PROCESS TECHNOLOGY

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AUTOMATION + CONTROL+ INSTRUMENTATION

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COVER FOCUS

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As the master distribution partner for Siemens in Australia, APS Industrial provides exclusive local access to not only Solid Edge but the complete portfolio of Siemens software. This, in addition to exclusive access to low-voltage electrical, automation and building technology hardware solutions, empowers customers with digital twin capabilities to achieve virtual commissioning.

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welcome

This issue of Process Technology coincides with the annual AOG Energy event in Perth. As the major industry event at this time of the year, AOG Energy continues to drive discussion and leadership in Australia's oil, gas and clean energy sector: without doubt the hottest industry topics in Australia today.

The current state of play in the natural gas market in Australia involves a mix of different outlooks. On one hand, investment in the sector remains strong, but at the same time, gas producers are facing increased scrutiny over matters of environmental sustainability.

Government intervention in the industry has also increased, with the federal government's Gas Code of Conduct and associated price caps now law, and significant reforms having been made to the Australian Domestic Gas Security Mechanism.

All this comes at a time when industrial automation technology is in a phase of rapid technological advancement, with the drive towards digitalisation taking centre stage, along with the rapid rise of artificial intelligence. These modern technologies hold the promise of greater efficiencies and lower costs across all industries — and come at a time when the hydrocarbon industries can truly benefit from them, whether that be futureproofing the plant or proactively managing emissions to meet greater emissions control requirements.

You may have already noticed that in this issue we are introducing a new-look Process Technology for 2024, in which we will continue with the same technically focused content that is our hallmark, but also bring some new features, including recent industry news, an industry column from industry bodies such as the IICA and a calendar of upcoming industry events. We will also from time to time include a short 'how-to' technical advice article.

I hope you enjoy our new-look magazine.

Glenn Johnson
Editor
pt@wfmedia.com.au

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FEB/MAR 2024

Introducing the new additions to our

Safety Locking Devices

PILZ

THE SPIRIT OF SAFETY

NEW

PSENmlock mini

Strong guard locking. Small and simple to install.

- Electromechanical
- Safe guard locking
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- Flexible actuator
- holding force FZH of 1950 N (F1max: 3900 N)
- up to PL d

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Reliable process protection with robust guard locking

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INDUSTRY NEWS

Marcel van Helten, CEO Red Lion Controls, and Staffan Dahlström, CEO HMS Networks, after signing.

HMS Networks acquires Red Lion Controls

HMS AB has announced that it has entered into a binding agreement to acquire US-based Red Lion Controls for a cash consideration of US$345 million.

Red Lion is a well-established provider of industrial automation solutions, and HMS has said that the acquisition will significantly strengthen HMS's presence in North America and enable cross-selling of both HMS's and Red Lion's products through their respective market channels.

"We are very happy to welcome Red Lion into the HMS Networks family — the companies are a great match both when it comes to products, geographic presence and cultural aspects," said Staffan Dahlström, CEO of HMS. "Red Lion's 'Access' products fit well with HMS's Anybus and Ewon product lines, while Red Lion's 'Connect' offering adds what HMS has been searching for over several years: a strong Ethernet switch offer with a strong market position.

Closing of the acquisition is expected to take place during the first half year of 2024, subject to customary closing conditions.

Renewable hydrogen hub for north Queensland receives federal funding

The Australian Government has announced it is investing up to $70 million to develop the Townsville Region Hydrogen Hub in north Queensland. The initial stage of the hub will produce 800 tonnes of green hydrogen per year, enough to fuel over 40 heavy vehicles a year. It will ramp up to around 3,000 tonnes for domestic supply, and ultimately in excess of 150,000 tonnes for export.

The hub, led by Edify Energy, will produce green hydrogen for use by local industry and in zero-emissions transport. It will also deliver a 17.6 MW domestic production facility with integrated renewable energy generation and battery storage.

Edify and its partners – including Siemens Energy, Queensland TAFE, James Cook University and Townsville Enterprise Limited – will work with industry bodies to provide education and training to ensure Townsville's workforce is skilled and ready to develop and sustain the region's hydrogen industry.

Construction will begin next year and be complete in 2026, with initial commercial operations scheduled to start in 2027.

The project has over $137 million of combined investment. The Commonwealth's contribution is up to $70 million, including $20.7 million from the Australian Renewable Energy Agency. The remaining funding is being sourced from industry and the German Government.

Townsville is part of over $500 million in Commonwealth funding for hydrogen hubs in regional centres like Gladstone, Bell Bay, Kwinana, the Pilbara, Port Bonython and the Hunter.

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Oil supply to hit new record in 2024: IEA

The world oil supply is expected to hit a new record of 103.5 million barrels per day (mbbl/d), with the US, Brazil, Guyana and Canada leading the production increase by 1.5 mbbl/d, according to a report by the International Energy Agency (IEA). On the other hand, OPEC supply is predicted to remain at a similar level as last year, assuming that the additional voluntary cuts initiated this month are gradually phased out in the second quarter of 2024.

According to Haitham Al Ghais, OPEC's Secretary-General, forecasts of peak oil demand will prove misguided.

"In 2023, the IEA asserted that it saw a global oil demand peak before the end of this decade and called for a halt to new oil investments," he said in a statement. "This was despite the IEA only a few years earlier highlighting that the world would still need oil for years to come and stressing the importance of investing in the sector.

"Peak oil supply has never come to pass, and predictions of peak oil demand are following a similar trend. Given the growth trends, it is a challenge to see peak oil demand by the end of the decade, a mere six years away."

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Australia signs gas supply deals for east coast markets


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The Australian Government has announced new gas supply deals in the east coast market. Under the government's gas code rules, more than 260 PJ of gas will be made available up to 2033 through the agreements signed with Esso and Woodside.

The gas, enough to power gas-fired power stations for approximately two and a half years, will be directed to southern demand centres, which are at risk of seasonal shortfalls. As per the announcement, the goal is to maintain a sufficient domestic supply to exert downward pressure on gas prices.

These latest commitments build on previous deals from November 2023 with Australia Pacific LNG (APLNG) and Senex Energy, backed by Posco International of South Korea. APLNG and Senex Energy agreed to provide up to 300 PJ of gas by 2030. APLNG is a partnership between ConocoPhillips, Origin Energy and Sinopec.

Despite Australia's capability to produce more gas than required for domestic consumption, the majority is earmarked for export. Meanwhile, the Labor Government has set a target for 82% of the country's power to come from renewable sources by 2030.

"We know that gas is critical to supporting a lower-cost, more renewable grid as ageing coal exits, and to support Australian manufacturing — which is why we have delivered this code to shore up energy reliability and affordability," said Minister for Climate Change and Energy Chris Bowen.

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Engineers Australia welcomes the government's AI response

Engineers Australia says it has welcomed the federal government's Interim Response to Safe and Responsible AI as a positive first step in balancing regulation and safety with innovation.

"Engineers Australia supports the government's commitment to a future where AI is both a force for good and responsibly managed. We must pioneer a path that balances innovation with safety, ensuring AI's benefits while protecting professionals, educators, students and the community," said Engineers Australia CEO Romilly Madew AO.

The government's announcement focused on ways to make sure the design, development and deployment of AI in legitimate high-risk settings is safe and responsible, while ensuring that AI can continue being used in low-risk settings largely unimpeded.

HRS to showcase turnkey processing solutions at APPEX 2024

HRS Heat Exchangers says it has developed a wide range of turnkey line solutions that are successfully being used by food processors worldwide, which it will showcase at APPEX 2024.

The range of all-in-one solutions include pasteurising, sterilising, aseptic filling and clean-in-place capabilities in a single system, as well as options that can be skid-mounted for easy installation.

Other HRS systems for the food and drink sector include deaeration systems, the I Series of ice crushers and melters, direct steam injection sterilisers (DSI Series) and dedicated CIP and SIP systems. The company also provides systems for customers to conduct product and processing trials before committing to a final production solution, and each HRS solution can be customised to the individual needs of the application.

HRS Heat Exchangers will be showcasing its range of complete line solutions for the food and drink industry on Stand E148 at APPEX, Melbourne Convention and Exhibition Centre, 12-15 March 2024.

LIBERATING STRANDED DATA VIA THE IIoT

Emerson Automation Solutions

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Modern edge-to-cloud IIoT solutions can make it easier to access and use stranded data.

Automation systems are in service almost everywhere, controlling and monitoring machines, industrial manufacturing, infrastructure, and other facilities. This activity generates volumes of data that could be used to improve operations and business outcomes — but only if the data can be accessed, managed and analysed effectively. Unfortunately, this valuable stranded data often remains inaccessible for many technical and commercial reasons.

Newer architectures are changing this predicament by combining flexible and capable edge computing with a cloud computing model, making it not only feasible, but actually practical, to analyse this data, gain new insights and to make the results available to users.

HOW TRADITIONAL INFRASTRUCTURES STRAND DATA

Until recent years, most manufacturing data was sourced from PLCs, HMIs, SCADA and historian systems running in the OT domain. These systems are built using industrial automation products, which maintain a tight focus on achieving control, visibility, production and performance to maximise operational efficiency and uptime. As such, accessing and analysing the associated data beyond immediate production goals was a secondary concern.

Designers architected and scaled the OT infrastructure correspondingly, leading to design choices like:

- selecting proprietary protocols meeting performance requirements, but without supporting flexibility and cross-vendor interoperability;
- minimising control and sensor data collected to maximise system reliability and simplicity;
- implementing localised on-premise architectures to minimise cybersecurity threats;
- vendor lockout schemes to protect intellectual property and promote reliable machine operation, often at the expense of connectivity.

While within the OT environment these data sources appear to be open, they are still quite difficult to access for applications outside of the OT environment where the data could be more easily analysed. In addition, many potentially valuable sources of data — such as environmental conditions, condition-monitoring information and utility consumption — are simply not needed for production or equipment control and are therefore ignored or not collected by these automation systems.

Traditionally, industrial automation systems were installed strictly on-premises and largely constrained by the specific hardware and software technologies available. OT devices were often installed with 'just enough' processing power and therefore lacked the necessary computing and storage elasticity to deliver on the full potential of the data often desired with the new class of analysis tools. Most of the familiar OT-centric software is not designed from the ground up

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for cloud connectivity, and certain features, and even basic security requirements, may be implemented inconsistently as add-ons. In many cases, IT-centric software is not attuned to the always-on, low-latency and high-volume data needs of an OT environment, and fails to offer a broad set of vendor connectivity controls. Security as an afterthought is not good enough; it must be built-in at all levels of the solution.

Pulling together ill-suited software to create an IIoT solution is problematic, can require kludgy custom scripts and is hard to support. With these needs and challenges in mind, some users may question how to recognise stranded data so they can begin taking steps to liberate it.

TYPES OF STRANDED DATA

Stranded data exists in many forms. It originates at machines, the factory floor and other systems throughout a facility, often as part of the OT but also associated with other support and utility systems. This data can be as granular as a single temperature reading, or as extensive as a historical data log identifying the number of times an operator acknowledged an alarm.

The variety of data types, source devices and communications protocols adds to the difficulty of building a comprehensive solution. Below are five categories of stranded data sources.

Isolated assets

Isolated assets are those within a facility with no network access to any OT or IT system. This is the most straightforward case, but not necessarily the easiest to solve. Consider a standalone temperature transmitter with 4-20 mA connectivity or even Modbus capability. It needs to connect with some type of edge device — PLC, edge controller, gateway or other — to make this data stream accessible. In many cases, such data is not critical to machine control, so it is not available through traditional legacy PLC/SCADA data sources.

Ignored assets

Ignored assets are connected with OT systems and generating data, but that data is not being consumed. Many intelligent edge devices provide basic and extended data. A smart power monitor can easily provide basic information like volts, amps, kilowatts and kilowatt hours using hardwired or industrial communication protocols, but deeper data sets, such as total harmonic distortion (THD), may not be transmitted. The data is there, just never accessed.

Under-sampled assets

Some assets generate data but are sampled at an insufficient data rate. Even when a smart device is supplying data to supervisory systems via some type of communication bus, the sampling rate may

be too low, the latency too great or the data set so large that the results are not obtained in a usable fashion. Sometimes, the data may be summarised before it gets published, resulting in a loss of fidelity of the data.

