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# IIoT: COMBINING THE BEST OF OT AND IT

## WHY INDUSTRIAL ORGANISATIONS NEED TO BRIDGE THE GAP

The time has come for more scalable operational systems that support better integration with enterprise IT technologies.







**D**isruptive technologies are causing major waves in the industrial sector, enabling organisations to vastly improve the accessibility of data in order to connect people, organisations and technologies.

These disruptive technologies are allowing organisations to directly access plant, manufacturing and remote industrial device data. No technology has been more disruptive in recent years than the Internet of Things (IoT).

The IoT refers to the network of physical objects made 'smart' with electronics, sensors, software and network connectivity, allowing these objects to collect and exchange data. The IoT is rapidly expanding: by 2020 there will be an estimated 20.8 billion devices in the IoT, and more than 30 billion devices will be wirelessly connected. The IoT ushers in an era in which objects can be monitored and controlled through existing network infrastructures, including the internet, to improve efficiency, accuracy and cost. In the consumer market, this has led to a flood of products such as smart door locks and connected home appliances.

### Data is revolutionising industry

Industrial organisations and system integrators are starting to realise the huge benefits of IoT and have coined their own term for it: the Industrial Internet of Things (IIoT). Confronted with a world where data is increasingly infused into every aspect of business, forward-thinking companies are now investing in data like never before.

General Electric (GE) and Siemens are two major companies leading in what *Smart Industry Magazine* calls the "ongoing digitization and 'data-fication' of industry". For example, GE has shifted its entire approach to the value of data in recent years by investing \$1 billion into rebuilding its software and analytics approach, and hiring a team of 1000 software engineers. GE continues to build big machines such as locomotives and jet engines but now also incorporates intelligence within its machines to collect and parse data. Through these efforts, GE expects to achieve a 1% improvement in productivity, which for a company of its size can equate to hundreds of billions of dollars.

Many other organisations are also embracing IIoT. A survey by Gartner found that the number of organisations adopting IIoT will reach 43% in 2016, and that includes many industrial organisations. As more organisations move to adopt IIoT, operational technology (OT) and information technology (IT) are converging.

Adapting to this convergence will require industrial organisations to change the way they think about OT and IT. Unfortunately, industrial organisations have kept data and control on the manufacturing floor, residing on restrictive and costly systems, unlike systems found in IT. Essentially, this has stopped useful data from reaching those who need it on the enterprise level to aid in their decision-making.

### The OT-IT divide

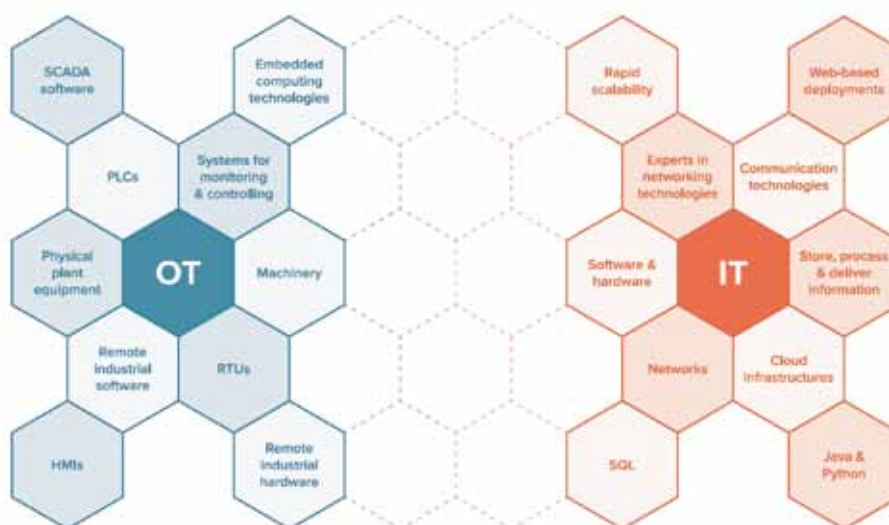
You are most likely to think of IT as the software, hardware, networks, communication technologies and systems that store, process and deliver information to all aspects of an organisation. IT professionals are experts in networking technologies and are very familiar with rapid scalability, cloud infrastructures, web-based deployments and technologies such as SQL, Java and Python.

OT encompasses machinery, physical plant equipment and remote industrial software and hardware. OT professionals focus on systems used for monitoring and control. They are adept with PLCs, RTUs, HMIs, SCADA systems and embedded computing technologies.

OT and IT tend to use different approaches to problem solving. IT implements solutions using a top-down approach, starting with the big picture, such as an organisation's overall needs. The big picture is then broken down into sub-components, and solutions are developed for each sub-component. The top-down approach forces you to understand the method of the solution and not just the problem.

OT professionals approach solutions from the ground up, starting from the individual components to build a more complex system. SCADA environments collect data from different processes on the plant floor, so those who work in OT must figure out how to integrate all the systems to work together. Because most OT technologies are proprietary, many SCADA solutions can be difficult to integrate. OT professionals work with sensitive, mission-critical, high-risk systems; therefore, their foremost concern is security, which is why internet and wide area network connectivity has not been a priority for them.

With the introduction of smart machines, big data and the Industrial Internet, OT and IT are finding themselves needing to solve the same problem: accessing industrial data. Unfortunately, since OT and IT have existed on separate planes, neither side truly understands the needs of the other from a solutions standpoint.



Even with this divide, a great opportunity exists for OT and IT to come together and leverage each other's strengths to arrive at a truly disruptive technology. Keeping OT and IT separate is an Industry 3.0, pre-IIoT mindset. To meet the demands of today's data-intensive environment and enter Industry 4.0, enterprises must work to align OT and IT.

### Benefits of OT-IT alignment

Gartner defines IT-OT integration as: "The end state sought by organizations (most commonly, asset-intensive organizations) where instead of a separation of IT and OT as technology areas with different areas of authority and responsibility, there is an integrated process and information flow." The alignment of OT and IT brings forth many major benefits. One of the biggest benefits is improved decision-making. By having access to a greater quantity of high-quality data, every person in an enterprise can make better decisions more often. If machines and devices are not connected to an IT network infrastructure, then the other parts of the enterprise cannot take advantage of the useful real-time data and operational intelligence.

Other benefits of OT-IT alignment include cost reduction, optimised business processes, lowered risks, faster development and integration times, and standardised communications and control. Connecting OT to the enterprise level can be a large cost, and OT can benefit from the affordability of maintenance and licensing costs that IT has to offer. Additionally, now that data can be easily accessed, those in OT and IT can share data across an organisation to make better decisions as a whole. By

integrating OT and IT systems, the overall system has greater value, optimising the way companies share information.

OT and IT alignment lowers the risk for an organisation. Not only do you get improved data accessibility, you also get the stability and fluidity of an IT infrastructure for an OT environment. Putting in an infrastructure to access a greater volume of high-quality data from the OT side can be done without impacting the current SCADA system. With cloud and virtualisation technologies, plant- or manufacturing-floor servers can be moved to the cloud, helping to reduce equipment as well as keeping systems up to date. With today's standard IT security protocols, OT can rest assured that their SCADA system will not be compromised.

With IT's strengths in standardisation, organisations can leverage technologies such as SQL databases, Java and SSL to quickly develop and deploy a solid, secure solution. The need for proprietary technology is a thing of the past. Organisations can monitor and control multiple systems without incurring high costs and being locked into a highly restrictive HMI/SCADA environment.

### Challenges of OT-IT alignment

The most pressing concern about integrating OT and IT is security. The reality is that the proliferation of sensors and other smart, connected devices has brought with it an increase in security vulnerabilities. OT and IT have historically had differing security needs although they have become more similar over time.

OT systems have used proprietary technologies that made them less likely to be targeted for attacks (security by obscurity). OT systems have also been fairly self-

contained by only having a few connections to other systems. On the other hand, IT and enterprise systems are well connected and frequently under attack but have a higher level of acceptable security risk because IT usually has a higher tolerance for downtime. From an OT perspective, downtime could equate to millions in lost revenue, and thus, their tolerance for downtime is lower.

Another big challenge organisations face is return on investment (ROI). The Research Director at Gartner, Chet Geschickter, said, "The big challenge now is demonstrating return on investment. Executives need to validate the contribution that IIoT can make in order to justify large-scale rollouts." With IIoT being essentially a new market, industrial organisations must prove that IIoT is the most cost-effective solution to bring industrial data into the enterprise level.

Then there is the fact that edge-of-network devices tend to use different protocols for sending and receiving data, and there is the issue of interoperability: how do we make all of these different kinds of devices all connect to each other?

### Should IIoT be built top-down or ground-up?

SCADA has already been doing many of the tasks associated with IIoT for years, even before the term came into use. For about 30 years now, industries like oil and gas, chemicals, pharmaceuticals and manufacturing have used sensors to improve their processes. From this perspective, IIoT is not as much a new thing as it is a redefinition and an extension of what OT professionals are already doing.

Many of the players in the IIoT space today are IT professionals who do not





THE IloT REQUIRES THE CONNECTION OF MANY DEVICES AND SYSTEMS TO COLLECT AND SHARE DATA, SO IT IS VITAL THAT THE IloT PLATFORM BE EXTRAORDINARILY FLEXIBLE, SCALABLE AND EQUALLY CAPABLE IN DEALING WITH BOTH OT AND IT TECHNOLOGIES.

necessarily understand the operational side. Even some IloT alliances and consortia have put forth a notion that IloT should be built using top-down, IT-driven methodologies. The problem is that if you try to put out an IT-centred, top-down IloT solution that isn't amenable to OT professionals, it simply will not succeed. IT professionals must prove operational excellence and security performance to an operations manager, otherwise the project comes to a complete halt. This makes a strong case that OT should drive the implementation of IloT, rather than IT.

To make IoT work in an industrial environment, the approach must be from the ground up. The IT side must recognise that top-down methodologies may not take into account the importance of stability and security, and the variety of protocols, in SCADA solutions. The OT side must recognise that IT has incredible potential to bring OT data into the enterprise. Since most of the needed data resides on the OT level, the ground-up approach is the best path to a fully functional IloT solution that combines proven OT and IT technologies.

### Enabling IloT: the ideal platform

The IloT requires the connection of many devices and systems to collect and share data, so it is vital that the IloT platform be extraordinarily flexible, scalable and equally capable in dealing with both OT and IT technologies.

Unlike most SCADA solutions, the ideal IloT platform must exhibit extreme agility and flexibility — no proprietary solutions, no locked data and no unneeded frustrations. The ideal IloT platform must be able to adapt quickly to a wide range of industries and applications without hindering current enterprise infrastructures. Furthermore, it should be capable of making changes without interrupting current processes and workflow.

Scalability is an incredibly important feature of the ideal IloT platform. As more systems and devices go live, the IloT platform must be able to quickly accommodate the influx of data points, giving organisations the ability to share and analyse massive amounts

of data in little time. The IloT platform should also scale without any restrictions. Taking a page out of the IT playbook, the IloT platform should offer unlimited licensing, allowing unlimited number of connections, tags and user clients.

The ideal IloT platform should bring interoperability between OT and IT by communicating with most if not all industrial and enterprise systems and devices. The platform combines IT standards such as SQL, Python and Java with OT standards such as OPC-UA and Modbus. By having a platform that can bridge the worlds of OT and IT, industrial enterprises are able to share data across an entire organisation easily.

### Enabling IloT: the ideal protocol

Message Queuing Telemetry Transport (MQTT) has quickly emerged as the standard messaging protocol for industrial M2M applications. Developed in 1999, MQTT has become one of the most dominant IloT message transport protocols.

MQTT was initially developed to suit the needs of the oil and gas industry. Oil and gas pipeline installations can cover several thousand kilometres in remote areas. A single installation may contain thousands of PLCs which connect to thousands of devices. Legacy communication protocols use a poll/response methodology which saturates communication channels with unchanged data, leading to network congestion. MQTT is a lightweight solution that makes the volume of usable data available in applications such as these. Other industries have also discovered the value of MQTT: it is now used in Facebook Messenger and Amazon IoT, and is both an ISO and OASIS standard.

The publish-subscribe methodology of MQTT creates a single, super-efficient data pipeline through which data is pushed from thousands of devices into a central location where it is accessed by industrial and business applications. MQTT maintains stateful sessions and is bidirectional. Its lightweight nature facilitates a higher

throughput rate, which significantly increases the data monitored or controlled.

MQTT's one-to-many capability enables the use of message-oriented middleware (MOM) technologies, which decouple edge-of-network devices and data-consuming client applications for more efficient information distribution and increased scalability. The decoupling of devices from applications is very significant from a development, information and security standpoint.

Connecting intelligent devices into the infrastructure through MOM technologies, rather than directly plugging them into applications, accomplishes three major things. First, it allows you to explore the possibilities of IloT — to build new solutions on the fly and to go wherever the data takes you. Secondly, it allows you to bring in much more data much more quickly. Thirdly, it improves security by not directly exposing edge-of-network devices. Middleware helps to keep vulnerable devices such as PLCs out of reach.

### Finding the optimal solution

Today, SCADA solutions are available that include OT-IT integration capabilities.

