Automation Pty Ltd
www.treotham.com.au



PNEUMATIC CONVEYOR FOR FRAGILE GOODS

Successfully solving the problems of using vacuum technology to convey the delicacies of the food industry, such as nuts, seeds, beans and lollies, as well as nutraceutical tablets and capsules, Piab's piFLOWt conveyor is dedicated to the gentle handling of delicate ingredients and products. The conveyor utilises a controlled, low-speed, guided entry into the conveyor, along with the elimination of all sharp edges, to ensure that products are handled with the maximum care.

Suitable for transporting up to four million items per hour, the conveyor can be used to transport any fragile goods within a processing plant. For the food industry this enables the safe handling of, for instance, coated sweets, roasted coffee beans, whole nuts and nutraceutical tablets.

Eliminating the use of inadequate standard equipment and alternative, often back-breaking, manual procedures, the device will safely transfer ingredients and products between the various processing units, such as tablet presses, coating drums and packaging lines, avoiding all risks of damage. At its core is piGENTLE, an innovative technology that maintains a gentle flow by regulating the feed pressure of the pump, ensuring that fragile ingredients or products are handled as delicately as possible.

piFLOWt is an extension to Piab's high-quality range of piFLOW conveyors for powder and bulk materials. It is specially developed to meet the stringent demands regarding operational safety and hygiene within the food, pharmaceutical and chemical industries.

Pneumatic Products
www.pneumatics.com.au

AIR VELOCITY TRANSMITTER

The Dwyer AVUL air velocity transmitter quickly and accurately measures air velocity or volumetric flow in imperial or metric units. Simultaneous current and voltage outputs on all models provide universal inputs to monitoring equipment while the output range, units, and 0–5/10 VDC output can be configured via local DIP switches. The optional integral display, or the portable remote display tool, provide a convenient way to locally monitor process values and configure the unit.

Models are available in 3% and 5% accuracy models to suit a variety of needs, and the optional BACnet MS/TP or Modbus RTU/ASCII communication protocol allows units to be daisy-chained while providing access to all of the velocity and flow data, as well as additional information such as air temperature.

Sensing elements in the AVUL have been coated with an engineered conformal coating to ensure durability and longevity. Field selectable ranges can be quickly configured without power to the unit.

Dwyer Instruments (Aust) Pty Ltd
www.dwyer-inst.com.au

EMBRACE INNOVATION

AT OZWATER'17

International Convention Centre Sydney, Darling Harbour

The Australian Water Association's international water conference and trade exhibition, Ozwater, will be held from 16–18 May at ICC Sydney.

The event will see water professionals, students, scientists, researchers and policy- and decision-makers from across Australia and internationally unite to usher in a new dawn for Australia's water security.

The event's conference program will include more than 150 sessions over eight streams, bringing together the who's who in water to discuss the important topics facing the water industry and provide a platform to exchange strategies and ideas in a public forum. Keynote speakers announced so far include: Lucy Turnbull AO, Chief Commissioner, Greater Sydney Commission; Dr Sander Klous, Partner-in-Charge Data & Analytics, KPMG; Dan Gregory, Founder and CEO, The Impossible Institute; and Jane Huxley, Managing Director, Australia and New Zealand, Pandora.

In particular, the conference will be focusing on the theme 'Embracing innovation and disruption for a smart water future', encouraging the belief that change, disruption and innovation are the keys to a resilient and a smart water future. The event will provide the opportunity to explore what this exciting future looks like for the water sector through technical papers, case studies, interactive workshops and Q&A panels.

The trade exhibition will feature a large display of the latest water industry science, innovation, technology, products and services for all water professionals and associated industries. New to the exhibition is the Innovation Pavilion — a space for inventors, creators, builders and makers to showcase products and services that are advancing the goals of sustainable water usage for future generations.

There will also be an extensive social program, enabling attendees to meet with their peers. A networking evening will be held on 15 May, prior to the main conference program, while Happy Hour at the Club House will enable guests to unwind at the end of the first day. The highlight of the program will be the Gala Dinner and AWA Australian Water Awards, held on 17 May — a celebratory event that allows guests to recognise industry excellence while enjoying a three-course meal.

What: Ozwater'17
When: 16–18 May
Where: International Convention Centre Sydney
Web: www.ozwater.org

AWA
www.awa.asn.au

METAL DETECTORS

Mettler-Toledo Safeline Limited has launched a series of enhanced features for profile throat metal detectors and gravity fall systems. The four enhancements are aimed at making metal detection a smoother, safer, less disruptive process that adds to the profitability of operations.