Inaccessible assets

There may be assets generating data (often non-process, yet still important for things like diagnostics), but in a generally inaccessible

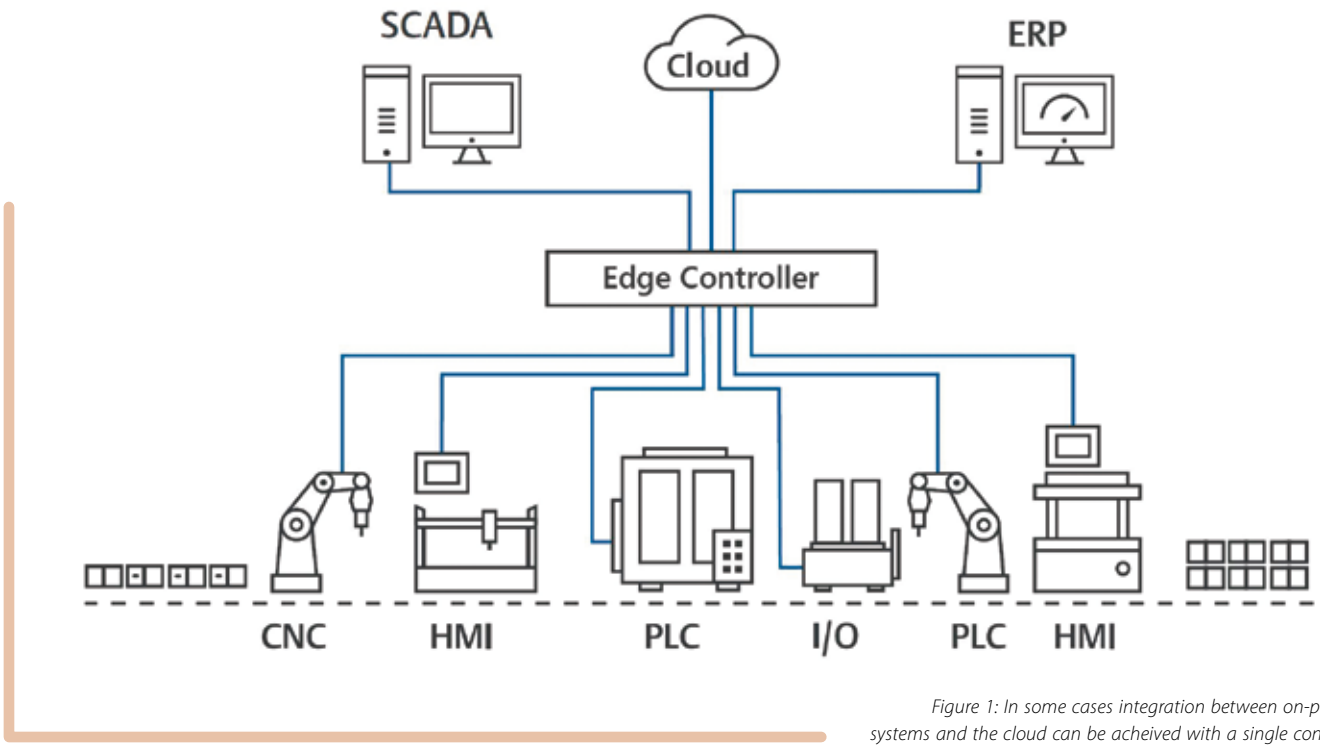

Figure 1: In some cases integration between on-premise systems and the cloud can be acheived with a single controller.

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format or not available via traditional industrial systems. Some smart devices have on-board data like error logs that may not be communicated via standard bus protocols but nonetheless would be very useful when analysing events that resulted in downtime.

Non-digitalised assets

An example of non-digitalised data is personnel generating data manually on paper, clipboards, whiteboards and the like, which misses the opportunity to capture this information digitally. For many companies, workers complete test and inspection forms and other similar documents in a physical paper format, without any provisions for integrating this information with digital records.

WHOSE JOB IS THE IIoT?

Industrial operations — especially in remote locations — typically have limited personnel available for administering and managing specialised OT/IT systems.

Another challenge revolves around which parties 'own' and 'need' the data. OT personnel administer the PLC/HMI/SCADA systems, while enterprise and IT personnel have a greater interest in carrying out IIoT initiatives and have the knowledge to manage large data warehouses or data lake projects.

Companies need a way to coordinate OT and IT efforts. Normally, the experts who understand the IT cloud infrastructure and have good ideas on what to do with available data lack the expertise to locate and interpret OT-sourced data, connect to it, and bring it to the cloud computing platforms. On the other hand, the people that well understand the OT data and connectivity challenges generally don't understand the cloud infrastructure or the potential this infrastructure can have. Systems making both the data access and cloud transfer simple and easy to set up are a critical missing link. While traditional automation platforms with the right features certainly play an important role in IIoT data projects, it is equally important to consider including technologies that can form an IIoT data gathering path parallel to the existing automation.

GAINING VALUE FROM EDGE-SOURCED DATA IN THE CLOUD

Connecting stranded data, especially to high-level on-site and cloud-based enterprise IT systems, is needed so that the many types of edge data can be historised and analysed to achieve deeper and longer-term analytical results, far beyond what is typically performed for near-term production-oriented goals. When an organisation — whether an end user or an OEM — can liberate stranded data from traditional data sources, and transmit this data to cloud-hosted applications and services, many possibilities are enabled, including AI model training for predictive diagnostics, proactive maintenance, long-term analytics, asset management, insights into production bottlenecks, efficiency and sustainability improvements.

Solving the challenges of stranded data, and effectively connecting edge data to the cloud where it can be analysed, is ultimately the purpose and strength of IIoT initiatives. IIoT solutions incorporate hardware technologies in the field, software running at both the edge and the cloud, and communications protocols, all effectively integrated and architected together to securely and efficiently transmit data for analysis and other uses. >>

> *STRANDED DATA IS AN ALL-TOO-COMMON REALITY AT MANUFACTURING SITES AND PRODUCTION FACILITIES EVERYWHERE. SOLVING THE CHALLENGES OF STRANDED DATA, AND EFFECTIVELY CONNECTING EDGE DATA TO THE CLOUD WHERE IT CAN BE ANALYSED, IS ULTIMATELY THE PURPOSE AND STRENGTH OF IIoT INITIATIVES.*

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CREATING AN EDGE SOLUTION

Digital transformation is necessary at the edge to liberate all forms of stranded data, and to transport this data to the cloud for analysis. Edge solutions can be an integral part of automation systems, or they can be installed in parallel to monitor data not needed by the automation systems. Many users prefer the latter approach because they can obtain the necessary data without impacting systems that are already operating in production. However, the key is that these new digital capabilities can connect with all previously identified forms of stranded data.

Edge connectivity solutions take many forms. Below are a few popular examples:

- Compact or large PLCs ready to connect with industrial PCs (IPCs) running SCADA or edge software suites.
- Edge controllers that are 'edge-enabled' running SCADA or edge software suites.
- IPCs running SCADA or edge software suites.

Hardware deployed at the edge may need wired I/O, or industrial communication protocol capabilities, or both, to interact with all sources of edge data. Once the data is obtained, it may need to be pre-processed or at least organised by adding context. Finally, the data must be transmitted to higher-level systems using protocols like MQTT or OPC UA.

For best usability and to minimise any subsequent processing efforts (and errors), OT data must be cleaned, transformed, structured and conveyed with its context. This means including naming conventions, engineering units and scaling values so the data stream self-describes the content. A seamless solution is needed to transport data from edge sources to cloud computing resources so the enterprise can fully take advantage by transforming the data into actionable information. Sending individual sensor information directly to the cloud is a first step but is not in itself an optimal method, compared with routing data through a proper OT automation system or a parallel installation of an edge-capable solution that will help provide semantic meaning.

Maintaining context is particularly important in manufacturing environments where there are hundreds or thousands of discrete sensors monitoring and driving mechanical and physical machinery actions. Modern automation software systems help preserve the relative relationships and context. Today's OT/IT standards are developing in a way that ensures the consistency and future flexibility of data and communications. It is important for any solution to be flexible yet standards-compliant — as opposed to custom setups that will be impossible to maintain long-term.

CONNECTING EDGE TO CLOUD

Once an edge solution is in place and can get the data, the next step is to make it accessible to higher-level IT systems, with seamless communications to cloud-hosted software. With clean, structured data in proper context and readily accessible in the cloud, data scientists and other analytics experts can apply big data principles to gain new insights from the data.

With the cloud, users can store data on virtual storage, without having to worry about the threat of losing important information due to local PC or server problems, or the possibility of running out of storage. Users also gain the ability to share data with authorised people.

For these and other related reasons, a cloud architecture fits well with the needs of organisations when implementing IIoT data projects.

Technology to bridge data between the edge and the cloud

IIoT connectivity solutions come in many sizes; indeed, there is great flexibility in choosing a right-sized implementation for each application.

Modern SCADA and control systems are now incorporating IIoT and cloud connectivity, so that process control systems can perform edge computing and serve as robust data sources for the IIoT, moving beyond traditional HMI/SCADA and IIoT solutions by offering extensive openness, scalability, security and integrated connectivity.

In some cases, depending on the need, the software can be hosted on an edge controller, a site-located PC or server, or a cloud computing resource. And because the software runs on an operating system like Linux or Windows, it is possible to scale application deployments from small, embedded edge devices up to larger server-based systems.

Built-in data routing and gateway functions make it easy to supply data to cloud and other IT systems. The technology makes it easy to securely collect and publish data on the cloud, manage business information flows towards ERP/MES business managerial systems or simply connect field devices to software applications.

Another way is to use IIoT connectivity technology that runs in parallel to an existing PLC/SCADA system, facilitating the execution of data gathering, analytics and other services, running on edge hardware. Users can create digital transformation projects for monitoring machine health and conditions, energy efficiency tracking, throughput improvements and other uses.

MODERN AUTOMATION SOFTWARE CONNECTS OT AND IT

Stranded data is an all-too-common reality at manufacturing sites and production facilities everywhere. It is the unfortunate result of legacy technologies incapable of handling the data, and traditional design philosophies focusing on basic functionality at the expense of data connectivity. Only recently has the importance and value of big data analytics become mainstream, so end users are working to build this capability into new systems and add it to existing operations. Edge-to-cloud data connectivity delivers value in many forms of visualisation, logging, processing and deeper analysis.

Any IIoT solution for bridging data between OT and IT relies on digital capabilities that can interface with traditional automation elements like PLCs, or can connect directly to the data sources in parallel to any existing systems. These edge resources must be able to preprocess the data to a degree and add context, and then transmit it up to cloud systems for further analysis.

COMPACT SAFETY LOCKING DEVICE

Small and simple to install, the PSENmlock mini safety locking device is designed to offer an economical solution for safety gate guarding.

Pilz Australia Industrial Automation LP
https://bit.ly/3ufgZGX

COMPACT TOWER INDUSTRIAL PC

Advantech has introduced the IPC-320, a compact tower IPC powered by 12th/13th Gen Intel Core i processors.

Advantech Australia Pty Ltd
https://bit.ly/3uoLU3u

E-STOP ACTUATORS

LAPP Australia's range of Wieland Electric E-Stop actuators can be used on a wide range of industrial and process engineering machinery.

LAPP Australia Pty Ltd
https://bit.ly/49sNiBb

CORRUGATED TUBE SYSTEM

The E-Rib corrugated tube system is a suitable solution for industries requiring precise cable movement and protection.

Treotham Automation Pty Ltd
https://bit.ly/3Swsm5m

NEW PRODUCTS

EXPANDED AUTOMATION SYSTEM

Beckhoff has expanded its MX-System modular and pluggable automation system with baseplates and modules in size 3. The size 3 modules can be combined with size 1 and 2 modules, expanding the range of applications in which the MX-System can be used.

The MX-System baseplate in size 3 offers an additional row of data slots, making more slots available to accommodate more function modules within the same width. The baseplate is also compatible with all function modules in the existing sizes. The principle of passive cooling remains the same in size 3, and the larger cooling surface means that other performance ranges can be achieved. The first size 3 modules are a 600 VDC supply with 40 A nominal current, a servo controller with 28 A nominal current, and a power supply for up to 63 A. More options based on size 3 will be added in the future.

This addition to the range increases the range of applications in which the MX-System can be used. Up to now, machines requiring high power inputs could only be implemented to a limited extent and in a hybrid manner using the modular MX-System. However, the 3-row baseplates are now able to replace the control cabinet for power distribution that was previously required in these cases, allowing more and larger machines to be configured control cabinet-free.

Beckhoff Automation Pty Ltd
www.beckhoff.com

ADAPTERS AND COUPLINGS

WIKA is offering a series of connection adapters and couplings that are designed for applications with pressures from 15,000 to 60,000 psi (1034 to 4136 bar).

The HPAC adapters and couplings enable safe connection to valves, nipples and fittings, even in confined installation situations such as in test benches and control cabinets. They are available in all common variants (female–male, male–male, female–female) and with NPT thread or cone-thread combination. The one-piece construction and high-quality materials offer high leak tightness and a long service life. Every adapter is laser marked for identification with article number, nominal pressure, connection size and more details.

WIKA also offers customer-specific assembly of fittings, valves and measuring instruments. These 'instrument hook-ups' are delivered ready for operation and leak-tested.