Such systems include features that make them effective as universal industrial automation platforms for HMI, SCADA, IloT and MES. When looking for such a solution you should find a vendor that offers an unlimited licensing model, which allows unlimited tags, clients and connections. Unlimited licensing allows solutions to grow along with an organisation without restrictions and additional costs. A scalable client-server architecture and cross-platform compatibility should also ideally be available, so users can web-launch it on desktop PCs or mobile devices. And by adding the MQTT protocol to the inherent capabilities of the platform, users can decouple intelligent devices from applications in order to make data available to the entire enterprise.

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## WIRELESS ETHERNET GATEWAY

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## INDUSTRIAL MODULAR TABLET

The AIM-38 is a 10.1" industrial-grade modular tablet that supports both Windows 10 IoT Enterprise and Android OS. It features a high-brightness display option (up to 800 nits) for enhanced visibility to support outdoor operations. The system also features 3.3 m drop protection and an IP65 rating for resistance to water and dust ingress. This extends the product

life cycle and offers enhanced protection for commercial and industrial applications.

The AIM-38 battery supports hot-swapping to ensure uninterrupted operation. It also offers up to 8 h of tablet operation time to enable long-duration mobile computing. For enhanced portability and convenience, the AIM-38 can be integrated with a wide range of accessories, including various types of charging stations, a hand/belt strap, a carry holster and a stand mount, all ensuring convenient operation and flexible configuration according to different usage environments.

Equipped with wireless communication capabilities (4G LTE, Wi-Fi, and Bluetooth), the AIM-38 supports real-time data transmissions and cloud-based database updates for improved management and operational efficiency. The inclusion of embedded 4G LTE technology facilitates voice calls and direct real-time communication, allowing for more comprehensive and efficient service. The unit is highly expandable and can be fitted with a range of modular peripherals, such as a 2D barcode scanner, magnetic strip reader, RFID module and IC card reader, in order to serve as an all-in-one service terminal.

**Advantech Australia Pty Ltd**  
[www.advantech.net.au](http://www.advantech.net.au)

## VALVE ISLAND

The pneumatic valve island Type 8647 AirLINE SP is a modular, electropneumatic automation system consisting of connection and valve modules. It has been especially developed for safe and complete integration into the SIMATIC ET 200SP decentralised peripheral system from Siemens.

Type 8647 is used to integrate pneumatic pilot valves directly into the SIMATIC ET 200SP and to control them via the ET 200SP. Pneumatically operated process valves (including safety shutoff valves), pneumatic cylinders or other pneumatic components can be connected to the pneumatic outputs.

If the pneumatic components are installed with position feedbacks, the position of the actuated pneumatic components can be displayed on the associated pilot valve. This can save time on start-up and maintenance.

**Burkert Fluid Control Systems**  
[www.burkert.com.au](http://www.burkert.com.au)



## PROCESS COMMUNICATION MODEM

Transtek has extended its capabilities in the field of process instrument communications by entering into a partnership with Softing Industrial. Softing manufactures data connectivity solutions and network health solutions for industrial automation.

The Softing MobiLink process communication modem is suitable for hazardous areas and can be interfaced to any fieldbus system. MobiLink supports multiple protocols to combine HART master, FOUNDATION Fieldbus host and Profibus PA master in a single device, while also offering USB 2.0 and Bluetooth 4.0 access. The hardware is fully compatible with ProComSol's DevCom App for Android devices making device configuration portable and fully integrated for HART.

The modem features wireless communication up to 14 m via an internal antenna and a rugged plastic enclosure rated to IP54 for water ingress. It is battery powered and has an integrated hanging strap loop. The software is compatible with Windows 7 through 10 and Android system.

**Transtek Pty Ltd**  
[www.transtek.com.au](http://www.transtek.com.au)



## COBOT ENERGY CHAIN CLAMPS

In addition to metal clamps, cobot users can now use clamps from the igus triflex R range specifically designed to attach the energy chain to the cobot arm. The design with rounded edges increases workplace safety by reducing the risk of injury when in contact with the robot. The plastic clamps can be quickly attached to the arm of the robot by a screw connection. The triflex R is simply attached to the clamp by a clip and fixed. The clamps are suitable for cobots from Universal Robots, TMS and Kuka LBR iiwa robot arms.

The triflex R range has been specifically developed for sophisticated 6-axis robots in industrial environments. By combining the flexibility of a hose with the stability of an energy chain, the round triflex R facilitates reliable cable guidance in multi-axis movements. A ball/socket principle provides high tensile strength and easy installation of the e-chain. The interior separation is freely selectable. The circular bend radius stop and the high twistability of the e-chain prevent the overstretching of cables, increasing the service life and operational reliability of the application. The triflex e-chains are available as a complete package with cobot designed clamps, cables and connectors immediately ready for connection.



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## IoT WIRELESS SENSOR DEVICES

Advantech's WISE-4210 series of IoT wireless sensor devices includes a wireless LPWAN-to-Ethernet AP and three wireless sensor nodes. The device-to-cloud total solution provided by this series allows IT, OT and cloud platform system developers to easily implement a private LPWAN, acquire field site data and achieve seamless integration with both public cloud, such as Microsoft Azure, and private enterprise clouds.

Based on proprietary LPWAN technology, the WISE-4210 series minimise frequency band interference, support a wider data transmission range, are compatible with lithium batteries and enable cloud platform integration. By locking the sub-GHz frequency band, WISE-4210 series significantly reduce susceptibility to interference for 2.4 GHz wireless communication technologies such as Wi-Fi, Bluetooth and Zigbee. By supporting a network transmission distance of up to 5 km, the WISE-4210 series meets the requirements of large-scale interior environments such as data centres, factories and warehouses for collecting and applying a wide range of interior data.

With LPWAN technology, only three 3.6 V lithium batteries are required to operate the nodes for up to five years, eliminating the need for additional wiring and frequent recharging. Additionally, the WISE-4210 series supports multiple transfer protocols, including MQTT, RESTful, Modbus/TCP and Modbus/RTU, for simple device-to-cloud connections.

The WISE-4210 series of LPWAN IoT wireless AP and sensor nodes provides the necessary device-to-cloud integration functions for conventional automation and emerging IoT applications. The WISE-4210 series allows users to easily deploy private networks and quickly develop systems.

**Advantech Australia Pty Ltd**  
[www.advantech.net.au](http://www.advantech.net.au)



## APM SOFTWARE UPDATE

Lloyd's Register (LR), a professional services company specialising in engineering and technology solutions, has announced the latest release of LR AllAssets. The upcoming software release adds significant functionality including a Maintenance module to the LR AllAssets Asset Performance Management (APM) platform, which includes FMEA, FMECA, RCM and maintenance optimisation capabilities and libraries.

In a climate of ever-increasing scrutiny of performance and risk, LR AllAssets brings asset performance assurance to business leaders. Preconfigured templates and a model builder tool enable users to build bespoke models without the need to engage third-party providers. A full understanding of risk in relation to industrial assets, plant performance and reliability is a critical component of any APM strategy.

LR's software enables users to easily configure risk models for their own operating environments in days or even hours without any software coding. This gives them shorter timescales to get the insight that is needed to make decisions.

Using a SaaS deployment model and open integration standards enables users to easily and securely connect to plant data sources with seamless integration using open protocols.

**Lloyd's Register**  
[www.lr.org/en/](http://www.lr.org/en/)

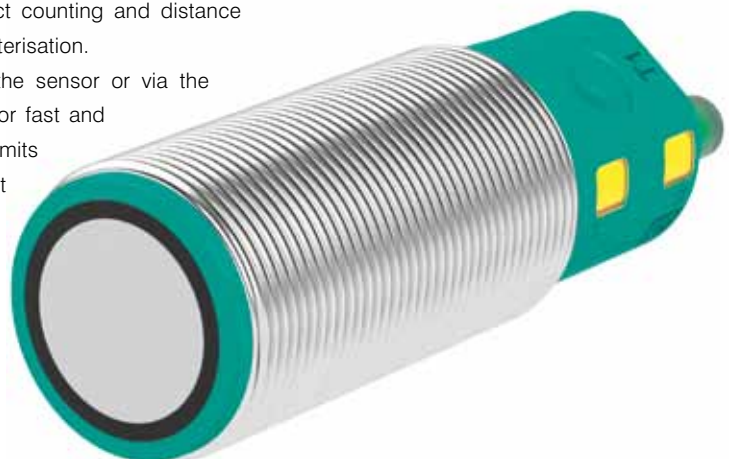
## DIFFUSE MODE ULTRASONIC SENSORS

Pepperl+Fuchs 30GM-IO series diffuse mode sensors can be used for a range of applications, from fill level measurement and presence detection to object counting and distance measurement, and offer integrated diagnostics and flexible parameterisation.

They are simple to parameterise, either using the buttons on the sensor or via the IO-Link interface. The 30GM-IO series offers an additional feature for fast and simple sensor parameterisation: two probes on the sensor itself permits millimetre-accurate setting of the switching distance and adjustment of the beam angle in three steps. The switching output can also be switched between an NO and NC contact. Through this communication channel, the sensors can be integrated easily into the control system to exchange both process and service data.

Different sound beam widths can be set via teach-in to suit the respective detection task. An IP67 degree of protection ensures maximum availability.

**Pepperl+Fuchs (Aust) Pty Ltd**  
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**COLLABORATIVE ROBOT WITH BUILT-IN VISION**

Techman's TM Robots are fitted with an intelligent vision system that produces seamless integration of the vision system with the collaborative robot hardware and software.

The onboard vision system

provides functions including totem pairing, object position, image enhancement mode, barcode identification and colour differentiation. These diversified functions have also been fully integrated in the control system of the TM Robot.

In combination with TM Robot's lead to teach and the built-in intelligent vision system, users can complete pick-and-place programming in 5 min and a programming background is not needed. Six different cobots are available in the range, from 4 to 14 kg payload and 700 to 1300 mm reach.

Australis Engineering is an official TM Robots distributor and integrator partner.

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**TEMPERATURE CALIBRATOR**

The NATA-certified Ametek Jofra CTC-660A dry block temperature calibrator is a portable and lightweight instrument that has been specially designed to effectively conduct on-site and maintenance shop calibration. The CTC-660A has an integrated informative colour display and intuitive operation for ease of use. It is available to rent from TechRentals.

The Jofra temperature calibrator features a dedicated temperature regulator that enables accelerated heating and cooling times as well as swift stabilisation time. Its temperature range covers 28 to 660°C with an accuracy from  $\pm 0.85^\circ\text{C}$  and stability from  $\pm 0.08^\circ\text{C}$ .

With the Jofra temperature calibrator's four integrated functions (set functions, preset mode, auto switch test and auto stepping), performing a three-point temperature calibration procedure can now be completed faster and easier.

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## Cobots strong enough to operate in a harsh environment



Aircraft Tooling Inc. (ATI), a Texas-based repair centre for the aviation industry, was surprised to find that UR robots could withstand the high temperatures and harsh environment while performing metal powder and plasma spray processes. The cobots have now been in operation for three years without breakdown or service requirements.

Aircraft Tooling has grown from a component-only repair station to include the overhaul of complete landing gear and engine mount assemblies and accessories. The company has continued to maintain exacting standards of quality and workmanship and has become highly regarded throughout the aviation industry. The main objective of ATI's repair scheme is to restore high-cost parts to new standard dimensions and release for further declared life.

The company was looking into automating repair tasks involving HVOF (High Velocity Oxygen Fuel) and plasma spray-on parts as required within the aviation industry. Juan Puente, thermal spray supervisor with ATI, had initially been recommended to purchase traditional industrial robots but what he found did not meet ATI's needs. "The cost was outrageous, the cast iron models we looked at were too bulky, we could not easily move them between cells, they were hard to program and all required safety guarding, which would not work in our small spray cells," he said.

"The UR10 robot had the required reach for the spray distance and the cost was about half of everything else we looked at," he continued. "It was very user friendly and portable. Because of its collaborative safety features we did not need to fence it in." He was able to get the UR10 unpacked and programmed in just four hours.

Although Puente readily admits that the UR10 "won their hearts", there was significant hesitation at ATI as to whether the robot would operate reliably in the spray booth's extremely hot and dusty environment.

"We were very surprised," he said. "I actually thought the robot wouldn't stand it. Some of these powder coatings are tungsten carbide, which is a hard metal coating. If it seeps into the bearings of the robot, we were afraid it would destroy them."

ATI opened up the seals on the UR10 and found the bearings intact. "There were no particles in there — after three years of operation it doesn't show," said Puente, adding that recoil from the spray gun was another concern. "We were nervous that the recoil would trip the robot or interfere with the servo capabilities. We went as high as the pressures would take to make it bounce, and it wouldn't do it. The robot simply stayed in position."

Nick Armenta, Automation Engineer with Olympus Controls, the UR robot distributor working with ATI, explained that the company's experience with the robot's durability is common.

"We very often see the robots operate in harsh environments, taking over jobs that humans don't want to perform," he said. "Many think of cobots as being fragile but the opposite is true, this is an extremely durable robot; it's sealed against dust, rated for high temperatures and works just as well in extreme environments as in a cleanroom."

ATI was also surprised to find that no preventive maintenance is required with the UR robots. "All we do is dust the robot arm off and keep on going," said Puente, adding that he did not have to pay for a licensing or service agreement. "That was really unusual compared to other solutions we looked at. With the UR robot, everything was included in the purchase price."

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# SAFE ROBOTICS

## SAFETY IN COLLABORATIVE ROBOT SYSTEMS

Fanny Platbrood and Otto Görnemann\*

Innovations in robotics are facilitating close collaboration between humans and machines, so the safety of these interactions must be effectively planned.