Reduced test (RT) mode enables a significant reduction in the frequency of metal detector testing. For example, a customer who was testing metal detector function every two hours can extend this to every 12 hours with RT, providing the extended test period is still within the customer's quarantine period for the product concerned. Onboard technology permanently checks the performance of all critical components within the system, analysing them 100% of the time to ensure they are in a state of good health.

In order to reduce that 5 min testing window, the Automatic Test System (ATS) was developed. ATS automatically introduces three test pieces into the metal detector's aperture in a controlled manner via a pneumatic system — one ferrous, one non-ferrous and one stainless steel — at the touch of a button. A 4-test sample option is also available, to facilitate testing for aluminium. The whole process now takes less than 30 s.

For increased performance, eDrive technology drives greater power to the transmit coil of the metal detector, enabling it to detect smaller real-life metal contaminants.

The fourth element is Emulation. Using VNC technology, Emulation allows operators to mirror the HMI of one or multiple Profile metal detectors onto remote networked devices, including mobile phones, tablets and laptops.

Mettler-Toledo Ltd
www.mt.com

Maintaining a steady flow of water in China

One issue facing China is that there is usually too much rain in the south and not enough in the north. The south-to-north water transfer project was designed to help alleviate this problem. Carrying nearly 45 billion cubic metres of water annually through a 2400 km network of canals, the entire project requires a high level of automation in order to guarantee smooth and continuous flow, and the efficient transfer of water to hundreds of millions of people.

When installing automated monitoring systems on water gate stations located along the main canal, partnering with the right equipment supplier was a priority for Hefei Sanli Automation Engineering Co., one of the main systems integrators on the project. For this reason, the firm teamed up with Siemens — a decision that would prove critical to the overall project success.

In addition to ensuring continuous and efficient transmission of water, the engineering safety, water quality, flood warnings and operational management were all highly important to be considered during the development of the main canal's monitoring system. On the Diaohe River to the Chuanhuang South section of the project, Hefei Sanli sought to meet these objectives by installing 82 Simatic S7-400 controllers, which are responsible for accurate automated control of on-site sluices to keep the flow of water steady. Siemens also provided 12 large-diameter electromagnetic flow meters ranging from DN800 to DN1600 for the main canal between Shijiazhuang and Beijing to help ensure stable and safe measurement of the water flow.

"Such a large and important water transfer project required an automation solution with high reliability and precision," said Wang Hao, an engineer at Hefei Sanli. "Siemens equipment met our technical requirements and the expertise of the staff played an integral role in building a high-performance control system for the main canal."

After water from the south reaches Beijing Tuancheng Lake, some of the water is used to supply the population in the surrounding area, and the surplus is transferred by the Jingmi feeder canal over 100 km to the Miyun reservoir for storage. Due to the elevation of the reservoir, the surplus water from the south must be pumped several metres upward through a set of nine pump stations.

Compared with the sluice gate control on the main canal, monitoring the pump stations for the Miyun reservoir storage regulation project is more complicated. "Water quality information must be quickly collected at critical control points for water transfer and transmitted in real time," explained Hao. "This is required to carry out engineering safety monitoring of osmotic pressure, earth pressure, joint metering and the underground water level."

To enable this monitoring, Hefei Sanli implemented 60 Simatic PCS 7 AS 410 controllers. Profibus and Profinet were also integrated for communication, which is necessary for monitoring various process variables. The PCS 7 AS 410 controllers allow the status point data to be collected in less than one second and transferred to the remote database in less than two seconds. Additionally, the CPU module has a mean time between failure (MTBF) of over 100,000 hours, guaranteeing availability of more than 99%.

For monitoring critical facilities such as gate stations, redundancy is a major challenge. The Simatic PCS 7 AS 410 helps ensure reliable data transmission with its paralleled hot standby function and redundant Profibus structure in which racks, power supply modules, CPU modules, and synchronous modules all have the same configuration. If one segment of the network is down, the communication can be rerouted through the remaining functional network sections.

All too often in automation engineering projects, failure is a result of communication problems between products or systems supplied by different vendors. Hao believes partnering with Siemens on the middle line of the south-to-north water transfer project helped avoid that problem. "Communication between equipment and instruments at the newly built pump stations and existing gates was integral to the overall project success," he said. "The strong compatibility of Siemens equipment enabled seamless integration with our network, which was vital for such a critical project."

Siemens Ltd

www.siemens.com.au

PANEL PCS

The Aplex Technology ViTAM Series is a multiplatform-based PC. Using ARM and x86 based processors, including the Intel Atom and Intel 6th generation iCore series, enables the series to deliver a system that is suited to users' needs. With a wide array of screen sizes available from 10.1″ all the way up to 24″ screens, there is a screen available to suit a range of industrial applications.