WIKA Australia
www.wika.com.au

COMPACT SAFETY CONTROLLER

The PNOZ m B0.1 standalone base unit for the PNOZmulti 2 range is a compact yet configurable small safety controller for small and medium-sized applications with three or more safety functions. It can be used as a standalone device or can be expanded with a maximum of one I/O module each as part of a modular system. Different I/O modules are available for this purpose: in addition to the existing expansion modules, there is now a relay output module, PNOZ m EF 2DOR.

The PNOZ m B0.1 offers 20 safe inputs, with up to eight that can be configured as auxiliary outputs. There four safe semiconductor outputs, up to PL e, SIL CL 3 depending on the application, and four test pulse outputs that can be configured as standard outputs.

It is designed to be a compatible successor to the PNOZmulti Mini compact controller. The variety of modules available for the PNOZ m B0.1 means that individual requirements can be assembled according to need, and all safety functions can be freely configured to suit the specific application.

Using Version 11.0 of the Multi Configuration Tool, existing PNOZmulti Mini projects can be easily migrated to the PNOZ m B0.1 base unit, and existing link modules and fieldbus modules can also be used. The result is a compact, but at the same time, modular system for the safety of small and medium-sized machines.

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

FANLESS EMBEDDED COMPUTER

Backplane Systems Technology Neousys Nuvo-9501 Series is a powerful, compact fanless embedded computer that is built on the advanced Intel 13th/12th-Gen Core 35 W/65 W LGA1700 CPU platform. The computer is equipped with up to 24 cores/32 threads, offering up to 2x the performance compared to the previous Intel 10th or 11th Gen platforms. This makes it a suitable computing solution for a range of industrial applications.

The Nuvo-9501 offers essential I/O functions for general industrial needs, including dual 2.5GbE ports, dual display ports and four USB 3.2 ports. Additionally, it features a Gen4 x4 M.2 NVMe slot for the latest NVMe SSDs, with read/write speeds of up to 7000 MB/s, making it suitable for high-speed data collection or surveillance applications. It also supports 1x M.2 2280 Gen4 x4 NVMe and 1x 3.5″/2.5″ SATA HDD/SSD storage for high-capacity storage needs up to 32 GB DDR4 3200 SODIMM. The computer has 2x 2.5GbE and 4x USB3.2 Gen 1 with screw-lock and has VGA + DP dual display outputs.

The compact size of the Nuvo-9501 (212 x 165 x 80 mm) makes it easy to integrate into various industrial applications, while its rugged design makes it suitable for operation in harsh environments, with an operating temperature range of -10 to 60°C. The computer can be customised to meet specific customer requirements, such as the addition of 4-CH isolated DI and 4-CH isolated DO (Nuvo-9505D only).

Overall, the Neousys Nuvo-9501 Series is a suitable choice for industrial computing applications that require high-performance computing and essential I/O functions in a compact, rugged and cost-effective package.

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

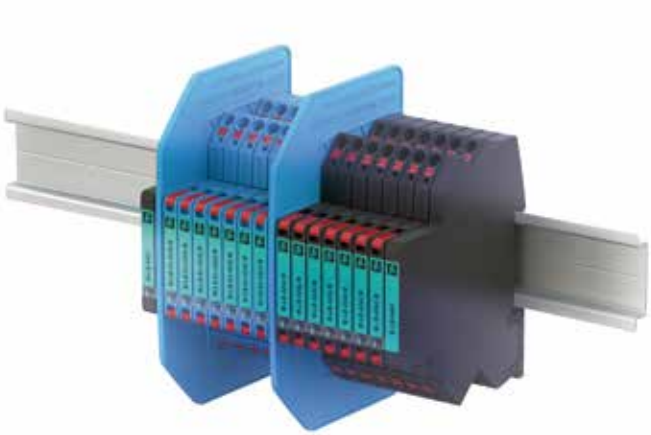
NEWPRODUCTS

SURGE PROTECTION SYSTEM

The modular design of the Pepperl+Fuchs M-LB-4000 system allows users to quickly exchange pluggable surge protection modules during operation without any interruption of the signal circuit. The entire protection function is housed in the protection module. If the protection module is removed and re-inserted with 180° rotation, the signal circuit is interrupted by the integrated disconnect function. This loop disconnect feature allows isolation testing as well as loop monitoring during commissioning.

With a width of 6 mm, the M-LB-4000 surge protection modules provide a high packing density and reduce installation space to a minimum. User-friendly mechanics allow operational staff to install the modules without any additional wiring effort. The M-LB-4000 also offers self-monitoring: the display shows status information that can also be forwarded to the control level with a fault status indication module, simplifying maintenance and reducing operational costs.

Pepperl+Fuchs (Aust) Pty Ltd
www.pepperl-fuchs.com



COMPACT CORIOLIS METER

Emerson's Micro Motion G-Series is a compact, lightweight, dual-tube Coriolis meter featuring advanced diagnostics and ease of use. It is suitable for process monitoring and optimisation applications across all industries and is designed for compact installations without lacking capabilities.

The Micro Motion G-series meter is designed to provide the benefits of Coriolis technology for general-purpose applications, offering easy selection with preconfigured models, simple installation, compactness and lightweight design. Quick connectivity is possible with the latest Micro Motion transmitter models 4200, 1600, 4700 and 5700, as well as streamlined maintenance with Smart Meter Verification so that operators can gain measurement confidence and process insight.

The Micro Motion model 4700 transmitter is fully scalable so users can have flexibility in what is needed. Advanced diagnostics help manage the flow and density measurement and optional Bluetooth allows users to wirelessly configure the instrument without the need for a hot work permit.

The Micro Motion G-Series and 4700 transmitter can together enhance process efficiency, asset maintenance programs and compliance.

Emerson Automation Solutions
www.emerson.com/au/automation

INDUSTRIAL-GRADE DDR5 MEMORY

The Advantech SQRAM DDR5 5600 series industrial-grade DDR5 memory offers a speed of up to 5600 MT/s and a bandwidth capability from 8 to 48 GB. In addition, it has also undergone laboratory testing for reliability in mission-critical applications, supporting a -40 to 95°C operating temperature range. These features make the SQRAM DDR5 5600 series suitable for multi-tasking and data-intensive systems, such as AI and machine learning, and edge server systems.

The pursuit of faster and more efficient performance coupled with high speed and capacity remains a top priority for most industrial applications. The SQRAM DDR5 5600 series provides 5600 MT/s of performance by adopting 13th Gen Intel Core processors with a 20% increase in read/write speed 4800 MT/s as tested by the AIDA64 Memory Benchmark v6.70. The memory architecture has a bandwidth improvement of nearly 50% over DDR4 with increased efficiency as core-counts per CPU continue to expand, helping relieve the bandwidth-per-processor-core crunch. Additionally, the DDR5-5600 DIMMs are built with 3Gbx8 ICs (an upgrade over the earlier 2Gbx8 ICs) to offer larger capacity and increased cost efficiency to run multiple applications simultaneously without worrying about exhausting memory resources.

The wide operating temperature range makes the DDR5 5600 suitable for outdoor installations. Additionally, SQRAM can provide other benefits such as anti-sulfuration, side fill, conformal coating and SPD write protection.

The Advantech SQRAM comes with its own software, SQRAM Manager and DeviceOn to monitor DRAM in real time, providing useful information including dynamic memory speed, temperature and an advanced overheating alerts.

Advantech Australia Pty Ltd
www.advantech.net.au

FUTUREPROOF PLANT STRATEGIES

A HOW-TO GUIDE

*Amish Sabharwal**

Industrial organisations face a major challenge in delivering future facilities that are both economically viable and environmentally sustainable.

In the unrelenting drive to operate more efficiently and sustainably, demand is increasing for large-scale capital projects. This provides huge opportunities for industrial organisations, but also requires companies to find innovative solutions to economic and environmental challenges. The increasing pressure from shrinking margins, global competition, and scrutiny of green certifications requires more than just an incremental change in how a capital project is delivered. The industry needs an end-to-end transformation that improves performance at every stage of the value chain.

Digital twin technologies are providing the means for this shift — connecting people, data, processes and technology, while making the most of cloud collaboration. This new way of working provides unrivalled insight and control, enabling organisations to optimise performance across capital projects and operations. Teams work more effectively and efficiently, with fewer risks and less wasted time and resources. With these new advanced capabilities, industries can design and operate facilities that are more efficient and greener than ever before. While the benefits of digital transformation are well recognised, successfully delivering smarter, connected facilities can be challenging. Below are some practical steps owner-operators, and their engineering, procurement and construction (EPC) partners, can take to create the digital plant of the future.

DELIVERING EFFICIENT, SUSTAINABLE PLANTS FOR THE FUTURE

A recent survey[1] of more than 850 industrial digitalisation experts spanning sectors including power, chemicals, energy and manufacturing found that 85% of industrial businesses expect their spending on digital transformation to increase in the next 12 months. The power industry expects to make the largest levels of new investment, with 42% of those surveyed planning a significant upswing in their technology spend.

As industries step into the future, digital twin technology is on track to achieve record efficiency and promote net-zero emissions. A cloud-enabled digital twin connects all capital project stakeholders around a single hub of end-to-end data, processes and tools that span conceptual design through to handover. It provides the data visualisation, models and analytics, training and maintenance insights required

to drive performance transformation in a way that optimises asset operations.

DIGITAL TWINS ARE THE KEY TO THE PLANT OF THE FUTURE

It is difficult to imagine a successful plant of the future without an intelligent digital twin supporting the plant's full lifecycle.

A digital twin is composed of a series of interwoven digital threads that link:

- **content:** including data sources, models and analytics, and knowledge;
- **context:** about individual equipment, sites, processes, the type of enterprise;
- **time:** including data from the past, current operations, and extensions into the future;
- **perspective:** of different teams using the data for engineering, operations, or optimisation and maintenance.

Digital twin technologies can incorporate the data available at a point in time at any phase, focusing on one or more use cases, and grow over time as it proves valuable.

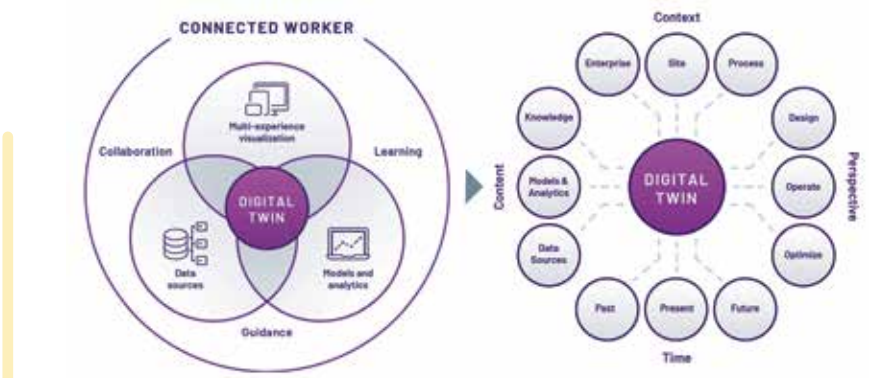


Figure 1: Digital twins and the plant of the future.

THREE STEPS TO ENGINEERING THE PLANT OF THE FUTURE

While most industrial companies agree that the plant of the future will be smart and connected, getting the digitalisation strategy right is more challenging. Relying on a 'lifted and shifted' on-premises strategy or creating in-house solutions that don't integrate smoothly won't deliver transformation. At best these approaches will cause frustration for stakeholders, and at worst, they will lead to spiralling costs without improved performance.

Digital twin capabilities can be maximised by prioritising connectivity at every level and at every phase of a capital project — from pre-front-end engineering design (pre-FEED) through to operations.

The process can be broken down into three steps.

Step 1: Define key project and plant KPIs

As Dr Stephen Covey said in his bestselling book, *The 7 Habits of Highly Effective People:* "Begin with the end in mind."

This means you should carefully define goals and objectives for this new plant early in the planning process. You want to design your engineering and execution processes to target those goals at each step so you can deliver the most efficient or sustainable operating plant possible, while delivering the project safely, on time and on budget.

- **Project KPIs:** To measure success and define relevant KPIs for the engineering and build phases of the project, evaluate your managed cost, the construction schedule, potential safety incidents and your estimated carbon impact.
- **Plant KPIs:** When thinking about how the plant will eventually operate, consider your overall efficiency goals, how you can make operations more sustainable, and what sort of visibility you need into real-time operations. Also look at how teams will collaborate and share information, how to support agile decision-making, and the insights you will depend on from your digital twin.

Step 2: Structure the project teams

Define your project plan, identifying how to structure the project team and ensure modern data sharing practices. Creating a technology infrastructure that supports this new way of working is typically deployed as a collaborative, cloud-based environment that all stakeholders can access.

Traditionally, contracts indicated that data would be handed over to the owner operator at specific construction milestones, often in different formats. The real-time insights and iterative process that are the core of digital transformation require a regular flow of updates and data. This is a new way of thinking and demands consideration and alignment at the earliest stages of the project. McKinsey describes this as "collaborative construction".