**R**ecent years have seen significant advancements in industrial automation applications in the fields of drive systems and object detection, paving the way for a new age of interaction between humans and machines.

With regard to functional safety and the associated standards (IEC 61508, IEC 62061, and ISO 13849-1/-2, for example), innovations in robotics delivering optimised functions are also facilitating close collaboration between humans and machines in the same workspace. Combining human abilities with those of robots in industrial environments creates production solutions that are characterised by better quality, lower costs, improved ergonomics and faster working cycles, to name but a few examples.

Taking the current status of the international standards that deal with the safety of industrial robots (ISO 10218-1/-2) and specifically the safety of robots for collaborative operation (ISO/TS 15066) as our starting point, this article will explain the guidelines contained in these standards which apply to the development of safe collaborative robot applications.

### Human-machine interaction and safety

In industrial manufacturing, there is an increasing need for flexible machines that are able to work autonomously and can be adapted

to changing production conditions quickly and efficiently. To protect persons against the dangers posed by their speed, movement, and force, robots usually work behind safety barriers. However, if close interaction between humans and machines is required, this effective standard method of physically separating the person at risk from the source of danger cannot be employed. For this reason, alternative methods must be applied to reduce risk.

### Definitions — Terminology

The interaction of humans with active robots and devices that are similar to robots can be characterised based on two interaction parameters: space and time. If there is no common space and no common time in which the human being and the active robot move, the movements of the robot do not pose a risk and the situation is deemed “not interactive”. Situations in which humans and robots share a common space but at different times are deemed “cooperative”. The term “collaborative” is used to describe situations in which humans and robots are working in the same space at the same time (Table 1).

### Coexistence

Even in industrial robot applications in which no human intervention is required during the production process, it will still be necessary





for an operator to enter the robot’s workspace — for the purpose of maintenance work, for example. In applications of this type, the workspace must be fenced off and the access doors must be interlocked. The interlock must ensure that hazardous robot functions are shut down whenever an operator enters the hazardous area, and must be maintained as long as a person remains present inside the hazardous area or the access doors are opened (Figure 1).

**Cooperation**

The processes involving an operator loading and unloading robot cells are a very common application for industrial robots. In cooperative application scenarios like this, operator and robot complete the necessary stages of the process in the same workspace at different times. Here too, technical safety measures are required.

Application	Different workspace	Shared workspace
Sequential processing	(not interactive)	Cooperation
Simultaneous processing	Coexistence	Collaboration

Table 1: Characterisation of human and robot interaction.

Depending on how the loading and unloading system is set up, it may be appropriate to use optoelectronic protective devices such as safety light curtains or safety laser scanners (Figure 2).

**Collaboration**

In certain applications, it is necessary for humans and active robots to interact in the same workspace at the same time. In these scenarios, which we call collaborative, the force, speed and movement paths of the robot must be restricted. If they are available, inherent or additional safety measures — such as limiting torque through the performance of the drives or safety-related parts of the system controller — can be used to minimise risk. Force, speed and movement paths must also be monitored and controlled based on the actual degree of risk. This degree of risk is also dependent on the distance between human and robot (Figure 3).

This application calls for reliable sensors that are able to detect a human presence or determine the speed at which humans are moving towards the hazardous area and their distance from it. Essentially, these sensors have to be able to overcome the future challenges that are an inevitable consequence of the development of collaborative technologies.

**Standards and requirements of safe collaborative robot applications**

The robot system described in Part 2 of ISO 10218 consists of an industrial robot and its end effector, as well as arbitrary machine parts, equipment, devices, external auxiliary motion axes and sensors to assist the robot in the completion of its tasks.

**Fundamental requirements**

There are a number of fundamental requirements to be met by the design of collaborative applications. Firstly, the collaborative workspace must meet the following requirements:

- It must be laid out so that the operator is able to complete their tasks in a safe and problem-free manner, without being exposed to additional hazards posed by supplementary equipment or other machines in the workspace.
- There must be no risk of injury as a result of cutting, crushing or stabbing. Nor must there be any risks posed by such things as hot surfaces or live parts which cannot be mitigated by reducing the speed, force or power of the robot system. The same of course also applies to the associated supporting equipment and workpieces.

Secondly, the operating space of the robot must be positioned a minimum distance away from adjacent accessible areas in which there is a risk of crushing or jamming. If this is not possible, additional protective devices must be used.

Wherever possible, safe axis limiting must be deployed in order to restrict the number of free movements of the robot in the space and thus to reduce the risk of personal injury.

**Collaborative operating modes according to ISO 10218-2 and ISO/TS 15066**

Technical specification ISO/TS 15066 states four collaborative operating modes which can be used either individually or in combination,

## Robot safety



Figure 1: Robot and human coexistence requires the use of safety barriers and interlocks.

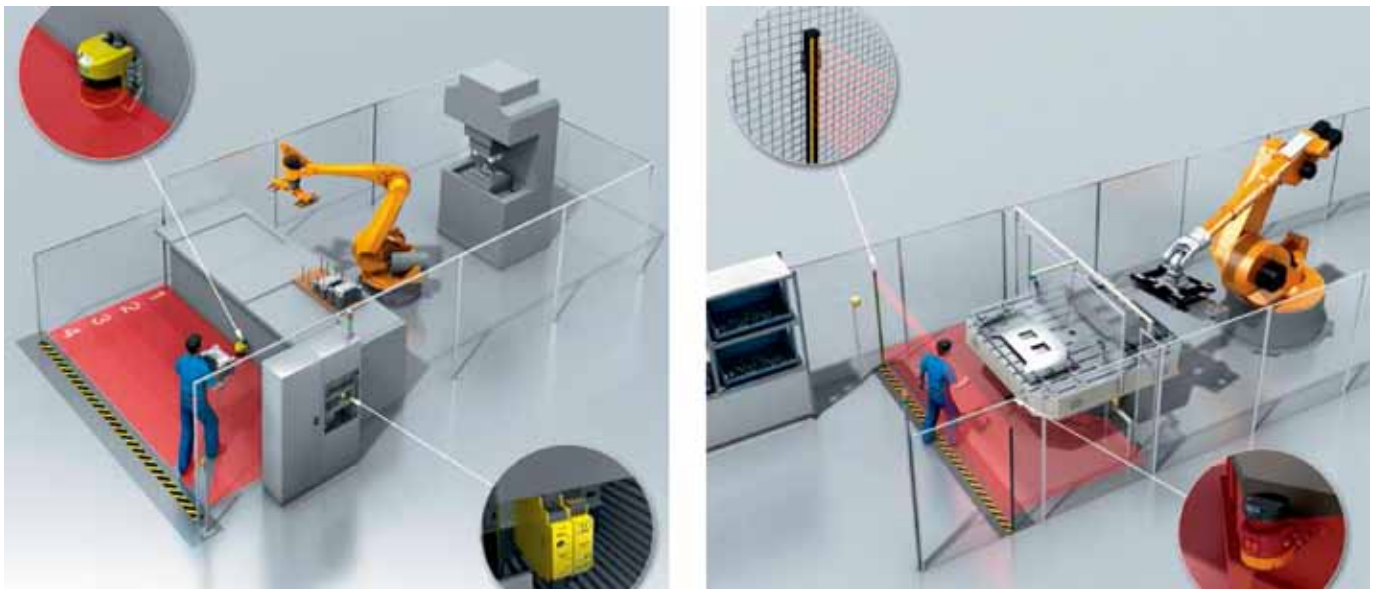


Figure 2: Robot and human cooperation utilising optoelectronic safety sensors.

depending on the requirement of the application concerned and the design of the robot system:

- **Monitored safe stop:** The robot is stopped during interaction with the operator in the collaboration space. This status is monitored and the drive can remain energised.
- **Manual control:** The safety of the human-robot collaboration is assured by the robot being guided manually under control at an appropriately reduced speed.
- **Force and power limitation — the path to collaboration:** Physical contact between the robot system (including the workpiece) and a person (operator) can take place either intentionally or unintentionally. The necessary safety is achieved by limiting the power and force to values at which injuries and risk are not to be expected. Collaboration based on limited power and force requires robots that have been designed specifically for this operating mode. Technical specification ISO/TS 15066 includes maximum values (biomechanical load limits) which must not be exceeded should the robot collide with body parts.
- **Distance and speed monitoring — the future:** The speed and movement paths (trajectory) of the robot are monitored and

adjusted based on the speed and position of the operator in the safeguarded space.

In collaborative applications, one or more of the methods listed above must be selected in order to ensure the safety of all persons who are exposed to the potential hazards. The method(s) selected will depend on the application at hand.

Current requirements to be met by the operation of collaborative robot systems include the use of a suitable safety-related control system which conforms to PL d according to ISO 13849-1.

### **Risk assessment**

A great variety of robot models are available on today's market. They range from standard industrial robots to robots that have been designed specifically for collaborative operation (collaborative robots or "cobots", as they are also known). Whenever robots are integrated into systems (with end effectors, etc), a risk assessment of the entire robot system (the full machine) must be carried out. The resulting measures derived to reduce risks shall then safeguard safe collaborative operation. This risk assessment must still be carried out even if the robot concerned has design features that reduce risk.





Figure 3: Human and robot collaboration requires the use for force, speed and torque control with robot equipment specifically designed to operate in a collaborative mode.

## Risk reduction

The inherent safety measures that are typically used on collaborative robots include:

- Limiting the maximum permissible forces or torques, for example through drive dimensioning.
- Setting up the robot interfaces in order to reduce the pressure impact or the collision forces transmitted (such as rounded robot surfaces or energy-absorbing padding).

However, the effectiveness of these inherent safety measures can be significantly impaired by the design of the robot tool, the support, the workpiece or other machines inside the collaborative workspace. Additional safety measures can be used to counter this, such as:

- Limiting power (torque), force or speed through the safety-related parts of the control system.
- Using pressure-sensitive protective devices (PSPE) or electro-sensitive protective devices (ESPE) to stop or reverse robot movements.

## Conclusion

In the future, humans and robots will work even more closely together in automation applications where great flexibility is required (such as in small batch production where levels of variability are high). Manual assembly operations are being replaced by human-robot collaboration, in which the abilities of human and machine are the ideal complement for one another. Subsequently, the ergonomics of workspaces in which high levels of productivity are required can be improved. The limitation of speed and force that is necessary for safety must be harmonised with productivity requirements.

The design principles in ISO/TS 15066 supplement the requirements already formulated in ISO 10218-1/-2 and create a basis for the design of collaborative robot applications.

The products and devices that are currently on the market are not able to fully meet all of the requirements expected of safe and unhindered human-robot collaboration today. The development of new sensor and robot technologies, along with intelligent control systems, is a fundamental requirement for future collaborative robot applications.

No two applications that are currently being solved with human-robot collaboration are the same. A dedicated risk assessment is vital, even if the robots that are being used have been designed specifically for interaction with human beings. The fact that robot

manufacturers are integrating measures for inherently safe design into their products does not relieve system integrators of their obligation as machine manufacturers to analyse and reduce potential risks.

System manufacturers and integrators of robot systems have to perform thorough checks of the structural safety measures taken by robot manufacturers. They are also required to consider any hazards or risks that may remain and design the robot system according to the results of this risk assessment. As a result of the risk assessment, additional measures to reduce risk based on experience (eg, safety light curtains or safety laser scanners, etc) must be taken by the system manufacturer in order to achieve a collaborative application where all aspects have achieved acceptable residual risk.

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\* Fanny Platbrood is Product Manager Industrial Safety Systems, Marketing & Sales at SICK AG in Waldkirch, Germany. Otto Görnemann is Manager Machine Safety & Regulations at SICK AG, also in Waldkirch, Germany.

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www.sick.com.au

## ROTATIONAL TORCH SLEEVES FOR ROBOTIC PLASMA CUTTING

Hypertherm, a US-based manufacturer of industrial cutting systems and software, is introducing three torch sleeves for XPR plasma-cutting torches and lead sets. The sleeves allow the torch and lead sets to remain axially fixed while the torch-holding device rotates 360° in either a clockwise or counterclockwise direction. This capability enhances torch lead life in high-flex applications.

The sleeves — available in short, medium and extended lengths — are suitable for bevel or 3D/robotic cutting applications when using either an XPR170 or XPR300 X-Definition Plasma system. The sleeves include several engineering advances. An outside diameter of 76 mm allows for an increased wall thickness and eliminates compression caused by clamping. Pre-sealed, high-precision bearings reduce axial play by 90% and radial play by 81%. This keeps out dirt and other particulates associated with plasma cutting and extends the life of the sleeve and lead system.

When used with Hypertherm's robotic/bevel lead sets, the rotational sleeve will afford users a robust industrial solution in applications requiring frequent rotational flexing when cutting with an XPR170 and XPR300.

**Hypertherm**

[www.hypertherm.com](http://www.hypertherm.com)



## MACHINE CONDITION MONITORING SYSTEM

The MCMS 200 machine condition monitoring system is specially tailored to the requirements of industrial gearboxes and stationary hydraulics systems with auxiliary power units mounted on roller bearings (such as pumps and electric motors).

Providing simultaneous measurement of fluid, vibration and process parameters, the system can detect imminent damage early and unplanned system downtime can be avoided.