The ViTAM Series feature a rugged design with their IP66/IP69K-rated stainless steel enclosure that enables them to withstand high temperatures (-20 to +60°C) and the ability to withstand high-pressure water.

The ViTAM screens use an optical bonding LCD with antireflection technology and have a high brightness of up to 1000 nits, making them suitable for use in sunlight or other areas where bright light can affect a screen's readability, while a modular design allows different modules to be added to the system, such as CAM, PoE, RFID and Wi-Fi/Bluetooth.

The ViTAM Series panel PCs have been designed to meet the needs of a range of industries that need a reliable solution in rugged environments. These include food and beverage, manufacturing, factory automation, kiosks, digital signage and communications.

Backplane Systems Technology Pty Ltd

www.backplane.com.au

High-quality compressed air for Malabar WWTP

As part of a process reliability and improvement project being undertaken at the Malabar Wastewater Treatment Plant in Sydney, an ageing compressed air system was recently upgraded.

Australia's largest water and wastewater service provider, Sydney Water, is a state-owned corporation wholly owned by the NSW Government. Sydney Water collects and treats around 1.5 billion litres of wastewater each day through a network of over 25,000 km of wastewater pipes, 677 pumping stations, 14 water recycling plants and 16 wastewater treatment plants.

Malabar Wastewater Treatment Plant (WWTP) is Sydney Water's largest wastewater treatment plant. It has an average daily discharge of almost 500 ML.

A significant project was initiated at Malabar WWTP to improve the reliability of the processes that treat wastewater, to ensure Malabar WWTP continues to comply with its environment protection licence requirements, improve safety and working conditions and reduce operating costs. This will ensure that Sydney Water continues to deliver great value for its customers and better conditions for its staff.

The project is being delivered by 4Malabar, an alliance between Sydney Water, John Holland, UGL Engineering and GHD.

Work on the improvement project started in 2014 and is expected to be completed by mid-2019. Since work has commenced, a number of improvements have been completed, including an upgrade of the ageing compressed air system.

Compressed air is used for a number of plant site services across Malabar WWTP, including valving, pneumatic actuation and sparging (coarse bubble aeration). A reliable and efficient supply of quality compressed air is critical to deliver these site services and was therefore a key criterion in selecting the new system.

Following a successful tender process, three Kaeser CSDX series rotary screw compressors, along with a Sigma Air Manager 4.0 compressed air management system, were selected to meet the requirements for Malabar WWTP.

The latest-generation CSDX series rotary screw compressors from Kaeser offers improved compressed air efficiency, providing significant energy savings in multiple ways. Firstly, the product is equipped with a low-speed and highly efficient screw compressor block featuring high-performance and flow-optimised Sigma Profile rotors. The Sigma Profile achieves power savings of up to 15% compared with conventional screw compressor block rotor profiles for a highly energy-efficient solution.

Efficiency is further enhanced with the inclusion of an IE3 drive motor. The Kaeser 1:1 drive design further eliminates the transmission losses associated with gear or V-belt driven systems as the motor directly drives the screw compressor block.

To reliably and efficiently manage the compressed air system, a Sigma Air Manager 4.0 (SAM 4.0) was installed. As a centralised control system, SAM 4.0 enables compressor performance to be precisely matched to actual air demand, thereby allowing additional energy savings.

The SAM 4.0 utilises adaptive 3D advanced control to make air generation and treatment even more intelligent, reliable and efficient. The algorithm of the adaptive 3D advanced control orchestrates the operation of the Kaeser compressed air system. As a result, just the right amount of compressed air power is provided to suit the specific needs of the application, with maximum energy efficiency. It continuously analyses the relationship between various parameters (eg, switching and control efficiency) and proactively calculates the optimum combination from a range of many in order to achieve optimum efficiency.

Up and running for some time now, the Kaeser compressed air system is proving to be reliable and efficient in delivery the high-quality compressed air that the Malabar Wastewater Treatment Plant requires.

Kaeser Compressors Australia
www.kaeser.com.au

OXYGEN ANALYSER

The XZR400 oxygen analyser from Michell Instruments is designed to measure trace levels of oxygen in pure, inert gases such as nitrogen, argon, helium and carbon dioxide. Capable of detecting oxygen down to 0.01 ppm, the analyser is used to ensure the purity of gas produced by cryogenic air separation.

The product uses Michell's MSRS zirconium oxide oxygen sensor, which contains a metallic sealed reference and ensures long-term repeatability of measurements. The MSRS means that no reference air is required. The technology is non-depleting, which gives the sensors a long life span of over seven years. Calibration is required every three to six months and can be carried out with just one calibration gas, saving time and money.