Look at which teams will be involved, including engineering, construction, fabricators, joint venture partners, etc. Ensure that all vendors, partners, and employees are aligned with how you plan to engineer, execute and operate the finished plant. Verify that individual stakeholder KPIs and processes are designed to support the overall project-wide goals outlined at the beginning of the process.

Step 3: Implement digital trans-formation and connected workflows

Despite massive growth in remote operations during the recent COVID-19 pandemic, most engineering and operations technology resides on premises. Digitalisation is a step in the right direction, but make sure you aren't just doing a lift-and-shift of data from one series of siloed on-premises systems to another.

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The cloud is where the power of data is truly unlocked by connecting people, processes and tools augmented by machine learning and AI to deliver real-time insights that don't exist in individual datasets. The cloud is where the performance transformation required to deliver efficient and green plants of the future takes place.

Creating a cloud-based digital engineering data warehouse (EDW) that includes all process and 1D, 2D and 3D structural data is the foundation of an industrial digital twin. It provides the necessary context to enable insights and 3D visualisation of any process, plant or enterprise.

ASSESS DESIGN ALTERNATIVES THROUGH SIMULATION

Today's investment decisions and design choices are being made in an environment of elevated uncertainty. From the earliest stages of concept development, engineers need to rely on process simulation to understand the potential behaviour of the plant across any range of future scenarios. Simulation creates a consistent, rigorous framework to explore the interplay between feasibility, reliability and sustainability.

Process simulation provides insight and knowledge during the early phases of a project lifecycle. It eliminates errors and mistakes in the design before you have to commit capital and when the cost to correct an error is the lowest.

The Construction Industry Institute (CII) report found that a project with a high FEED maturity and accuracy outperformed projects with low FEED maturity and accuracy by 24% in terms of cost growth and 12% in terms of change order performance.[2]

Connect engineering processes in the cloud

Connected technologies create the framework and insights needed to align people, processes and data. The integration of process and 1D, 2D and 3D engineering on a single platform draws efficiencies from conceptual planning through project completion. Teams can submit their projects into detailed design with confidence that the FEED designs are validated and that they can revalidate at any time as the design matures.

When multi-discipline engineers contribute and share data in real time using integrated, on-premises tools or by leveraging cloud collaboration, they achieve new levels of efficiency while reducing costly errors and rework.

Figure 2: Three steps to implementing a plant of the future.

Simultaneously aggregated project data contributes to the creation of an asset digital twin which is easily transferred to the cloud to enable connected workers and ramp optimisation programs quickly.

When collaborating on a single platform, project teams can reduce engineering efforts by 30%, cut project costs by 5%, and also improve collaboration and change management downstream in the procurement and construction phases of the project.

Execute digitally

Just like engineers, project execution teams require agile working practices — but later in the project when the stakes are higher.

Capturing an error in engineering might take a few hours of time to identify and rectify the issue across the other disciplines, but if you have already ordered equipment and mobilised construction teams, the downstream costs, carbon impacts and time wasted can spiral quickly.

Managing change is critical, but it is possible to avoid problems. This is why project teams need to change how they work, and leave disconnected, manual and client-built procurement and construction solutions in the past.

Modern 3D model integration, built-in analytics and construction work package (CWP) visualisation allow engineering, procurement and construction teams to execute according to advanced work packaging and integrated project delivery best practices to speed up project cycles and minimise costs, while reducing the overall risk of inevitable late project changes.

Integrated, digital workflows in the project execution phase can enable savings of 8–10% of the total installed cost of a project.

Leverage the digital twin throughout

As data is created, it not only progresses, but also informs the capital project as it becomes the earliest stage of the digital twin. Project updates are no longer cumbersome to create and delivered at a point in time, but available in real time to all necessary stakeholders. Execution teams can assess and visualise engineering progression to plan material and equipment to arrive on time, and schedule construction teams accordingly.

The purpose of a capital project is to produce an operating asset. So too for a digital twin. The need to connect people, process and the plant does not end with the start of regular operations. In the plant of the future, the knowledge and effort that create the digital twin during the capital project become the foundation for the next level of value creation, including process optimisation, predictive maintenance and workforce development.

> *"WHILE MOST INDUSTRIAL COMPANIES AGREE THAT THE PLANT OF THE FUTURE WILL BE SMART AND CONNECTED, GETTING THE DIGITALISATION STRATEGY RIGHT IS MORE CHALLENGING.*

CONCLUSION

Industrial organisations face a major challenge in delivering future facilities that are both economically viable and environmentally sustainable. Unified digital twin technologies hosted in the cloud are becoming a proven route to achieving these imperatives — providing the insights and connectivity required for efficient, productive and sustainable industrial plants of the future.

By conceiving of projects with a modern digital twin at the very beginning, you can ensure the entire project incorporates the latest digital technologies to bring the plant of the future to life.

1. AVEVA 2021, Approaching the Age of Performance: Insights from industries in evolution.
2. El Asmar M, Gibson GE et al 2018, The Maturity and Accuracy of Front-End Engineering Design (FEED) and Its Impact on Project Performance, Construction Industry Institute.

**Amish Sabharwal is the Executive Vice President for AVEVA's Engineering Business Unit, which is responsible for delivering simulation, engineering, design, project execution, operator training and project management software to the Global Industrial Market. Amish has 25 years of experience globally within the energy, chemicals and power industries.*

Converting oilfield gas flares into revenue

Whenever crude oil is extracted, water, sand and natural gas are part of the mixture. And when large reserves were discovered in the Ixachi field south of Veracruz, Mexico, extracting and transporting the oil was the relatively easy part: separating and shipping the oil via pipeline is always fairly straightforward. Managing the natural gas is another matter.

"Oil is handled like a liquid and transported by pipeline or truck," said Mudar Jamal Eddin, Engineering Director, Grupo Nuvoil. "Natural gas must be processed and compressed before it can be transported in commercial pipelines."

If a processing plant is not accessible, producers typically ignite or 'flare' the natural gas to dispose of it. This practice is both wasteful and raises environmental concerns. Flaring also represents a lost source of revenue for oilfield operators. To keep flaring to the minimum and maximise returns, Ixachi operators called on Nuvoil to deliver a gas conditioning plant near the oilfield as quickly as possible. Nuvoil is a leading energy services and solutions provider headquartered in Veracruz.

The scope of work for the gas conditioning plant included engineering, procurement and construction — and later operation and maintenance of the completed plant. Located on 13 hA about 16 km from the well pad, the completed Papan Gas Processing Plant was specified to process 9.77 million standard cubic metres (Sm^3) of natural gas per day.

A typical timeline for a similar project is two to three years. Nuvoil was asked to complete the plant in nine months.

"While the timeline was challenging, we knew we had the capacity to meet our customer's needs," Eddin said. "We had built similar plants in the past, and flare avoidance is our core business."

To meet customer requirements, Nuvoil designed a cryogenic gas processing system. The complexity of the system is difficult to overstate.

At the wellhead, oil, water, sand and natural gas are separated. The resulting sour gas, which contains sulfur, enters the Papan Gas Processing Plant at about 93°C. In the first step, the gas is chilled to 49°C and residual sand and dirt are separated.

Next, the gas enters the sweetening plant, where sulfur is removed, and then moves to a molecular sieve dehydration system, where humidity is absorbed. In the subsequent chilling process, the gas temperature drops to about -85°C.

"Chilling triggers gas condensation," Eddin said. "As a result, we can remove LPG (propane/butanes) and other hydrocarbons. What remains is almost pure methane and ethane."

Finally, the gas is compressed for transport via commercial pipelines.

To speed implementation of the plant, Nuvoil selected a control system integrator they had successfully worked with in the past, Ascend Automation & Controls. Ascend is a division of CAM Integrated Solutions and a member of the Rockwell Automation PartnerNetwork program.

"Our company is very familiar with gas conditioning systems," said Horacio Tinoco, Vice President, Ascend Automation & Controls. "We developed a control system for Nuvoil about 11 years ago. Of course, the new system enables even more sophisticated and efficient operation."

The Rockwell Automation control platform is based on Allen-Bradley ControlLogix process controllers and a FactoryTalk View HMI. To ease system monitoring, Nuvoil relies on a video wall in the plant featuring twelve 55" displays and four operator workstations in the control room.

To manage the process, more than 3000 instruments are physically connected to the system — and nearly 150 PID loops are included.

In the near future, Ascend will be adding FactoryTalk Historian software to the system: "First, we focused on getting the plant up and running," Tinoco said. "Now, we are aiming to provide long-term data storage capabilities so Nuvoil can run analytics for multiple purposes."

Nuvoil completed the plant in the required time of nine months and was running at full capacity within 13 months. Today, the plant processes about 9000 Sm^3 of gas daily, representing revenue of about US$200,000 each day.

"When oilfield operators flare gas, they are burning resources — and burning money," Tinoco said. "Gas conditioning facilities open up an additional source of revenue."

Ascend looks forward to a continued partnership with Nuvoil as they continue to optimise plant operations.

"Currently, we are exploring artificial intelligence (AI) options to enhance efficiency," Eddin said. "We are evaluating our exact needs so we can match it with the products that Rockwell Automation offers — and add those capabilities."

Rockwell Automation Australia
www.rockwellautomation.com/en-au.html

FRAMELESS MOTORS

The Wittenstein cyber kit line of frameless motors are available in compact sizes with an outer diameter of 100 or 112 mm, as well as in three different lengths of 30, 60 and 120 mm. Each includes an integrated PT1000 and a PTC temperature sensor to protect against thermal overload and enable constant monitoring of the drive temperature. The modular motor system also provides design flexibility due to the choice between small or large hollow shafts as well as voltage classes for 60 and 600–750 VDC. The cyber kit line is compatible not only with the Wittenstein cyber motor's cyber simco drive 2 servo drive but also with other standard servo drives.

The motors, which can also be used as direct drives, are both frameless and bearingless. With their compact dimensions and reduced weight, they are suitable for direct, space-saving integration into machines. Due to the hollow-shaft concept cable, compressed air, vacuum, fibre-optic and laser feedthroughs for gripping elements or sensors, among others, can be implemented when only limited space is available.

As far as performance is concerned, the cyber kit line medium bridges the gap between the cyber kit line small and cyber kit line large series of frameless motors. Collaborative and industrial robotics, machine tools, packaging technology, actuators for assembly, transfer and handling systems, testing and measuring machines or tasks in semiconductor manufacturing are typical applications.

Treotham Automation Pty Ltd
www.treotham.com.au

COMPACT EMBEDDED BOX PC

The BOXER-6646-ADP is a compact (220 x 154 x 61.6 mm), yet powerful fanless embedded PC powered by a 12th Generation Intel Core processor. With its array of features and expandability, the BOXER-6646-ADP has been specially designed for a wide range of industrial applications.

The BOXER-6646-ADP benefits from a hybrid CPU architecture of up to 12 cores and 16 threads, Intel Iris Xe Graphics and dual-channel DDR5 support up to 64 GB, while still retaining power efficiency. With a 28 W CPU alongside Intel Gaussian & Neural Accelerator technology, the BOXER-6646-ADP is able to handle high-speed industry workloads while maintaining low power consumption.

A space-efficient design means the BOXER-6646-ADP can house a large amount of I/O to channel a greater volume of data, faster. It is equipped with multiple 2.5GbE LAN ports, three 10 Gbps USB 3.2 Gen 2 slots and a quadruple display interface featuring both HDMI 1.4 and DP 1.4.

The BOXER-6646-ADP also offers greater expandability, equipped with an M.2 2230 E-Key, M.2 3052 B-Key and M.2 2280 M-Key; users are just one module away from incorporating 5G, Wi-Fi or NVMe functionality to their project. It also features a 2.5″ SATA drive bay for additional storage and supports both Windows 10 and 11.

It possesses a wide range DC input of 10~35 VDC and an operating temperature range of -20~60°C. To protect user data from being damaged by power source variation, the BOXER-6646-ADP is equipped with reverse power protection, over/undervoltage and current protection, alongside surge and short-circuit protection.

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

CODING AND MARKING SYSTEM

Leibinger IQJET is used for the direct coding and marking of products and packaging. Suitable for the food and consumer goods sectors (FMCG), it also has applications in the industrial sector.

The plug and print solution is equipped with four assistance systems.

The SMART.OS operating system has a large 10″ touch display and numerous interfaces, including OPC UA and an integrated PLC, which are designed to ensure easy integration into the production line.

IQPRINT technology is designed to help ensure print quality. When not in use, the entire ink circuit, including the print nozzle, is sealed airtight and the ink continues to circulate. Thanks to this technology, regular maintenance and printhead cleaning routines can be eliminated, which can increase productive time.

The SMART.EFFICIENCY assistance system is designed to keep operating costs to a minimum, with a consumption rate of ~2.7 cc/h for MEK inks. Ink cartridges can be emptied down to the last drop and do not require separate disposal.