Hydac's FluMoS Expert software is used for central system administration and data analysis. The software supports several MCMS 200 systems and enables a database or cloud-based data storage. It is a high-performance tool for measurement data visualisation and analysis.

The system offers two input channels for vibration acceleration sensors (ICP), three input channels for HYDAC SMART fluid sensors, 10 input channels for analog sensors, and two switching outputs for controlling power units and signalling equipment. Direct connection of the sensors is via M12 connectors and the system is simply integrated via an Ethernet connection.



An integrated data logger provides failsafe and IT-independent measurement data storage, and the system has a high protection class of IP66 so there is no need for a switch cabinet to be installed.

**HYDAC International**

[www.hydac.com.au](http://www.hydac.com.au)



## SAFETY SOLENOID DRIVER

The Pepperl+Fuchs FD2-RCI-EX1 is a solenoid driver for safety applications up to SIL 3 according to IEC 61508 with HART positioners in SIL 3. It enables partial stroke tests independent from valve status. Only one barrier is necessary, so it saves on the need for a second barrier and wiring.

The FD2-RCI-EX1 allows communication with the valve via the same two-wire field connection, even when the system is off. The switching signal from the SIS is transferred into a current, and communication with the field device takes place via a second parallel HART transparent input that is independent from valve position. If the control system turns off the valve, the HART switching function of the FD2-RCI-EX1 solenoid driver delivers a small current in order to maintain communication — even without valve activation. All diagnostic information is available at any time via the same wiring pair, while fully conforming to SIL 3 requirements.

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### POWER SUPPLY

The PULS CP20.241-V1 DIN rail power supply is equipped with an additional remote-controlled ON/OFF feature, allowing users to switch on or off the power supply output with a signal switch or transistor. This remote feature makes the centralised control of multiple components easy and fast.

The compact design of the CP20 unit (48 mm width) is possible due to an efficiency of 95.6%. The devices have been optimised not only for high peak efficiency at full load, but also high efficiencies in the partial load range. High efficiency levels across the entire load range mean low energy costs. The devices also achieve a service lifetime of at least 94,000 h, at up to 40°C ambient temperature, 100% load and 230 VAC.

In addition to the high power density, users benefit from a comprehensive approvals package and useful features. These features include a power reserve of 20% (up to 45°C continuously and between 45 and 60°C short term), an small input inrush current, full output power between -25 and +60°C (with derating up to 70°C) and high immunity to transients.

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### PNEUMATIC AUTOMATION PLATFORM

The Festo Motion Terminal is claimed to be the world's first pneumatic automation platform to be controlled by apps. Due to software apps that replace over 50 individual components, Festo has moved pneumatics into the era of Industry 4.0.

The pneumatic and digital automation platform combines all the functions necessary to enable more adaptable and economical production processes and offers a control concept with a fusion of mechanics, electronics and software. Numerous functions can be combined with the same hardware using VTEM without the need for modifications, additional parts or difficult installation.

The Festo Motion Terminal combines the benefits of both electric and pneumatic automation. With the matching Motion App, users can change functions at the press of a button, whether for a simple change in the directional control valve functions, gentle travel in the end positions, energy-efficient movements or proportional characteristics of the motion profiles. The platform combines the strengths of pneumatics — such as robustness and easy commissioning and operation — with benefits that until now were restricted to servo-pneumatics or electric automation for complex motion tasks. This means in the future this development can replace dedicated pneumatic and electric applications.

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### CONVEYOR BELT CLEANING SYSTEM

The Jet System 4 is an intelligently automated conveyor belt cleaning system that removes debris from the conveyor belt, and increases hygiene and cleanliness in dry cleaning environments. Dry steam jets clean deep into the structure of mesh belts without chemicals. Users can clean and sanitise using less than 30 L/h of water.

The portable conveyor belt cleaning system quickly and easily adjusts to a range of sizes of conveyor belt systems for maximum utilisation in a factory.

A touch screen gives access to simple controls, stored programs and advanced features for consistent conveyor belt cleaning.

A smart algorithm offers an efficient cleaning pattern, the spinner head rotates at 200 rpm and the product has been approved by an Intralox warranty for a number of belts.

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### POWER QUALITY ANALYSER

The Elspec G4500 is a power quality analyser that utilises the PQZIP algorithm, enabling users to continuously measure, store and analyse waveform signals regardless of their size. The device complies with standards for aggregations, time clock uncertainty, flagging and transient influence quantities. It is available to rent from TechRentals.

The unit measures and records 5000 power parameters continuously at resolutions of 1/2 cycles, 10/12 cycles, and 150/180 cycles. The instrument features I/O ports, a web-based interface, Wi-Fi, and voltage and current inputs.

The product is IEC6100-4-40 Class A compliant and features a plug-and-play probe interface for automatic detection of probes and clamps; a configurable report module for the creation of custom report templates; and an external battery (2 h life) which allows for continuous recording in the event of a power loss.

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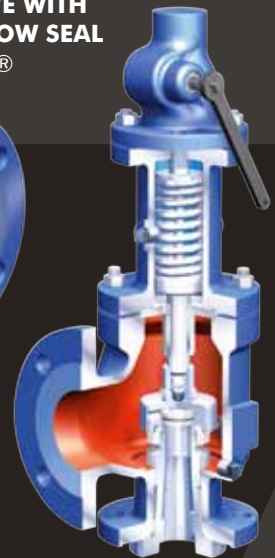
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## MANUAL INSPECTION ROUNDS ASSISTANT

Emerson has released AMS Inspection Rounds, an application for the AMS Trex Device Communicator that will make it easier for operations teams to capture, report and respond to abnormal plant conditions that pose risks to reliability, safety and performance. The application allows personnel to accurately record field condition data and automatically deliver that data to other plant systems where decision-makers can drive effective action.

Most plants rely on manual inspection rounds to detect abnormal plant conditions not identified by sensors. With AMS Inspection Rounds, operators on rounds can electronically record any abnormal or hazardous conditions immediately, such as unusual equipment noise, spills, smells, excessive corrosion or safety hazards. Condition data can be entered on the ruggedised AMS Trex and timestamped for compliance and audit requirements.



AMS Inspection Rounds delivers condition data to other plant systems via a wired or secure Wi-Fi connection, eliminating the need for manual entry. It also provides automated workflows to operations and maintenance personnel while they are in the field, ensuring complete, consistent and repeatable collection of condition data.

With clear dashboards of routes, status, alerts and action items, users can identify, schedule and coordinate steps for resolving issues more quickly. Electronic recording of route data saves hours of

time typically lost in transcribing paper notes to electronic media and simplifies the generation of audit trails — freeing personnel to focus on more important tasks. Operations and maintenance teams can also access historical data to identify and eliminate root causes of recurring problems.

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## FIBRE-OPTIC SPLICE BOXES

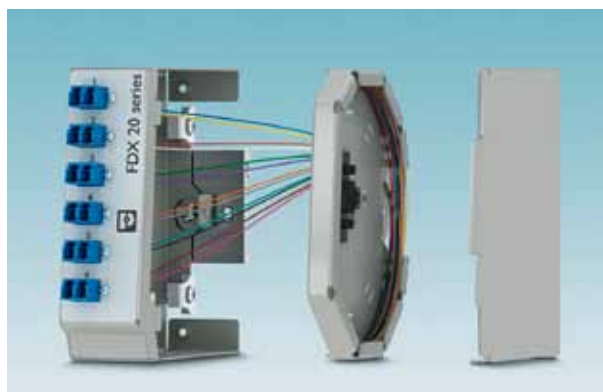
The Phoenix Contact FDX 20 series fibre-optic splice boxes are designed to ensure continuously reliable data transmission.

With their compact and uniform design, the splice boxes provide ample interior space for the secure connection of fibre optics. They are available in connection versions with six ST duplex, six SC duplex, six E-2000 (LSH) or 12 LC duplex connections. The pigtail tray in the device interior enables the convenient splicing of the FO conductors and enables minimum and safe bend radii.

The ready-to-splice pre-assembly significantly reduces mounting times and improves the clarity of the splice boxes in the control cabinet, due to the intuitive front operation and consistent product design.

### Phoenix Contact Pty Ltd

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## DATA ACQUISITION AND PROTOCOL CONVERSION

The Data Station DA10D and DA30D data acquisition and protocol converters from Red Lion are designed to bridge the communication gap between serial, Ethernet and fieldbus devices to unlock data from field equipment such as PLCs, drives and controllers. Features of the range include point-and-click built-in MQTT connectors and embedded OPC UA server functionality to easily connect to cloud platforms as an IIoT gateway utilising the Red Lion's Crimson 3.1 software.

With a growing list of over 300 serial, Ethernet and fieldbus drivers, the Data Station provides the freedom to choose best-in-class components for a given application, regardless of vendor.

The DA10D and DA30D protocol converter and data acquisition platforms can act as a part of any plant's industrial data collection, visualisation and management system, to provide real-time data from virtually any industrial equipment. Additional options include a data, event and security logger with cryptographic signature support and SQL queries that can be executed periodically or on demand. The platform also offers an optional web server with mobile responsive design, full-screen display suitable for tablet or mobile viewing, HTTPS operation with the provision of certificates, HTTP redirect, CSS and JavaScript support.

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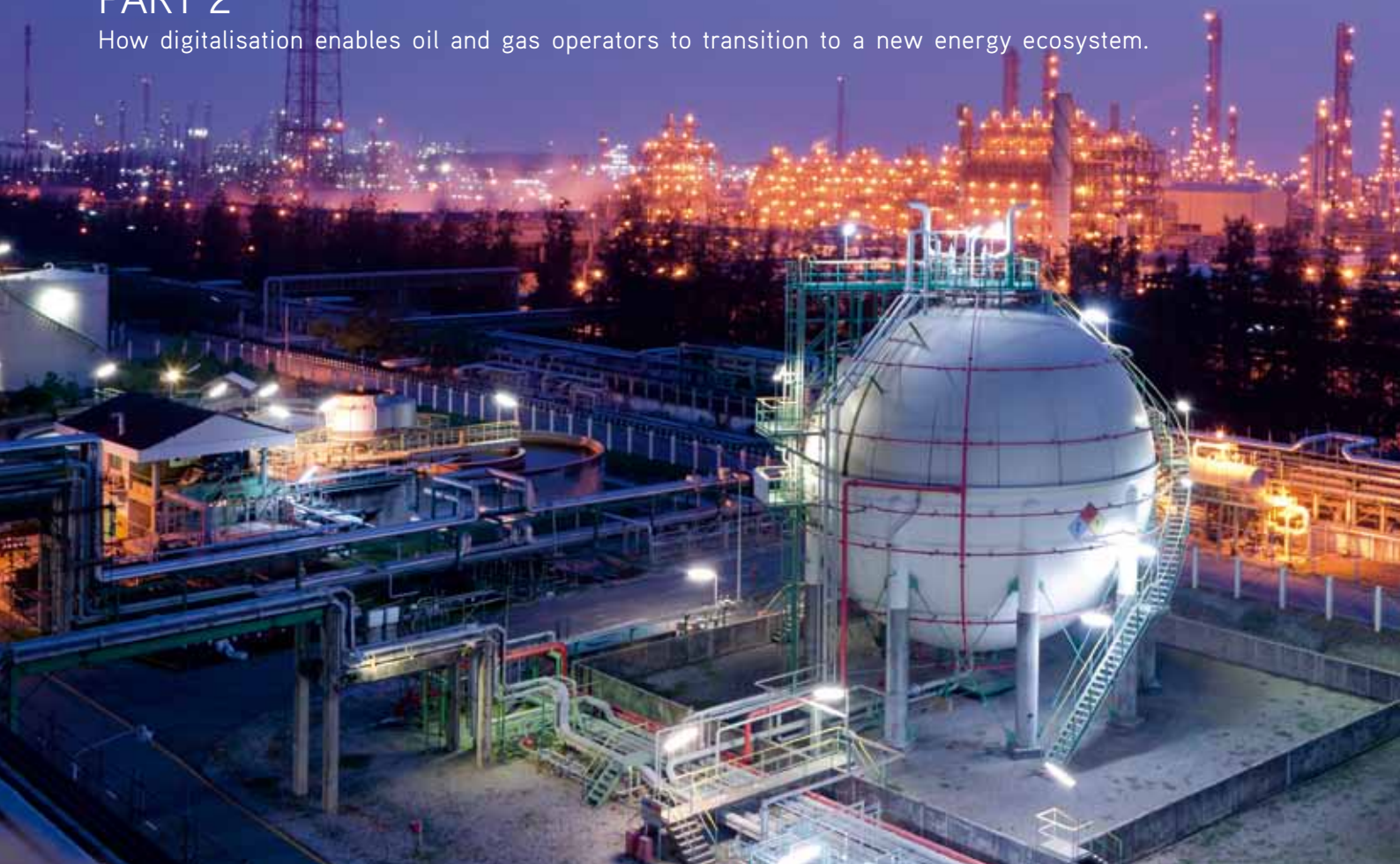
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# INNOVATION THAT WILL TRANSFORM THE ENERGY FUTURE

## PART 2

How digitalisation enables oil and gas operators to transition to a new energy ecosystem.



In Part 1 of this article, we discussed the changing landscape for the energy industries, and how oil and gas companies are beginning to transition to strategies to migrate their core business to new energy sources. But there are many hurdles to overcome, and new digital strategies need to be adopted.