The range features four configurations: rack mount, wall mount, bench mount and transportable. All models include an intuitive touch-screen interface for quick and easy operation, with barometric pressure and digital flow meters as standard. One or two 4–20 mA outputs are available and other options include digital outputs such as Modbus RTU over RS485 protocol, RS232, internal or external sample pumps, and process pressure correction.

AMS Instrumentation & Calibration Pty Ltd

www.ams-ic.com.au

EMBEDDED COMPUTER

The Aaeon BOXER-6404U is a compact multicore embedded controller featuring quad- or dual-core Celeron processors, fanless operation, compact size and robust construction.

The BOXER-6404U is based on the Intel System on Chip chipset, with factory-installed processor options including a quad-core Celeron J1900, 2.0 GHz or dual-core Celeron N2807, 1.58 GHz processor. It is equipped with one SODIMM socket supporting up to 8 GB (J1900) or 4 GB (N2807) of DDR3L system memory, two Gigabit RJ-45 Ethernet connectors, one USB 3.0 port, one USB 2.0 port, one RS-232 port and 8-bit digital I/O.

A 2.5″ SATA hard drive and a half-size mSATA SSD can be internally mounted for operating system and data storage. System expansion is possible via one full-size Mini-Card slot and one half-size Mini-Card slot. A VGA output is provided for high-resolution displays.

The BOXER-6404U measures only 166 x 106.6 x 41.5 mm. Wall-mounting brackets are included while optional VESA and DIN rail mounting kits are available.

The fanless design of the BOXER-6404U coupled with an operating temperature range of -25 to 60°C ensures long-term reliable operation in industrial and embedded environments. It can be powered from a 12–24 VDC source. An optional 100–240 VAC power pack is also available.

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

TEMPERATURE AND VOLTAGE ACQUISITION

The M-UNI2 from Ipetronik offers temperature and voltage measurement within a single device. The flexible module is suitable for mobile testing as well as test bench applications.

The product provides eight analog inputs that can be configured individually via IPEmotion either for thermal elements Type K (NiCr/NiAl) or voltage (±30 V). The analog signals from the measurement inputs are converted by the 16-bit A/D converter and are then output to CAN bus according to the ISO 11898-2 standard.

Typical measurement applications include aggregate and component testing, voltage monitoring/analysis in vehicle networks, thermal management applications and HVAC analysis.

The unit also features cold junction compensation, a linearisation look-up table and complete galvanic isolation for all inputs, CAN bus, power supply and enclosure.

Metromatics Pty Ltd
www.metromatics.com.au

MINIATURE PRESSURE TRANSMITTERS

The ATM Mini is a precision pressure transmitter from STS in a durable miniature package. It is particularly suitable for demanding measurement tasks in test and measurement applications.

Weighing only 50 g, the small outer dimensions of 17.5 x 49 mm allow the pressure transmitter to be easily mounted on small or winding components.

With process connection down to 1/8″ NPT or 8 mm, users can choose whether the measured values are transmitted via a current signal (mA) or a voltage signal (VDC). Electrical connection options include small DIN plug, M12 and PUR cable, and accuracy is 0.1% of full scale.

Available in gauge or absolute, and operating in an extended temperature range from -40°C to 125°C, the product allows maximum flexibility without compromising on quality.

Automated Control Pty Ltd
www.automatedcontrol.com.au

ALL-IN-ONE DIGITAL MULTIMETER AND THERMAL IMAGER

The FLIR DM284 is an all-in-one true RMS digital multimeter and thermal imager targeting maintenance engineers, panel builders and electricians. It is suitable for use in the field and especially for those working on commercial electric and light industrial applications or on HVAC systems.

The product combines a digital multimeter with true-RMS measurement capability together with a built-in 160 x 120 thermal imaging camera. Use of the handheld device can therefore speed up troubleshooting by quickly pinpointing hotspots and visually guiding the user to the precise location of an electrical problem.

The integration of Infrared Guided Measurement (IGM) technology brings thermal-imaging camera technology to test and measurement instruments that see daily use in situations and applications in maintenance and HVAC systems on sites and in buildings. This means that the DM284 can save time, as well as increase operator safety by allowing users to identify possible issues in advance and from a totally safe distance.

Offering a specially designed easy-to-read big-digit screen, the product has a simple and intuitive user interface along with various thermal colour palettes. It offers a total of 18 measurement functions, including true-RMS, VFD mode for motors and drive controllers, low impedance (LoZ) measurements and non-contact voltage (NCV) detection. The device also comes with high-quality test probes and a Type K thermocouple input. The handheld unit has been drop-tested and is IP rated for splash and water resistance. It can also be used with the flexible clamp option.