Thanks to the SMART.CARE function, maintenance is virtually eliminated.

Requiring no scheduled maintenance for five years, the system's operating costs are claimed to be as much as 30% lower than conventional systems.

Result Group
www.resultgroup.com.au

HART MULTIPLEXER SOFTWARE

A growing number of remote I/Os are using Ethernet instead of a fieldbus such as Profibus to connect to the controller. Softing's smartLink SW-HT is designed to respond to this trend by providing an Ethernet connection to tunnel HART commands to the remote I/Os. It enables the use of remote I/Os from various manufacturers, including Allen-Bradley, Siemens, Schneider Electric and R. Stahl. The latest version 1.40 extends the support to Siemens ET 200iSP and Turck excom remote I/Os.

Configuration and diagnostic data are accessed via Emerson's AMS Device Manager or other HART IP-enabled plant asset management applications. smartLink SW-HT provides an Ethernet connection for tunnelling the HART commands to the remote I/Os. At the field level, smartLink SW-HT can be integrated easily and without risks, and the integration can be carried out during ongoing operations. No additional hardware is required in the process. The application thus makes it easier for users to implement open, standards-based and scalable system architectures. It also enables connectivity to be integrated into edge solutions managed by IT.

Softing Industrial Automation GmbH
www.industrial.softing.com

iStock.com/Galeanu Mihai

THE CASE FOR INDUSTRIAL ENERGY EFFICIENCY

Companies worldwide are navigating challenges related to geopolitical uncertainties and a strained value chain including for commodities, components and people. But one thing remains at the top of the business agenda — mitigating climate change.

The need for energy independence

Electricity demand has been anticipated to grow more than 10 times faster than other forms of energy over 2022–2030, resulting in around 50% higher than average annual investment in electricity networks in 2022–2023 (vs 2016–2022), according to the IEA World Energy Outlook 2023.

The International Energy Agency (IEA) estimates that energy efficiency will deliver a full quarter of the entire world's emissions reductions to 2050. Electrification is anticipated to deliver a further 20%.

In our part of the world, recent research commissioned by the Energy Efficiency Council ANZ confirms these international figures hold here in Australia. Energy efficiency and electrification can deliver 14% and 26% of Australia's emissions reductions respectively, at low cost.

Thinking global and acting local

At COP28 the Australian Government joined the signatories of the Global Renewables and Energy Efficiency Pledge. These signatories declared that they will participate in tripling renewable energy capacity by 2030 and doubling energy efficiency improvements year on year.

When it comes to industrial energy efficiency, we need to look in our own backyards and realise the actions we can take today — to not only acknowledge energy efficiency as the first step in reducing carbon emissions, but intently apply it.

Scaling technological solutions

Electric motors are the workhorse of industries and hold sizeable potential for energy savings. They are essential to almost every sector, yet many are inefficient. Industrial electric motors and the systems they drive use approximately 45% of the world's energy. Fortunately, advanced motor designs offer higher efficiency, which makes upgrading motors an effective way to reduce energy consumption.

The most efficient motors today are synchronous reluctance motors (SynRM), which deliver IE5 efficiency by being paired with a variable speed drive (VSD). Upgrading from an existing IE2 motor to an IE5 SynRM motor-drive package cuts energy losses by approximately 50%, consequently offering financial savings on energy costs.

A VSD adjusts a motor's speed to correspond with its load requirements, which means whenever a motor is not operating at full speed, it's saving power. Slowing a motor can produce significant savings. For example, reducing a motor's speed by just 20% reduces energy use by 50%.

This is especially important as around three in four motors run pumps, fans and compressors, which rarely need to operate continuously at full speed. In common applications, adding a VSD can deliver savings of 30% on average. Despite this, only around 23% of the world's electric motors are energy optimised through the control of a VSD, so industrial businesses are missing out on a significant opportunity to save electricity.

Data-driven efficiency insights

In addition to hardware improvements, digitalisation takes energy efficiency to the next level. Even small upgrades can have a big impact when it comes to reducing industrial energy consumption.

Digitally connected drives transmit real-time data from the motor and driven machine to show exactly how much energy is being used. Operators can then analyse this data, identify potential inefficiencies and take action to address them — thus increasing their energy efficiency while maintaining process quality and reliability.

The additional upside of acquiring data-driven insights and having an effective service partnership in place, is that businesses can prevent unplanned downtime, which is currently costing the typical Australian industrial business $349,000 per hour, compared to $194,000 globally, as revealed in a recent survey.

Promoting energy efficiency through collaboration

Multi-stakeholder initiatives like the Energy Efficiency Movement (EEM) will continue to be integral for raising awareness and spurring action to combat climate change through collaboration.

In November 2022 the EEM released the 'Industrial energy efficiency playbook', which makes the business case clear — in both financial and CO_2 impacts, energy efficiency pays off. The playbook lists 10 key energy efficiency actions for industrial leaders. These include auditing operations for energy efficiency, bringing digital connectivity to physical assets, and using high-efficiency motors with variable speed drives.

Facing the task at hand, head-on

To significantly contribute to the IEA's Net Zero Roadmap, which aims to keep the 1.5°C goal attainable, Australia will need to strengthen its transition to high-efficiency technology, enable its operations digitally, and participate in more collaborative partnerships that are committed to achieving double the energy efficiency improvement ambition for this decade.

R. Narayanan joined ABB in 1989 and has held a range of roles including key leadership positions. He was appointed Group Senior Vice President and Head of ABB Motion, Asia, in 2019 and is also currently at the helm of ABB's Motion business in Australia.

NEW PRODUCTS

LASER TRIANGULATION SENSOR FOR PRESS BRAKES

Precisely bent sheets are required in a wide range of applications, for example in the automotive industry and shipbuilding. The Wenglor MLSL1xxS50 uses laser triangulation to measure metal parts precisely to help achieve consistent pressing results. The device is mounted on the press brake and detects all surfaces and provides relevant angle information.

Seamlessly integrated into the software of standard control system manufacturers, the sensor can be connected easily via plug-and-play and put into operation and adjusted directly.

The sensor's optical angle measurement is aimed directly at the sheet metal and can therefore be used for all combinations of upper tools. Continuous monitoring of the angles helps determine exact bending angles, regardless of production-related influencing factors.

The product offers consistent results for different batches of sheet metal production, different materials, different bending directions to the rolling direction and slightly fluctuating sheet thicknesses. Through direct integration into the control system, predefined parameters determine the specifications of the bending process, which can be readjusted immediately.

The sensors can monitor various work steps and bending operations along the press. With long components in particular, the angle can be checked over the entire length.

Treotham Automation Pty Ltd
www.treotham.com.au

REMOTE I/O MODULES WITH PROFINET

Acromag has announced the enhancement of its BusWorks NT series remote I/O modules with the addition of Profinet protocol. The modules are now compatible with three key field protocols: Profinet, EtherNet/IP and Modbus TCP/IP. They have been certified by the PROFIBUS Nutzerorganisation for Profinet standards, for interoperability across different vendors and systems.

The NTE Ethernet I/O models feature dual RJ45 ports, a web server for convenient monitoring or controlling I/O channels, and field-configurable communication protocols. Each module can manage up to 16 diverse input or output signals, such as voltage, current, temperature, TTL and relay control signals.

The modules facilitate up to 64 channels on a single IP address by connecting three NTX expansion I/O modules via an integrated DIN rail bus. They also distribute power along the DIN rail bus to the expansion modules. Their rugged build is designed for operation in harsh environments, withstanding extreme temperatures and high noise levels.

The NT2000 Series presents a wide array of I/O signal processing options, including analog I/O models, discrete I/O models and temperature monitoring modules. These modules are adaptable for various applications, such as factory automation, process instrumentation and HVAC/energy management.

Metromatics Pty Ltd
www.metromatics.com.au

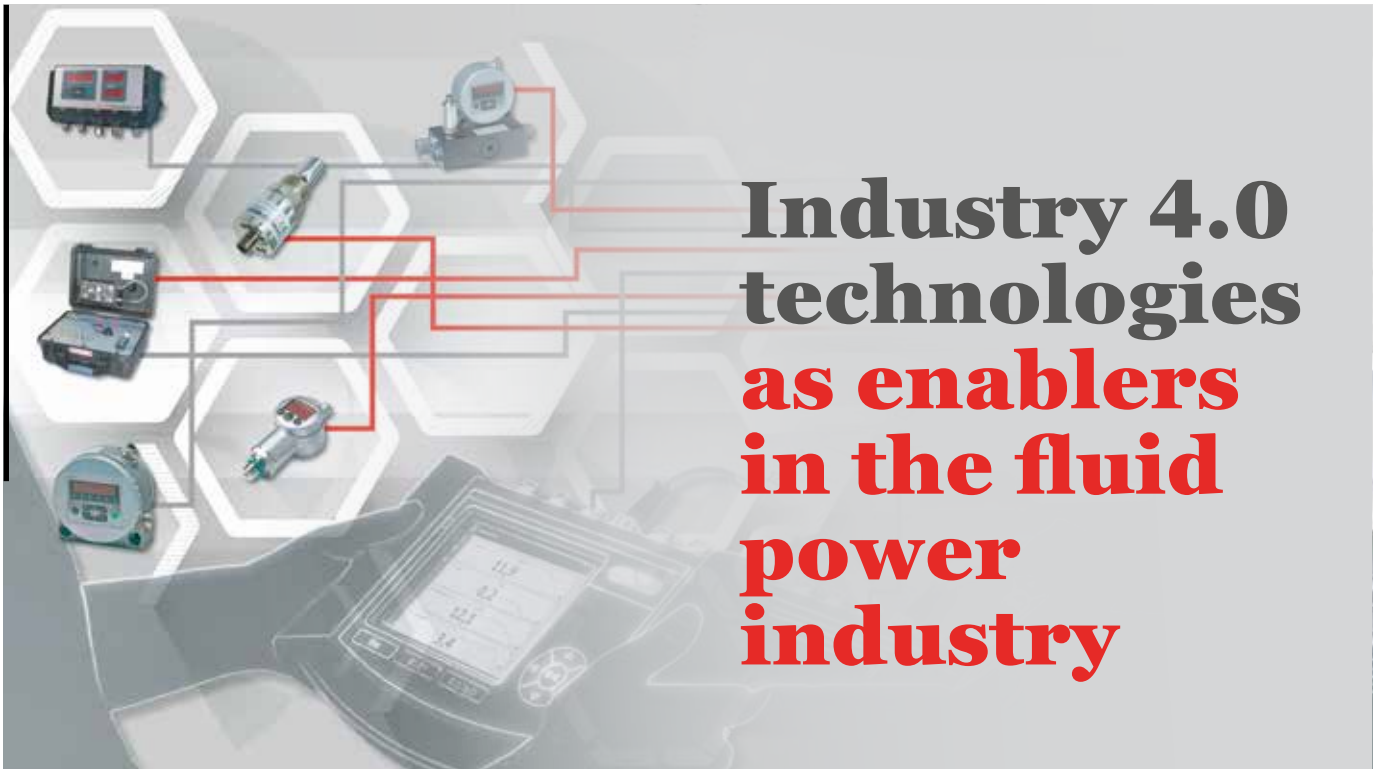
INDUSTRIAL COMPUTER

The iBase CMB108 industrial computer is designed to cater to the demands of various industrial applications. The range offers 13th/12th Gen Intel Core i9/i7/i5/i3 DT processors and two DDR5-4800/5600 U-DIMM slots, supporting up to 64 GB of memory.

The CMB108 supports discrete GPU cards and offers a variety of expansion slots, including a PCI-E(x16) slot and two PCI-E(x4) slots. The unit is 362 x 350 x 156 mm in size and is powered by a 500 W 1U Flex ATX power supply. It supports multiple display interfaces such as HDMI, DisplayPort and DVI-D, alongside 2.5GbE ports and USB 3.0 ports for rapid data transfer.

The system has the capacity to house up to four sets of 2.5" storage devices with RAID 0/1 support. Additionally, it includes two M-Key slots for NVMe, an E-Key slot for WiFi/BT and a B-Key slot for 5G connectivity. The CMB108 also comes equipped with fTPM, DIO, iAMT(16.1) and a watchdog timer.

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



Industry 4.0 technologies as enablers in the fluid power industry

INDUSTRY 4.0 TECHNOLOGIES ENHANCE AND ADVANCE CONDITION MONITORING USING HISTORICAL MACHINE DATA FOR REAL-TIME PREDICTIONS.

Industry 4.0 technology enablers are a group of diverse technologies — including machine learning, robots, additive manufacturing and cloud technology — which all work together in an ecosystem, according to HYDAC Technical Training Manager Paul Marley, who has been involved in the fluid power industry for over 30 years as a hydraulic fitter and technical trainer.