### Hurdles ahead

Oil and gas companies face significant hurdles to realising the full value of the digital initiatives, not only in any future energy ecosystem, but also in their current exploration and production environment. Some of the more regularly debated barriers are detailed below. One common thread is that collaboration throughout the entire supply chain is critical to help overcome these hurdles.

#### Regulation

Some commentators believe that today's data security regulations are not fit for purpose and that much effort is needed to ensure this happens in the new world order. This can only be addressed through technology, as well as due diligence in the operational use of data and a recognition that compromise is not an option.

It has been recognised that the industry does not have global standardisation and that there was a need to develop an 'ISO-like standard' to which the high-performance industries can adhere.

Also, intellectual property frameworks have not yet adapted to a new era of data sharing along value chains, in which companies must feel confident that, by dispersing their data, they are not compromising it.

#### Lack of standardisation

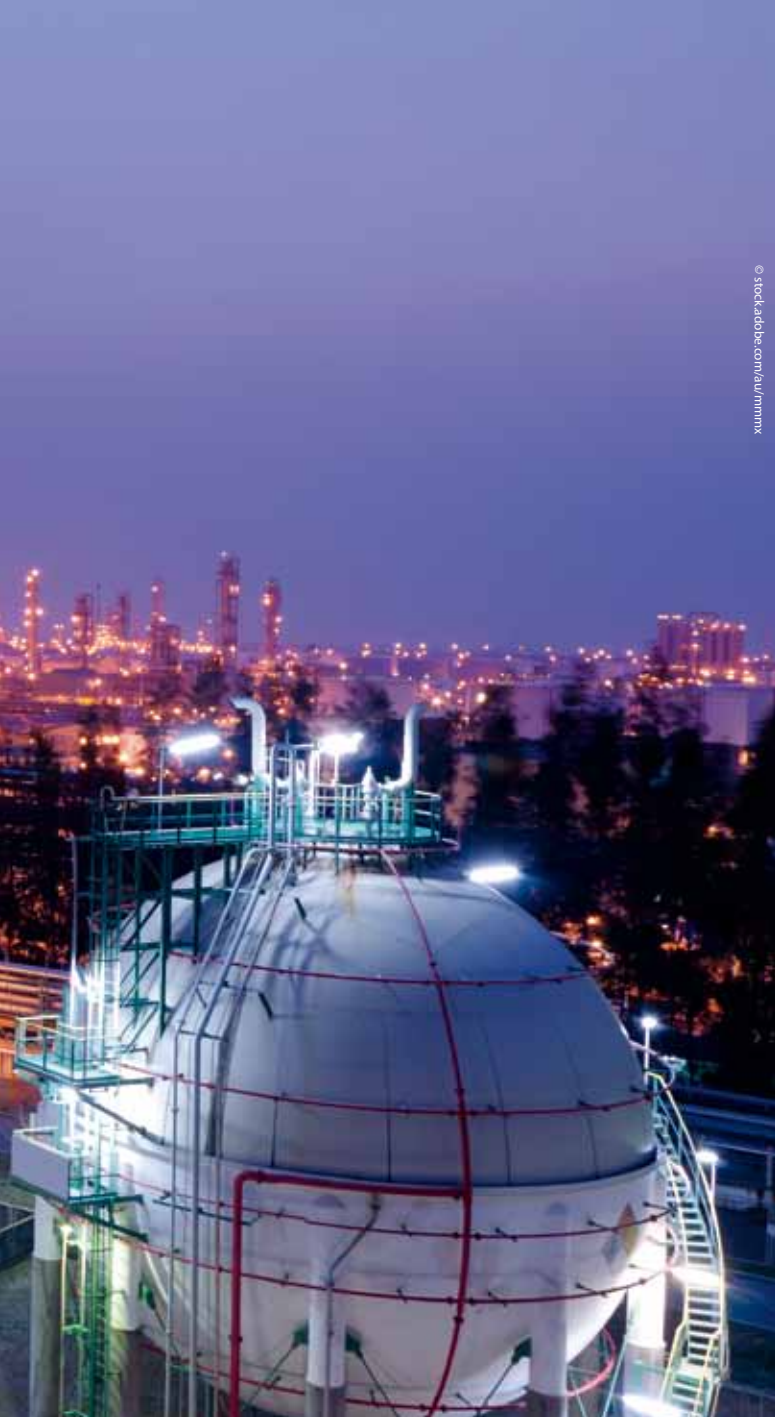
Much of the data coming from sensors is not standardised or integrated across platforms. Moreover, ownership of, or access to, data between suppliers, operators and contractors is often uncertain. Even when data is accessible, it is often too complex or large, obscuring any clear insights.

ExxonMobil's work with Lockheed Martin — to develop an open standard, open architecture control system that runs on commercial software and hardware — is an excellent example of how the oil and gas industry can embrace the proven digital strategies of other industries to improve performance.

#### Energy ecosystem

For digitalisation to deliver all its potential benefits, it must be integrated throughout an industry. For oil and gas, efficiency, productivity and health and safety will only be maximised if systems, equipment and sensors from across the industry's value chain are sharing data and learning from one another.





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An integrated information system is essential as companies move into the digitalisation age. The exploration and production (E&P) departments of oil companies often do not share data, even between themselves. This must change, especially as the transition is seeing a move from the once dominant 'exploration' departments to an era where the 'production' departments are the value drivers.

#### **Business models**

Unless work processes and business models are changed, oil and gas companies risk losing out to new rivals from inside and outside the industry. Companies from other sectors have often already adapted to changing markets by embracing new business models and integrating information technology (IT) with operational technology (OT) in an effort to reduce costs and boost efficiencies. According to Accenture<sup>1</sup> "transforming current operating models to one increasingly enabled by technology might include narrowing the business scope to the most profitable assets; gaining efficiencies from repetitive, standardised designs and processes; increasing automation; outsourcing core functions; engaging in a more variable approach to cost (such as linking service contracts to wells and production instead of day rates); and using analytics to optimise day-to-day operations".

#### **Culture and mindset**

Oil and gas companies tend to be capital and technology centric, while, at the same time, being people intensive.

Future concerns include how many people will be needed, the training that they should be given and the types of people that should be hired who are fit for purpose.

Executives can no longer afford to be sceptical about digital and de-prioritise automation in relation to other parts of the business deemed to be more critical, such as geology, well services or turbomachinery. When digital changes are proposed that challenge existing work models, it is imperative that the stakeholders most likely to recognise the impact are included in discussions about it.

In response to other technologies, many disparate small systems and solutions have cropped up to deal with local problems; and, lower down in the organisations, employees often use manual workarounds and are distrustful of technology and its proponents.

Furthermore, the industry is inherently unable to take more of an experimental, 'fail-fast' approach because of its conservative nature and concern about the potential consequences of change. It is important to start now in preparing the workforce to manage and operate new technologies and digital plants of the future.

#### **Talent**

Technology and innovation often fail, not through lack of investment or weakness in the technology, but through a lack of cultural change.

Tomorrow's digital worker must be engaged and prepared today. However, the next generation of engineers often favour working in industries perceived to be 'greener' than oil and gas.

It is important that today's workforce is training in new technologies and to help them embrace and adapt to new technologies and the changing demands of their workplace and roles.

Furthermore, workforces, particularly in manufacturing and process industries, are ageing, and consideration needs to be given on how to avoid the loss of valuable knowledge and experience to retirement. It is important to actively capture process knowledge by converting data collection and analysis practices into software applications that can be deployed remotely. These 'advanced digital service' developments are fundamental to the collaborative operations way of working described earlier.

#### **Cybersecurity**

Many traditional cybersecurity best practices do not apply to industrial control systems. For today's industrial control systems there is a greater scope of impact as systems expand to include connected computing devices, personnel, equipment infrastructure, applications, services and telecoms. In a control room companies cannot expect every user — at shift handover — to log off their system so that operators can track the actions of every individual. Use of cryptography to protect data in transit could mean time constraints are not met in control system communications. Many intrusion detection systems do not speak the communication languages of today's industrial control systems. A malicious command sent to an industrial device often looks identical to a legitimate command. There needs to be a better understanding of pattern-of-life analysis.

Generally, national and international oil companies adopt a 'keep data within our gates' policy. There are many reasons ranging from close ties to government, sensitive commercial data and international conflicts. Many of these reasons are not related to cybersecurity issues but follow a 'better safe than sorry' approach which, in effect, limits the usefulness of the digital ecosystem.

### *IT/OT integration*

A key benefit of IT/OT data integration is that it addresses the challenges of managing ever increasing costs, minimising schedule overruns, mitigating risk, optimising or maximising production and controlling energy expenditure and efficiency. Unfortunately, many companies have little or no data integration across the value chain and still operate in silos, with data not being shared with other departments. Many still rely on spreadsheets combined with human expertise for crucial decision support. But, things are changing with companies now taking steps to implement IT/OT data integration. These players have a consolidated view of production systems and the most advanced can dynamically view and adjust operations across the value chain.

IT and OT cannot operate in silos if good shareholder returns are to be delivered in light of increasingly difficult and uncertain market realities. Companies are coming to realise that addressing emerging challenges effectively means transitioning to an environment which provides remote asset diagnostics, continuous automation and production optimisation made possible through a fully integrated approach to power, automation and telecom systems.

### **Building a digital strategy for energy transition**

Success during the energy transition relies heavily on the creation of a robust digital strategy that has buy-in from the boardroom. Here are some key considerations that will help avoid investing scarce resources without realising the benefits.

#### *Prepare and retrain executives*

The energy transition's success resides on an effective digital transformation roadmap, driven by a culture of innovation and technology adoption. Boardrooms need to act decisively and embrace digital by:

- setting a clear vision — according to Accenture<sup>1</sup> those embedding digital and technology as a strategy beyond efficiency are finding that digitalisation can create synergies across business, reduce duplications of investment and open their business to new opportunities;
- committing funding and resources;
- actively championing change management and encouraging new ways of working;
- accepting a flatter organisation where decisions can be made by well-informed colleagues deeper in the organisation;
- being receptive to new ideas and ways of working by collaborating with the supply chain;
- forming digitally powered, multidisciplinary teams with the freedom to think differently.

#### *Invest in talent*

The fall in the oil price forced the industry to think differently. It introduced new technologies which depend on a new breed of engineer to fully understand the impact on a business. As the world transitions towards a different energy mix, this talent pool will evolve, and even more new skills will be needed.

Companies need to continually assess the current skill levels and rapidly identify any gaps. They need to build a digital strategic workforce plan to address any shortage of skills.

#### *Continually explore the potential of digital*

Building an end-to-end digital infrastructure that connects all data sources into a centralised platform needs much investment, both in time and resources. It is important to start now and identify the true cost implication so that realistic budgets can be set and a quantifiable return on investment established. Going forward, many oil and gas companies will not have full control over the supply chain, with distribution networks owned by partners. This alone will require a robust digital infrastructure where collaboration is essential.

#### *Assess and benchmark current data architecture*

Data and software integration is the number one area for consideration. There is an abundance of critical, yet disparate, software applications deeply embedded within operations. Using digital technology to integrate these software platforms is a significant area for improvement. However, unless highly reliable data is commonplace across systems and databases, users will mistrust it. Creating a strong culture of data integrity while ensuring data confidentiality and security concerns are effectively managed is, therefore, the most significant single digital investment companies can make. Without a strong foundation in capturing, safeguarding and sharing data, potentially business-transforming insights are lost. Without adequate integration, new investments will be wasted as they will not be able to rely on historic data and will merely add fresh, high-quality, insufficiently used data to the rest.

#### *Work the data harder*

Today's analytics are more sophisticated at diagnosing, sorting, comparing and identifying cost savings and performance improvement areas than ever before, and certainly at a pace far faster than the average employee. These include visualisation tools, predictive analytics, cloud-based analytics, machine learning and artificial intelligence. They simply allow oil and gas operators to do much more. Using digital insights to automate processes boosts throughput by eliminating delays from human decision-making and frees up employees to focus on higher value-adding activities.

#### *Collaborate*

Changing consumer preferences, such as the sharing economy, will bring challenges not yet apparent. Developing collaborative partnerships with peers and suppliers to innovate, develop digital capabilities quickly and capitalise on new business models will be core to the success of the new world energy companies. Harnessing innovative ideas and, more importantly, turning them into reality will not be possible without industry collaboration both by production companies and suppliers along the value chain. Only in doing so will oil and gas companies drive innovation in the industry and secure competitiveness.

#### *Reference*

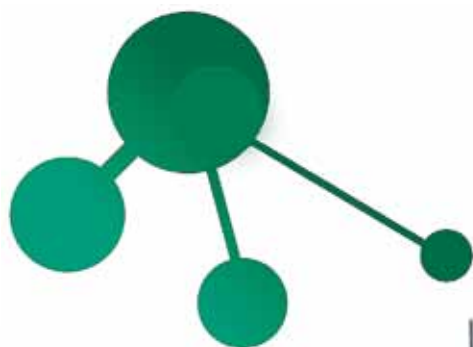
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## HAND PUMP

Calibrating pressure transmitters in the field requires a hand pump that can generate pressure and vacuum easily and then control pressure to precise test points. In the case of differential pressure transmitters, the user must calibrate both the high and low side of the DP cell. This means the fine adjust control must be precise at 12 kPa as well as 3.5 MPa.