RS Components Pty Ltd

au.rs-online.com

ROTARY LOBE PUMPS FOR HYGIENIC APPLICATIONS

Alfa Laval's SRU rotary lobe pumps are suitable for industries such as dairy, food, beverage, personal care and pharmaceuticals, which require contamination-free pumps to meet high standards of hygienic, low-shear, low-pulsation operation.

The pump handles both cleaning-in-place and sterilisation-in-place, and can be supplied with documentation to support validation requirements.

Features designed to maximise performance and minimise contamination risk include a defined compression front cover sealing, rotor nut retention design, drainable pump head and ultraclean surface finishes.

To ensure high-efficiency fluid transfer with low pulsation, low shear and low noise characteristics, the company employs computational fluid dynamics (CFD) to establish exact geometry for the rotors and rotor case.

The pumps have a robust gearbox construction with heavy-duty shafts, torque locking assemblies and taper roller bearings throughout. They comply with EHEDG, 3-A, 3.1 and FDA hygienic standards and have ATEX approval for use in explosive environments.

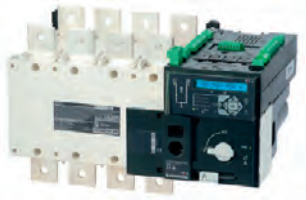
Alfa Laval Pty Ltd
www.alfalaval.com.au

AUTOMATIC TRANSFER SWITCH

The role of automatic transfer switch equipment (ATSE) is to provide a dependable power transfer between the main source and the emergency source for essential or critical loads.

NHP offers a wide range of open-transition, load break-based transfer switches from Socomec that guarantee both the continuity of the power supply and the safety of operators. All devices comply with IEC60947-3 and AS/NZS 60947.6.1.

The ATyS p is a three-phase automatic transfer switch with advanced logic functions and positive break indication. In automatic mode the product enables the monitoring of, and the on-load changeover switching between, two power supply sources, in accordance with the parameters configured via an LCD display or the communication bus.



The device is intended for use in low-voltage power supply systems where a brief interruption of the load supply is acceptable during switchover.

NHP Electrical Engineering Products Pty Ltd
www.nhp.com.au

USING FLOW CONDITIONERS

*Don Lundberg**

FOR IMPROVED FLOW MEASUREMENT

Flow conditioners can help reduce costs by saving space and improving flow measurement accuracy.

When looking for a way to reduce plant operating costs, one of the potentially simplest — and often least expensive — solutions is to measure liquid and gas flow more accurately. Plant upgrade projects that focus on the continuous improvement of flow measurement and control can trim overall production costs by eliminating waste and reducing maintenance costs through:

- higher product throughput and yield;
- reduced use of consumables;
- lower energy costs;
- simplified maintenance (avoiding unplanned maintenance);
- safe operations for employees;
- environmental compliance.

It all goes back to the simple truism that "you can't control what you don't measure". To go one step further, add "accurately measure" to the formula for process control cost reduction.

Flow measurement analysis

The first step is to analyse the different media and flow instruments already in place, with an eye towards those affecting the costliest processes. Prioritise the search by potential cost impact (not necessarily fluid volume) to achieve the most significant return on investment.

While every process and plant is somewhat different, some common critical measurement applications are necessary for efficient operations. Those include:

- pump protection;
- plant gases distribution;
- fluid additive/injection monitoring;
- compressed air consumption;
- boiler fuel gas and air optimisation;
- tank blanketing;
- analyser flow assurance;
- stack gas monitoring (CEMS, QAL1, MCERTS);
- flare gas measurement.

Poor measurement accuracy in these applications can be extremely expensive. The next step is to audit the efficiency of the flow instruments that are performing these critical measurements. Operators should ask a lot of questions about their plants' flowmeters and flow switches.

Start by considering which flow measurements are the most critical to efficiently process throughput and the quality of the end product. Are you primarily measuring liquids, gases or steam? Which media is the most expensive to generate and move through the plant?

Once the most critical processes have been identified and the costs prioritised, look at the flowmeters and flow switches already in place. If the plant moves liquids, gases and steam, several different flow sensing technologies may be installed.

Why is having an inventory of the existing flow sensing technologies important? Many different types of flow meter and flow switch sensing technologies exist. Some are better at liquids but do not measure steam or gas, and others are exclusively for gas. Is the best flow sensing technology in place for the media being measured?