Technologies of interest in the fluid power industry

In Industry 4.0, the collaboration between cloud technology and robotics is pivotal for comprehensive solutions. Predictive maintenance, a standout innovation, utilises sensor technology for on-demand, data-driven forecasting. Enhancing and advancing condition monitoring, the inclusion of predictive maintenance into Industry 4.0 enablers represents an evolution: using historical machine data for real-time predictions.

This evolution is essential for heightened efficiency and innovation, making the seamless convergence of cloud technology, robotics, and predictive maintenance a linchpin for success. The transition from traditional monitoring to predictive paradigms marks a tangible leap toward industry goals, underlining the transformative impact of advanced technologies in shaping the future of manufacturing.

The difference between predictive maintenance and condition monitoring

Predictive maintenance diverges from traditional condition monitoring by focusing on accurate forecasting rather than the current state of the machine. Unlike its predecessor, it actively collects real-time data throughout a machine's operation, a paradigm shift facilitated by Industry 4.0. This continuous monitoring, a departure from periodic readings, enhances accuracy and facilitates the early detection of potential failures.

The shift towards real-time data recording offers heightened precision in assessing machine conditions and identifying issues at their nascent stages. Importantly, this approach is not limited to new machines; it can be applied retroactively. However, it's crucial to recognise that installing sensors on aged, frequently malfunctioning machines alone won't suffice. A comprehensive strategy involves repairing maintenance practices, optimising lubricant storage, and providing training for users, operators, and maintenance personnel.

While sensors represent a powerful tool, they are part of a broader solution that requires a holistic approach. In the domain of condition monitoring, Industry 4.0 elevates possibilities, as the accuracy of information gleaned sets it apart from its predecessor, Industry 3.0, marking a transformative leap in operational insights and efficiency.

The benefits of predictive maintenance

The crucial question surrounding the efficacy and return on investment in condition monitoring versus predictive maintenance hinges on the latter's successful implementation. While the inherent risk of failure of any applied solution exists, the affirmative answer depends on obtaining buy-in from all levels of the business. A common challenge lies in interruptions to planned machine servicing, often due to a production department prioritising schedule. However, if the maintenance department holds the authority to adhere to plans, successful data collection can lead to a tangible return on investment.

Addressing the need for condition monitoring on a reliable machine is not solely about enhancing reliability. Instead, the strategic placement of sensors on a dependable machine, after it has become reliable, aids in predicting future performance. This proactive approach acknowledges that all machines, regardless of reliability, require interventions and repairs. The advantage lies in the sensors' ability to gather data for more accurate predictions, underscoring the importance of continuous monitoring for optimal operational insights.

In fostering a maintenance mindset, particularly in the Australian context of mechanics repairing machines, a fundamental distinction arises — the maintenance department's role is to ensure reliability, not just to conduct repairs. Industry demands a synthesis of knowledge, skills, and technology to enhance and sustain the reliability that the maintenance department seeks to achieve.

HYDAC International
www.hydac.com.au

iStock.com/Sakorn Sukkasemsakorn

PROACTIVE DECISION-MAKING FOR EMISSIONS MANAGEMENT

THE ROADMAP TO NET ZERO

Ron Beck, Senior Director, Industry Marketing, Aspen Technology, Inc.

In order to make good on commitments to achieve net zero carbon emissions, companies in the process industries need to stop relying on a reactive approach.

Shareholders, financial institutions, governments and intergovernmental commissions are exerting pressure on industry to progress towards a target of achieving net zero carbon emissions by 2050. Many major emitters — including industrial producers — have pledged to make more progress and be more transparent regarding their efforts and results in emissions management.

For many companies, this shift will require a significant change in how they operate. Most are currently only able to see and report on their enterprise-wide carbon emissions yearly — and it is often a

backwards-looking view of the data. Quite simply, this lack of real-time insight into emissions will not suffice as companies must understand their options, decide on actions and track progress against net zero commitments across their entire value chain.

New digital technology solutions give industrial producers a valuable new option for emissions management and avoidance: real-time visualisation of emissions data across the entire organisation. Companies that implement these tools can quickly move from a reactive approach to proactively making informed decisions to resolve, and even avoid, critical issues and in the process achieve 15–20% of emission reduction potential simply through faster and better operational decision-making.[1]

Emissions reduction has been a focal point of the 2023 United Nations Climate Change Conference (COP28), as it was during COP27.

At the same time, the International Sustainability Standards Board (ISSB) released two new reporting standards for sustainability in 2023: IFRS S1, a sustainability reporting standard, and IFRS S2, a climate change reporting standard. The European Union has already signalled that it will be recognising those reporting standards. And in the US, the Securities and Exchange Commission (SEC) has issued a proposed rule change to require sustainability and GHG emissions reporting from public companies that have announced net zero commitments to their investors.

These are just a few examples of the global imperative companies face to increase transparency around their progress towards net zero carbon goals. In this context, industrial producers — in particular, energy (oil and gas), chemicals (bulk and specialty) and mineral processing companies — need to be able to report accurately, consistently and in an auditable way:

- greenhouse gas emissions
- carbon intensity of their products and operations
- progress against future pledges

This level of reporting is challenging, time-consuming and expensive for companies. To a large extent, industrial organisations are still cobbling together their emissions reporting by merging complex spreadsheets created by different functional groups, different assets and different business units. As a result, they get a view into their enterprise carbon emissions only once a year, and it's an after-the-fact report with high potential for inaccuracy.

Step one in any emissions avoidance transformation is to gain a greater understanding of — and a greater view into — operations in real time. Using the latest technology that can capture, visualise and interpret from across the enterprise is the key to moving from just reporting on emissions to proactively prioritising decisions that strategically reduce emissions while minimising impact on profit.

Several industry-leading companies are acting tactically to improve their carbon emissions picture. Organisations in the process industries are beginning to take advantage of new technology-powered visualisation and decision-making frameworks — and by doing so, they're changing emissions tracking from an annual process to a daily event. These companies can now see where issues are in real time and take immediate action to resolve them, or even change operational plans to avoid them in the first place.

SEVEN STEPS TO ACTIVE DECISION-MAKING

Currently, even as companies make emissions reduction a component of their business, many are challenged to truly understand their operational data and make effective decisions around carbon mitigation. In fact, McKinsey reports that less than 10% of the data collected in facilities is actually being used to make emissions-related decisions.[1]

In short, companies are deciding how to reduce carbon and where to invest without the analytical tools that can provide:

- a detailed understanding of how much carbon is being emitted
- the capital and operating impacts of making changes
- ranked options for balancing emissions with yield and profit

To achieve a state of active decision-making, companies need to implement a framework that enables them to optimise across multiple parameters and multiple disciplines (engineering, operations, compliance and executive) — with a particular focus on balancing profit with decarbonisation.

Advanced technology offers a seven-step roadmap that can quickly transform the emissions management function:

1. Mobilise existing data to calculate emissions in real time

The starting point is accurately collecting, validating and contextualising information on fuel use and electricity use, as well as any real monitoring data available. Advanced data and analytics technology solutions can bring this data into view instantly and ensure that it is consistent across the enterprise. The mass balance approach is state-of-the-art for both downstream and upstream assets.

2. Utilise planned emissions and profit from the planning system

Planning systems are well established to optimise for profit, and the most advanced tools now also provide templates for tracking carbon through the system, to predict and optimise the plan for carbon emissions. Planners can look at scenarios involving higher- or lower-carbon feedstocks and less-carbon-intensive process routes. Plans can be evaluated and compared for impact on both emissions and margin.

3. Map actual to plan, evaluate gaps and prioritise options

With these pieces in place, companies can look at the plan versus the actual on a real-time basis — and visualise it for all levels of the organisation. A dashboard can highlight impacted units and systems in a plant, and indicate which of them is not operating within the emissions avoidance plan.

4. Target emissions management KPIs by region and company

Every organisation has specific targets that they must create a plan against and keep metrics on. Calculations and rules can vary by country, province or state, and there are also internal carbon pricing rules. Emissions management and visualisation technology can be customised to reflect each company's parameters — giving them the ability to track actual emissions, carbon intensity by product, bio-feedstock content and performance against specific emissions allowances.

5. Gain a deep understanding of operational flexibility and benchmark performance

Using plant data to calibrate rigorous hybrid models, operators will leverage AI to continuously adjust the models to how the unit is actually running — and tune the model to be accurate in predictively modelling carbon emissions. These models also provide a true representation of what's achievable in terms of emissions reduction, giving decision-makers accurate data to set benchmarks against.

6. Optimise energy usage and emissions with utilities insight

With energy use being the largest contributor to emissions, it's critical to use models when making operations decisions on electricity, steam and fuel. Using a utilities model can help operators find the best way to use utilities and generate optimal results — and the contribution of renewable power to the utility mix can be tracked and included in the decision-making process.

7. Generate auditable results

Transparency is critical in today's environment, as regulators — both governmental and financial — are demanding to verify emissions reporting. A system that enables outside auditors to review emissions data is essential to track and prove progress on emissions management goals.

This is what the ideal end state will look like when an advanced decision management framework is implemented. But where do companies start? The good news is, much of the necessary data collection infrastructure is already in place.

MOBILISING EXISTING DATA TO CREATE IMPACT

The elegance and utility of today's technology is that it can take advantage of all the different measurement and data systems that companies have already invested in, and it is possible to roll all their process information and emissions data up into a single, easy-to-use dashboard.

Companies that are currently filling in spreadsheets to track emissions and energy use can now move to an advanced, real-time visualisation, including features like a geographic view across the whole network and a logical process flow diagram view.

By mobilising the data available from all the different systems that are running in each plant, such a technology framework enables teams across the organisation to understand their mission at a detailed level — and the concurrent actions of other players — and ensures the tools being used are synchronised and that everyone is working from the same data and toward the same outcome.

FROM	TO
Annual reporting	Daily insight into emissions management performance
Shared spreadsheets	Single-view operational metrics
Unreliable data	Shared emissions and operating data across teams and levels
Inconsistent methodologies	Easy-to-audit calculations for transparency to financial markets, regulators, NGOs

Table 1: The advantages of moving to integrated emissions reporting.

> *CURRENTLY, EVEN AS COMPANIES MAKE EMISSIONS REDUCTION A COMPONENT OF THEIR BUSINESS, MANY ARE CHALLENGED TO TRULY UNDERSTAND THEIR OPERATIONAL DATA AND MAKE EFFECTIVE DECISIONS AROUND CARBON MITIGATION.*

In addition, all the data should be packaged and presented at a high level in such a way that anyone in the organisation can absorb it. By simplifying and organising the important data, this technology empowers the broader organisation to understand what is happening and take action if needed.

CONCLUSION

If companies are going to make good on their commitments to achieve net zero carbon emissions, looking at emissions once a year in an after-the fact report is simply not a viable option. In order to make the necessary step change in carbon reduction, companies in the process industries must empower the entire organisation to take action by providing daily insight into what's happening across the enterprise and unit-by-unit, how performance compares to the plan, and where money can be spent with most impact.

By using technology that compiles systems data into a single, interactive decision-support solution, with a visual dashboard that provides daily insights, leading organisations are advancing the way they do business. They're making a true impact in emissions management and avoidance while also protecting profit.

Instead of relying on a reactive approach, compiling systems data into a single, interactive decision-support system can help companies to proactively use their sustainability strategies as a competitive advantage.

1. McKinsey & Co 2022, The green IT revolution: A blueprint for CIOs to combat climate change.

Sydney Water replaces actuators to ensure clean drinking water

REPLACING HYDRAULIC ACTUATORS WITH ELECTRIC ACTUATORS FROM AUMA ENSURES DRINKING WATER IS FREE FROM OIL CONTAMINATION.

By replacing hydraulic actuators with AUMA electric actuators, the supply of water from the Potts Hill Outlet Works to the City of Sydney's drinking water supply network can be guaranteed to be free of contamination from leaking oil.

Conversion to electric drive technology

An existing hydraulic actuation system has been replaced with advanced electric actuators from AUMA at Potts Hill Outlet Works in Sydney. The actuators automate three large penstocks that control the water flow from a set of three pipelines into the city's network of pipes and reservoirs. The installation is part of a major pipeline network operated by Sydney Water Corporation that handles approximately 80% of the city of Sydney's drinking water supply.

The main reason for replacing hydraulic with electric actuation technology was concern that the hydraulic oil might leak and mix with the drinking water.

Clean drinking water with modern actuators

The AUMA solution consists of SA 14.2 multi-turn actuators equipped with GST 25.1 spur gearboxes and AC .2 actuator controls. The actuators were delivered in the extra-robust STW version that is particularly suited to penstocks and other civil engineering constructions for water applications.

A key reason for choosing AUMA was Sydney Water's positive experience with AUMA actuators that have been operating reliably for several years in other installations. Additional reasons include the modular design that made the actuators easy to adapt to the application's requirements, the advanced data logging features of the AC .2 actuator controls, and the special long-runtime motors suitable for short-time S2 (30 minute) duty.