The DCAP-PV hand pump allows the user to control pressure or vacuum easily and move through their tests without worrying about leaks when calibrating gauges. The Ralston Quick-test system of hoses and connectors lets the user connect without thread tape to each adapter and in many cases also to the device being calibrated without a wrench.

The fine adjust piston on the DCAP-PV also lets the user open or close a pressure switch easily. Actuating a pressure switch multiple times to ensure it is working correctly can be achieved easily.

The pump works well for calibrating flow computers, which require precise control of pressure to each side of the differential pressure cell. The pump and hose need to have a low volume so that the user is not spending a lot of time compressing air just to fill a hose. The connections on most flow computers can be accessed with Ralston Quick Connect adapters without thread sealant. If some test points are below ambient pressure, the pump can be used to pull a vacuum.

**Transtek Pty Ltd**

[www.transtek.com.au](http://www.transtek.com.au)



## RELAY MODULES WITH LOCKABLE MANUAL OPERATION

Relay modules with a PLC interface from Phoenix Contact now also include modules with lockable manual operation in a 14 mm overall width. They are particularly suitable for efficient and time-saving maintenance as well as easy commissioning.

The relay modules meet standard provisions for approvals in accordance with UL and EAC, and are subject to the RTII degree of protection. They are available with screw-in and push-in connection technology, saving space in the control cabinet due to their thin design. As prefabricated complete modules, they are equipped with input voltages of 24 VDC, 120 and 230 VAC. Their modular design allows relay modules to be combined, including those with advanced functions.

**Phoenix Contact Pty Ltd**

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## PROCESS VALVE PLUG-AND-SOCKET OPTION

Rotork IQ electric valve actuators have been enhanced with the option of a plug-and-socket electrical connection.

The optional modular Rotork plug-and-socket interface provides a fast connect and disconnect option for IQ3 multiturn and IQT3 part-turn actuators. It supports three-phase, one-phase and DC (IQT3 only) electrical variants and includes many actuators with explosion-proof EXd enclosures conforming to ATEX, IECEx, CSA and CSAus international standards.

The plug-and-socket terminal cover maintains the integrity of the actuator's double-sealed enclosure and IP68 watertight environmental protection (submersible in 20 m of water for 10 days).

A plug-and-socket interface is favoured in some industries for providing quick and easy field wiring and quick removal or interchange of actuators for maintenance and other operating requirements. The Rotork solution provides further flexibility to the user-friendly design of the IQ actuators.

**Rotork Australia**

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## DUAL-CHANNEL TRANSMITTERS

Acromag's DT Series dual transmitters are designed to offer a more cost-effective and space-saving solution to interface a variety of process and sensor signals to control systems.

With two independent signal conditioning channels in a 17.5 mm-wide module, users can achieve savings compared to using multiple single-channel transmitter units. A signal splitter mode lets one input drive both outputs. Loop-powered 2-wire and externally powered (7–32 VDC) 4-wire versions are also available.

Input options include process current, DC voltage, thermocouple, RTD and resistance signals with proportional process current or unipolar/bipolar voltage output.

A USB port simplifies set-up on a PC with Windows software or on an Android mobile device using Acromag's Agility app. Hazardous location approvals, high noise immunity and a wide operating temperature range make DT transmitters suitable for use in harsh environments.

High-resolution A/D converters perform high-accuracy measurements with repeatability and stability. High-voltage isolation separates each input, output and power circuit from each other. The configuration software helps users quickly select I/O ranges and precisely scale input/output limits. Each model supports several input ranges and can output a proportional 0/4–20 mA, 0–10 V or  $\pm 10$  VDC signal. Removable, front-facing terminal blocks facilitate wiring, and a rail power bus option can supply multiple units from a single connection or establish redundant power.



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**ENERGY CHAIN FOR LONG TRAVELS**

Energy chain manufacturer igus has developed the plane-chain, an energy chain concept for long travels and high speeds. With a side-mounted e-chain in a specially designed guide trough, the system is said to ensure a compact and failsafe energy and data supply.

The advantage of the side mounting is that the designer saves space due to the low installation height. The convex bathtub shape of the trough allows the E6 series e-chain to travel securely in two recessed channels. The stainless steel trough with its low friction factor ensures a long service life of the chain. For additional sound insulation of the system, a special plastic insulating layer can be used on the outside of the trough. Due to the lightweight components, the e-chain solution can be easily mounted below the ceiling for linear robots.

Completely enclosed plane-chains are also available on request. Thus, no objects can get in from the outside, significantly increasing reliability. In addition to the application potential of the plane-chain for automation, the concept in enclosed form is also suitable for the energy supply on cranes, because cables and e-chains within the corrosion-free troughs are protected from damage caused by wind and weather.

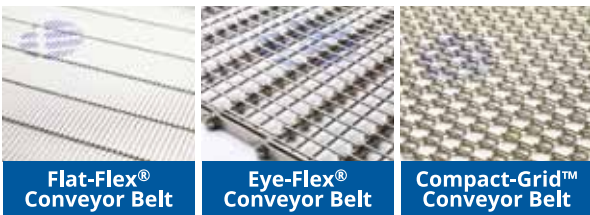


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**DISTRIBUTED ENERGY INTEGRATION  
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Bentley Systems has announced the availability of OpenUtilities DER Planning & Design Assessment Solutions, the latest of Bentley's electric utility software offerings that provide decision support and cost-based models and simulations for distributed energy resources (DER) integration. In partnership with Siemens' Digital Grid business unit, OpenUtilities Solutions for DER empowers electric utilities, electric-ity suppliers and distribution network operators (DSO) with software applications to analyse, design and evaluate DER interconnection requests through desktop and cloud-based services, while supporting the resilience of network operations.

The solutions generate an electrical digital twin for utilities — a GIS digital twin that enables owner/operators to more efficiently model the grid for decentralised energy without compromising safety.

OpenUtilities DER Optioneering offers a cloud-based decision support initial screening and supplemental screening mechanism to evaluate DER interconnection requests using validation checkpoints and hosting capacity analysis. Utilities can benefit from this fast-tracked interconnection procedure to readily approve DER applications or to defer them to power systems planners to conduct further studies and impact analysis.

In cases where more detailed system impact studies are needed before an interconnection request can be approved, OpenUtilities Analysis gives power system engineers a mechanism to reduce the amount of manual work required at each step of an impact analysis study. This means good forecasting, state-of-the-art models and the ability to efficiently study many power flow scenarios within the network.

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## EDGE PROGRAMMABLE CONTROLLER

Opto 22 has announced the addition of international standard IEC 61131-3 programming options in its groov EPIC edge programmable industrial controller. Adding these programming options to the existing flowchart and custom user-written options in groov EPIC gives control engineers the ability to program using a variety of languages they already know, while taking advantage of the EPIC's extended capabilities for automation and IIoT applications. All IEC 61131-3 standard languages are supported by the product, including Function Block Diagram (FBD), Structured Text (ST), Sequential Function Charts (SFC) and Ladder Diagram (LD).

Adding the IEC 61131-3 option gives engineers several key advantages. First, they can pick the best software tool for their specific application. Second, they can mix and match several software tools to build control and IIoT solutions on one unified platform. And last, companies can continue to leverage existing employee knowledge in IEC 61131-3 programming methods, including decades-old ladder logic.

The PC-based CODESYS Development System V3 is used to create and compile IEC 61131-3 programs for download to a pre-installed CODESYS Runtime running on the controller.



In addition to IEC 61131-3, the product can also be programmed using Opto 22's native PAC Control. Other programming options include using software languages supported on the Linux operating system through secure shell. This access — along with toolchains and interpreters for Java, C/C++, Python and JavaScript/Node.js — allows developers to create custom applications. In addition, the device includes Node-RED as another programming option, which uses a flow-based development environment optimised for edge data processing and communications.

**Systems 22 Pty Ltd**

[www.systems22.com.au](http://www.systems22.com.au)

## MOBILE DCS APP UPDATE

Emerson has enhanced its DeltaV Mobile app to ensure plant personnel have faster access to process information and to help organisations tailor the notifications personnel receive. DeltaV Mobile — a mobile app that provides read-only access to a plant's distributed control system and operation data — now offers improved customisation and access to third-party systems in one app.

Custom notifications provide personnel across the organisation fast access to essential information including batch status, safety instrumented systems bypasses, key performance indicators or any other process parameter they want to monitor. These notifications are customised

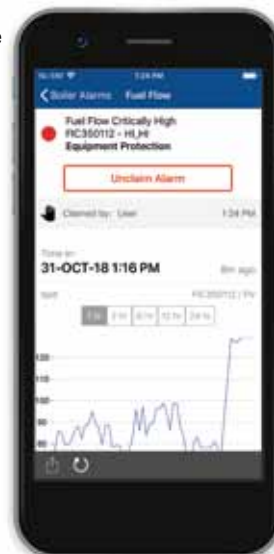
to individuals, ensuring personnel such as process engineers and supervisors are notified on-demand of information relevant to their job, but do not create additional control system nuisance alarms or notifications that add unnecessary distractions for control room operators and other personnel.

Notification escalation paths now include user-specific time delays, reminders and limits for each stakeholder in the organisation. Users can claim ownership of notifications to clearly communicate to plant personnel who is investigating the problem and sparing others from the distraction of notifications for problems that are already being investigated.

Open Platform Communication (OPC) browsing makes it easier to create watchlists and custom alerts from any OPC Classic data source, including from historians such as the OSIsoft PI System, third-party control systems and PLCs. In addition, a bulk editing tool allows users to bulk-create lists (with or without notification preferences) in spreadsheet applications, making it easier to create personalised watchlists and alarm lists.

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# IMPLEMENTING SECURE REMOTE ACCESS TO MACHINES

## KEY CONSIDERATIONS

Machine builders need a safe and effective way to gain visibility into their machines and to be able to remotely connect to and manage their machines.

**T**he IIoT has revolutionised the way business owners view their production environment by providing the capability to acquire real-time data from machines and devices in the field so that business owners can efficiently monitor and control production processes. OEE and zero equipment downtime are no longer just buzzwords because they are the key to a successful business. In order to increase production efficiency and cut operation costs, business operators are adopting new technologies and tools to help them gain more insight into their processes and systems. This new trend is compelling machine builders to provide tools and services that support the goals of zero downtime and high OEE for business owners' machines and equipment. Remote access technology is key to helping machine builders achieve these goals.

Data collected from experienced support engineers indicate that an estimated 60–70% of operational problems in machines simply require a software upgrade or some parameter changes to fix the problem, and tellingly, many of these can be done remotely! By adopting remote access solutions, machine builders can avoid time-consuming and expensive on-site work for troubleshooting such problems in the field.

Furthermore, with remote access technology, machine builders can acquire real-time data from machines installed at field sites. And, based on the actual condition of the equipment, machine builders can predict machine failures before they occur. This ability gives business owners the opportunity to schedule machine maintenance services in advance, thus enabling them to improve the availability of their machines, in addition to improving production quality and speed. Such predictive maintenance services provided by machine builders can dramatically improve the overall equipment effectiveness of plant machines and equipment.

Some machine builders have adopted traditional remote access methods, such as virtual private networking (VPN) and remote desktop connections (RDC), to improve their service levels and to provide quick response times for their customers. However, these traditional remote access solutions have various limitations and constraints that prevent machine builders from achieving their maximum service potential.

### Challenges for OEMs in using VPN and RDC solutions

VPNs and RDC — the latter of which uses virtual network comput-





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ing (VNC) — are two common methods used to remotely access machines and equipment at field sites.

VPN and RDC solutions can facilitate secure connections to remote machines. However, many of these solutions lack the flexibility or the intelligence to meet the specific needs of industrial machine builders. There are five key elements that such machine builders have to consider when they use VPN and RDC solutions.

#### ***Time-consuming set-up process requiring extensive IT knowledge***

Multiple parameters, including IP address, domain name, key ID, authentication mode, a suitable encryption algorithm and an efficient hash function, all need to be configured to properly establish connectivity with remote machines and to be able to exchange the necessary authentication keys and data. This process is complex and time-consuming, and requires extensive IT knowledge, which a majority of automation engineers may not be familiar with.

#### ***Compromises in corporate security policies are required***

VPN applications require the VPN server to have a static public IP address, and some specific network ports need to be configured to permit inbound and outbound traffic. In the inbound firewall rules,

users have to create NAT rules and enable port forwarding to allow inbound VPN connections. In the outbound firewall, UDP port 500 or UDP port 4500 or some other designated port has to be configured to allow outbound VPN connections. Most IT departments are unwilling to implement these changes in their organisation's network because the changes may create network vulnerabilities and compromise network security. Creating firewall rules that are secure and flexible at the same time has proven to be a major challenge for most IT departments, especially those that manage industrial networks.

#### ***Complexity and high cost of ensuring security***

VPN connections between machine builders and machine operators are usually site-to-site connections, which typically provide machine builders with remote access to all local devices in a plant's network. Plant operators want to restrict the network access of machine builders so that only a selected set of machines are accessible. For example, plant operators need ways to restrict access by plant equipment and specify the applications that can be accessed remotely to prevent unauthorised access to production information and unauthorised or accidental operation of plant equipment. The only way to mitigate this risk is for IT departments to create separate end-to-end connections using VPN technology, which, as previously noted, is complex and expensive, thereby drastically increasing set-up and maintenance costs.