Once the types of flowmeters and flow switches in place are determined, then ask that impolite question: How old are they? Many flow instruments are designed to operate for decades, but that does not mean a newer technology will not perform more accurately or consistently. Is it worth the expense to replace older flow instruments with newer technology devices?

Another question to ask: Are flow measurement instruments installed everywhere they are needed to optimise plant process control? To optimise a process, sometimes multiple points of measurement are helpful to compare or confirm accurate flow rates or total flows.

Before making any expensive decisions about upgrading flow instruments, operators should think about implementing flow conditioners to enhance existing flow instruments. Improving the flow measurement accuracy in the process control loop does not always require a new flowmeter or flow switch.

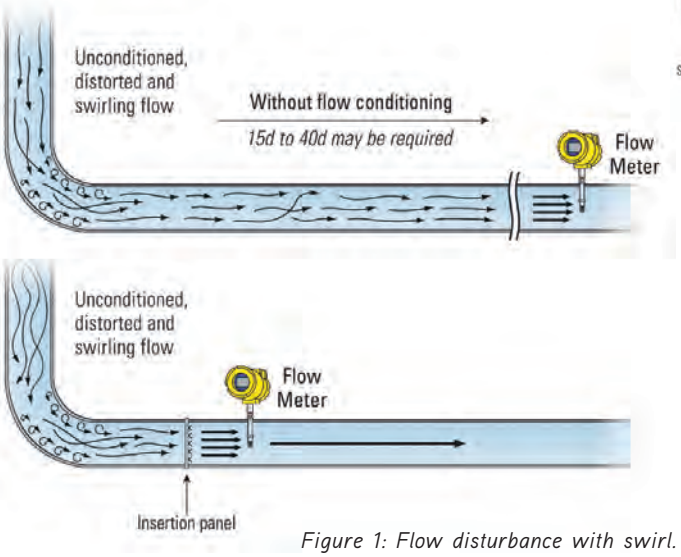


Figure 1: Flow disturbance with swirl.

An alternative solution

One of the leading causes of inaccurate flow measurement is asymmetrical or distorted flow conditions in the upstream and downstream pipe runs from the flowmeter or flow switch. Commonly known as swirl in the pipe (see Figure 1), this condition in the flow stream 'confuses' many flow sensors because their accuracy depends on a steady-state uniform flow regime.

For example, several popular flowmeters — including differential pressure, magnetic, ultrasonic and turbine — feature sensing technologies that can be significantly affected by swirl and asymmetrical flow conditions inside the pipe. Depending on the technology, these meter sensing technologies require a minimum of 6 to 10 upstream and up to 5 downstream straight pipe diameters for accurate measurement.

Unfortunately, most process industry plants are rich with bulky equipment and other real estate that make installing the required pipe straight runs required for accurate flow measurement difficult. Often plant upgrades and retrofits require adding more flowmeters in locations that are difficult to accommodate without flow conditioning devices because of their straight-run pipe requirements.

Flow conditioners reduce straight pipe diameter requirements and can correct the flow profile distortions caused by upstream flow disturbances. These unpredictable flow profile variations are neutralised by a well-designed flow conditioner, which creates a consistent and predictable outlet flow profile to the flowmeter, resulting in accurate and repeatable flow measurements.

Flow conditioner designs include honeycomb vanes, perforated plates, tabs, tube bundles and vanes. They all have their advantages and disadvantages, depending on many factors including the viscosity of the process media, the metering technology, pipe layout and cost requirements.

The process requirements, especially the viscosity of the process media, will likely shorten the list of potential candidates when selecting a flow conditioner. For example, some technologies are prone to clogging in slurries or due to contaminant build-up in dirty gas processes.

Some flow conditioners (see Figure 2) with a tab-type design offer extremely low pressure drop, providing significant energy cost savings when compared with other flow conditioning technologies. They help maximise obtainable plant product throughput.

Four different flow conditioner designs can accommodate many process requirements:

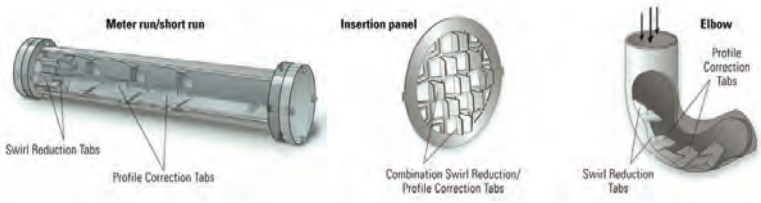


Figure 2: Types of flow conditioner.