Sydney Water appreciated AUMA's long experience and deep knowledge of the water industry, as well as the comprehensive aftersales service. Experts from AUMA's local Australian subsidiary, Barron, completed the selection and sizing of the actuator/gearbox combinations. Barron also supplied three 4-metre custom-made linear thrusters needed to replicate the operation of the old hydraulic system and to provide the required stroke of 2.4 m. Barron service engineers provided supervisory help on-site during mechanical installation, commissioning and site acceptance test.

"The AUMA actuators installed in the Potts Hill Outlet Works have now been in use for almost ten years without any incidents. We greatly appreciate the reliability and longevity of AUMA products," said Hieu Pham, Lead Networks Operations Engineer South, Sydney Water Corporation.

Barron GJM
www.barron.com.au

NEW PRODUCTS

CAPACITANCE LEVEL INSTRUMENT

Hawker Electronics is offering a capacitance detection system for non-conducting liquids or free-flowing powders. This can be a point level for on/off control and alarms, or it can be a continuous level measurement.

Hawker Electronics FLEXICAP variable capacitance systems comprise a Flexilevel wall-mounted unit and cable probes with lengths over 3 m and up to 13 m available.

A capacitance probe works in two ways — with conducting liquids and non-conducting liquids. The capacitance principle uses two detector plates and one insulator. By changing one of the factors it is possible to measure the change in capacitance and give a continuous output signal.

For conducting liquids an insulated cable with a stainless steel conductor is used. As the conducting liquid rises and falls in the tank, the change is detected and an output signal is produced. For non-conducting liquids two concentric or parallel rods are used and the liquid rises and falls within the orifice or gap. The capacitance change is detected and an output signal produced.

Probe length must be decided in advance for accurate measurement, and by using the system can measure to the top of the tank unaffected by foam or turbulence.

The controller gives digital indication, four programmable trip points and a diagnostic trip point to detect cable breakage or a short circuit between the controller and the probe.

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

IoT-BASED COMPRESSOR MONITORING SYSTEM

ELGi Equipments has announced Air~Alert, an IoT-based air compressor monitoring system.

Air~Alert is a data transmission and analysis service that monitors critical parameters and sends out insights and alerts to users. The system is designed so that users can improve uptime and maximise efficiency with smart monitoring and data related to air compressor performance. The service also enables them to act in time to avoid potential failures. It delivers trend graphs and information about operating parameters, including discharge pressure, oil temperature, variable frequency drive (VFD) speed (where fitted), total running hours, trips and alerts on a live online interface accessible remotely.

Air~Alert also notifies users and ELGi dealers about scheduled maintenance and fault occurrences while predicting commonly occurring failures. Monthly summary reports on overall health and operating parameters, including upcoming service requirements and preventive maintenance based on the data obtained, are sent to the user.

The operational and performance data from the compressors are acquired by Air~Alert from the compressor controller, transmitted in an encrypted form and sent to secure and dedicated Air~Alert servers in the cloud. Algorithms then work on the data to enable intelligent prediction with alerts, reports and trends — which are returned securely to the operators as easy-to-read dashboards.

Elgi Equipments Ltd
www.elgi.com.au

REMOTE MANAGEMENT SYSTEM

The iEi IRM-TSi410X-8G2H-R10 is a centralised remote management system designed to streamline operations technology (OT) tasks on a daily basis, enhancing service availability on the edge side of network infrastructures.

The iRM is a single-point solution for monitoring all critical industrial PCs, such as industrial servers, IPCs, and virtual IPCs within an OT network. One of the core benefits of the iRM is efficient management and troubleshooting. It is designed to offer seamless monitoring and centralised control of managed applications, and quick issue diagnosis tools.

The wide-temperature mini server comes with a pre-installed operating system and has a one-click OS recovery feature. Data protection is enhanced through a selection of RAID configurations.

This fanless iRM Mini Server is equipped with an Intel Atom x6425E processor, 8 GB of RAM, and two industrial-grade 512 GB SSDs preinstalled. With four drive bays, HDMI output and a power input range of 9–36 VDC or a 90 W AC adapter, it is compliant with RoHS standards.

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

Balancing cost and functionality with the right logic solver

THE SLA MULTILOOP AND MULTIFUNCTION SAFETY LOGIC SOLVER AND ALARM FILLS THE GAP BETWEEN SINGLE-LOOP LOGIC SOLVERS AND COSTLY SAFETY PROGRAMMABLE LOGIC CONTROLLERS (PLC).

The IEC 61511 Functional Safety international standard recommends the use of a functional safety lifecycle and provides guidance on the implementation of safety instrumented systems for the process industry. Central to the IEC 61511 standard lies the Safety Instrumented System (SIS), which mitigates risks to protect personnel, facilities, and the environment. Each SIS includes one or more Safety Instrumented Functions (SIFs) that help ensure safe operation. The logic solver serves as an essential element within each SIF, identifying hazardous situations and implementing measures to counteract or alleviate potential risks.

In the dynamic landscape of process engineering, there has been an escalating demand for cost-effective and compact logic solvers equipped with intrinsic voting capabilities, as a large gap exists between simplex and complex logic solvers relating to point/loop count, complexity requirements, and cost. Low point-count logic solver requirements are often handled with single loop logic solvers while larger safety systems with high point-counts are tackled with larger and costly Safety PLCs.

The SLA Multiloop and Multifunction Safety Logic Solver and Alarm from Moore Industries closes the gap between a single-loop logic solver and a Safety PLC, offering scalable safety and alarming solutions that augment existing Safety Instrumented Systems or control systems. Unlike a single-loop logic solver, which handles only one specific control function, and the pricey Safety PLC, which is designed for more complex and higher point counts, the exida certified and SIL 2/3 capable SLA strikes a balance by efficiently managing multiple control loops within a process at a reasonable cost.

When a Safety PLC is too complex or resource-intensive for just a few loops, or when a SIF needs multiple inputs for a 2oo3 voting scheme, the SLA is especially effective. It performs as a multiloop logic solver with built-in voting and enhanced maths capability typically found in Safety PLCs. The SLA can handle everything from simple alarming to more complex schemes that include 1oo2, 2oo3 or even 5oo8 voting architectures, enabling it to act on hazardous risk mitigation; warn of unwanted process conditions; provide emergency shutdown; or provide on/off control in Safety Instrumented Systems and traditional alarm trip applications.

The SLA accepts up to four discrete and six analog inputs from a wide array of devices and sensors. HART data from connected field devices can pass through the SLA to its analog outputs enabling connected hosts and asset managers bidirectional communication for continuous monitoring and programming. Its four relay outputs and up to four discrete contact closure outputs can be driven by any of 16 internally configured alarms, where individual or multiple alarms can be assigned to each relay or discrete output. Relay and discrete outputs can also be triggered by any input or internal diagnostic fault. Three optional analog outputs allow the transmission of any input or internally calculated equation or variable.

With user-configured security jumpers to ensure secure digital communication and prevent unauthorised programming, the SLA is easily configured with any FDT-compliant host utilising the SLA's DTM with simple drop-down menus and checkboxes. No custom or licensed software is required. This ease-of-use functionality includes a powerful equation editor that the user can employ to create monitoring, alarming, and control schemes involving simple to complex equations using timers, running min/max functions, prebuilt analog and discrete logic functions, and more.

Moore Industries
www.miinet.com

MOORE INDUSTRIES WORLDWIDE
Demand Moore Reliability

IS IT A LEAK?
UNDERSTANDING THE ADIABATIC PROCESS IN PRESSURE CALIBRATION

Heikki Laurila, Product Marketing Manager, Beamex

The adiabatic process is a physical phenomenon that can make us think our pressure calibration system is leaking.

The adiabatic process is something we have all encountered if we have been working with pressure calibration. Often we don't realise it, and we think there is a leak in the system.

In short, the adiabatic process is a physical phenomenon that causes the pressure medium's temperature to increase when we increase the pressure in a closed system. When we stop pumping, the medium's temperature cools down, and it will cause the pressure to drop — so it does indeed look like a leak in the system.

You can find many in-depth, complicated physical or mathematical explanations of the adiabatic process on the internet. But hey, we are not physicists or mathematicians, we are calibration professionals! Lucky for you, you've got me to simplify this for you!

In this article we take a closer look at the adiabatic process, and how to recognise and avoid it. A little bit of compulsory theory to start with and then diving into practical things.

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WHAT IS THE ADIABATIC PROCESS?

An adiabatic process is a thermodynamic change whereby no heat is exchanged between a system and its surroundings.

For an ideal gas undergoing an adiabatic process, the first law of thermodynamics applies. This is the law of the conservation of energy, which states that, although energy can change form, it can't be created or destroyed.

We might remember from our school physics the formula with pressure, volume and temperature, and how they depend on each other. The combined gas law says that the relationship between pressure, volume and absolute temperature is constant:

$$\frac{PV}{T} = k$$

where:
P = pressure
V = volume
T = absolute temperature
k = a constant

When using the above formula and comparing the same pressure system under two different conditions (different pressure), the law can be written as the following formula:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

We can think of this formula as representing our normal pressure calibration system, having a closed, fixed volume. The two sides of the above formula represent two different stages in our system — one with a lower pressure and the second one with a higher pressure. For example, the left side can be our system with no pressure, and the right side the same system with high pressure applied.

Looking at the formula, we can conclude that as the volume of a pressure calibration system remains the same, and if the pressure changes, then the temperature

must also change. Or the other way around, if the temperature changes, then the pressure will also change.

Figure 1 shows a typical pressure calibration system, where we have a pressure pump, pressure T-hose, pressure instrument to be calibrated (1) and pressure calibrator (2).

Typically, the volume of our pressure calibration system remains the same, and we change the pressure going through the calibration points. When we change the pressure (and the volume remains the same) the temperature of the medium will change.

We can most commonly see the adiabatic process when we raise the pressure quickly with our calibration hand pump, causing the medium (air) to get warmer. Once we stop pumping, the medium starts to cool down causing the pressure to drop — at first quickly, but then slowing down and finally stabilising. This pressure drop looks like a leak in the system.

The same also happens with decreasing pressure — if we decrease the pressure quickly, the medium gets colder. When we stop decreasing, the media will start to warm up, causing the pressure to rise. This may seem odd at first — how can the pressure rise by itself? Of course, the pressure does not increase a lot, but enough for you to see it and wonder what's going on.

So, the adiabatic process works in both ways, with increasing and decreasing pressure. The faster you change the pressure, the more the medium temperature will change, and the bigger effect you can see.

If you wait a while, the temperature of the pressure medium will stabilise to the surrounding temperature and the effects of the adiabatic process will no longer be visible. This is the essential learning from the adiabatic effect.

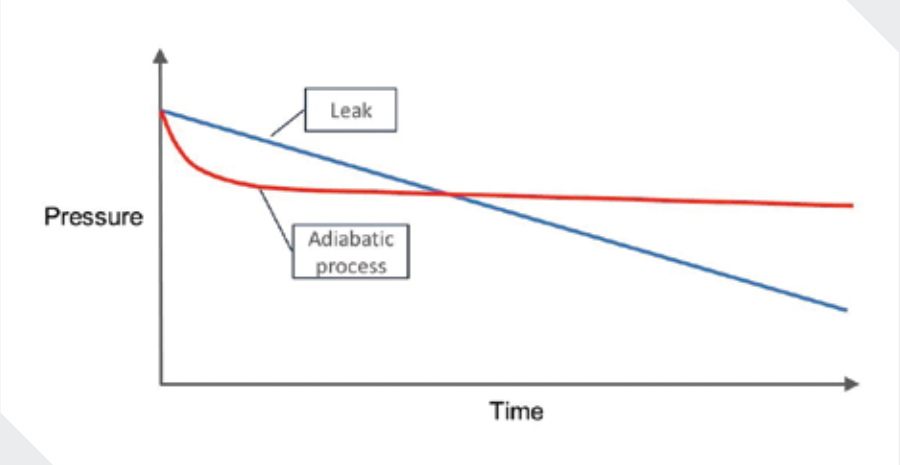

Figure 2: The pressure drop caused by the adiabatic process is fast at first, but then slows down and eventually stabilises, while the pressure drop caused by a leak is linear.

HOW DO YOU KNOW WHEN IT'S THE ADIABATIC PROCESS AND WHEN IT'S A LEAK?

The main difference between the adiabatic process and a leak is that the pressure drop caused by the adiabatic process is bigger in the beginning, then slows down and disappears as the system stabilises. In contrast, the pressure drop caused by a leak is linear and continues at the same rate. Figure 2 demonstrates the difference.

HOW TO AVOID THE ADIABATIC PROCESS

Pressurise slowly

One of the easiest ways to minimise the adiabatic effects is to change the pressure slowly. By doing so, you allow the medium more time to reach the same temperature as its surroundings, minimising any temporary temperature changes. In practice, if you increase the pressure with a hand pump, and you step through several increasing calibration points, this may already be slow enough to avoid seeing the adiabatic process.