#### ***VPN security is difficult to manage***

One way to achieve a higher level of security is to have different pre-shared keys or X.509 certificates for each VPN tunnel. When the number of VPN tunnels required are few, it is easy to manage the keys or certificates for these connections. However, as the number of VPN tunnels grows, it becomes more difficult to manage these keys and certificates. When VPN servers or client systems are changed, certificates have to be regenerated. When a certificate expires, a new certificate has to be assigned and reloaded to the system, which further complicates maintenance.

#### ***Scalability and flexibility are costly***

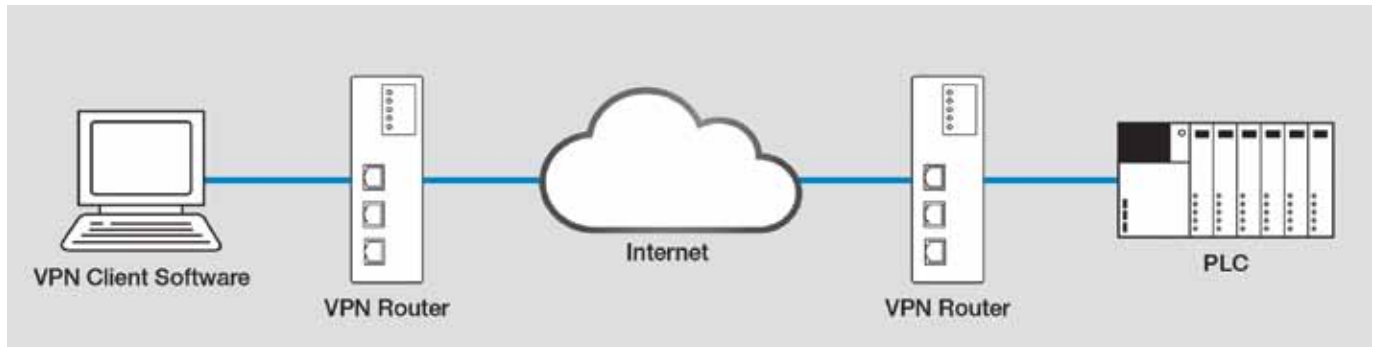
VPN servers typically have a limitation on the number of VPN tunnels they can support. When a business grows, more and more machines and devices are connected to the network with an increasing number of engineers supporting business operations. This leads to an increase in the number of VPN connections required. Once this number exceeds the VPN server's capabilities, machine builders will need to install a new VPN server and go through an additional time-consuming configuration process.

VPN servers are typically located in the machine builder's service centre. A large number of VPN clients in remote sites are connected to these VPN servers in the centralised service centre. Support engineers typically do not have access to the server from outside the service centre, so in order to have access to the VPN servers from outside — for example, by using OpenVPN or L2TP over IPsec — VPN servers have to be installed at remote sites, and each VPN server needs to have a public IP address. This results in high installation and maintenance costs. In addition, a remote connection



## Remote access

### Virtual Private Network (VPN)



### Remote Desktop Connection (RDC)

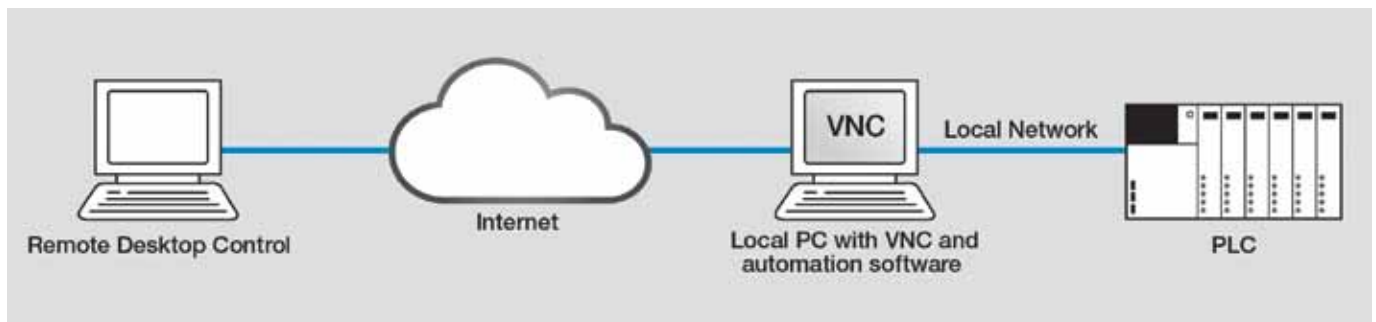


Figure 1: Traditional remote management tools – VPN and RDC.

requires different network subnets on the server side as well as on the client side. If engineers want to simultaneously diagnose remote equipment on different sites, they have to be aware of the IP subnet configurations at the remote IP sites in order to avoid IP address conflicts and other problems.

Similarly, a remote desktop connection to a PLC or other controller is neither straightforward nor convenient. It requires, at a minimum, a dedicated PC that is connected to the machine and has all of the relevant software tools installed. As a business grows, the number of dedicated PCs and the number of software tool licences will increase, leading to a steep rise in IT costs. In addition, one needs to consider the effort to maintain the PCs and the software tools installed on them. Machine builders tend to prefer identical versions of the software tools to be installed on both the client and host machines since this simplifies the troubleshooting process. To do so, the IT engineers assigned for maintenance need to coordinate all updates to software tools between the server and client sides.

Because of these limitations and restrictions in VPN and RDC-based remote access solutions, machine builders and equipment manufacturers are looking for easy-to-use, secure, flexible and scalable solutions that can be used to remotely manage their machines and equipment.

### Cloud-based secure remote access

Cloud-based remote access is a new type of remote access solution that enables flexible remote access to field machines. The network topology of a cloud-based remote access solution is composed of three components: a remote gateway, a cloud server and client software. Remote gateways are connected to field equipment in order to remotely access and control them, while client software is installed on the engineer's PC or desktop. The cloud server can be

installed on a cloud-based platform such as Amazon Web Services or Microsoft Azure.

The remote gateway and client software will both initiate outbound secure connection requests to the cloud server. The cloud server maps the two connection requests and, after successful authentication on both sides, a connection is established.

Cloud-based secure remote access solutions implement a network topology that enables the creation of outbound connections in the form of remote access tunnels, thereby effectively overcoming the challenges that the traditional VPN and remote desktop control technologies present. In addition, cloud-based remote access brings a number of additional benefits for machine builders.

#### *Ease of use*

In a cloud-based remote access solution, security parameters are configured automatically, permitting plug-and-play access without the need for technical configuration. Machine builders do not need to configure these parameters; they just need to click on a button to establish a remote connection.

Virtual IP addresses make also multipoint remote access effortless. Irrespective of the initial IP addresses set up by machine builders, cloud-based solutions assign a unique virtual IP address to machines. Machine builders can use these virtual IP addresses to establish multiple simultaneous remote connections. In addition, machine builders can use identical IP schemes for different field sites without worrying about IP address conflicts.

Management is also easier because in cloud-based remote access solutions, the cloud server is the central point for establishing and managing remote connections. Administrators can monitor the traffic status and volume of each connection by connecting to the cloud server. Furthermore, administrators can easily manage client

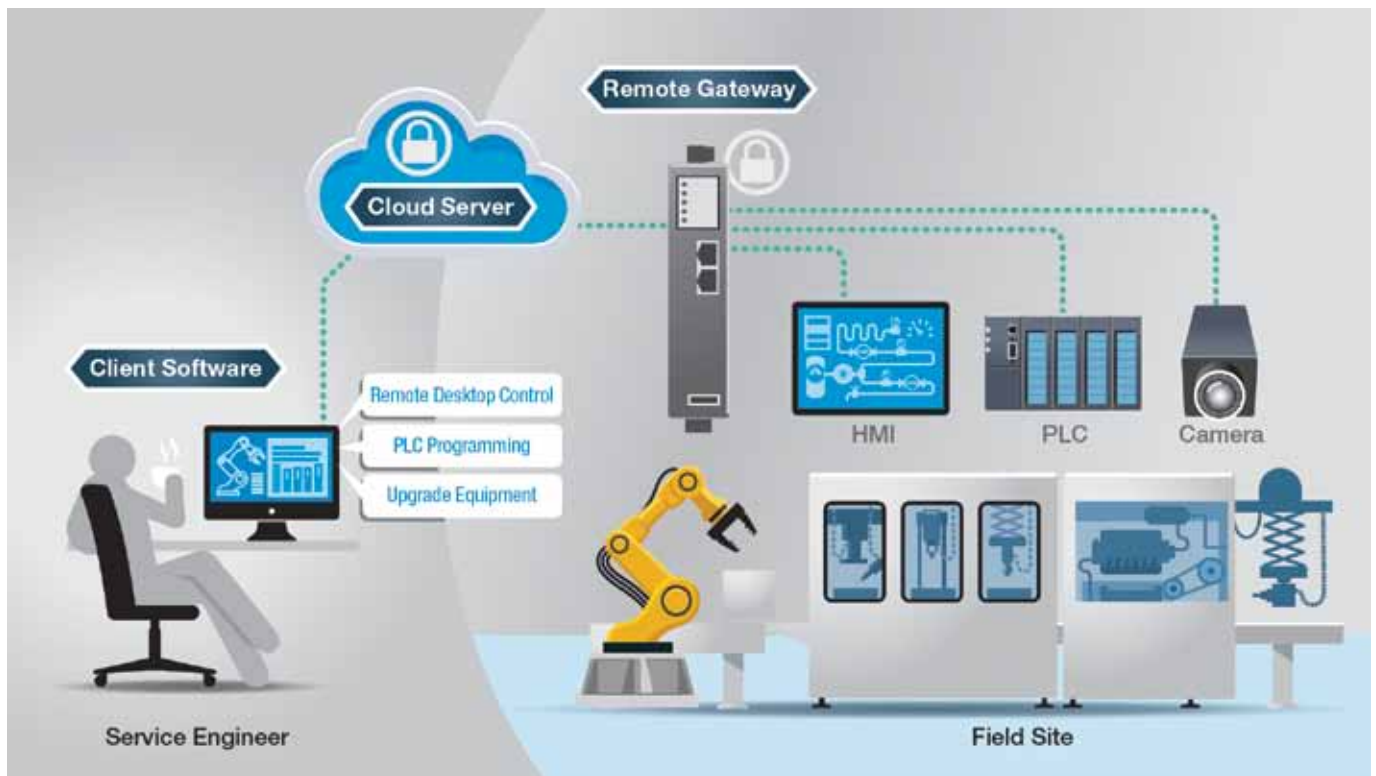


Figure 2: Cloud-based secure remote access.

accounts, remote gateways and certificates without the need for frequent reconfiguration. All these management tasks can be done via an easy-to-set-up cloud-based server portal.

### Enhanced security

Cloud-based remote access solutions provide end-to-end data encryption between an item of remote equipment and an engineer's PC. The cloud server only routes the traffic and does not decrypt or store the data that is passing through, preventing data leaks.

The ability to provide on-demand remote access control simply is also an advantage. Machine builders use remote access solutions to perform troubleshooting, monitoring, maintenance and diagnostics. Remote access to machines and equipment is typically not required on a continuous basis and hence can be used on an as-needed basis to minimise security issues and reduce costs, especially in cases where remote connectivity is based on a volume-dependent pricing option, such as with cellular technology. Furthermore, machine operators want to be able to take measures to prevent machine builders from remotely accessing all applications on their local network by limiting the scope of remote access to only applications that machine builders need to access, thereby eliminating the risk of interference with plant operations. Cloud-based remote access provides machine operators with the ability to initiate or accept remote connections, and machine operators can create rules as to which services and applications — such as HTTPS or Telnet — that machine builders are authorised to use remotely. They can also control who has the authority to use them, for example, by restricting access to a specific set of service engineers.

Existing IT security policies can also be maintained, because cloud-based remote access solutions build outbound connections using the outbound service port 443 to access remote equipment, which does

not present any issues for IT departments managing plant networks. Cloud-based remote access solutions can work in harmony with the IT security policies of machine operators.

### Flexibility and scalability

Since client software isn't limited to specific hardware, as long as they have an active client account, users can download the client software to any laptop or PC and have remote access from anywhere and at any time.

Cloud-based remote access solutions also create a transparent tunnel that connects the client with the remote equipment as if they were on the same network. So regardless of the remote equipment being accessed, and independent of the protocol used to pull data or for programming, machine builders can remotely acquire data or program remote equipment using their own software tools as if the machine builder was sitting next to the remote equipment.

Network expansion is also much easier. Network administrators can easily add and remove equipment and manage client accounts and certificates as they expand their remote networks.

### Conclusion

OEMs and machine builders require a secure, easy-to-use and scalable remote access solution to enable on-demand remote access to their machines deployed in the field. Traditional VPN and RDC solutions are cumbersome and require IT and networking knowledge as well as changes in security and firewall policies. A remote access solution that is backed by a cloud-based management infrastructure can provide the ease of use, flexibility and scalability required by OEMs, without compromising on security.

**Madison Technologies**  
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**SMALL BEVEL GEAR UNITS**

Nord Drivesystems has launched the SK 9x0072.1 series of NORD-BLOC.1 bevel gear units that are washdown-optimised for hygienic applications. The series offers smaller gear units for torques up to 50 Nm as an efficient alternative to worm gear units.

The series has a power range from 0.12 to 1.1 kW and covers speed ratios from 3.03 to 47.67:1.