1. The **insertion sleeve style** is the most cost-effective version. It can be installed directly into existing pipe or specially designed to meet unique piping configurations.
2. The **meter run style** tab flow conditioner offers a complete, simple pipe section replacement for new and existing piping systems. It is a seven pipe diameter-long spool piece comprised of three pipe diameters of flow conditioning internals and a built-in downstream settling chamber.
3. The **short run** style tab-type flow conditioner offers a simple flow conditioning pipe section replacement for new and existing piping systems. It is a three pipe diameter-long flow conditioning spool piece with just the tab flow conditioning internals.
4. The **elbow** style tab-type conditioner is a 90-degree long radius elbow. It offers a simple flow conditioning elbow replacement for new and existing piping systems. It can isolate irregular velocity profiles and swirl normally encountered in a single elbow, and it can isolate irregular velocity profiles entering the flow conditioner.

Success stories

Below are some examples of the ways in which flow conditioners have been used in real applications:

1. At an oil and gas production field, the process team needed to add new waste gas flowmeters to a flare gas unit to meet environmental requirements. Unfortunately, the existing piping layout could not accommodate flowmeters. Adding a tab-type, meter-run flow conditioner to the meter assembly eliminated the required straight run for accurate measurement.
2. At a cramped wastewater treatment plant undergoing a large expansion project, new flowmeters were required in the aeration process for efficient and cost-effective pumping of air into the treatment ponds. Adding a tab-type, meter-run flow conditioner saved valuable plant real estate, reduced the piping costs and allowed room for additional equipment.
3. An offshore oil pumping station required a new pump to increase capacity. The station had no capacity for the pump's required straight run and no way to expand the platform to accommodate the newly identified piping requirements. Placing a tab-type, elbow conditioner in the elbow solved the space problem with large cost reductions and freed up real estate for other possible uses.

Conclusion

When looking for ways to decrease process costs, enhancing the flow instrumentation accuracy may be a solution. This does not always mean purchasing a new flowmeter or a new switch, though that may be the best solution. Can the same results be achieved by adding a flow conditioner instead? If a new flow instrument must be purchased, can a flow conditioner reduce the required installation space, piping and total installed cost?

**Don Lundberg is a member of senior technical staff at the Vortab Company.*

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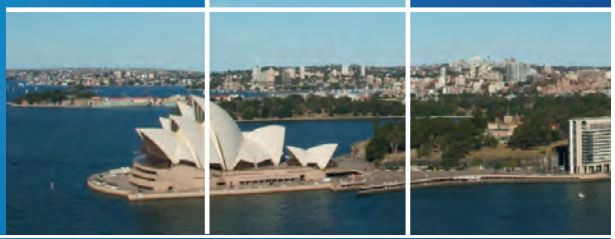

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AS I SEE IT

INDUSTRY 4.0 IN PRACTICE

Industry 4.0 and the Industrial Internet of Things are buzzwords that we hear all the time and by most accounts are here to stay. We also hear that for Australian manufacturing to remain competitive, we should embrace these concepts and modernise our processes. But how? Where do we even begin?

In your workplace, if you are discussing issues such as predictive maintenance, condition monitoring, model/recipe changes, format changes, energy management, asset management, traceability and quality assurance, then you are already on the path of Industry 4.0. Some basic measures will help you along the journey.

Lean principles are often the starting point of an Industry 4.0 installation: achieving flexible manufacturing and creating better efficiencies in production with increased visibility of every stage of the process. Collecting and analysing accurate information about the process gives us the resources to make a series of informed decisions every day.

Balluff recently implemented an Industry 4.0 upgrade project at our own production and stores locations as part of a larger program. I think that the lessons learned in this pilot project could be valuable for others embarking on the Industry 4.0 journey.

First you must build a team. Industry 4.0 expands visibility of the production cycle away from just the shop floor. A cross-functional team should be interviewed to ascertain who needs what data. Include the plant manager, line managers, engineers, production managers, quality manager, operators, maintenance, IT etc. Each job function should be asked "what do you want to know?" or "what information would make you more productive?" This may also be a good time to establish what each team member does not need to know to avoid the potential of information overload.

The team should identify components or 'things' with Ethernet connectivity and discover what data can be captured and downloaded to the devices. Be willing to pay for the functionality! Consider the value in increased efficiencies against upfront costs. Often additional data is available over and above the traditional functionality of the device. How can this data be managed and what happens if there are data connection failures? Is the data critical on an operational level?

Visibility of the data is important, of course. What data do you want to see and where do you want it presented to allow you to make decisions? For example, process data or exceptions, or diagnostic data that may indicate problems? The best devices provide conditional monitoring or health indication to allow you to flag potential problems before they happen and put preventive maintenance steps in place. Consider how you want to present this information. In some cases, the local HMI or a 'smartlight' indicator that can be seen from a long distance is sufficient for diagnostic information. At other times, remote connections or email alerts to mobile devices and remote locations are essential.