If you pump as quickly as you can up to 300 psi (20 bar), then you will most certainly see the effect of the adiabatic process.

Wait after pressurising

After adjusting the pressure, give it some time to stabilise. A minute or two should do the trick. This allows any temperature changes in the medium to reach equilibrium with the ambient conditions, and the pressure will stabilise accordingly.

PRESSURE MEDIA

You can also affect the adiabatic process with your choice of pressure medium. In practice it is of course not always possible to change the medium. Your normal hand pump uses the air as media, but for higher pressure, you may use a hydraulic pump with water or oil as the medium.

The effects of the adiabatic process are generally more prominent in air- or gas-operated calibration pumps than in hydraulic (water or oil) ones. This is mainly due to gas being much more compressible, so the pressure increase will push gas molecules closer together, and this work done in gas is transformed into energy, causing heat. In addition, gas or air has lower thermal conductivity than liquids, so less heat is conducted away from gas.

CONCLUSION

In our service department, we regularly get questions about pressure pumps having leaks, while in most cases it turns out to be the adiabatic process that has made the customer think that there is a leak.

Understanding the adiabatic process and its impact on calibration pressure pumps is crucial for users to avoid misdiagnosing issues. By changing pressure at a moderate pace and allowing adequate time for stabilisation, you can achieve more accurate and consistent results.

This article was originally published on the Beamex blog at https://blog.beamex.com/adiabatic-process-in-pressure-calibration. Beamex products are distributed in Australia by AMS Instrumentation & Calibration Pty Ltd.

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

AMW2024 COMES TO DARLING HARBOUR

AMW2024 is on at ICC Sydney, in Darling Harbour 17–19 April 2024.

Australian Manufacturing Week (AMW2024) is run by the Australian Manufacturing Technology Institute Limited (AMTIL), with the NSW Government as the major sponsor. The event will occupy more than 6560 m^2 of exhibition space at the ICC Sydney, in Darling Harbour. More than 215 organisations have already taken stands to showcase the latest manufacturing technologies, processes and support services.

There will be seven Zones on the show floor of Australian Manufacturing Week, each showcasing its own areas of expertise. These include:

- **The Austech Machine Tools Zone** — specifically targeting the metalworking, machine tool and ancillary market in the global manufacturing space.
- **The Additive Manufacturing Zone** — showcasing various techniques within additive manufacturing include stereolithography, selective laser sintering, material extrusion, sheet lamination, binder jetting, cold spray processing, material jetting, directed energy deposition and many more of the most advanced technologies within this sector.
- **The Australian Manufacturers Pavilion** — showcasing the capabilities of Australia's precision engineering and advanced manufacturing industry. The Australian Manufacturers Pavilion is where AMW2024 celebrates the very best in Australian manufacturing.
- **The Manufacturing Solutions Zone** — offering a concentration of optimised solutions to the most common challenges experienced by manufacturers, from materials handling and warehousing to integrated manufacturing and safety solutions. The Manufacturing Solutions Zone incorporates everything from equipment for materials handling and logistics to safety and software products.
- **The Robotics & Automation Zone** — featuring the latest state-of-the-art equipment and processes for the optimisation of manufacturing operations. There will be industrial robotics, automated solutions, instrumentation and control systems, measurement, pneumatics, IoT solutions, Industry 4.0 and digitalisation.
- **The Weld and Air Solutions Zone** — highlighting advanced welding processes and providing high-quality interactive experiences that demonstrate the latest developments and applications in the welding sector. Welding is critical in metal fabrication and manufacturing. In fact, it is used in creating more than half of all of products manufactured in Australia today.
- **The Plastic Technology Zone** — providing an opportunity to see and feel the latest in plastics machinery, mould-making technologies, recycling materials and the many plastics manufacturing processes. Plastic technology is a specialised branch of study that includes the study of diverse types of chemicals that exhibit plasticity.

Now is the time to register for your attendance at AMW2024. This is the show not to miss in 2024.

Register at www.australianmanufacturingweek.com.au.

Automation in the oil and gas industry

Enhancing efficiency and safety

Ella Averill-Russell, IICA Sydney Branch Manager

Automation has become a transformative force across various industries, and the gas and oil sector is no exception. In Australia, however, the oil and gas industry has been somewhat slow in adopting automation technologies, missing out on the efficiency and safety benefits that come with them.

Benefits of automation

There are a number of benefits of using automation, including enhanced efficiency, improved safety and data-driven decision-making.

Automation streamlines operations by reducing manual intervention. Automated systems excel at performing routine tasks with precision and speed, leading to increased operational efficiency. From drilling to distribution, automation minimises downtime and maximises production.

Safety is paramount in the gas and oil sectors. Automation mitigates the risks associated with hazardous operations by minimising human exposure to dangerous environments. Robots and automated systems handle tasks in extreme conditions, reducing the likelihood of accidents and ensuring worker wellbeing.

Finally, because automation systems generate real-time data, they provide valuable insights into operations. This data can be analysed to optimise processes, predict equipment failures and improve decision-making. Predictive maintenance, for example, allows companies to address potential issues before they lead to costly downtime.

Automation challenges

The application of automation is not without its challenges, however: in cost, workforce adaptation, interoperability and cybersecurity. The significant upfront investment required for implementing automated systems can be a challenge. Companies must weigh these costs against the potential gains in efficiency, safety and profitability. Automation also necessitates a shift in the workforce's skill set, requiring employees to adapt to working alongside automated systems. Training programs are essential to facilitate a smooth transition.

Achieving interoperability between diverse systems, platforms and technologies can also pose a significant hurdle. Existing legacy systems and stringent regulations further complicate the process.

Lastly, as the latest automation technologies heavily rely on digital technologies, the industry faces increased cybersecurity risks. Robust measures are required to safeguard automated systems from potential cyberthreats.

Future trends

The future of automation in the oil and gas industry lies in the integration of advanced AI technologies. AI can optimise decision-making processes, enhance predictive analytics and enable machines to learn and adapt, further improving efficiency and reducing operational risks.

Automation also facilitates the shift towards remote and autonomous operations. Technologies like drones and remotely operated vehicles (ROVs) enable tasks such as inspections and maintenance in challenging environments without direct human involvement.

The industry's efforts to reduce its environmental impact can also be aided by automation. Automated systems optimise energy consumption, minimise waste and improve overall resource efficiency, aligning with global sustainability goals.

Industry insights and corporate support

Automation has become a cornerstone in the evolution of the oil and gas industries, offering benefits from operational efficiency to enhanced safety. Despite challenges, the ongoing integration of advanced technologies and a commitment to addressing issues position the industry for continued growth and innovation.

WHAT'S ON?

February

Engineering Education Australia Virtual Workshop: Pumping system design for engineers
26-29 February 2024
portal.engineersaustralia.org.au/node/52211

IICA TÜV Functional Safety Engineer SIS Training – Perth
27 February - 4 March 2024
Mercure Hotel, Perth
iica.org.au/Web/Web/Events/Event_Display.aspx?EventKey=TUV27FEB

Engineering Education Australia Virtual Workshop: Fundamentals of asset maintenance and reliability management
28 February 2024
portal.engineersaustralia.org.au/node/52226

March

APPEX – Australasian Processing & Packaging Expo
12-15 March 2024
Melbourne Convention and Exhibition Centre
www.appex.com.au/

AOG Energy
13-15 March 2024
Perth Convention & Exhibition Centre
aogexpo.com.au/

IICA TÜV Functional Safety Engineer SIS Training – Brisbane
19-22 March 2024
The Sebel, Brisbane
iica.org.au/Web/Web/Events/Event_Display.aspx?EventKey=TUVMAR24BN

April

Australian Manufacturing Week
17-19 April 2024
ICC Sydney
australianmanufacturingweek.com.au/

Hannover Messe
22-26 April 2024
Exhibition Grounds, Hannover, Germany
www.hannovermesse.de/en

AspenTech OPTIMIZE 24
29 April – 3 May 2024
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THE LAST WORD

THE NEED FOR SPEED

Have you ever spared a thought for how hard modern-day computers are forced to work? Our society simply would not exist without computers being as powerful as they are. And as life becomes ever more digitised, it's certain that the computers we'll need for tomorrow will have to be far more powerful than the ones we use now. Conversely, if we had to rely on the computers we had just a decade or so ago, society as we know it now would not be able to function! Put simply, we don't just need computers, we need fast computers!

Moore's law states that the number of transistors on a microchip doubles every two years, thereby giving a two-fold increase in overall computing power. This observation was made by Gordon Moore, the co-founder of Intel. That this statement was made in 1965 yet remains true today is quite remarkable given all that's happened in the world of computers.

Whether such exponential growth in processing power can be maintained in the longer term remains to be seen. But what is clear is that recent developments, such as the quest for digital transformation and the rise of AI, will require an order of magnitude increase in computational power.

The world of industrial automation is no exception to this. We've already seen a sharp rise in demands for computing power, as users strive for faster production rates to achieve ever greater efficiencies — just to remain competitive.

Fortunately, much hardware development has occurred in computing, especially in the consumer market. Costs for PC hardware have however plateaued, mainly due to the large market size and the intense competition between suppliers. These factors combined have seen buyers get 'more bang for their buck' over the years, and the industrial sector has been able to take full advantage of the latest innovative techniques.

The introduction of multi-threading into industrial controllers has enabled programs to be broken up into tasks, which can in turn be executed cyclically at predetermined intervals. In this way, certain tasks are allowed to execute more regularly than others, whilst maintaining real-time performance.

Similarly, the advent of multi-core CPUs has greatly improved processing speeds by allowing applications to be distributed across several cores within one CPU. More advanced industrial PCs allow programmers to time slice these cores between the operating system and control program. Certain control tasks can then be assigned to specific CPU cores and executed when the control program is active.

Intel's 'Turbo boost' feature, where the speed of individual cores can be set, represents a game changer. Thus far, all CPU cores needed to be clocked at the same rate, but by allowing the rate to be set for individual cores (while monitoring their power consumption and temperature), speed improvements of up to 50% can be achieved.

The constant improvements by CPU manufacturers like Intel and Ryzen are providing new techniques that greatly enhance process automation technology. By utilising CPU resources more effectively, faster execution speeds and better throughput can be achieved. We'll need this even more in the coming years.

Harry Mulder is the Principal Automation Engineer at Beckhoff Automation. He has been involved in industrial automation for over 30 years and is fascinated by how new innovations keep affecting the direction of the industry. He really enjoys the practical element of his job, where he has a chance to get his hands dirty!

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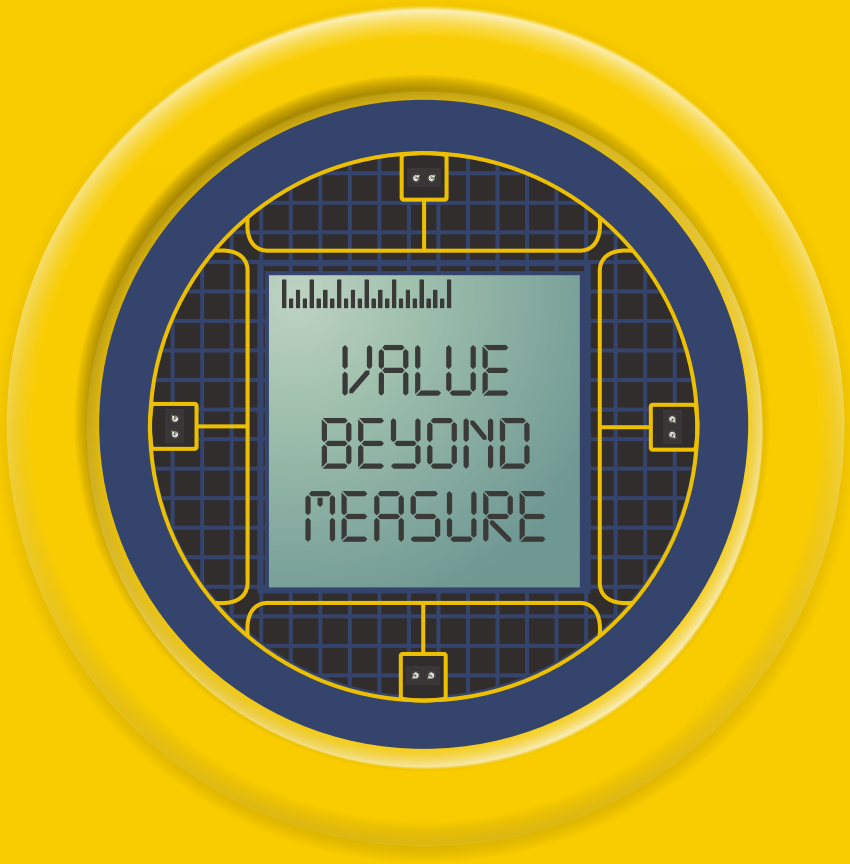

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