The two-stage helical bevel gear units are characterised by high efficiencies, compact design and long working life. The aluminium housing offers high rigidity and durability with low weight.

The modular design provides wide application flexibility due to numerous application and mounting options. There are two models available: SK 920072.1 and SK 930072.1. The open housing of SK 920072.1 is lightweight and solid. It is also available with a universal foot flange.

With its closed housing, the SK 930072.1 is suited to applications with stringent requirements for hygiene and cleanliness. Additional protection is provided by the optionally available nsd tupH surface treatment.

The standard version is equipped with a B14 flange. All versions are available with solid or hollow shafts. The motor can be mounted directly without a coupling or adapter (IEC or NEMA).

Accessories including torque arms, flanges, covers and fastening elements from the Universal series may also be used. The compact and flexible bevel gear units are suitable for intralogistics and packaging technology and, due to their washdown design, may also be suited to the food and beverage industry.

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**IIoT GATEWAY**

The Winmate EAC Mini EACFA20 is an Android-based industrial IoT gateway with low power-consuming Freescale Cortex A9 i.MX6 processing and expansion possibilities. The expansion modules offer a range of options for additional serial interfaces such as CANBus, DIDO, Wi-Fi and 4G LTE wireless connectivity, with more than 30 possible combinations. All necessary connectors allow the product to send data from manufacturing facilities directly to cloud systems.

The gateway features a fanless cooling system, metal housing and a range of mounting options (including desk, wall, VESA, DIN rail and pole). The gateway supports the Android 6.0 operating system and has a compact size of 100 x 70 x 31 mm.

**Backplane Systems Technology Pty Ltd**  
[www.backplane.com.au](http://www.backplane.com.au)





### IoT DEVELOPER KIT

The iEi Integration TANK AIoT Developer Kit is a solution designed for operational and information technologists, with an Intel core processor for optimal performance, pre-installed OpenVINO toolkit, Intel Media SDK, and Ubuntu operating system for out-of-the-box ease of use, and rapid development and deployment.

Featuring support for a choice of Intel's Core i5-6500TE processor (2.3 GHz quad core, 35 W thermal design power) or Core i7-6700TE processor (2.4 GHz, quad core, 35 W thermal design power), the kit is capable of analysing multiple high-definition (HD) video streams and large amounts of sensor data. This is backed up by its 1 TB HDD, DDR4 memory and wide selection of I/O interfaces including four USB 3.0 ports, four USB 2.0 ports, four RS-232 ports (two with RJ-45 and two DB-9 with isolation), two combined RS-232/422/485 ports, 8-bit digital input (4-bit input, 4-bit output), plus VGA, HDMI and DisplayPort interfaces. In terms of expansion, the TANK supports two PCIe with eight data lines, one half-size PCIe Mini and one full-size PCIe Mini supporting mSATA.

The kit is capable of operating in a wide temperature range of -20 to 60°C with air flow.

**ICP Electronics Australia Pty Ltd**

[www.icp-australia.com.au](http://www.icp-australia.com.au)

### PUSH-IN TERMINAL RANGE

The Allen-Bradley Bulletin 1492-P terminal range features push-in actuators for ease of use. The push-in technology used allows for easy insertion of cables (solid, stranded or ferrules).

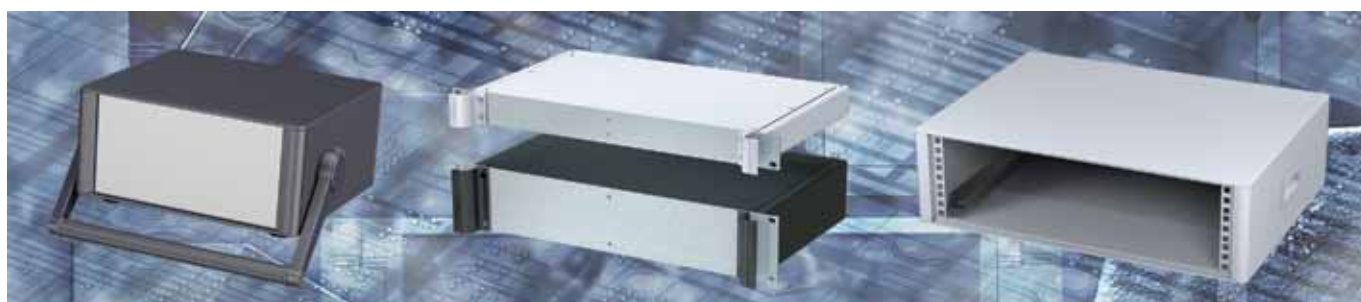
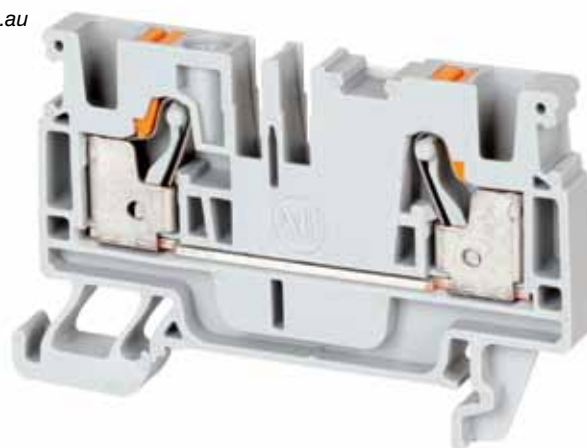
A low force is required on insertion and to release the cable — the push-in actuator is simply depressed using a tool such as a screwdriver. Alternatively, with fine stranded flex the actuator can be depressed for insertion.

The use of the actuator is fast and easy. It eliminates difficulties in removing cables that can be present with spring clamp technology and is of an insulated design that eliminates the exposure to live conductors. The easy insertion force makes the product approximately 30% faster to use than standard screw-type terminals, according to the company.

The push-in terminal blocks are available in a wide range of standard and application-specific offerings, includes standard terminal blocks of 1.5–6 mm<sup>2</sup> in single- or double-deck configuration. Application-specific terminal blocks such as sensor blocks and power distribution blocks are also available, offering a simplified solution to various requirements.

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## Smokin' good: clean compressed air for Texas BBQ Foods



Texas BBQ Foods is a family owned and operated company based in Inglewood in the Taranaki Region of New Zealand's North Island. There, in a state-of-the-art facility, the team produce a range of Texas-inspired smoked beef brisket, pork belly, cheeses and butter along with rubs and sauces.

The family follows the traditional Texas BBQ style of preparing meat which has its beginnings in the European meat-smoking traditions originally brought to Texas by German and Czech settlers in the 19th century. Taking only the best NZ-grown beef and pork, a rub is first applied to the meat before it is smoked in one of the plant's four large meat smokers using mesquite-chips for an authentic Texas BBQ flavour. Once the meat is cooked it goes straight into a blast chiller, before it is sliced, vacuum packed and chilled, ready to be despatched. The vacuum packing process is an important stage in ensuring the products retain their integrity, allowing consumers to enjoy the meats, cheeses and butters days or even weeks later.

In developing the manufacturing plant, it was clear that a reliable supply of compressed air would be critical to the operation.

"A critical factor in selecting a compressed air solution for us was to find one that would deliver a reliable supply of clean air," said Ash Peters, Director of Texas BBQ Foods. "We also wanted it to be easy and low maintenance, quiet in operation and a nice tidy unit that would be simple to install."

Compressed air would be required across the facility for various purposes including powering the thermoformer packing machine. This automated machine places the finished meats into trays before a vacuum seals the packets.

The company wanted to use local suppliers wherever possible. With a good reputation and also local to the company, Texas BBQ Foods

therefore contacted local authorised Kaeser partner Pace Power & Air for a solution. After reviewing the requirements Pace Power & Air recommended and subsequently installed a Kaeser Aircenter 6 that would operate with a food-grade lubricant, along with two Kaeser F6 filters: one KE and one KA.

The Aircenter from Kaeser Compressors presents the ideal solution where a complete and compact turnkey system is required. Within one space-saving compact package the Aircenter includes a Kaeser rotary screw compressor, an energy-efficient refrigeration dryer and an air receiver.

The Aircenter has been designed to be user- and maintenance-friendly. It has excellent accessibility to all service points and in addition it includes a Sigma Control 2 controller for ease of system control and monitoring. With this internal controller, compressor performance can be precisely adjusted to match respective compressed air consumption for optimum efficiency.

To meet the air purity level required for food manufacture, two Kaeser filters were also installed. The Kaeser filter range uses modern deep-pleated filter media to remove particles and aerosols, while a highly effective carbon fibre mat traps oil vapours. Together with innovative flow dynamics, they deliver exceptional filtration efficiency with minimal pressure loss.

The compressed air system has now been in operation at Texas BBQ Foods for a couple of months. "It's doing exactly what it's supposed to! We are finding it to be reliable, nice and quiet in operation, user-friendly, requiring only minimal checks," Peters said.

**Kaeser Compressors Australia**

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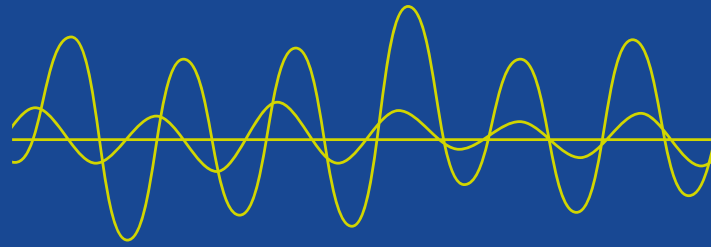


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# AS I SEE IT



## THE IoT HUB AND HOW THE IA TRIANGLE WENT TO BED

Operations technology is now feeling the pace of rapid change introduced by the internet. Unlike ever before, we are experiencing firsthand how the rules change when the internet touches industrial technology.

The IoT Hub (cloud data concentrator) and MQTT (connectivity) are here with the operational industry (vendor and end user) being caught off guard in terms of understanding, skill sets required and capability to roll out solutions. This is compounded by new players from outside the industrial automation industry leveraging the open IoT platform provided by the likes of Amazon and Microsoft, all claiming to bring a change in “bottom line profitability”.



The gap in knowledge is not in virtualisation or hosting operations systems such as SCADA in the cloud. It's the point where operational information meets open IT tooling (machine learning, predictive analytics) — the convergence point. The skill sets required to bring operational information into an IT environment then turn it into meaningful insights requires a new level of thinking, training and education.

The IoT hub seeks to connect billions of devices all at once, meaning any industrial device in the field can provide operational information directly into the cloud, bypassing the age-old automation triangle of information transfer (level 1 to 4). This approach enables a more intuitive and holistic way of gaining industrial insights straight from the edge of your operations.

For industrial automation vendors, this means that skill sets required to deliver a project have expanded — now it is necessary to be able to practically bridge industrial software (SCADA) and hardware (DCS/PLC/RTU)

systems with open cloud analytic systems provided by the big cloud providers.

Having in-depth understanding of operations and operations technology places industrial vendors with in-house engineering capabilities at an advantage in being able to provide tangible business insights. From an end user's point of view, this means

With the technology stars aligning the internet (NBN/5G), data centre (IoT Hub) and connectivity (MQTT secure) the industrial automation industry has been catapulted into a world that behaves with a greater sense of urgency. With this rapid change and uncertainty a degree of reassurance can be found in the fact that industrial automation technology has been pioneering rugged control, communica-

tion and system visualisation well before PCs made their way into the office and the term IT was coined. With reliability, availability and operability purpose-built for the process at hand, tighter partnerships between end users and engineering-focused industrial automation vendors, the pivotal blocks for building a secure and profitable digital future are already here.



*\*Shalveen Sharma is an electrical engineer with 12 years' hands-on technical and commercial experience with industrial automation systems. Having worked for multiple IA vendors, he is now responsible for the marketing strategy for Yokogawa's SCADA/*

*DCS/PLC/IloT platforms across Australia and New Zealand.*



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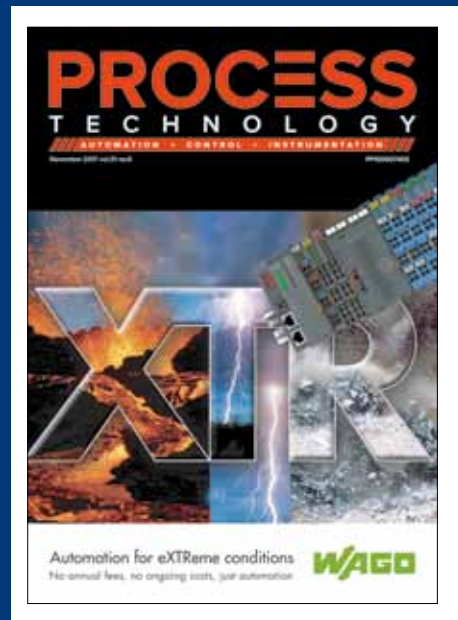
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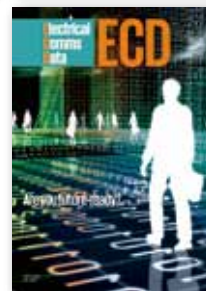
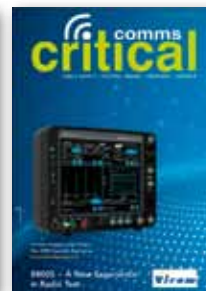
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