Always plan for the future. Design your system so that it is easy to adapt and add to as Industry 4.0 solutions develop further. Utilise the expandability of an industrial network. If you can make two sizes, you should easily be able to make three if the market demands it.

It helps to start small. Think of your strategy for interfacing new and existing technologies, then pick one operation or even one application. Prove success, refine methods and then build on the success. The aim is a plug-and-play solution, not plug-and-pray!

Jim Wallace is the Marketing Manager at Balluff Australia. During his 18 years at Balluff Australia and previously in the UK, he has specialised in RFID and connectivity system solutions as well as various sensing technologies.

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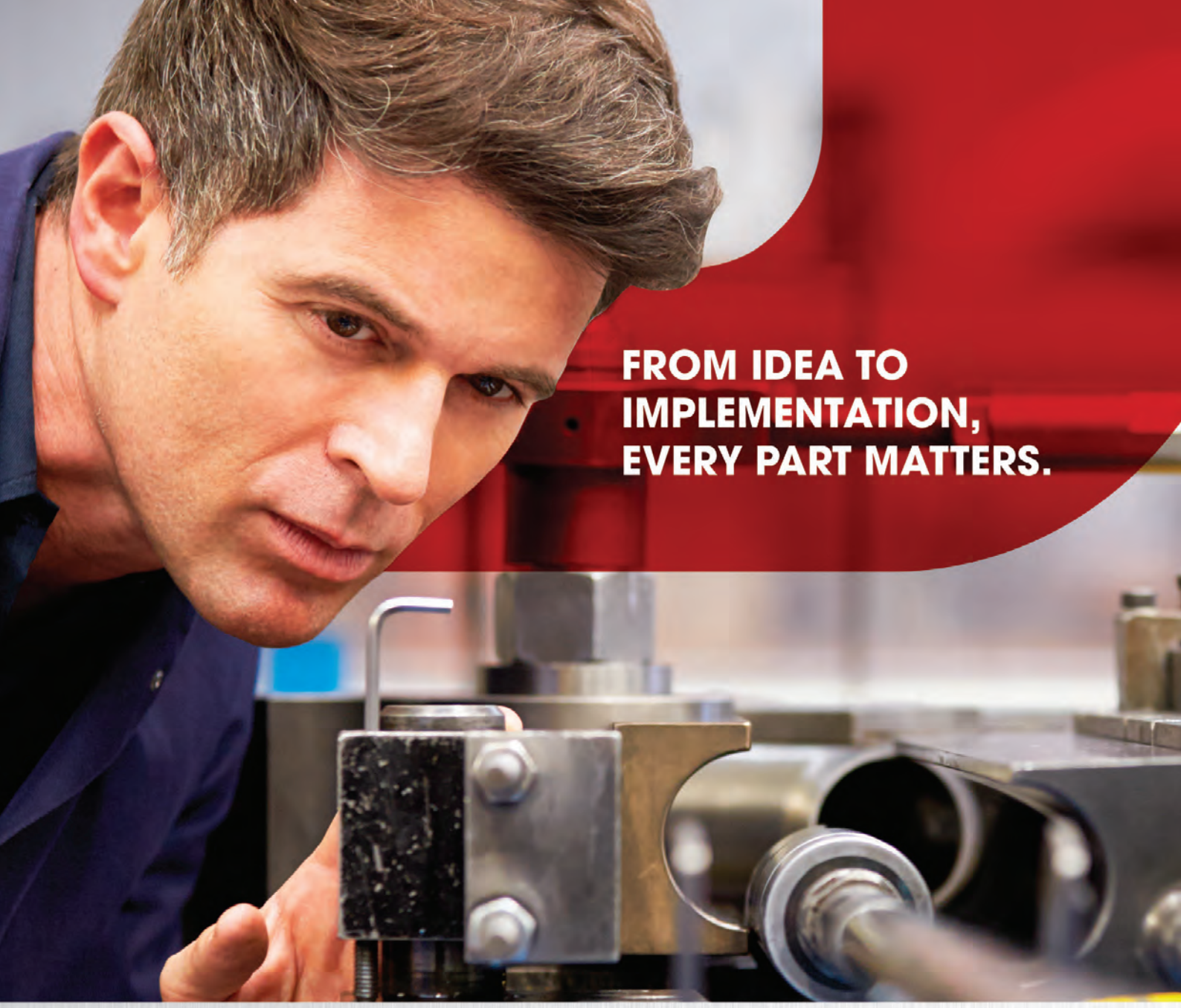

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